

**T.C.
SAKARYA UNIVERSITY
INSITUTION OF SOCIAL SCIENCES
DEPARTMENT OF ISLAMIC ECONOMICS AND FINANCE**

**STAKEHOLDER PRIORITISATION OF GREEN SUKUK
CHALLENGES UNDER UNCERTAINTY: A MIXED-METHODS
STUDY USING BAYESIAN BEST–WORST METHOD**

Mohamed Zakaria FODOL

PHD THESIS

Thesis Supervisor: Assoc. Prof. Hakan ASLAN

AUGUST - 2025

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**“This thesis was defended Face to Face on 04/08/2025 and was unanimously accepted by
the jury members whose names are listed below.”**

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Mohamed Zakaria FODOL

04/08/2025

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In the name of Allah, the Most Gracious, the Most Merciful.

“Indeed, my prayer, my sacrifice, my life and my death are for Allah, the Lord of all the worlds.” (Al-An‘ām: 162)

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Mohamed Zakaria FODOL

04/08/2025

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ABBREVIATION

AAOIFI	: Accounting and Auditing Organization for Islamic Financial Institutions
AHP	: Analytic Hierarchy Process
BWM	: Bayesian Best-Worst Method
BDT	: Bayesian Decision Theory
CDP	: Carbon Disclosure Project
CBI	: Climate Bonds Initiative
CSR	: Corporate Social Responsibility
CR	: Credal Ranking
DEMATEL	: Decision-Making Trial and Evaluation Laboratory
EIA	: Environmental Impact Assessment
EKC	: Environmental Kuznets Curve
EKE	: Expert Knowledge Elicitation
FGD	: Focus Group Discussion
GGT	: Green Growth Theory
GS	: <i>Green Sukuk</i>
GHG	: Greenhouse Gas
GDP	: Gross Domestic Product
GCC	: Gulf Cooperation Council
IPCC	: Intergovernmental Panel on Climate Change
IFRS	: International Financial Reporting Standards
IIFM	: International Islamic Financial Market
IRENA	: International Renewable Energy Agency
IF	: Islamic finance
IFSB	: Islamic Financial Services Board
ISF	: Islamic Social Finance
KAP	: Knowledge, Attitudes, and Practices
MaS	: Maqasid al-Shar'ah
MAP	: Maximum a Posteriori
NPV	: Net Present Value
OIC	: Organization of Islamic Cooperation

PAP	: Principal-Agent Problem
QCA	: Qualitative Comparative Analysis
ROI	: Return on Investment
SSB	: Shariah Supervisory Board
SMEs	: Small and Medium Enterprises
ESG	: Social and Governance
SRI	: Socially Responsible Investment
SEM	: Structured Equation Modelling
SRI	: Sustainable and Responsible Investment
SDGs	: Sustainable Development Goals
TOPSIS	: Technique for Order of Preference by Similarity to Ideal Solution
UAE	: United Arab Emirates
UNEP	: United Nations Environment Programme
WB	: World Bank

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ABSTRACT	
Title of Thesis: Stakeholder Prioritisation of Green Sukuk Challenges Under Uncertainty: A Mixed-Methods Study Using Bayesian Best–Worst Method	
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<i>Green Sukuk</i> is a Shariah-compliant financial innovation designed to fund environmentally sustainable projects, has attracted growing attention as a potential bridge between Islamic finance and global sustainability agendas. However, despite increasing issuances in countries such as Malaysia, Indonesia, and Saudi Arabia, the <i>Green Sukuk</i> market remains limited in scope, uneven in development, and fragmented in governance. This dissertation investigates multidimensional barriers constraining market growth and proposes a structured framework for prioritising and addressing them. This study adopts an integrated methodology that combines systematic and bibliometric literature reviews, expert interviews, and Bayesian Best-Worst Method (BWM) analysis. Literature mapping identifies thematic gaps in conceptual clarity, regulatory coherence, and stakeholder alignment. Qualitative insights from expert interviews uncovered the contextual, institutional, and ethical dynamics shaping the market. The BWM, used here as a probabilistic decision tool, enables nuanced prioritisation of challenges and potential solutions under uncertainty. The findings reveal a set of critical barriers, such as Shariah-Green misalignment, fragmented certification mechanisms, and low investor awareness, that vary in intensity across jurisdictions. The study’s triangulated approach allows for the construction of a stakeholder-informed challenge taxonomy and flexible decision framework applicable to emerging and established Islamic finance contexts. By integrating decision science with ethical and institutional analyses, this study offers practical and conceptual insights into the evolving landscape of Islamic green finance.	
Keywords: <i>Green Sukuk</i> ; Islamic Finance, Sustainable Investment, Multi-Criteria Decision Making (MCDM), Bayesian Best-Worst Method	

ÖZET	
Başlık: Yeşil Sukuk Zorluklarının Belirsizlik Altında Paydaş Önceliklendirmesi: Bayesyen En İyi–En Kötü Yöntemi (BWM) Kullanılarak Karma Yöntemli Bir Çalışma	
Yazar: Mohamed Zakaria FODOL	
Danışman: Doç. Dr. Hakan ASLAN	
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Çevresel açıdan sürdürülebilir projeleri finanse etmek üzere tasarlanmış faizsiz bir finansal yenilik olan Yeşil Sukuk, İslami finans ile küresel sürdürülebilirlik hedefleri arasında bir köprü işlevi görme potansiyeliyle giderek daha fazla ilgi görmektedir. Malezya, Endonezya ve Suudi Arabistan gibi ülkelerdeki artan ihraçlara rağmen, Yeşil Sukuk piyasası halen sınırlı kapsamlı, dengesiz gelişen ve yönetim açısından parçalı bir yapıdadır. Bu tez, piyasayı kısıtlayan çok boyutlu engelleri incelemekte ve bu engellerin önceliklendirilmesine yönelik yapısal bir çerçeve sunmaktadır. Çalışmada sistematik ve bibliyometrik literatür taraması, uzman görüşmelerine dayalı nitel analiz ve Bayesyen En İyiden-En Kötüye Yöntemi (BWM) gibi entegre yöntemler birlikte kullanılmıştır. Literatür analizi, kavramsal netlik, düzenleyici uyum ve paydaş etkileşimi konularında önemli boşlukları ortaya koymaktadır. Uzmanlarla yapılan görüşmeler, piyasayı şekillendiren kurumsal, etik ve bağlamsal dinamikleri açığa çıkarmıştır. BWM ise, belirsizlik ortamında zorlukların ve çözüm seçeneklerinin önceliklendirilmesine olanak sağlayan karar destek aracı olarak bu bağlamda uygulanmıştır. Bulgular, farklı ülkelerde şiddeti değişen temel engelleri—ESG ile Şariat uyumsuzluğu, standart eksikliği, yatırımcı farkındalığının düşük olması gibi—gözler önüne sermektedir. Bu çok yöntemli yaklaşım, paydaş temelli bir zorluk taksonomisi ile esnek bir karar verme çerçevesi geliştirilmesine olanak sağlamıştır. Araştırma, İslami sürdürülebilir finans alanına etik, kurumsal ve karar bilimi boyutlarını bütünleştiren yenilikçi katkılar sunmaktadır.	
Anahtar Kelimeler: Yeşil Sukuk; İslami Finans, Sürdürülebilir Yatırım, Çok Kriterli Karar Verme (ÇKKV), Bayesyen En İyiden-En Kötüye Yöntemi (BWM)	

INTRODUCTION

The accelerating climate crisis is one of the most pressing challenges in contemporary economic and financial systems. The Intergovernmental Panel on Climate Change (Intergovernmental Panel on Climate Change) confirms that anthropogenic greenhouse gas emissions, primarily from fossil fuel combustion and land use change, have unequivocally warmed the atmosphere, oceans, and land, with global surface temperature averaging 1.1°C above pre-industrial levels during 2011–2020 (Intergovernmental Panel on Climate Change, 2023). This warming is already manifested in more frequent and severe heat waves, floods, droughts, and cyclones, along with complex cascading risks such as food insecurity, biodiversity loss, and ecosystem degradation (IPBES, 2019). The interlinkages between climate change, ecological decline, and socioeconomic vulnerability are particularly acute in emerging and developing economies, many of which face elevated exposure to climate hazards while lacking adequate adaptive capacity.

To address these global risks, the Paris Agreement has committed nations to limiting warming to well below 2°C and pursuing efforts to restrict it to 1.5°C, a target that requires achieving global net-zero CO₂ emissions by around the mid-century (United Nations Framework Convention on Climate Change, 2024). Complementary global frameworks such as the United Nations Sustainable Development Goals (SDGs) embed climate action (SDG 13) within a broader sustainability agenda, linking environmental protection with poverty reduction, economic equity, and institutional resilience (United Nations, n.d.). However, as the UN Environment Programme's Emissions Gap Report (2024) notes, current policy trajectories and Nationally Determined Contributions (NDCs) are insufficient, requiring “deep, rapid, and sustained” mitigation efforts in this decade.

Achieving these goals critically depends on closing the climate finance gap. The Intergovernmental Panel on Climate Change (2023) estimates that annual mitigation investments must increase three- to six-fold between now and 2030 to align with 1.5°C-consistent pathways. The Climate Policy Initiative (2024a, 2024b) reports that, while global climate finance reached approximately USD 1.5 trillion annually in 2021–2022, this remains only about one-third of the required flows, with adaptation finance lagging even further behind. This shortfall is especially acute in developing countries, where

capital access is constrained by currency risks, sovereign debt pressures, and underdeveloped domestic capital markets.

Here, capital markets emerge as pivotal conduits for mobilising and allocating resources to low-carbon and climate-resilient infrastructure. Instruments such as green, social, sustainability, and sustainability-linked bonds and, in the Islamic finance context, Green Sukuk offer structured mechanisms to channel investments into environmentally beneficial projects while meeting investor requirements for transparency, accountability, and return (Johnstone, 2023). Green Sukuk, in particular, integrate the ethical principles of Shariah-compliant finance with the environmental objectives of sustainable finance, making them especially relevant for jurisdictions where climate vulnerability intersects with Islamic economic values (Suriani et al., 2024; Ulfah et al., 2024; Zahir, 2024). However, as this dissertation explores, the ability of Green Sukuk to fulfil their potential is contingent on overcoming structural, institutional, and stakeholder-related barriers that currently constrain market expansion and effectiveness.

Situating the Green Sukuk market within the broader climate finance and sustainability landscape, this study recognises that addressing regulatory fragmentation and inconsistencies among multiple standards, including Shariah governance frameworks, local green finance regulations, and global green standards such as the Green Bond Principles and Climate Bonds Standard, fragmented certification mechanisms, and low investor awareness, is not merely a matter of market efficiency (Alnabulsi & Jreisat, 2024; Chapra et al., 2008; Ibrahim & Markom, 2024).

These structural and institutional challenges directly affect the credibility, comparability, and scalability of Green Sukuk, making their resolution integral for meeting global environmental targets. The prioritisation of these barriers, as undertaken in this dissertation through a Bayesian Best–Worst Method (BWM) framework, contributes to aligning Islamic green finance instruments with the urgency and scale of climate transition.

Sustainable Finance and Islamic Finance Synergies

Islamic finance is grounded in the principles and objectives of Shariah (*maqāṣid al-sharīʿah*), which form both its theoretical foundation and operational framework. These principles include prohibition of interest (*riba*), avoidance of excessive uncertainty

(*gharar*), emphasis on asset-backed and risk-sharing transactions, and commitment to ethical investment and distributive justice (Chapra, 1992; Kahf, 2006; Asutay, 2012). Guided by these values, Islamic finance aims to protect life (*hifz al-nafs*), wealth (*hifz al-māl*), faith (*hifz al-dīn*), intellect (*hifz al-‘aql*), and progeny (*hifz al-nasl*), while also safeguarding the environment (*hifz al-bi’ah*) as a moral and legal imperative within the Islamic moral economy (Asutay, 2013; Harun & Rahmat, 2025).

This framework inherently positions Islamic financial products, including Green Sukuk, as socially responsible, environmentally conscious, and economically just. They are designed not only to generate profit within ethical bounds but also to contribute to human well-being, equitable wealth distribution, and the preservation of natural resources. While these objectives overlap with contemporary sustainability concepts, such as ESG integration and the United Nations Sustainable Development Goals (SDGs), the discussion here does not revolve around proving conceptual compatibility. Rather, it focuses on identifying and addressing the regulatory, institutional, and market challenges that hinder Green Sukuk from fulfilling its historical mandate and future potential within the global sustainability finance architecture.

Concept and Definition of Green Sukuk

Green Sukuk are Shariah-compliant investment certificates whose proceeds are earmarked exclusively for projects with verifiable environmental benefits. Their legal and operational structures are defined by Islamic contracts (e.g., *ijarah*, *istisna*, *wakala*) and must comply with recognised Shariah governance standards, such as those issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) or the Islamic Financial Services Board (IFSB) (AAOIFI, n.d.; ICMA, 2022). They are also subject to local and international green finance frameworks, such as Malaysia’s Sustainable and Responsible Investment (SRI) Sukuk Framework, Indonesia’s Green Bond and Green Sukuk Framework, the Green Bond Principles, and the Climate Bonds Standard (Securities Commission Malaysia, 2014; Indonesia MoF, 2018; Climate Bonds Initiative, 2024).

The key features of Green Sukuk include the following.

- Shariah compliant structuring overseen by qualified Shariah supervisory boards.
- Use-of-proceeds restrictions that direct funds solely to pre-approved green projects.

- Asset-backed nature, ensuring investment in tangible, real economic assets.
- Green certification and external review to validate environmental eligibility and impact.

This dual compliance with Shariah standards and green taxonomies offers a unique ethical proposition but also introduces regulatory and procedural complexity. Variations in Shariah interpretations, national green taxonomies, and international certification schemes can increase issuance costs, create operational inefficiencies, and fragment the market challenges that this dissertation addresses through systematic stakeholder prioritisation.

Scope and Eligible Project Categories

Green Sukuk finance a wide range of environmentally sustainable projects aligned with recognised green taxonomies. Common eligible sectors include the following.

- Renewable energy (solar PV, wind, hydropower, and geothermal energy).
- Energy efficiency (building retrofits and efficient manufacturing systems).
- Clean transportation (electric mass transit and low-emission freight system).
- Sustainable water and wastewater management (water recycling and flood resilience infrastructure).
- Green buildings (certified under LEED, BREEAM, or equivalent standards).
- Climate-resilient infrastructure (disaster mitigation and adaptation projects).
- Sustainable agriculture and forestry (reforestation and agroecological systems).

Eligibility criteria are typically detailed in an issuer's Green Sukuk framework, referencing international guidelines such as the Green Bond Principles or Climate Bonds Standard, alongside local regulatory requirements. Proceeds are ring-fenced and issuers are required to report on both allocation and impact, with independent verification often mandated to ensure credibility and transparency (ICMA, 2022; Indonesia MoF, 2018; Securities Commission Malaysia, 2014).

Environmental and Sustainability Contribution

The environmental contribution of Green Sukuk is operationalised through three interrelated mechanisms:

1. Direct environmental benefits include reductions in greenhouse gas emissions, increased renewable energy generation, improved energy efficiency, enhanced water quality, and the restoration of degraded ecosystems.
2. Alignment with global and national climate goals, financing projects that directly support Nationally Determined Contributions (NDCs) under the Paris Agreement, contributing to SDG targets (especially SDGs 7, 11, 12, 13, and 15), and advancing national green growth strategies.
3. Reduction of greenwashing risk through transparent governance, standardised reporting, credible external reviews, and the adoption of clear green taxonomies aligns with both local and international standards.

By mobilising capital for projects that deliver measurable environmental outcomes, Green Sukuk serves as a practical bridge between Islamic financial principles and the urgent demand for climate finance. Their design inherently seeks to avoid activities that harm society or the environment, thereby reinforcing the ethical underpinnings of Islamic finance while contributing to the global transition toward a low-carbon, climate-resilient future.

Research Problem

Despite the increasing global interest in ethical and climate-aligned finance, the *Green Sukuk* market continues to face persistent structural and operational challenges that constrain its growth and credibility. These challenges include fragmented regulatory environments and certification processes, limited awareness among investors, high transaction and structuring costs, especially for new or cross-border issuances, and a general lack of consistent post-issuance reporting frameworks. Together, these issues undermine investor confidence and limit market scalability (Liu & Lai, 2021).

Academic literature has acknowledged many of these challenges, yet most contributions remain descriptive or conceptual. Few studies have moved beyond theoretical discussions to empirically prioritise the most critical obstacles facing the GS ecosystem. Notably, there is a shortage of studies using structured, stakeholder-informed decision frameworks that could provide policymakers and practitioners with actionable insights (Fahad & Areeba, 2022; Harun & Rahmat, 2025). While ESG–Shariah integration is often

mentioned in passing, a more urgent and practical concern lies in the broader misalignment of standards, frameworks, and market expectations across jurisdictions.

Furthermore, a unified understanding of what constitutes a credible "green" financial instrument in the context of Islamic finance is still lacking. National differences in Shariah interpretation and sustainability screening criteria, particularly between Southeast Asia, the Gulf Cooperation Council (GCC), and emerging markets such as Türkiye or Sub-Saharan Africa, have led to inconsistencies that hinder cross-border participation and standardisation efforts (Nik Abdullah & Haron, 2022). This regulatory and definitional ambiguity amplifies risk perceptions among institutional investors and limits the ability of the GS to function as a reliable climate finance tool.

Most critically, the literature has yet to adequately address the multi-stakeholder nature of GS ecosystems. Key actors, including regulators, issuers, Shariah boards, investors, and sustainability verifiers, often operate with differing priorities and incentives. A clear gap remains in applying decision-analytic methodologies that can meaningfully incorporate this diversity of viewpoints, particularly under conditions of uncertainty and competing objectives. Without such tools, field risks remain trapped in high-level debates that lack the precision required to guide policy and product innovation.

Research Subject

This dissertation focuses on the global development of the *Green Sukuk* (GS) market, with a specific focus on identifying, categorising, and prioritising the challenges that inhibit its widespread adoption and operational scalability. Positioned at the intersection of Islamic finance, sustainability, and strategic decision-making, the study investigates *Green Sukuk* not merely as financial instruments, but as ethical tools for financing climate-resilient infrastructure and public goods in Muslim-majority and ethically driven markets.

The subject matter responds to the need for stakeholder-informed diagnosis of the structural, regulatory, and operational bottlenecks that limit *Green Sukuk* performance across diverse jurisdictions. Rather than limiting its scope to ESG–Shariah integration or single-country case studies, this research takes a more systemic view. It considers how fragmented governance, market asymmetries, and verification challenges collectively

undermine the integrity, comparability, and attractiveness of *Green Sukuk* as a climate-finance solution.

Methodologically, the study was anchored in a pragmatic mixed-methods design. It integrates expert-based qualitative insights and a structured multi-criteria decision-making technique, namely, the Best-Worst Method (BWM), to derive a prioritised framework of barriers and strategic responses. In doing so, this dissertation contributes to an emerging strand of sustainable Islamic finance that is both empirically grounded and methodologically innovative.

Geographically, while the scope is global, the analysis draws particular relevance from the experiences of countries at the forefront of Islamic green finance, including Malaysia, Indonesia, the United Arab Emirates, Saudi Arabia, and Türkiye, and select markets in sub-Saharan Africa. These jurisdictions illustrate varying degrees of institutional maturity, regulatory alignment, and market innovation, offering a valuable comparative lens for examining both the common and context-specific challenges in GS implementation.

Essentially, the research subject brings together theory, field-based expertise, and quantitative modelling to generate actionable insights for policymakers, financial institutions, and scholars seeking to scale *Green Sukuk* markets within an ethical, resilient, and inclusive development paradigm.

Study Aim and Purpose

This dissertation addresses these gaps by combining expert interviews with the best–worst method (BWM) to systematically elicit and rank the challenges facing *Green Sukuk* development. The goal is to provide a prioritised, stakeholder-informed roadmap for improving market readiness, structural design, and regulatory coherence in alignment with Islamic ethical principles and global green finance objectives.

Research Objectives and Questions

This dissertation pursues five interrelated research objectives that collectively explore the foundational, empirical, and strategic dimensions of the *Green Sukuk* market. These objectives are:

RO1. To critically examine the conceptual and institutional underpinnings of Green Sukuk within the broader field of Islamic sustainable finance.

RO2: To identify and synthesise the core challenges that hinder the development, credibility, and adoption of Green Sukuk across diverse jurisdictions.

RO3: To explore how experts across regulatory, financial, and scholarly domains perceive these multidimensional constraints, including structural bottlenecks, coordination failures, and ethical–sustainability tensions.

RO4: To evaluate the relative importance of these barriers based on expert-informed prioritisation, highlighting areas of consensus and divergence in stakeholder views.

RO5: To propose and critically evaluate strategic solutions and policy pathways that can strengthen the scalability, governance, and developmental role of Green Sukuk in line with both Islamic values and sustainability imperatives.

These objectives were guided by the following five research questions:

RQ1. What are the underlying theoretical and institutional foundations that shape the design, purpose, and evolution of the *Green Sukuk* market?

RQ2. What are the primary challenges hindering the credibility, scalability, and cross-market adoption of *Green Sukuk* instruments?

RQ3. How do practitioners and domain experts perceive the multidimensional barriers facing *Green Sukuk*, particularly with respect to regulatory coherence, stakeholder coordination, and ethical-sustainability integration?

RQ4. Which of the identified barriers are regarded as most critical by experts and what do these priorities reveal about current market readiness and systemic bottlenecks?

RQ5. What strategic policy directions, institutional innovations, and practical measures can be proposed and assessed to strengthen *Green Sukuk* ecosystems and enhance their alignment with Islamic finance principles and sustainability objectives?

These questions reflect the interdisciplinary scope and operational focus of the study. They span theoretical, empirical, and normative dimensions, and are addressed across multiple chapters using a mixed-methods research design.

Significance and Contribution

This study addresses the urgent need for structured, ethically grounded, and practically informed solutions in the *Green Sukuk* domain. The contributions of this study are threefold.

Theoretical: It integrates Maqāṣid al-Sharī‘ah, Stakeholder Theory, Green Growth Theory, and Bayesian Decision Theory into a novel interdisciplinary framework for sustainable Islamic finance.

Methodological: It introduces the Best-Worst Method (BWM) in this context, offering a decision model that handles expert judgment, consistency, and uncertainty more effectively than traditional ranking tools.

Practical and Policy: It generates a ranked taxonomy of Green Sukuk challenges, validated by experts, and offers actionable policy and market recommendations for cross-border harmonisation, certification simplification, and regulatory coherence.

By situating *Green Sukuk* at the intersection of ethical finance and climate policy, this study provides timely insights for scholars, regulators, issuers, and investors seeking to advance Islamic finance’s contribution to sustainability transition.

Methodological Overview

In this dissertation, pragmatism is employed primarily as a methodological guidance tool and structuring framework for the research process, rather than as a fully adopted philosophical worldview. Its application is therefore practical: guiding the sequencing of methods, the integration of qualitative and quantitative approaches, and the organisation of the dissertation chapters to ensure a logical flow from literature-based exploration to empirical prioritisation and synthesis.

Pragmatism is particularly suitable for applied finance research, in which the primary objective is to produce useful, actionable knowledge for a diverse set of stakeholders. This enables methodological flexibility, allowing the study to draw on different techniques and evidence types to address the multidimensional challenges facing the Green Sukuk market. In this study, pragmatism supports a combination of

1. Systematic Literature Review (SLR) to identify, categorise, and synthesise documented challenges and barriers in the Green Sukuk market through bibliometric mapping and thematic analysis.

2. Expert Interviews (Qualitative Phase) to validate and refine the findings of the SLR, gathering contextual, institutional, and operational perspectives from practitioners and policymakers.
3. Bayesian Best–Worst Method (BWM) Analysis (Quantitative Phase) — to prioritise challenges under uncertainty, producing a comparative ranking informed by expert judgment.

While pragmatism offers methodological versatility and coherence in structuring this dissertation, it is not without limitations. As a philosophical position, it has been criticised for lacking a strong ontological foundation and for prioritising problem solving over deeper theoretical development (Biesta, 2010; Morgan, 2014). From a research methodology perspective, pragmatism’s emphasis on “what works” can risk underemphasising the epistemological tensions between qualitative and quantitative paradigms, potentially leading to superficial integration if not carefully managed. In this dissertation, these risks are mitigated by grounding each methodological phase in established procedures, PRISMA for the SLR, Braun and Clarke’s framework for thematic analysis, and the formal Bayesian BWM model for quantitative prioritisation, ensuring that methodological rigor is maintained despite the flexible overarching framework.

Applied in a targeted and procedural manner, this methodological approach achieves a balance between adaptability and research integrity. The approach allows the investigation to move fluidly from problem exploration to empirical prioritisation while keeping the analytical depth required to generate findings that are both academically robust and practically relevant to stakeholders in Islamic green finance.

Structure of the Dissertation

This dissertation is organised into six main chapters framed by an unnumbered introduction and conclusion. The Introduction outlines the study’s background, problem statement, research objectives and questions, significance, and overall structure.

Chapter 1 presents the *Research Design and Methodology*, detailing the philosophical foundation, the rationale for the embedded mixed-methods approach, and ethical considerations guiding the study.

Chapter 2 develops the *Theoretical and Conceptual Framework*, drawing on Maqāṣid al-Sharī'ah, stakeholder theory, environmental economics, and decision theory, to build the study's analytical lens.

Chapter 3 provides a *Systematic and Bibliometric Literature Review*, mapping the evolution of *Green Sukuk* research, identifying major themes and methodological gaps, and constructing a challenging taxonomy for empirical investigation.

Chapter 4 presents a *Qualitative Analysis*, based on expert interviews and thematic analysis, uncovering stakeholder perspectives on *Green Sukuk* challenges and potential solutions.

Chapter 5 reports *Quantitative Prioritisation* using the Best-Worst Method (BWM), offering a structured ranking of the identified challenges based on expert judgment.

Chapter 6 synthesises insights from both empirical phases, discusses convergence and divergence in stakeholder views, and interprets the broader implications for theory, practice, and policy.

The conclusion, as a final section, summarises key findings, provides strategic policy recommendations, and proposes a forward-looking research agenda for advancing the *Green Sukuk* ecosystem.

CHAPTER 1: RESEARCH DESIGN AND METHODOLOGY

This chapter presents the research design and methodological foundations of the study, situated within the broader goal of identifying and prioritising challenges in the global *Green Sukuk* (GS) market. It offers a coherent roadmap for the conceptualisation, implementation, and validation of the research. All methodological choices—philosophical, strategic, and procedural aligned with the aim of generating context-sensitive, theory-informed, and stakeholder-relevant insights.

The chapter begins with the rationale for adopting a mixed-methods approach, this chapter situates the study within the pragmatist tradition, which values methodological flexibility and practical relevance. It then outlines the sequential integration of expert interviews and the Bayesian Best-Worst Method (BWM), followed by discussions on data sources, expert selection, ethical considerations, and methodological limitations. Collectively, these components underpin a rigorous and transparent enquiry into the institutional, operational, and ethical constraints that shape *Green Sukuk*'s scalability.

1.1. Rationale for the Mixed-Methods Approach

Green Sukuk exists at the intersection of Islamic finance, sustainable investment, regulatory systems, and stakeholder ethics (Rahim & Mohamad, 2018; Rozman & Azmi, 2022; Siddiquee, 2019). Studying this complex ecosystem requires more than a descriptive analysis; it demands a methodologically flexible design capable of capturing both the depth of expert perspectives and the structure of decision-making under uncertainty.

To address this challenge, this study adopted a sequential *exploratory–explanatory* mixed-methods design (Marwan et al., 2024; Zain & Muhamad Sori, 2020). This approach is grounded in the belief that no single method can adequately address the multidimensional barriers in the GS market. The qualitative phase, comprising expert interviews, allows for a grounded understanding of challenges from multiple stakeholder standpoints, including regulators, issuers, investors, and Shariah scholars. These insights are then used to inform the development of a structured quantitative tool, the Bayesian best–worst method, that enables the prioritisation of identified challenges based on expert judgment.

This methodological integration served two strategic purposes. First, it ensures that the research remains contextually anchored, reflecting real-world complexities, rather than abstract generalisations. Second, it enables analytical robustness by modelling (Bin-Armia & Riana, 2023; Hariz et al., 2023) stakeholder consensus and divergence through a decision science lens. Therefore, the mixed-methods approach not only enhances empirical validity but also supports the dissertation's normative aim of proposing feasible, ethically grounded, and stakeholder-informed solutions to unlock the potential of the *Green Sukuk* market.

1.2. Research Philosophy and Methodological Integration

This research is anchored in the philosophical tradition of pragmatism, which offers a practical and flexible foundation for methodological choices. Pragmatism does not seek truth in absolute terms but focuses instead on what works in addressing real-world problems (Biesta, 2010). It values outcomes, relevance, and usefulness over strict adherence to epistemological boundaries. This makes it particularly suitable for a study like this one, which is situated in the applied and evolving field of sustainable Islamic finance, where complexities arise from multiple stakeholder interests, normative commitments, and contextual sensitivities.

One of the core strengths of pragmatism is its capacity to support methodological pluralism. Rather than being locked into a single paradigm, such as positivism or constructivism, pragmatism encourages researchers to use both qualitative and quantitative methods in a way that serves the research purpose (Creswell & Clark, 2017; Creswell & Plano Clark, 2023; Morgan, 2007). Creswell and Clark (2017) emphasize that in mixed methods research, methodological decisions should follow the logic of inquiry: methods are selected based on their appropriateness for answering the research questions, not due to allegiance to a particular worldview (Creswell & Plano Clark, 2023). Similarly, Tashakkori and Teddlie (2010) describe pragmatism as a paradigm that enables researchers to prioritise practical solutions, contextual relevance, and the integration of multiple forms of evidence.

Morgan (2007) offers further support by introducing the concept of abductive reasoning, where the researcher iteratively moves between theory and data. This abductive stance encourages flexibility and ongoing reflection, allowing the researcher to refine both their

understanding and methods as the study unfolds. Biesta (2010) adds that such flexibility is not a weakness but a strength, pragmatism resists rigid methodological orthodoxy and instead insists that methodological choices be evaluated based on their ability to contribute to meaningful understanding.

However, this flexibility has drawn critical attention. Scholars, such as Hampson and McKinley (2023) and Shan (2022), argue that pragmatism, in seeking to accommodate diverse methods and perspectives, may lack a strong normative foundation for making principled design or inference decisions. In some cases, the “what works” criterion can become overly permissive, opening the door to ad hoc or inconsistent reasoning, especially when methodological justifications are not clearly articulated. Without well-defined epistemic criteria, there is a risk that pragmatism will become a convenient label rather than a disciplined research stance.

In mixed-methods applications, critics such as Gobo caution that pragmatism may unintentionally reproduce positivist tendencies, particularly when quantitative dominance or instrumental reasoning overshadows deeper epistemological reflection. Furthermore, Zachariadis et al. (2013) suggest that other paradigms such as critical realism may provide more robust ontological and causal explanations, particularly when dealing with complex, multi-layered social phenomena. These critiques do not negate the utility of pragmatism but underscore the importance of applying it consciously and with epistemic reflexivity. Similar concerns arise in the context of Islamic finance, although they are often more practical than philosophical. Scholars, such as El-Gamal (2006) and Asutay (2007, 2012, 2016), have criticised the industry's pragmatic drift, noting that many financial products prioritise formal Shariah compliance over the deeper moral and developmental aims of the Islamic moral economy. This tension illustrates the limitations of an overly pragmatic orientation when ethical and substantive outcomes are considered for feasibility or marketability. It is important to distinguish this industry-level pragmatism from the philosophical pragmatism used in the research methodology.

Accordingly, this dissertation adopts pragmatism solely as a methodological paradigm, not as an ethical or product design stance. It provides the logical foundation for employing a sequential mixed-methods design that integrates qualitative and quantitative tools, expert interviews and the Bayesian best-worst method, based on their utility in addressing complex stakeholder-based challenges in the Green Sukuk market. Rather than

sidestepping philosophical coherence, this approach uses abductive reasoning and design logic to align methodological choices with research goals while remaining critically aware of pragmatism's limits and the importance of substantive alignment with Islamic ethical values.

Reflecting this philosophy, the study adopts a *mixed methods design* that integrates four distinct but interconnected components:

- 1. Systematic and Bibliometric Literature Review:** These methods provided a foundation for the study by mapping the scholarly landscape of Green Sukuk and sustainable Islamic finance. The SLR, guided by PRISMA standards, ensured methodological transparency, while the bibliometric analysis, using Biblioshing (R-Package), and VOSviewer and R-based tools, revealed thematic clusters, co-occurrence patterns, and knowledge gaps. Together, they informed the development of an initial framework of challenges and opportunities in the field.
- 2. Expert Interviews:** To contextualise and expand upon the findings from the literature, semi-structured interviews were conducted with eight senior experts. These interviews allowed for the incorporation of lived experience and domain expertise, which added richness and depth to the preliminary framework. Data were analysed thematically using Braun and Clarke's (2006) six-phase approach, facilitated by MAXQDA software. This qualitative phase was crucial in grounding the study in practitioner realities and informed the design of the subsequent quantitative tool.
- 3. Bayesian Best-Worst Method (BWM):** To prioritise the barriers and solutions identified in the qualitative phase, this study employed the Bayesian BWM, a probabilistic extension of the classical BWM model (Mohammadi & Rezaei, 2020; Rezaei, 2015). Unlike traditional multi-criteria decision-making (MCDM) techniques such as AHP or TOPSIS, which often rely on deterministic assumptions and perfect consistency among expert judgments, Bayesian BWM accommodates the uncertainty and diversity of expert opinions, which are particularly relevant in complex and context-sensitive domains such as Green Sukuk. While classical BWM simplifies comparisons to "best" and "worst" scenarios to reduce cognitive burden (Rezaei, 2015), it still treats preferences as fixed estimates. Bayesian enhancement addresses this limitation by generating posterior probability distributions for each criterion, enabling outputs such as credal rankings, credible intervals, and dominance matrices

that transparently model uncertainty (Li et al., 2025). The Bayesian BWM, applied in this study as one of the earliest known uses of Islamic sustainable finance, offers a novel and robust approach for identifying where expert consensus and divergence lie, thereby deepening empirical and decision-analytic insights within the field (Mohammadi & Rezaei, 2020).

- 4. Thematic Embedding of Methods:** One of the distinguishing features of this dissertation is its embedded design, methods are presented within the thematic chapters where they are most relevant, rather than in a standalone methodology section. This is a deliberate choice, aligned with the pragmatist view that method should follow purpose and context. As Biesta (2010) and Morgan (2007) argue, method cannot be separated from the knowledge it seeks to produce. Embedding the methods within each analytical chapter allows the reader to follow the research logic organically, understanding each method in direct relation to the question it addresses.

This embedded structure reflects the study's sequential exploratory–explanatory design, where qualitative insights from the literature and expert interviews inform the Bayesian BWM, and the resulting quantitative findings validate the framework within a broader stakeholder context.

By aligning pragmatic philosophy with a mixed and embedded methodology, the research design remains both contextually responsive and analytically rigorous, fulfilling pragmatism's aim to generate useful, grounded knowledge for complex real-world issues (Biesta, 2010; Creswell & Clark, 2017; Morgan, 2007; Tashakkori & Teddlie, 2010).

1.3. Integrated Methodology and Structural Logic

In designing this study, I faced a key decision: should the methodology be isolated into a standalone chapter, or distributed within the substantive chapters? Guided by a pragmatist philosophy and an exploratory–explanatory logic, I chose a *distributed methodological integration*. This approach aligns with best practices in applied mixed-methods research and respects the complexity of the *Green Sukuk* market, a domain shaped by ethical, institutional, financial, and stakeholder dynamics.

Pragmatism, as a research paradigm, prioritizes the practical relevance of methods to real-world problems (Creswell & Clark, 2017). It rejects rigid methodology in favor of

approaches that yield the most meaningful insights for the issue at hand. In this study, each method was chosen and embedded to explore a specific layer of inquiry:

- The *bibliometric and systematic literature review* appear in Chapter 3 to situate the *green sukuk* concept within sustainability and Islamic finance literature. By analysing publication patterns and thematic gaps, this phase identifies where empirical and theoretical contributions can be made.
- The *expert interviews* are introduced and methodologically justified in Chapter 4. Their interpretive depth helps uncover nuanced stakeholder perspectives, rich, contextual narratives that would be disconnected if abstracted into a separate methods section.
- The *Bayesian Best-Worst Method (BWM)* is fully explained and applied in Chapter 5. This latest advancement in multi-criteria decision making (Mohammadi & Rezaei, 2020) was selected over traditional AHP or Delphi methods because it integrates probabilistic modelling of expert uncertainty, supports smaller sample sizes effectively, and enables richer policy-oriented prioritisation.

By embedding methods where they are used, the reader remains oriented to both ‘*what*’ was done and ‘*why*’ it was relevant at each stage. This fosters narrative clarity and intellectual coherence, avoiding the artificial separation of method and meaning.

Notably, this sequence follows an exploratory–explanatory design: qualitative insights first identify challenges; quantitative Bayesian modelling then confirms and ranks these issues with statistical rigor. The integration culminates in Chapter 6, where qualitative depth and quantitative structure are synthesized to produce theoretical insights and stakeholder pathways, and set the foundation for policy proposals in the conclusion section.

Thus, the distributed integration of methods is more than a stylistic choice, it is a principled, philosophically grounded strategy that enhances transparency, supports reader engagement, and reflects the iterative nature of mixed-methods research (Creswell & Clark, 2017).

1.4. Justifying Methodological Choices and Sample Adequacy

The integrity of this research design rests not only on philosophical grounding and procedural logic but also on the credibility and robustness of the empirical techniques

employed, particularly the expert interview phase and the subsequent Bayesian Best-Worst Method (BWM) application. Given the relatively small but targeted sample sizes, it is necessary to address the rationale and validity of these methodological decisions within the context of the study's aims and epistemic orientation.

At the core of this dissertation lies a precise and practical objective: to identify, validate, and prioritise the key challenges and barriers hindering the development of the Green Sukuk market and proposing stakeholder-informed solutions. This mission required a research design that was logically tied to decision-oriented modelling, not to general population inference. Therefore, methodological rigor in this context is evaluated based on fitness for purpose, construct clarity, and decision relevance, not conventional criteria of sample representativeness or saturation in isolation.

The qualitative phase, discussed in Chapter 4, involved eight expert interviews purposively selected from a pool of thirteen validated candidates based on their domain expertise, institutional role diversity (regulators, issuers, investors, and scholars), and regional representation. These interviews were conducted after an extensive bibliometric and systematic literature review (Chapter 3), which provided a foundation for identifying the preliminary challenge categories and gaps in the Green Sukuk market. The interviews served to validate, refine, and contextualise the literature-derived findings. According to Braun and Clarke's (2006) six-step thematic analysis protocol Malterud et al. (2016) concept of *information power*, this sample size was conceptually appropriate and analytically sufficient.

Since the interviews in this study were not ethnographic but instrumental and designed to refine and verify decision criteria, the endpoint of data collection was determined by conceptual convergence rather than ethnographic depth. As Guest et al. (2006) observed, smaller samples may yield valid and reliable results when the research topic is specific, and the sample is expert based. Indeed, this study's thematic saturation was achieved when additional interviews no longer yielded substantially new data, a point that supports both the adequacy and parsimony of the design.

In the quantitative phase, presented in Chapter 5, the BWM questionnaire was completed by 21 of the 25 invited Green Sukuk professionals. This sample size aligns well with the method's own technical assumptions and literature precedents, where panels of 15–30 experts are not only common but also optimal (Rezaei, 2016; Mohammadi & Rezaei,

2020). Unlike traditional methods such as AHP or Delphi, Bayesian BWM is specifically designed to work with smaller expert panels by leveraging posterior probability distributions and minimising the cognitive burden through structured pairwise comparison. The method thus offers both statistical robustness and policy interpretability, making it especially suited to small-sample, high-expertise contexts, such as Islamic sustainable finance (Hariz et al., 2023; Li et al., 2020).

Importantly, the qualitative and quantitative phases were not disconnected but were sequentially integrated. The interview findings directly informed the development of the structured criteria used in the BWM model, thereby ensuring that the quantitative analysis reflected the contextual realities of the field. In turn, the Bayesian BWM converted these validated challenges into a credal ranking framework, capturing both expert consensus and uncertainty in prioritisation. This design aligns with the sequential exploratory–explanatory typology in mixed methods research (Creswell & Plano Clark, 2023) and upholds the pragmatic paradigm’s central commitment to problem solving, contextual fit, and flexible integration (Johnson & Onwuegbuzie, 2004; Morgan, 2007).

In sum, the methodological choices in this dissertation are not only justified, but *also optimal* within the study’s conceptual boundaries and decision science orientation. The expert interviews provided depth, structure, and contextual fidelity (Chapter 4), while the Bayesian BWM offered analytical rigor and policy relevance (Chapter 5). Rather than rigidly applying traditional mixed-methods metrics, this design reflects methodologically principled pragmatism, in which validity is judged by the appropriateness, coherence, and practical utility of the chosen tools in addressing the research question.

Figure 1 illustrates the logical flow of the research design grounded in pragmatic philosophy. Beginning with a foundation of methodological pluralism, the study adopts a mixed methods approach, integrating systematic literature review, expert interviews, and Bayesian Best-Worst Method. These components are embedded thematically across chapters, supporting a sequential exploratory–explanatory design that culminates in a coherent and context-responsive research framework.

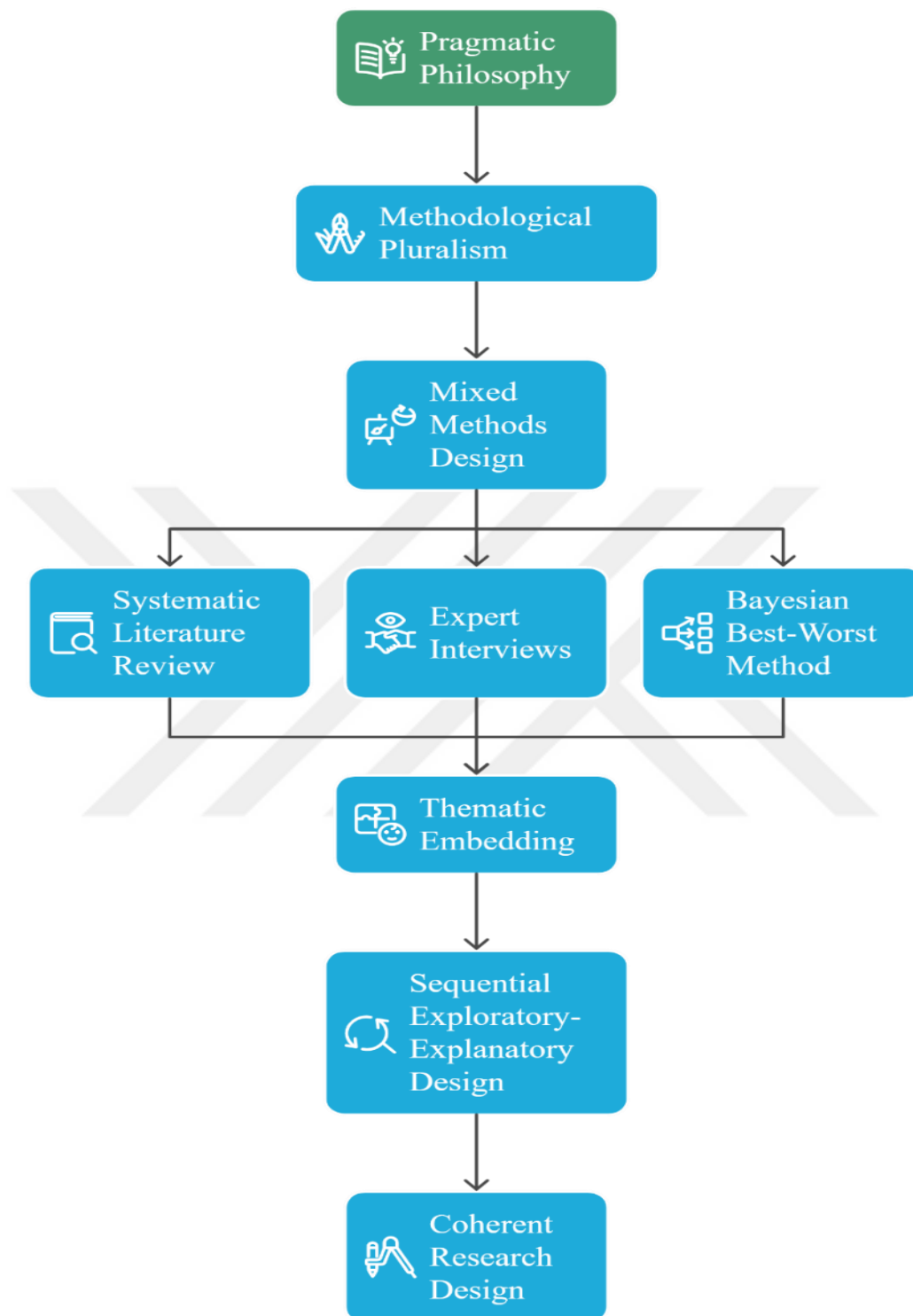


Figure 1: Framework of the Research Design Aligned with Pragmatic Philosophy

Source: Author's own elaboration using Napkin.ai.

1.5. Data Sources and Expert Selection

This study draws on two primary empirical data sources: semi-structured expert interviews and structured prioritisation surveys using the Best-Worst Method (BWM). In both phases, participants were purposively selected based on their expertise in Islamic finance, green finance, sustainability certification, and regulatory practice. The rationale for relying on expert judgment stems from the study's aim of exploring nuanced institutional, ethical, and operational challenges that are often inaccessible through standard datasets or general public surveys.

In the *qualitative phase*, eight experts (out of 13) were interviewed between August and November 2024. They represent a diverse mix of institutions, including regulatory bodies, Islamic finance consultancies, green finance advisory firms, Shariah boards, and international development agencies. Geographic diversity was also considered, with participants drawn from Southeast Asia, Gulf Cooperation Council (GCC) countries, Türkiye, and Africa. This heterogeneity was essential for ensuring that the data reflected multiple institutional logics and contextual variations in the *Green Sukuk* (GS) ecosystem. For the quantitative phase, a subset of validated experts from the same or similar domains participated in a structured BWM survey to prioritise the challenges identified in earlier stages. Although limited, the sample size was appropriate for the BWM methodology, which was specifically designed to yield robust insights from small expert panels (Mohammadi & Rezaei, 2020; Rezaei, 2015). In both phases, participants were selected based on the following criteria: (i) professional experience of at least five years, (Shafii et al.) demonstrated engagement in Islamic or sustainable finance initiatives, and (iii) institutional role in shaping or assessing green financial products.

1.6. Research Ethics and Integrity

Ethical integrity is a guiding principle of the research process. All participants were provided with clear written information about the study's purpose, role, and right to withdraw at any time. Informed consent was obtained prior to the interviews and survey responses. The study was approved by the institutional research ethics committee, ensuring that the data collection procedures complied with relevant standards for confidentiality and participant protection.

Data from the interviews were anonymised and stored securely using encrypted digital systems. Identifiers were removed during transcription and reporting to protect the respondents' identities. In the BWM phase, survey responses are collected using password-protected platforms with no personally identifiable information.

Several strategies have been employed to address potential bias and ensure analytical neutrality. In the qualitative phase, reflexivity was maintained through journaling during data collection and engaging in peer debriefing. A thematic analysis was conducted systematically using Braun and Clarke's (2006) six-phase method to ensure transparency and consistency. In the quantitative phase, the use of Bayesian BWM helped mitigate bias by incorporating uncertainty into expert judgments, allowing for probabilistic modelling rather than fixed-point estimates.

1.7. Methodological Limitations

Despite its methodological strengths, this study has several limitations. The qualitative phase was based on a purposive sample of eight experts. Although this number is acceptable for thematic saturation in expert-focused studies —meaning that additional interviews beyond this point were unlikely to produce new themes/criteria or insights (as discussed in Section 1.4, Chapter 1)— it does not represent the full spectrum of perspectives across all markets where *Green Sukuk* are issued. Second, expert interviews inherently carry a risk of interpretive bias. Although thematic coding was conducted rigorously, the complete elimination of interpretive subjectivity is not feasible in qualitative analysis, as the process inherently involves researcher judgment when categorising and synthesising data.

To mitigate this, coding was conducted systematically in MaxQDA using its structured code system, memoing functions, and retrieval tools to ensure the transparency, consistency, and traceability of coding decisions. Coded outputs and emerging themes were subsequently reviewed and discussed with the monitoring thesis committee to validate the interpretations and refine the category boundaries. These measures substantially reduced the potential for bias, although some degree of interpretation remained inherent in the qualitative process.

Third, the quantitative BWM phase, while methodologically robust, relies on a relatively small pool of expert participants. Although this is consistent with best practices in multi-

criteria decision-making involving specialist input (Rezaei, 2015), it limits the generalisability of findings beyond the studied contexts. Finally, embedded design, while offering narrative coherence, makes it more challenging to isolate and replicate individual methodological components outside their thematic chapters.

To address these limitations, this study applied triangulation by integrating evidence from an extensive systematic literature review, expert interviews analysed through thematic coding in MaxQDA, and quantitative prioritisation using the Bayesian Best–Worst Method (BWM). Transparency was maintained by documenting all coding decisions in a structured codebook, utilising MaxQDA’s audit trail and memoing functions, and implementing clearly defined replicable modelling steps for the BWM. All findings were framed within the boundaries of their empirical scope, with the aim not to generalise to all contexts, but to provide credible, context-rich, and practically relevant insights for policymakers and practitioners in Islamic sustainable finance.

Overall, this chapter outlined the study’s methodological design, guided by a pragmatist philosophy that supports integrating qualitative and quantitative approaches. A sequential mixed-methods strategy, starting with expert interviews followed by BWM prioritisation, was used to reflect the complexity of the *Green Sukuk* market. The methods were embedded within relevant chapters to enhance contextual relevance and coherence. The next section introduces the theoretical and conceptual foundations of this study.

CHAPTER 2: THEORETICAL BACKGROUND

This chapter sets out the theoretical foundations that frame the analysis of the key challenges in the GS market. Addressing these challenges requires an interdisciplinary approach that integrates ethical principles, economic development logic, stakeholder dynamics, and structured decision making under uncertainty.

These four core theories form the basis of this study. *Maqasid al-Shariah* offers a normative foundation, linking Islamic finance to broader environmental and social objectives. *Green Growth Theory* frames sustainability as a driver of economic development, supporting the role of financial instruments in mobilising green investments. *Stakeholder Theory* highlights the interdependence of actors, such as issuers, regulators, and investors, in shaping market functionality and trust. *Bayesian Decision Theory* provides a methodological basis for prioritising challenges through expert judgment and structured comparison.

Together, these theories offer a coherent lens for analysing *Green Sukuk* development barriers from ethical, structural, and operational perspectives. The next section discusses each of these in turn.

2.1. Islamic Finance and Maqasid al-Shariah

Islamic finance is a faith-based financial system governed by the rules and ethics of *Shariah* Islamic law, which offers a distinctive alternative to the conventional interest-based financial system (Zahir, 2024). At its core, Islamic finance promotes justice, transparency, and shared prosperity by ensuring that all financial transactions are rooted in the real economy and serve public interest. Rather than being limited to the Muslim world, Islamic finance is increasingly viewed as a form of ethical and responsible finance with applications that resonate globally, particularly in the context of sustainability and social impact (Fahad & Areeba, 2022).

The foundational principles of Islamic finance emerge from *fiqh al-mu'āmalāt* (Islamic commercial jurisprudence) and include the following key pillars.

- 1. Prohibition of *riba* (interest):** The charging or paying of interest is strictly forbidden as money is not seen as a commodity that can generate profit on its own. Instead, profits must be derived from genuine economic activities that involve risk and effort.

2. **Avoidance of *gharar* (excessive uncertainty):** Contracts involving ambiguity or speculative elements are prohibited to protect the interests of all parties and to promote contractual clarity.
3. **Ban on *maysir* (gambling or speculation):** Investments must not involve high-risk speculative behaviour that resembles gambling or betting on uncertain outcomes.
4. **Profit and loss sharing (PLS):** Financial transactions should be based on partnerships where both risks and rewards are shared fairly. This is mostly implemented through the *Mudarabah* and *Musharakah* contracts.
5. **Asset backing and real economic linkages:** Every financial contract must be tied to a tangible asset or service, reinforcing the connection between finance and real economic value.
6. **Ethical and socially responsible investment:** Transactions involving prohibited (haram) industries such as alcohol, weapons, pornography, and gambling are not permitted. Instead, Islamic finance prioritises investments that contribute positively to society.

These principles aim to establish a just and stable financial environment that reduces systemic risks and supports the equitable distribution of wealth. As such, Islamic finance serves not only religious obligations, but also broader social and economic objectives.

Over time, a wide range of financial instruments have been developed to operationalise these principles. These instruments can be broadly classified into three categories.

Equity-based instruments: These include *musharakah* (joint ventures) and *mudarabah* (profit-sharing investment partnerships). In these arrangements, capital providers and entrepreneurs share profits and losses according to their agreed upon ratios. These contracts promote entrepreneurship and risk-sharing, aligning the interests of all parties (Zahir, 2024).

Trade-based instruments: Contracts such as *Murabaha* (cost-plus sale), *Salam* (advance payment for future delivery), and *Istisna'* (manufacturing or construction financing) allow institutions to provide financing while maintaining compliance with Shariah principles. These instruments are often used for consumer financing, real estate, and commodity trading (Abdullah & Keshminder, 2022).

Lease-based instruments: *Ijarah* contracts allow for the transfer of the right to use an asset in exchange for rent. They are widely used in vehicle leasing, equipment financing, and infrastructure projects (Ibrahim & Shirazi, 2020).

Each instrument is structured to ensure transparency, fairness, and compliance with ethical standards. Importantly, they all reflect a departure from interest-based lending, positioning Islamic finance as a system rooted in partnerships and productivity.

With these instruments in place, Islamic finance has grown into a vibrant ecosystem composed of diverse market segments including Islamic banking, Islamic capital markets, Islamic investment funds, and *takaful* (Islamic insurance). In particular, the Islamic capital market has played a vital role in enabling long-term financing of public and private sector projects. Unlike conventional capital markets, which rely heavily on interest-bearing bonds, Islamic capital markets mobilise resources through Shariah-compliant instruments, such as Sukuk (Ibrahim & Shirazi, 2020).

Supporting this financial system is a dynamic stakeholder network. These include:

- **Islamic financial institutions:** banks, asset managers, and insurers that design, offer, and manage Shariah-compliant products.
- **Shariah supervisory boards:** Panels of qualified scholars who review and approve financial products and ensure alignment with Islamic law.
- **Regulatory authorities:** Central banks and securities commissions that provide legal frameworks for market development and investor protection.
- **Standard-setting bodies:** International organisations, such as AAOIFI and IFSB, establish accounting, governance, and prudential standards for Islamic finance.
- **Multilateral institutions:** Entities such as the Islamic Development Bank (IsDB), which promotes sector development and issues their own Shariah-compliant instruments.
- **Supporting actors:** Legal advisors, rating agencies, verification bodies, and auditors that contribute to the credibility and operational integrity of the system.
- **Scholars and research institutions:** Academic and think-tank communities that contribute to intellectual development, legal interpretation, and innovation in Islamic financial thought.

Together, these actors form a robust ecosystem that enables consistent and ethical functioning of Islamic financial markets (Fahad & Areeba, 2022; Noordin et al., 2018).

2.1.1. Sukuk: Concept, Structure, and Role

A central innovation within this ecosystem, particularly in the field of Islamic capital markets, is Sukuk, a financial instrument that enables governments and corporations to raise funds in a Shariah compliant manner. Often referred to as the Islamic counterpart of conventional bonds, Sukuk serves a similar economic purpose: mobilising long-term capital for infrastructure, public services, and development projects. However, they differ fundamentally in their structures, risk-sharing mechanisms, and legal forms.

Sukuk are structured around real assets or investment activities rather than debt obligations. Investors in Sukuk hold ownership rights, whether in tangible assets, usufructs (the right to benefit from an asset), or cash flows generated by a project (Zahir, 2024). This asset-based nature ensures compliance with Islamic finance's prohibition on interest and insistence on value creation.

The most common contractual structures used in Sukuk include Ijarah (lease-based), Murabaha (cost-plus), Musharakah (joint venture), Mudarabah (profit-sharing), and Istisna' (construction-based) arrangements (Zain & Muhamad Sori, 2020). This enables issuers to design instruments tailored to various sectors and project types while maintaining religious compliance.

This structure ensures alignment with the Shariah principles, particularly the prohibition of interest (*riba*) and the requirement that all financial activities must be linked to real economic transactions (Noordin et al., 2018).

According to the ISRA textbook *Islamic Financial System: Principles and Operation* (Muhammad & Ahmed, 2016), Sukuk issuance typically involves the following key components:

- 1. Special Purpose Vehicle (SPV):** A legally independent entity created to hold the underlying asset and issue Sukuk certificates to investors.
- 2. Underlying Asset:** A tangible or income-generating asset (e.g. infrastructure project, real estate, leased equipment) forms the economic basis of a transaction.
- 3. Contractual Structure:** Sukuk are structured using Shariah-compliant contracts, such as:
 - *Ijarah* (lease-based Sukuk): Investors earn rental income from leased assets.
 - *Murabaha* (cost-plus sale): Used in trade financing, where profits are predetermined.

- *Musharakah* and *Mudarabah* (PLS-based Sukuk): Investors share profits (and potential losses) from a business or project.
- *Istisna* (construction-based): Applied to infrastructure projects, where funds are used to build an asset over time.

4. Payment Flow: Investors receive periodic profit distributions (not interest) and are repaid the principal at maturity, typically from the proceeds of the underlying asset.

An important feature of Sukuk is that it creates a direct link between capital markets and real economic activities. By ensuring that capital is invested in productive Shariah-compliant projects, Sukuk embodies the Islamic financial principle of value creation with social responsibility. This makes them particularly attractive for infrastructure development, housing, healthcare, and other public benefit initiatives.

The global Sukuk market has witnessed rapid growth, particularly in jurisdictions such as Malaysia, Indonesia, Saudi Arabia, the United Arab Emirates, and Pakistan. Sovereign Sukuk, issued by national governments, has become a popular instrument for public finance, while corporate Sukuk are increasingly being used by companies seeking alternative sources of capital.

According to Zulkhibri (2015), the expansion of Sukuk has been facilitated by supportive regulatory frameworks, standardisation of contract templates, and growing investor demand for ethical, asset-backed securities. However, challenges remain in areas such as cross-border harmonisation, liquidity, and rating methodologies.

Most relevant to this study is the emergence of a new generation of Sukuk aligned with environmental objectives, which is now termed ***Green Sukuk***. These instruments are designed not only to comply with *Shariah* but also to meet international environmental finance standards (fadzli, 2024).

However, before exploring *Green Sukuk* and its market challenges, it is critical to examine the ethical and normative foundation that makes such innovation meaningful in Islamic finance, namely the framework of *Maqasid al-Shariah*.

Figure 2 summarises the key building blocks of Sukuk, including their core components (SPV, asset backing, and payment flow) and various Shariah-compliant contractual structures (*Ijarah*, *Murabaha*, and *Mudarabah*). Their primary development objectives include infrastructure, housing, and health care.

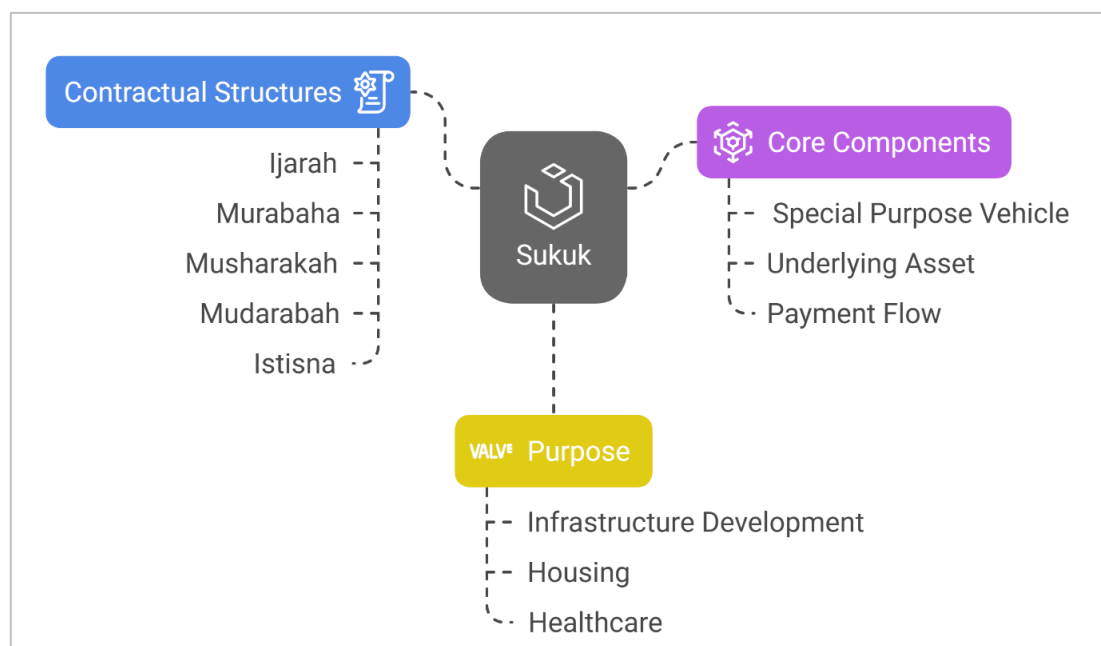


Figure 2: Structural Elements and Functions of Sukuk Instruments

Source: Author's Compilation using Napkin.ai

2.1.2. Maqasid Al-Shariah as a Theoretical Lens

As Islamic finance continues to evolve and intersect with global sustainability imperatives, there is an increasing call to revisit its ethical roots, not merely to comply with technical legal rulings but to rediscover its transformative moral potential. Thus, the concept of *Maqasid al-Shariah*, the higher objective of Islamic law, become profoundly important (Suriani et al., 2024).

It provides an ethical scaffolding for Islamic finance to meaningfully contribute to human well-being, ecological balance, and social justice. *Green Sukuk*, as instruments designed to mobilise capital for environmentally beneficial projects, embody this convergence between faith and global responsibility.

Maqasid al-Shariah refers to the overarching goals of Shariah that aim to promote public benefit (*maslahah*) and prevent harm (*mafsadah*) (Rahman et al., 2024; Suriani et al., 2024). Rooted in the intellectual heritage of scholars like Imam al-Ghazali and Imam al-Shatibi, classical maqasid theory identifies five essential objectives known as *al-daruriyyat al-khamsah*:

- 1. Preservation of Religion (ḥifẓ al-dīn):** Upholding faith, moral order, and freedom of religious practice.

2. **Preservation of Life (ḥifẓ al-naḥs):** protecting human safety, health, and well-being.
3. **Preservation of Intellect (ḥifẓ al-‘aql):** Promotes education, critical thinking, and rational governance.
4. **Preservation of Lineage (ḥifẓ al-nasl):** Ensuring family integrity and social cohesion.
5. **Preservation of Wealth (ḥifẓ al-māl):** Securing economic rights and ensuring resource utilisation.

Recent scholarship increasingly recognises the sixth objective: *ḥifẓ al-bi’ah*, or the preservation of the environment (Mangunjaya, 2023). As humanity grapples with climate change, biodiversity collapse, and resource depletion, scholars have argued that safeguarding the natural environment has become a foundational prerequisite for fulfilling all other areas (Haris et al., 2024).

Islamic teachings strongly emphasise environmental stewardship. The Qur’an repeatedly reminds humanity of its role as a *khalīfah* (steward) on earth (Qur’an 2:30) and warns against corruption (*fasād*) on the land (Qur’an 30:41). In this light, *ḥifẓ al-bi’ah* is not merely a modern reinterpretation; it is an ethical rediscovery rooted in the spirit of Islam. According to Mangunjaya (2023), this principle requires communities to avoid waste, preserve ecosystems, and act with a view towards intergenerational justice.

When seen through this *maqasidic lens*, environmental degradation is not just a scientific or policy concern; it is also a moral crisis. It threatens the protection of life through pollution and climate-induced disasters; it undermines the preservation of wealth by degrading productive land and natural assets, and weakens societal stability, thereby affecting lineage and intellect. Thus, integrating *ḥifẓ al-bi’ah* into the *Maqasid framework* gives Islamic finance a renewed purpose—to act as a vehicle for ecological renewal and ethical transformation (Agustina, 2023; Ibrahim & Markom, 2024).

Green Sukuk represent a practical application of this expanded *maqasid*. By financing projects, such as renewable energy plants, forest conservation, and clean water infrastructure, they operationalise the goal of environmental protection within a Shariah-compliant structure (Abdullah & Nayan, 2020; Supriyadi & Fidhayanti, 2023). More importantly, they embody the spirit of ethical investment, ensuring that the mobilisation of capital reflects not only the rules of halal transactions but also the broader values of *ṭayyib*: that which is good, pure, and beneficial (Bin-Armia & Riana, 2023; Faizi et al., 2024).

Within this paradigm, the success of *Green Sukuk* should not be measured solely by market uptake or issuance volume. It should be judged based on the extent to which it protects human life, preserves natural resources, and secures the rights of the future generations. As noted by Asutay (2012), true Islamic finance must transcend legal forms to deliver social substance. When grounded in *maqasid*, especially *hifz al-bi'ah*, Islamic finance becomes not only compliant, but compassionate, just, and forward-looking.

In summary, *Maqasid al-Shariah*, including environmental protection, served as the primary theoretical lens for this study. It not only legitimises the structure and function of *Green Sukuk* but also frames their purpose as a contribution to the broader Islamic vision of holistic sustainability. This framework will be instrumental in evaluating both the structural barriers and normative potential of *Green Sukuk* in the following chapters.

2.2. Green Growth Theory and Green Finance

Green finance refers to a set of financial instruments, policies, and frameworks that are designed to support environmentally sustainable development. This involves mobilising capital for projects that reduce greenhouse gas emissions, improve resource efficiency, protect biodiversity, and strengthen climate resilience. These include investments in renewable energy, green buildings, clean transportation, reforestation, and sustainable agriculture (Indicators, 2011). Green finance can be operationalised through diverse channels such as green bonds, sustainability-linked loans, green investment funds, and public climate finance mechanisms. Its primary objective is to align financial flows with climate and environmental goals, especially under frameworks such as the Paris Agreement and UN SDGs (Raimi et al., 2024).

Green Growth Theory (GGT) emerged in the late 2000s as a strategic response to the long-standing tension between economic development and environmental preservation. It gained global traction through the Organisation for Economic Co-operation and Development (Indicators), the World Bank, and the United Nations Environment Programme (United Nations Environment Programme), and was formally introduced through the OECD's 2011 report *on green growth*. The theory was heavily influenced by economists such as Cameron Hepburn, Stéphane Hallegatte, and others, who argued for an integrated model of sustainable development that prioritises growth through resource

efficiency, innovation, and environmental protection (Hallegatte et al., 2012; Indicators, 2011).

At its core, GGT challenges the conventional paradigm, which views environmental regulations as a cost to growth. Instead, it proposes a transformative development model, in which environmental sustainability becomes an engine, not a constraint, of economic progress. The central hypothesis is that growth and sustainability can be decoupled, that is, economies can continue to grow while reducing their environmental footprint through green investments and structural reforms. However, this hypothesis operates firmly within a pro-growth economic paradigm and does not directly address critiques of ethical economics and Islamic economic thought that question the ethical desirability, distributive justice, and long-term viability of perpetual economic expansion (Chapra, 1992 (Asutay, 2012 #175)) (Asutay, 2012).

In particular, the degrowth and post-growth schools argue that absolute decoupling on a global scale is yet to be empirically demonstrated, warning that efficiency gains often lead to rebound effects (Hickel & Kallis, 2020). From an Islamic finance perspective, the emphasis on *falah* (human well-being) and the *maqasid al-shariah* (objectives of Shariah) implies that economic activity should be evaluated not only by its capacity to grow but also by its ability to promote justice, equity, and stewardship of the Earth (Asutay, 2013).

The key principles of GGT include the following:

- Decoupling growth from harm by enhancing energy efficiency and adopting low-carbon technologies.
- Innovation-led investment in renewable energy, circular economy models, and sustainable business practices.
- Inclusive green transition that supports job creation, public health, and reduced inequality.
- Policy reform through carbon pricing, green taxonomies, and institutional alignment.
- Natural capital preservation by recognising the value of ecosystem services in economic planning (OECD, 2020).

Unlike models that treat sustainability as a constraint (Environmental Kuznets Curve) or result of failure (market failure), GGT offers a proactive framework for integrating ecological priorities into national policy and finance.

2.2.1. Relevance to Islamic Finance and *Green Sukuk*

Green Growth Theory aligns closely with Islamic finance when stripped of interest-based or speculative elements. While GGT is a contemporary policy framework, its core values, public benefit, resource stewardship, and human welfare, echo long-standing Shariah objectives such as *maslahah*, *hifz al-māl*, and *hifz al-nafs*.

Green Sukuk exemplifies this alignment by financing projects like renewable energy and sustainable infrastructure in a Shariah-compliant manner. These instruments mobilise ethical capital toward environmental outcomes, reinforcing both Islamic moral imperatives and national sustainability goals (Fahad & Areeba, 2022).

In contrast to other models such as the Environmental Kuznets Curve or Market Failure Theory, GGT provides a forward-looking, action-oriented lens. It frames *Green Sukuk* not just as faith-based tools but as strategic levers for policy reform, innovation, and inclusive green development, especially evident in pioneering cases such as Malaysia and Indonesia.

2.3. Stakeholder Theory and Sustainability Dynamics

The stakeholder Theory (ST) is a foundational concept in business ethics and organizational management that expands the traditional notion of corporate responsibility beyond shareholders. Freeman (1984) introduced the stakeholder theory as a framework for redefining the purpose of the firm beyond shareholder primacy. Freeman asserts that organisations, whether corporations, public institutions, or even financial systems, should consider the interests and well-being of all parties affected by their actions (Freeman, 2010; Freeman et al., 2021).

A “stakeholder” is broadly defined as any individual, group, or institution that can affect or be affected by the objectives, operations, or outcomes of an organisation. These include internal actors (employees, managers, and shareholders) and external actors (customers, regulators, suppliers, communities, NGOs, and the environment). Stakeholder Theory challenges the narrow profit-maximising logic of shareholder capitalism by proposing that long-term success and legitimacy arise from balancing diverse interests, building trust, and fostering collaborative relationships (Donaldson & Preston, 1995).

This theory has become particularly influential in sustainability-linked finance, in which outcomes are inherently multidimensional. In green finance, for example, investment

success is no longer measured solely by financial returns but also by environmental and social impacts. Consequently, financial instruments such as green bonds and *Green Sukuk* must address the expectations of a broad and often fragmented set of stakeholders, each with different priorities, regulatory mandates, and ethical values (Sullivan & Mackenzie, 2017).

2.3.1. Applying Stakeholder Theory to the *Green Sukuk* Ecosystem

In the context of *Green Sukuk*, Stakeholder Theory provides a valuable lens through which to understand the complexities of market development, adoption and legitimacy. The issuance, verification, and successful implementation of *green sukuk* depend on the coordinated efforts of multiple interdependent actors. Key stakeholders in the GS ecosystem include the following.

- **Issuers:** Governments, corporations, or financial institutions that structure and launch *Green Sukuk* to fund environmentally beneficial projects. They are responsible for ensuring that proceeds are used as declared and reporting obligations are met.
 - **Investors:** Both institutional and retail investors seek financial returns and comply with the Shariah principles and environmental, social, and governance (ESG) criteria. Their confidence is crucial to market liquidity and long-term participation.
 - **Regulators and policymakers:** Central banks, securities commissions, and national green finance committees create the legal and institutional environment in which *Green Sukuk* operates. Their roles include standardisation, tax incentives, green finance roadmaps, and Shariah governance regulations.
 - **Shariah Supervisory Boards (SSBs):** These bodies ensure that the Sukuk structure complies with Islamic legal principles. *Green Sukuk* may also be called upon to assess the alignment of environmental objectives with Islamic ethical values.
 - **External Reviewers and Verifiers:** Independent certifiers, ESG rating agencies, and second-party opinion providers evaluate whether the use of proceeds meets the accepted environmental standards (the ICMA Green Bond Principles and Climate Bond Initiative). Their verification affects credibility and international investor appeal.
- Each stakeholder holds distinct interests, often shaped by institutional mandates, religious convictions, fiduciary duties, or reputational concerns. Coordination is critical for

ensuring the integrity, transparency, and effectiveness of *Green Sukuk*. However, this coordination is also a major structural challenge in the market.

Accordingly, Stakeholder Theory helps to conceptualise several persistent challenges in the *green sukuk* landscape:

Coordination Gaps: Misalignment among stakeholders, particularly between issuers, regulators, and verifiers, can lead to delays, inconsistent standards, or duplicated compliance burdens. For instance, varying interpretations of Shariah compliance and “green” eligibility can complicate the product structuring and certification processes.

Trust and Credibility Issues: Investor trust is shaped by confidence in the environmental impact of a project and the integrity of its certification. A lack of clear, independently verified green criteria or inconsistencies in Shariah ruling scan undermine credibility, especially in cross-border issuances.

Market Awareness and Capacity Constraints: Many issuers and regulators in OIC (Organization of Islamic Co-operation (OIC) countries lack experience with sustainability-linked finance. Limited awareness, technical expertise, and green finance training restrict broader participation and innovation in the *Green Sukuk* space(Fahad & Areeba, 2022).

Fragmented Standards: The absence of unified frameworks that integrate Islamic and environmental guidelines can confuse stakeholders and discourage scaling. This lack of standardisation affects both market efficiency and international comparability (Liu & Lai, 2021).

Stakeholder Theory reframes *Green Suksuk* challenges as issues of coordination and engagement rather than being purely financial or technical. It points to solutions such as multi-stakeholder platforms, harmonised taxonomies, integrated certification, and inclusive policy dialogues, tools that foster trust and align institutional interests.

By situating *green sukuk* within a relational ecosystem, the theory highlights that market development depends not only on product design or investor appetite but also on collaborative governance and ethical alignment.

This relational perspective sets the stage for the next concept, which introduces Bayesian Decision Theory to prioritise these challenges under uncertainty through expert-based evaluation.

2.4. Bayesian Decision Theory and Prioritization under Uncertainty

Bayesian Decision Theory (BDT) is a formal, probabilistic framework used to support decision making in situations marked by uncertainty, incomplete information, or subjective judgment. Rooted in the foundational work of Thomas Bayes (1701–1761), this theory provides a structured way of updating beliefs in light of new evidence and making optimal choices based on probabilities and outcomes (Berger & Berger, 1985).

Berger and Berger (1985) define BDT as a framework that integrates two core components:

- **Bayes' Theorem**, which allows decision-makers to update prior beliefs (subjective probabilities) after observing new data or expert opinions; and
- **Utility theory** evaluates the desirability or cost of potential outcomes based on the decision maker's preferences and risk tolerance.

The central idea is that every decision involves some level of uncertainty, and optimal choices should be based not only on fixed outcomes, but also on *expected utilities weighted by belief probabilities*. Bayesian reasoning thus shifts decision-making away from rigid or purely deterministic models, enabling more adaptive and evidence-sensitive processes.

This theory has been widely applied in economics, artificial intelligence (AI), risk analysis, and public policy (Mohammadi & Rezaei, 2020). More recently, it has proven useful in fields such as sustainability, climate policy, and financial innovation, where data may be incomplete, future scenarios uncertain, and expert judgment plays a critical role in structuring strategic decisions (Billah & Adnan, 2024).

2.4.1. Relevance to *Green Sukuk* Challenges

In the context of this dissertation, the application of BDT is highly relevant because of the nature of the research problem: identifying and prioritising challenges in the development of the GS market. Challenges such as regulatory fragmentation, limited awareness, verification complexity, and Shariah-standard misalignment are often qualitative, interdependent, and difficult to quantify using traditional metrics. Moreover, they vary across countries, institutions, and levels of market maturity.

Given the lack of standardised historical data and the nuanced nature of stakeholder perspectives, this study relies on expert-driven prioritisation to assess the most critical

barriers. The BDT provides a rational foundation for incorporating expert opinions in a structured, transparent, and mathematically coherent manner. This ensures that decision making reflects not only the experts' rankings but also their degrees of certainty or confidence, which are especially important in sustainability-oriented finance.

2.4.2. Connecting BDT to the Best-Worst Method (BWM)

The empirical method chosen in this study, the Bayesian Best-Worst Method (BWM), is a multi-criteria decision-making (MCDM) approach conceptually aligned with Bayesian principles. Originally developed by (Rezaei, 2015 #112@@author-year), BWM allows experts to identify the most important (best) and least important (worst) criteria from a set of alternatives and to compare the remaining criteria relative to these two anchors.

The Bayesian extension of the BWM improves upon the original model by incorporating uncertainty in expert assessments and generating probabilistic rankings rather than deterministic scores. This is particularly useful in complex markets, such as *Green Sukuk*, where data availability is limited, preferences differ across stakeholders, and thus, there is a need to model expert confidence and potential disagreements.

The justification for using the BDT in this study is twofold:

- **Methodological alignment:** BDT underpins Bayesian BWM, offering a rigorous framework for converting expert judgments into ranked priorities while accounting for uncertainty.
- **Problem structure fit:** *Green Sukuk* market development involves multidimensional barriers with no clear empirical weights. Thus, a probabilistic expert-based model is more appropriate than traditional scoring or regression-based methods.

By grounding the empirical analysis in BDT, this study ensures that its methodological approach is consistent with its research environment, uncertain, evolving, and dependent on expert insights. The next chapter builds on this theoretical foundation to design a mixed-methods research strategy, which combines qualitative insights with quantitative prioritisation using Bayesian BWM.

Although these theories are not used directly in the design or testing of this study's empirical model, they provide essential contextual scaffolding to understand the urgency, structure, and ethical dimensions of sustainability challenges and help clarify the rationale for Islamic finance engagement in global green transitions.

To consolidate the theoretical landscape introduced in this chapter, Table 1 summarises the core theories applied in this study, along with their disciplinary origins, key insights, and specific relevance to the GS context.

Table 1: Core Theoretical Foundations and Their Relevance to the Study

Theory	Disciplinary Origin	Key Insight	Relevance to Study
Maqasid al-Shariah	Islamic Legal Theory	Promotes preservation of life, wealth, and ethical finance	Provides ethical foundation for <i>Green Sukuk</i>
Green Growth Theory	Development Economics	Economic growth and environmental sustainability can be mutually reinforcing	Justifies <i>Green Sukuk</i> as tools for climate-aligned infrastructure
Stakeholder Theory	Organizational Management	Long-term value creation depends on stakeholder trust and collaboration	Explains relational dynamics in <i>Green Sukuk</i> issuance and legitimacy
Bayesian Decision Theory	Decision Science	Rational decision-making under uncertainty using expert judgment and probability	Underpins use of Bayesian BWM for prioritizing GS challenges

Source: Author's Creation

In summary, this chapter outlines the theoretical foundations of the study. It examined four key frameworks: Maqasid al-Shariah as the ethical base of Islamic finance, Green Growth Theory as a link between development and sustainability, Stakeholder Theory to explain actor dynamics in the *Green Sukuk* ecosystem, and Bayesian Decision Theory to support expert-based prioritisation under uncertainty.

CHAPTER 3: EXPLORING THE GREEN SUKUK LANDSCAPE: A BIBLIOMETRIC AND SYSTEMATIC REVIEW

Green Sukuk are increasingly recognised as a vital link between Islamic finance and global sustainability goals. However, their development has not been without challenges, from regulatory fragmentation to limited market awareness. To better understand these issues, this chapter offers a structured review of existing academic literature.

This review was conducted in two stages. First, a bibliometric analysis was conducted to explore the broader patterns in Islamic finance research related to sustainability over the past three decades. This mapping phase helped to identify dominant themes, key contributors, and research gaps, particularly the lack of focused studies on *Green Sukuk* challenges and stakeholder dynamics. These findings informed the second stage, a Systematic Literature Review (SLR) specifically targeting *Green Sukuk* publications between 2017 and early 2025.

Building on the theoretical foundations established in Chapter 2, this chapter combines both techniques to examine how the field has evolved, what challenges have been addressed, and where important gaps remain. Section 3.2 briefly summarises the bibliometric findings as the starting point of the review. Section 3.3 outlines the methodology used for SLR, including the inclusion and exclusion criteria. Sections 3.4 and 3.5 then present the results of the SLR both descriptively and thematically. The final section highlights major research gaps and outlines how this study aims to contribute to the field.

Together, these two review techniques lay the groundwork for the empirical analysis in the following chapters and offer a clearer view of the current landscape of *Green Sukuk* research.

3.1. Islamic Finance and Sustainability: A Bibliometric Overview

To lay a strong foundation for this study's focused review of *Green Sukuk* literature, an extensive bibliometric analysis was first conducted. This initial phase mapped the intellectual development of Islamic finance research in the context of sustainability over three decades (1995–2024). The results of this analysis were peer-reviewed and published

in a Q1-ranked journal indexed in both Scopus and Web of Science, offering independent validation of its methodological rigor and relevance to the field (Fodol & Aslan, 2025). This bibliometric study analysed 155 documents sourced from both databases using the R-based Biblioshiny package. It aimed to visualise thematic trends, evaluate scholarly impact, and identify the major knowledge clusters shaping the discourse on Islamic finance in the sustainability era. The findings revealed sharp growth in research output after 2015, coinciding with global climate frameworks such as the Paris Agreement and the launch of the UN Sustainable Development Goals (SDGs).

Several prominent themes emerged across the co-word and thematic mapping analysis. These included Islamic social finance and the SDGs, green investment and ethical governance, Maqasid al-Shariah and sustainability integration, and emerging instruments like Takaful and Waqf for climate resilience. The study also highlighted the key authors, institutions, and countries that have shaped the field's trajectory, particularly Malaysia, Indonesia, and selected GCC economies.

Despite the field's growth, the analysis revealed several gaps. *Green Sukuk* appeared only marginally in keyword clusters and author networks, suggesting a lack of sustained scholarly engagement with this instrument as a standalone research domain. Additionally, cross-country studies, policy evaluations, and empirical models assessing the environmental and developmental outcomes of Islamic finance remain limited. The bibliometric phase also identified methodological underutilisation of decision-making tools, such as multi-criteria analysis or Bayesian models, despite their relevance to sustainability prioritisation.

This bibliometric mapping contributes threefold:

- **First**, it offers a clear visualisation of how Islamic finance has engaged with sustainability agendas over time.
- **Second**, it provides a strategic scoping mechanism to locate underexplored niches, including *Green Sukuk* barriers and stakeholder misalignment.
- **Third**, it informed the construction of a targeted Systematic Literature Review (SLR) by identifying publication trends, thematic saturation points, and missing analytical perspectives, particularly those involving market dynamics, Shariah–ESG alignment, and institutional governance.

In terms of future research, the study recommends greater integration of Islamic finance with environmental performance indicators, increased empirical investigation of Islamic green instruments (especially *Green Sukuk*), and deeper attention to decision-support frameworks capable of handling stakeholder diversity and policy complexity.

Accordingly, the next section presents the design and execution of SLR, which builds directly on these insights. It narrows the focus to 43 studies on *Green Sukuk* published between 2017 and 2025, applying the PRISMA method to synthesise core challenges, identify structural gaps, and support the development of a stakeholder-informed decision framework.

3.2. Systematic Literature Review on *Green Sukuk* Challenges

Following the bibliometric mapping of Islamic finance in the sustainability era, this section presents a systematic review of *Green Sukuk* literature. Although the bibliometric phase identified broad research trends and thematic clusters, it also revealed notable gaps, particularly around project-level insights, stakeholder alignment, and market challenges. To address these gaps, a systematic literature review focused on 43 studies published between 2017 and 2025. The aim is to synthesise the key barriers, stakeholder dynamics, and structural issues that shape the global development of *Green Sukuk*. This targeted review builds an analytical foundation for subsequent expert-based prioritisation in later chapters.

3.2.1. Objectives and Review Questions

This systematic review aims to provide a comprehensive and structured synthesis of the barriers impeding global development and effective implementation of *Green Sukuk* (GS). As a Shariah-compliant climate finance instrument, the GS occupies a unique position at the intersection of ethical investing, sustainability, and Islamic finance. However, market expansion remains limited by the complex interplay of regulatory, operational, and governance-related constraints. While previous research has explored isolated aspects of GS, such as issuance trends or legal feasibility, there is a lack of integrated analysis that captures the full range of market-, institutional-, and stakeholder-specific barriers.

The primary objective of this review is to identify, classify, and synthesise the critical challenges and misalignments that obstruct GS development across various jurisdictions and stakeholder groups. This includes mapping regulatory inconsistencies, Shariah-Green integration gaps, certification hurdles, and transparency concerns. The review also pays particular attention to underexplored regions, such as sub-Saharan Africa, the GCC corporate sector, and non-sovereign Southeast Asian issuers, where structural constraints may differ significantly from those in more mature GS markets.

Beyond the description, the findings of this review serve a foundational role in broader research designs. The synthesised challenges will inform the development of a structured evaluation framework, providing the criteria for the subsequent expert-based prioritisation using the Bayesian Best-Worst Method (BWM). This chapter represents a critical bridge between the theoretical grounding of Chapter 1 and the decision-focused analysis in the empirical chapters that follow.

To guide this review, the following research questions were developed.

1. What are the core barriers limiting the development of the *Green Sukuk* market and how do these barriers impact different stakeholder groups, including issuers, investors, regulators, and verification bodies?
2. How can current regulatory and institutional frameworks be improved to better align the Shariah principles with international sustainability and GS standards?
3. What risks do greenwashing and limited transparency pose to the credibility of *Green Sukuk* instruments and what mechanisms are proposed in the literature to address these concerns?

By addressing these questions, the review not only contributes to the theoretical and policy understanding of GS challenges, but also lays the groundwork for a more robust, expert-driven decision-making process in subsequent chapters.

3.2.2. Methodology (PRISMA, criteria, selection, extraction)

This section outlines the methodological procedures employed to identify, screen, and synthesise the most relevant academic studies on *Green Sukuk* challenges, ensuring alignment with the research objectives and the broader theoretical framework established in Chapter 1.

3.2.3. Review Framework and Rationale

To ensure methodological rigor and replicability, this systematic literature review adopts a dual framework that combines the PRISMA 2020 protocol (Page et al., 2021) with a narrative-based PICO approach (Richardson et al., 1995; Schardt et al., 2007). This hybrid model enables both transparency in article selection and a focused analytical lens tailored to research objectives.

The PICO framework presented in Table 2 structured the scope of this review by clarifying the key analytical dimensions. *Population* (P) encompasses a diverse group of stakeholders involved in the *Green Sukuk* (GS) ecosystem, including issuers, investors, regulators, Shariah boards, ESG verifiers, and actors in multilateral development. *Intervention* (I) centres on the identification and categorisation of barriers encountered throughout the GS lifecycle, such as legal ambiguities, structuring complexities, liquidity constraints, certification inconsistencies, and alignment issues between the ESG and Shariah standards.

Although the *Comparison* (C) component is not always explicitly addressed across the reviewed studies, comparisons between GS and conventional green bonds or traditional Sukuk appear in a subset of the literature. These comparative insights offer a useful context for governance structures, investor sentiment, and credibility challenges. The primary *outcome* (O) of this review is the thematic synthesis of stakeholder-related constraints and structural market challenges. Finally, the review period was confined to publications between 2017 and 20 February 2025 covering the evolution of GS literature since Malaysia's first issuance in 2017 (Muhamat et al., 2024).

Table 2: PICO Framework for the Systematic Review

PICO Element	Definition in This Study	Notes
P (Population/ Problem)	Stakeholders involved in the global <i>Green Sukuk</i> (GS) market, including issuers, investors, regulators, policymakers, Shariah boards, ESG verifiers, development partners, and end beneficiaries	Broad and inclusive to reflect the multi-actor nature of the GS ecosystem and its institutional diversity
I (Intervention / Focus)	Systematic identification and thematic classification of challenges and barriers related to the design, issuance, governance, and implementation of GS instruments	Includes regulatory, market, operational, green certification, governance, and Shariah alignment issues

Table 2 (continued)		
C (Comparison)	Comparative insights, where available, between <i>Green Sukuk</i> and either conventional green bonds or traditional Islamic Sukuk instruments	Not the primary axis of analysis; explicitly present in ~20% of the reviewed literature
O (Outcome)	A structured synthesis of challenges and stakeholder-specific constraints to support policy reforms, market development, and improved alignment between Shariah principles and ESG standards	Emphasis on insights with implications for sustainable finance architecture and Islamic ethical integration
T (Time / Setting)	Peer-reviewed journal articles published between 2017 and March 2025, retrieved from Scopus and Web of Science (WoS) databases	Captures the post-introduction evolution of GS, following the inaugural issuance in Malaysia (2017)

Source: Author's Creation.

The PRISMA framework complements this narrative lens by offering a structured and auditable process to identify, screen, and select eligible studies. Unlike traditional literature reviews, the PRISMA method facilitates a transparent trial of inclusion decisions, helping minimise bias and enhance the reliability of the findings.

3.2.4. Data Sources and Search Strategy

The database search was conducted on 25 February 2025 targeting the literature relevant to the challenges and development of the GS market within the broader framework of financial sustainability. To ensure coverage of high-quality peer-reviewed literature, we used two widely recognised and multidisciplinary academic databases, Web of Science (WOS) and Scopus.

Our keyword strategy was informed by three prior reviews on GS, each of which offered valuable groundwork, but also revealed certain limitations. Fahad and Areeba (2022) used an expansive set of finance and sustainability terms across major databases, although the inclusion of broad Islamic finance concepts diluted their thematic focus. Alkadi (2024) Alkadi (2024) expanded the database scope to include EBSCO, ScienceDirect, and Emerald, yet similarly adopted a wide net that lacked conceptual specificity. Meanwhile, Alkadi (2024) employed a bibliometric approach but treated the SRI *Sukuk* and GS as interchangeable, overlooking important distinctions.

Although SRI *Sukuk* may encompass projects aimed at social or governance objectives, they do not necessarily focus on environmental sustainability. In contrast, *Green Sukuk* is explicitly intended to finance environmentally focused initiatives, such as renewable

energy, climate adaptation, and pollution control, in line with internationally recognised green bond principles. To account for frequent misclassifications in the literature that conflate *Green Sukuk* with *SRI Sukuk*, related terms were included in the search query. However, during eligibility screening, we excluded studies that addressed only *SRI Sukuk*, without any reference to *Green Sukuk* or environmental finance.

Accordingly, we refined our approach to focus solely on GS and its closest conceptual derivatives, avoiding broader Islamic finance and sustainability terms, to maintain thematic clarity. The Boolean search string is as follows:

("Green Sukuk" OR "Islamic Green Bonds" OR "Green Islamic Bonds" OR "Green Sustainable and Responsible Investment Sukuk" OR "SRI Green Sukuk" OR "Green SRI Sukuk" OR "SRI Sukuk" OR "ESG Sukuk" OR "Environmental Sukuk" OR "Sustainable Sukuk" OR "Shariah-Compliant Green Bonds" OR "Ethical Sukuk" OR "Green Waqf Sukuk" OR "Renewable Energy Sukuk" OR "Climate Sukuk" OR "Carbon Sukuk" OR "Green Investment Sukuk" OR "Sustainable Development Sukuk").

The complete list of search terms and Boolean operators used across Scopus and Web of Science is provided in **Appendix 1**.

Importantly, we did not combine "*Green Sukuk*" with limiting terms such as "challenges", "barriers", or "sustainable finance", recognising that many relevant papers may not explicitly include such keywords in their titles or abstracts. Instead, we applied a broader inclusion strategy and manually screened all the *Green Sukuk*-related publications to determine their relevance based on our research objectives.

3.2.5. Inclusion and Exclusion Criteria

Building on our search strategy and screening process, we applied clear and consistent inclusion and exclusion criteria to ensure the relevance, quality, and rigour of this systematic review. Our criteria were informed by the research objective of examining the barriers and challenges affecting *Green Sukuk* and were refined in light of the limitations observed in previous reviews (Alkadi, 2024; Delle Foglie & Keshminder, 2022; Fahad & Areeba, 2022).

We restricted our inclusion to peer-reviewed journal articles and conference papers published between 2017 and 25 February 2025. This timeframe aligns with the emergence of *Green Sukuk* in scholarly literature following the first issuance in 2017. By focusing

on peer-reviewed outputs, we ensured that the data analysed were credible, original, and academically rigorous. Materials such as dissertations, working papers, non-peer-reviewed reports, and previously published systematic or bibliometric reviews were excluded because they typically lack new empirical findings or theoretical contributions. Language and topic relevance are critical filters. Only English publications were considered, reflecting both the practical constraints of the review and the predominance of English in the international academic discourse. Most importantly, eligible studies had to place *Green Sukuk* at the core of their analysis from regulatory, structural, market, investment, or policy perspectives. Articles that briefly mentioned *Green Sukuk* or treated it as a secondary theme, particularly those that focused on non-environmental SRI *Sukuk*, classical Islamic *Sukuk*, or broader Islamic financial instruments, were excluded. This carefully defined selection process ensured that the final set of studies offered direct, high-quality insights into the evolving *Green Sukuk* market. As we transition into thematic synthesis, we selected contributions from the empirical foundation to analyse the market's most pressing challenges and stakeholder dynamics.

3.2.6. Data Collection and Screening Process

The data collection and screening process followed a four-stage PRISMA protocol to ensure transparency, methodological accuracy, and relevance to the research objectives. We began by conducting a structured Boolean search in Scopus and the Web of Science (WOS), two leading academic databases known for their comprehensive coverage of peer-reviewed literature on sustainable finance, environmental management, and Islamic economics. The search yielded 484 records: 443 from Scopus and 41 from WOS.

During the identification stage, we applied preliminary filters to remove 345 records based on the title and abstract irrelevance. An additional 30 duplicates were eliminated using EndNote 21, a reference management tool that supports accurate citation tracking and duplicate detection. This process left 109 articles for the full-text screening.

At the eligibility stage, each full-text article was carefully reviewed according to inclusion criteria. We excluded 48 studies at this point: 47 were book chapters or conference proceedings and one was not published in English. The remaining 62 peer-reviewed journal articles were assessed for their substantive relevance. Among these, 18 were excluded: 11 focused on classical *Sukuk* or non-environmental SRI *sukuk* and 7 were

general bibliometric reviews or SLRs that did not directly engage with stakeholder challenges or market barriers.

The final inclusion stage resulted in a curated dataset of 43 high-quality peer-reviewed studies, which formed the empirical basis of the thematic synthesis. These articles explicitly examine *Green Sukuk* within the context of regulatory, structural, ethical, and institutional dynamics. The complete selection process is shown in Figure 3, which follows a PRISMA flow diagram.

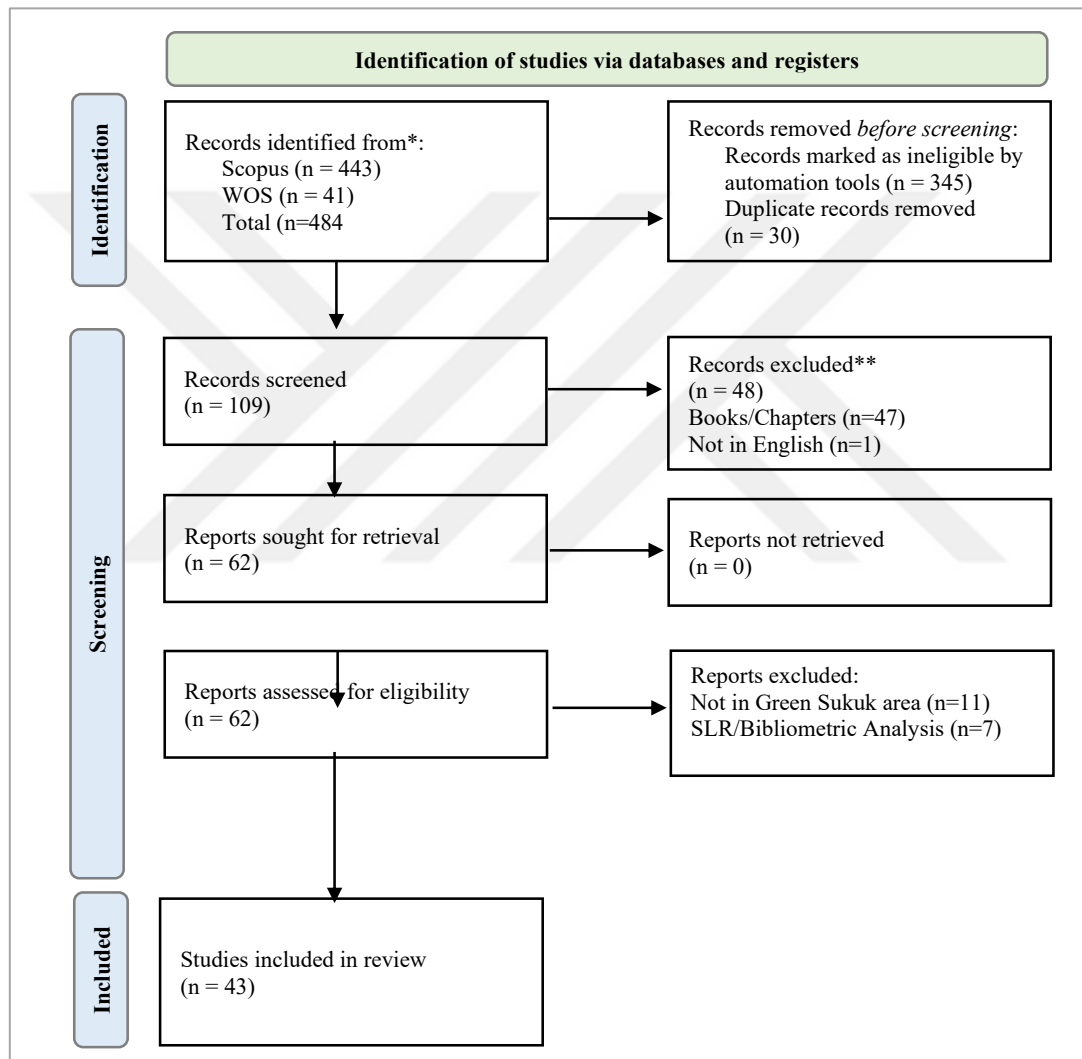


Figure 3: PRISMA Flow Diagram – Study Selection Process

Source: Adapted from Page et al. (2021)

3.2.7. Descriptive Results

Table 3 outlines the thematic distribution of the 43 peer-reviewed studies included in the systematic review. We organised the literature along five analytical dimensions: regional

scope, methodological orientation, stakeholder focus, instrument typology, and attention to greenwashing. A complete list of the studies, including their methodological approaches, regional coverage, and key findings, is provided in Appendix 2.

In terms of *geographic focus*, this research was heavily concentrated in Southeast Asia. Indonesia and Malaysia accounted for the majority of the contributions, comprising 18 (41.9%) and 17 (39.5%) studies, respectively. This reflects both countries' sovereign leadership and the SRI GS issuance. For instance, Liu and Lai (2021) analyse Malaysia's strategic deployment of GS for nation-building, while Endri et al. (2022) and Suriani et al. (2024) explore barriers and macro-impacts in the Indonesian context. The Gulf Cooperation Council (GCC) region contributes seven studies (16.3%), primarily focusing on Saudi Arabia, the UAE, and Bahrain (Riaz et al., 2024; Shalhoob, 2023).

Nine studies (20.9%) examined other national contexts, including Nigeria, Italy, and Turkey, and selected OIC countries that offer important geographic diversification (Akinde et al., 2025; Tepeli & Mirgen, 2024). Finally, five studies (11.6%) adopted a comparative or global perspective. For instance, Azhgaliyeva et al. (2020) evaluated ASEAN green bond frameworks while devoting substantial attention to *Green Sukuk* and offering valuable insights into their integration. Similarly, Chavarria-Flores and Warren (2024) examined climate bond innovations in Indonesia and Seychelles, with an emphasis on *Green Sukuk*, thereby enriching the literature with a broader international perspective.

From a methodological perspective, we observed that the literature was predominantly qualitative, with 19 studies (44.2%) employing case studies, thematic content analysis, or expert interviews. Examples include Jaafar and Brightman (2022), who apply ethnography to examine evolving Islamic moral economies, and Faizi et al. (2024), who explore institutional barriers in Indonesia. Quantitative studies accounted for 14 papers (32.6%), often adopting econometric modelling, panel analysis, or event study methods, such as Narayan et al. (2022) and Hariz et al. (2023). Six studies (14%) used mixed methods, combining document analysis with stakeholder interviews (Raeni et al., 2022). Additionally, 11 papers (25.6%) were conceptual, policy-focused, or legal in orientation, reflecting a growing interest in regulatory frameworks and ethical foundations (Ibrahim & Shirazi, 2020; Supriyadi & Fidhayanti, 2023).

Interestingly, only a few studies have investigated decision analysis methodologies, despite their suitability for navigating the complex trade-offs inherent in *Green Sukuk* design. Notably, Endri et al. (2022) applied the Analytic Network Process (ANP) to map issuer-side challenges and strategic priorities for corporate *Green Sukuk* in Indonesia. Their approach stands out for incorporating expert judgments across regulatory, market, and project dimensions, offering a structured lens for addressing multidimensional decision-making problems. Given the layered nature of GS involving financial, ethical, and environmental considerations, future research would benefit from the broader use of multi-criteria decision-making (MCDM) tools.

With respect to stakeholder coverage, issuers were the most studied group, appearing in 23 studies (53.5%). These include deep explorations of institutional motivation, project structuring, and reputational drivers (Abdullah & Keshminder, 2022; Muhamat et al., 2024). Regulators and policymakers followed closely, as featured in 21 studies (48.8%), as seen in Rozman and Azmi (2022) and Chavarría-Flores and Warren (2024). Investors are addressed in 17 papers (39.5%), particularly through behavioural modelling and demand-side analysis (Akinde et al., 2025; Timur et al., 2025).

Shariah boards and scholars are explicitly discussed in 12 studies (27.9%), such as Bin-Armia and Riana (2023), which assess the normative gaps between *Shariah* principles and implementation. Notably, civil society and end-beneficiaries remain marginalised in this literature, featuring only five studies (11.6%), including Mangunjaya (2023) and Jaafar and Brightman (2022), both of which advocate deeper community engagement.

In terms of instrument typology, over half of the studies (22/43; 51.2%) focused on sovereign *Green Sukuk*, underscoring their importance in national climate strategies, particularly in Indonesia and Malaysia (Raeni et al., 2022). Corporate *Green Sukuk* were discussed in 14 studies (32.6%), often highlighting market entry and project financing challenges (Rahim & Mohamad, 2018). Retail-focused *Sukuk* remains underrepresented and addressed in only three studies (7%), including the study by Timur et al. (2025). Additionally, six studies (14%) explored SRI-linked *Green Sukuk*, with a distinct emphasis on Malaysia's regulatory innovations and blended social-environmental objectives (Kassim & Abdullah, 2017; Noordin et al., 2018).

Finally, we identified a growing subset of literature that addresses greenwashing concerns. Sixteen studies (37.2%) explicitly addressed the risks of superficial ESG

alignment or procedural compliance without substantive environmental impact. Notable examples include Liu and Lai (2021) and Keshminder et al. (2022). Another 12 papers (27.9%) expressed implicit concerns often related to transparency, misaligned incentives, or ambiguous green standards, such as Bin-Armia and Riana (2023) and Rozman and Azmi (2022).

This thematic synthesis offers a foundational lens through which we examine the development, scope, and structure of the *Green Sukuk* literature. Each category identified above is explored further in the following sections.

Table 3: Thematic Profile of GS Research (2017–2025)

Theme	Sub-theme	Count	Fraction	Percentage
Regional Focus	Malaysia	17	17/43	39.5
	Indonesia	18	18/43	41.9
	GCC (Saudi, UAE, Bahrain)	7	7/43	16.3
	Other (Nigeria, Italy, Turkey, Europe, OIC)	9	9/43	20.9
	Global/Comparative	5	5/43	11.6
Methodological Focus	Qualitative / Case Studies / Thematic	19	19/43	44.2
	Quantitative / Econometric / Event Studies	14	14/43	32.6
	Mixed Methods	6	6/43	14
	Conceptual / Policy / Legal Analysis	11	11/43	25.6
Stakeholder Focus	Issuers	23	23/43	53.5
	Investors	17	17/43	39.5
	Regulators / Policymakers	21	21/43	48.8
	<i>Shariah</i> Scholars / Boards	12	12/43	27.9
	Civil Society / End Beneficiaries	5	5/43	11.6
Green Sukuk Types	Sovereign	22	22/43	51.2
	Corporate	14	14/43	32.6
	Retail	3	3/43	7
	SRI-focused (Securities Commission Malaysia)	6	6/43	14
Greenwashing Discussion	Explicitly addressed Greenwashing	16	16/43	37.2
	Implicit concern Greenwashing	12	12/43	27.9

Source: Author's compilation.

3.3. Thematic Synthesis

3.3.1. Barriers and Structural Challenges in the *Green Sukuk* Market

In reviewing the literature on *Green Sukuk*, we identified a diverse yet recurring set of structural constraints that continue to shape the development, credibility, and scalability

of this emerging market. Across the 43 studies examined, six overarching categories of challenges and barriers emerged (Figure 4), each engaging distinct regulatory, financial, and ethical dimension. These barriers are not merely technical inefficiencies but also reflect deeper tensions at the intersection of Islamic finance, sustainable development, and global capital markets.

For analytical clarity, we distinguish between challenges that introduce complexity without necessarily preventing market growth, and barriers that actively restrict participation or progress. The categorisation of these challenges and barriers is provided in the following point, based on the author’s synthesis of 43 peer-reviewed studies published between 2017 and 2025.

3.3.1.1. Categorisation of Challenges and Barriers in the GS Market

To enhance analytical clarity, we distinguish between challenges, general difficulties that complicate but do not necessarily obstruct market development, and barriers, which represent more restrictive obstacles that actively hinder participation or progress within the *Green Sukuk* ecosystem. This typology enables a more detailed interpretation of the constraints affecting *Green Sukuk* adoption.

Drawing from a thematic synthesis of 43 peer-reviewed studies published between 2017 and 2025, we categorise the challenges and barriers into six overarching domains. This classification facilitates a structured assessment of the institutional, regulatory, financial, and operational factors shaping the GS market globally.

Table 4 presents this typology of *Green Sukuk* market constraints, distinguishing between broad challenges and restrictive barriers across six thematic domains to support structured analysis.

Table 4: Typology of Challenges and Barriers in the GS Market by Domain

Category	Challenges (Broad Difficulties)	Barriers (Restrictive Obstacles)
Regulatory & Policy	Complex approval processes, ESG-Sukuk integration uncertainty	Lack of global standardization, fragmented Shariah interpretations
Shariah Compliance	Differences in Shariah screening methodologies	Inconsistent rulings preventing cross-border issuances
Market & Liquidity	Low Sukuk secondary market activity, investor unfamiliarity	Absence of robust trading platforms

Table 4 (continued)		
Investment & Risk	High structuring costs, perceived lower returns	Institutional reluctance due to risk perception
ESG & Green Certification	Weak reporting mechanisms	Greenwashing risks due to non-uniform verification
Structural & Operational	Limited financial innovation in Sukuk structuring	High transaction costs discouraging issuers

Source: Author's synthesis based on the SLR of 43 peer-reviewed studies (2017–2025).

A prominent challenge found in the 12 studies centres on regulatory fragmentation and legal uncertainty. Although jurisdictions such as Malaysia and Indonesia are praised for regulatory innovation, they are often undermined by burdensome procedures and ambiguous sustainability criteria. Noordin et al. (2018) underscore the procedural complexity of *Green Sukuk* issuance under Malaysia's dual regulatory system, where overlapping oversight from *Shariah* and sustainability bodies prolong approvals.

Similarly, Endri et al. (2022) highlight the volatility of policy signals in Indonesia, which weakens investor confidence, despite strong sovereign issuances. Faizi et al. (2024) and Akinde et al. (2025) argue that fragmented legal regimes and the absence of unified *Green Sukuk* standards obstruct cross-border harmonisation, particularly in emerging markets lacking institutional depth.

The structural and liquidity constraints addressed in 22 studies remain persistent. Although GS issuance is rising, especially in Southeast Asia, the supporting infrastructure is underdeveloped. Suroso et al. (2022) and Raimi et al. (2024) identified high structuring costs, limited buy-side depth, and weak secondary trading as the core bottlenecks. Similarly, Morea and Poggi (2017) warned that bespoke structuring requirements would increase transaction costs and deter replication. Despite sovereign *Sukuk* dominating attention (51.2%), few studies explore the limited corporate issuance linked to high entry costs and the absence of liquidity mechanisms, suggesting that, while volume grows, market depth lags.

Aligning *Shariah* principles with green finance imperatives presents a more nuanced challenge, as examined in ten studies. The difficulty lies not only in theology but also in institutional fragmentation. With no unified global Islamic authority, divergent fatwas generate conflicting views on what qualifies as both “green” and “*halal*.” Liu and Lai (2021) emphasise that inconsistent *Shariah* opinions on assets, revenue screening, and impact measurement cause uncertainty among investors and issuers. Jaafar and Brightman (2022) added that many GS structures merely Islamise conventional

instruments, without reflecting a coherent moral economy. While Malaysia (39.5%) shows progress in harmonising *Shariah* and green standards, this remains the exception across the broader Islamic world.

Investor-related barriers, cited in 24 studies, emerged as the most dominant constraint. Despite the rising interest in Islamic investor behaviour, limited awareness, risk perception, and opacity restrict engagement. Corapi (2023) and Timur et al. (2025) attributed this to poorly communicated value proposition. In many markets, GS lack benchmarks or inclusion in mainstream indices. Narayan et al. (2022) highlight risk asymmetry, with investors uncertain about project outcomes and *Shariah* compliance. Retail and civil society voices remain marginal, with only 11.6% of studies engaging them, suggesting that GS are still elite financial tools disconnected from wider participation.

In parallel, 11 studies explored the challenges associated with ESG standards. The absence of universally recognised green criteria creates confusion and increases the risk of greenwashing. Rozman and Azmi (2022) note that inconsistent ESG frameworks allow selective disclosure. Abdullah and Keshminder (2022) argued that ambiguity in “environmental benefits” undermines market integrity and climate impact assessments. The clashes between external ESG metrics and internal *Shariah* standards add to this uncertainty. While 16 studies raised greenwashing concerns, few have proposed integrated models that preserve both environmental and theological integrity.

Lastly, certification and verification deficiencies, discussed in six studies, emerged as subtle yet serious barriers. Corapi (2023) critiques the informal nature of verification, often handled by third parties with limited technical and religious expertise. In the same vein, Liu and Lai (2020) and Liu and Lai (2021) highlight gaps in post-issuance monitoring. However, Faizi et al. (2024) called for standardised second-party opinion frameworks that integrate *Shariah* and environmental due diligence. Without credible verification, reputational risk looms not only for issuers, but also broadly for Islamic green finance.

Altogether, these six categories reveal an ambitious, but fragmented, *Green Sukuk* market. Despite scholarly progress, particularly in Southeast Asia, systemic barriers persist across the regulatory, ethical, and operational spheres. As we explore next, addressing these challenges requires coordinated engagement and stronger alignment between sustainability goals and Islamic financial principles.

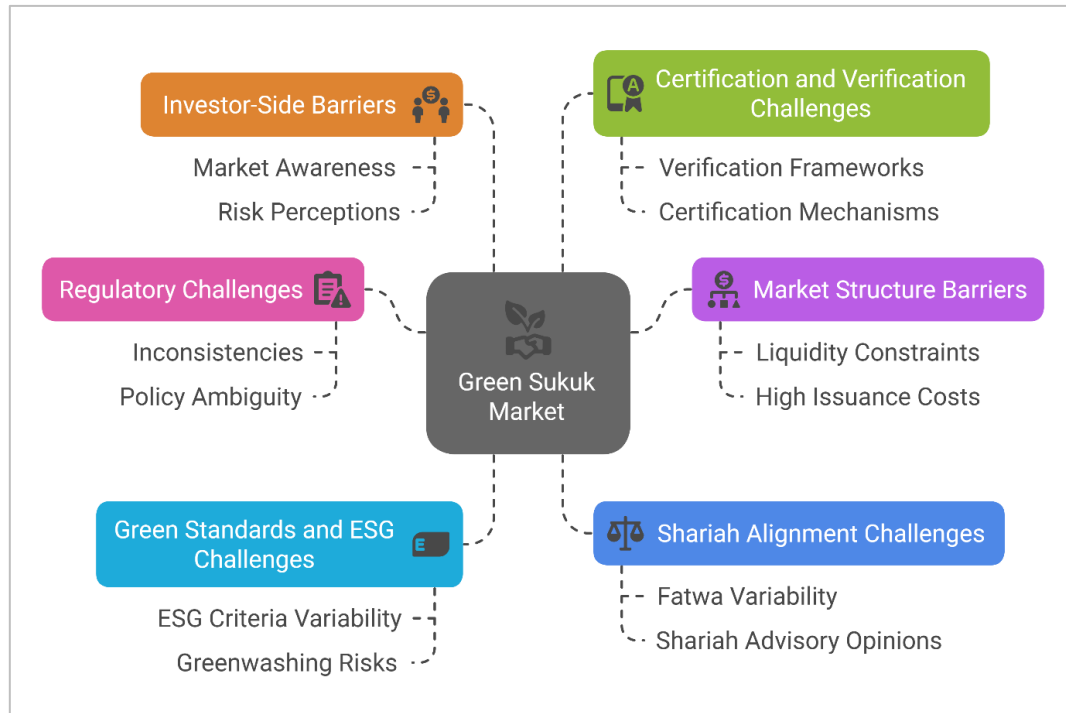


Figure 4: Challenges in the *Green Sukuk* Market

Source: Author's Compilation.

3.3.1.2. Greenwashing and Integrity Risks

In our review, greenwashing and broader integrity concerns emerged as recurring themes that were explicitly addressed in 20 of the 43 studies. In the context of *Green Sukuk*, greenwashing refers to the misrepresentation or exaggeration of environmental benefits, where *Sukuk* are marketed as sustainable without meeting credible ESG or Shariah standards (Kassim & Abdullah, 2017; Supriyadi & Fidhayanti, 2023). These risks, rooted in weak verification systems, fragmented ESG frameworks, and jurisdictional inconsistencies, undermine market trust and credibility. As discussed earlier, they directly affect investor confidence and reputational capital, especially in ethics-driven financial environments.

Corapi (2023) and Liu and Lai (2021) highlight how fragmented ESG standards and discretionary certification frameworks create ambiguity, increasing the potential for greenwashing. Although 16 studies engage in this issue directly, our broader synthesis shows that 28 studies raise related concerns, suggesting that the misrepresentation of environmental benefits is more systemic than often acknowledged. Rozman and Azmi

(2022) further illustrated how vague or unverifiable sustainability claims contribute to procedural compliance without meaningful environmental impact.

Jaafar and Brightman (2022) and Raeni et al. (2022) draw attention to the misalignment between *Shariah* rulings and ESG standards, especially in cross-border contexts, reinforcing the institutional tensions observed earlier. This disconnect complicates assurance mechanisms and exposes issuances to integrity risks on both the ethical and environmental fronts.

The literature strongly advocates harmonised ESG frameworks, third-party audits, and robust disclosure practices. Faizi et al. (2024), and Chavarría-Flores and Warren (2024) emphasise the role of transparent reporting and regulatory enforcement in upholding market credibility. We share this view and stress that without systemic improvements, *Green Sukuk* instruments may fall short of their transformative potential and lose legitimacy among key stakeholders.

3.3.1.3. *Green Sukuk* Impact Outcomes

In our review of the *Green Sukuk* literature, we found that 23 out of 43 studies explicitly examined the tangible outcomes that these instruments generate across climate action, social development, and governance improvement. While discussions on barriers and stakeholder dynamics often highlight institutional limitations, this subset of literature shifts attention toward the realised benefits of *Green Sukuk*, particularly their capacity to operationalise Islamic finance principles in service of global sustainability agendas. Figure 5 visually summarises how *green sukuk* issuance channels finance climate action, SDGs, and ESG outcomes, while underscoring the need to address implementation challenges for lasting impacts.

One of the most prominent outcomes is *Green Sukuk*'s contribution to climate change mitigation. Several studies provide empirical evidence on how *Green Sukuk* finance renewable energy, clean infrastructure, and carbon-reducing projects. For example, Suroso et al. (2022) documented how Indonesia's sovereign *Green Sukuk* program supports large-scale energy transitions aligned with national climate goals. Similarly, Ali et al. (2024) quantified emission reductions linked to green project financing, showing that *Green Sukuk* can generate verifiable environmental outcomes. These findings reinforce the potential of *Green Sukuk* to deliver measurable climate action; while also

addressing investor concerns about impact verification, an issue raised in earlier discussions on certification and integrity risks.

We also observed a growing body of literature positioning *Green Sukuk* as a practical tool for advancing Sustainable Development Goals (SDGs). Raimi et al. (2024) explore how *Green Sukuk* -backed initiatives support targets such as clean energy access, sustainable cities, and water sanitation. Building on this, Pirgaip and Arslan-Ayaydin (2024) argue that aligning *Sukuk* structures with specific SDG indicators enhances both the impact clarity and investor engagement. These insights not only affirm the ethical foundation of GS but also illustrate how targeted financial engineering can bridge capital mobilisation with sustainable development objectives.

Beyond environmental and developmental goals, several studies have emphasised the broader ESG impacts of *Green Sukuk*. Jaafar and Brightman (2022), for instance, highlighted how community-based infrastructure projects, ranging from schools to healthcare facilities, reflect *Green Sukuk*'s embedded social value of GS. At the governance level, Ebrahim et al. (2021) stressed that *Green Sukuk* transactions often incorporate enhanced transparency mechanisms that foster accountability and ethical compliance. These elements are particularly relevant given the governance-related barriers identified earlier, including inconsistencies in regulatory frameworks and reporting standards.

By further extending its developmental reach, *Green Sukuk* has shown positive effects on local economies and community resilience. Faizi et al. (2024) discuss how *Green Sukuk* -financed public infrastructure creates employment, improves service delivery, and contributes to long-term growth in underfunded regions. Similarly, Mangunjaya (2023) complements this view by framing *Green Sukuk* as a tool for inclusive growth, especially in the majority of developing countries, where *Shariah*-compliant instruments are often more trusted than conventional alternatives. These findings echo stakeholder perspectives on the catalytic role of development partners and issuers in delivering financial return and social dividends.

However, maximising the impact of *Green Sukuk* requires continuous improvements in policy design and implementation. Billah and Adnan (2024) call for stronger alignment between *Green Sukuk* issuance and well-defined SDG targets to avoid mission drift and ensure effective capital allocation. Simultaneously, Bin-Armia and Riana

(2023)underline the importance of integrating robust audit and disclosure protocols to mitigate greenwashing and maintain credibility—an issue we previously identified as central to market integrity. Addressing these challenges is not only essential for sustaining stakeholder trust but also for scaling *Green Sukuk* adoption globally.

Taken together, the evidence suggests that *Green Sukuk* is more than symbolic commitment, offering tangible, multidimensional impacts when carefully structured and responsibly governed.

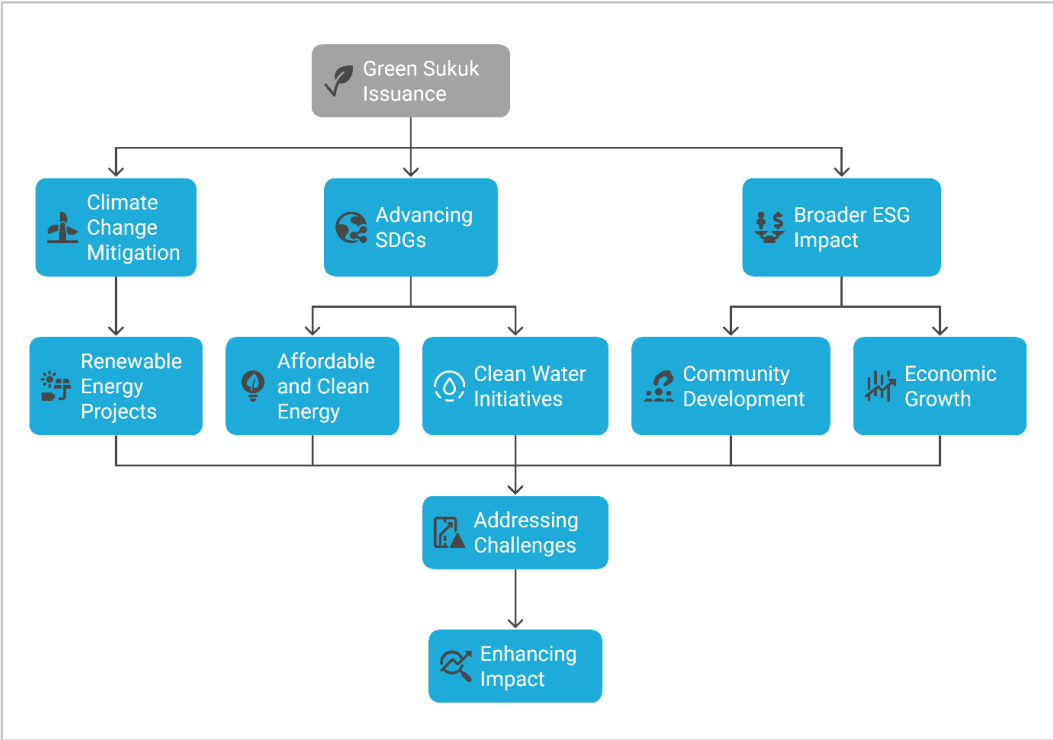


Figure 5: Pathways of Impact in *Green Sukuk* Issuance

Source: Author’s Compilation.

3.4. Research Gaps and Future Agenda

As a continuation of the analysis of the theoretical underpinnings established in Chapter 1, particularly the emphasis on stakeholder complexity, ethical alignment, and uncertainty modelling, this systematic literature review identifies several critical research gaps that impede the advancement of *Green Sukuk* as both financial instruments and normative tools for sustainability. These gaps not only reflect the empirical limitations of existing studies but also signal opportunities to refine policy, theory, and practice in subsequent stages of this research, including expert validation and multi-criteria prioritisation.

A key finding relates to the narrow geographic scope of *Green Sukuk* literature. As detailed in the descriptive results, scholarship remains disproportionately focused on Southeast Asia, especially Malaysia and Indonesia, while other regions such as Africa, Türkiye, and the GCC corporate sector receive limited analytical attention. This imbalance undermines our understanding of how GS instruments can be adapted to suit the diverse regulatory environments, institutional frameworks, and socioeconomic contexts. Although scholars such as Ali et al. (2024) recognise Africa's renewable energy potential, few studies have examined how GS can be structured to meet local constraints. Therefore, future research should include context-specific insights into underrepresented regions, strengthening the global relevance and inclusivity of the *Green Sukuk* design.

Another significant omission concerns the absence of project-level impact assessments, particularly from the investor perspective. Although macro-level benefits and strategic policy implications are relatively well covered, empirical data on how individual *Green Sukuk* -funded projects perform in terms of financial returns, environmental outcomes, and social value creation are lacking. Given the central role of investors in GS legitimacy, as highlighted in both Stakeholder Theory and thematic synthesis, future research must offer robust data-driven evaluations of project-level outcomes. Doing so would enhance impact transparency and reduce exposure to credibility risks such as greenwashing.

This gap is also linked to the under-explored intersection of Islamic social finance and *Green Sukuk* structures. While theorists like Raimi et al. (2024) point to shared principles between instruments such as zakat or waqf and sustainability goals, there remains a lack of empirical work on how these tools could be operationalised within GS frameworks. Future studies could explore hybrid financing models that simultaneously address environmental sustainability and social equity, reinforcing the maqasid-based foundation of *Green Sukuk* explored.

Methodologically, the field shows limited engagement with decision-making frameworks. Despite the growing call for multi-criteria evaluation tools, few studies go beyond descriptive approaches to assess the trade-offs between Shariah compliance, financial viability, and environmental integrity. Endri et al. (2022), for instance, demonstrate the utility of Analytic Network Process (ANP) in evaluating corporate GS challenges, yet broader adoption of MCDM tools, such as AHP, BWM, TOPSIS, or MOORA, remains sparse. Given this study's reliance on Bayesian Decision Theory and

the upcoming use of the Bayesian Best-Worst Method (BWM), there is strong justification for expanding the application of MCDM techniques across diverse GS research contexts.

In addition, the review reveals a growing but under-theorised discussion of technological integration, particularly concerning digital transparency and traceability. Although Corapi (2023) explored the theoretical role of blockchain in reducing *Green Sukuk* integrity risks, empirical validation is lacking. Technologies such as blockchain and artificial intelligence (AI) can enhance real-time compliance tracking, ESG data accuracy, and investor confidence, but they remain underutilised. Future studies should investigate pilot applications focusing on their feasibility, risks, and transformative potential in GS ecosystems.

Finally, this review confirms the lack of comparative regulatory research in this field. While regulatory inefficiencies and fragmented policies are widely acknowledged, few studies offer cross-jurisdictional analyses of how regulatory innovations, such as standardised taxonomies, flexible structuring protocols, or secondary market incentives, could foster GS adoption. Addressing this gap would provide actionable guidance to enhance market depth, cross-border flow, and institutional trust.

In summary, these gaps highlight the need for a more interdisciplinary, practice-oriented, and regionally inclusive research agenda. Bridging theoretical foundations with stakeholder realities and advancing tools for empirical decision making is essential for strengthening GS innovation, credibility, and global relevance. Figure 6 presents a visual summary of these research priorities and their contributions to the evolving knowledge landscape of GS.

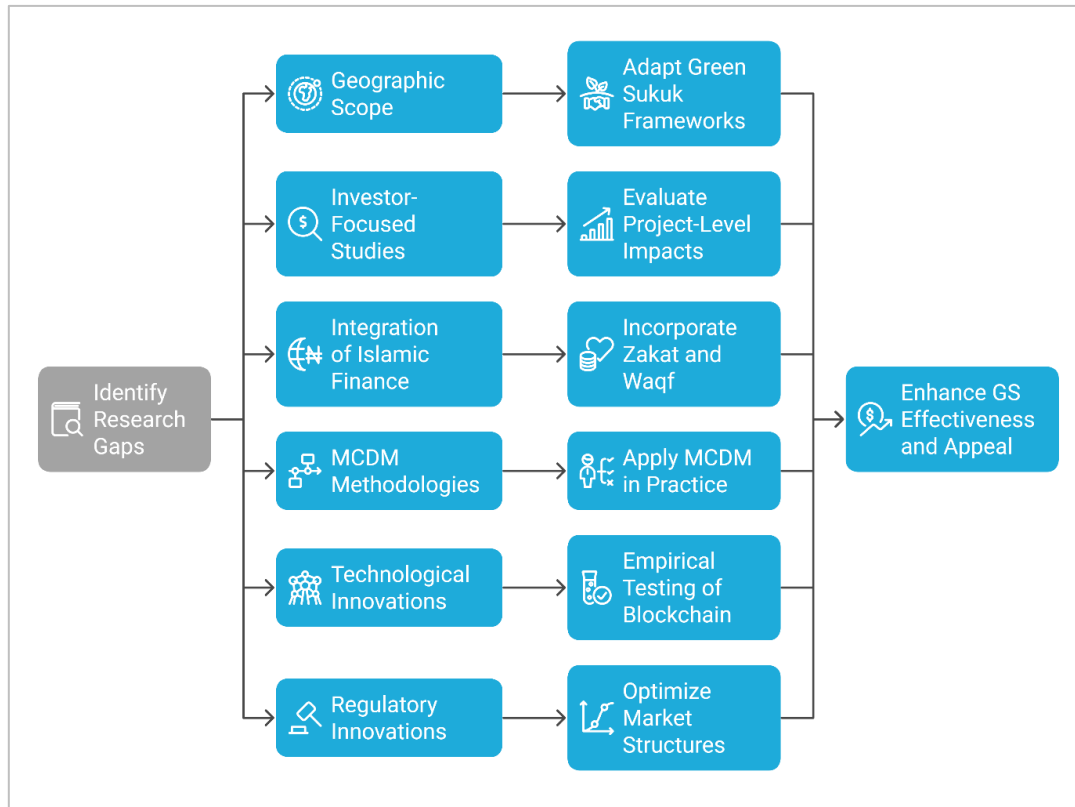


Figure 6: Key Research Gaps and Future Directions in *Green Sukuk* Literature

Source: Author's Compilation.

This systematic review delivers a structured, global perspective on the evolving *Green Sukuk* landscape, filling a critical gap in Islamic sustainable finance research. By synthesising findings from 43 peer-reviewed studies through a PRISMA-guided methodology, it identifies the core regulatory, institutional, and market-based challenges that inhibit *green sukuk* development.

Beyond mere categorisation, the review highlights how fragmented frameworks, low investor awareness, and weak ESG–Shariah alignment continue to limit *green sukuk* market growth, particularly in underexplored regions such as Africa, the GCC, and Türkiye. These insights help inform targeted interventions that address structural inefficiencies while fostering market confidence and cross-border harmonisation.

Theoretically, the findings underscore Islamic finance's compatibility with sustainability imperatives, positioning *Green Sukuk* as a faith-based instrument and a credible tool for inclusive development. For scholars, this study offers a platform for future empirical work and methodological innovations. Practitioners provide actionable insights into enhancing certification systems, investor engagement, and policy coherence.

In sum, the review establishes *Green Sukuk* as a vital bridge between Islamic finance and global sustainability goals, offering both conceptual clarity and practical direction for a more resilient and equitable financial future.



CHAPTER 4: QUALITATIVE DATA ANALYSIS AND RESULTS PRESENTATION

This chapter presents the qualitative phase of the study, which investigates the key challenges, barriers, and enabling conditions in the global *Green Sukuk* market. It builds directly on the conceptual foundations developed in previous chapters and lays the groundwork for the subsequent quantitative prioritization using the Bayesian Best-Worst Method (BWM). The qualitative component aimed to elicit expert-driven insights that would enhance the empirical relevance and stakeholder orientation of the study's conceptual framework.

Data were collected through in-depth interviews with a purposive sample of experts in Islamic finance, sustainable investment, and green capital markets. Thematic analysis was conducted following Braun and Clarke's (2006, 2019) six-step approach, supported by MAXQDA software for systematic coding. The analysis focused on identifying recurring patterns, divergences, and context-specific experiences, allowing themes to emerge inductively from the data.

This chapter is structured as follows: it begins with a detailed description of the research procedures and expert selection process, followed by a discussion of ethical considerations and trustworthiness criteria used to ensure rigor. It then presents the thematic findings across five major domains, each supported by subthemes and illustrative expert quotations. These results provide a refined and empirically grounded typology of *Green Sukuk* challenges, which informs the BWM instrument and contributes to theory, practice, and policy.

4.1. Data Collection and Interview Procedures

4.1.1. Data Collection

This qualitative study followed an inductive, expert-driven approach to explore the real-world challenges and opportunities in the *Green Sukuk* market. The data collection was guided by the need to capture deep, practice-based insights from professionals actively engaged in Islamic finance, green finance, and sustainable development. Ethical clearance for this phase was granted by the Social and Human Sciences Ethics Committee of Sakarya University (Reference: E-61923333-050.99-380589) on July 17, 2024. The

clearance ensured that the research complied with rigorous academic standards, including informed consent, data privacy, and participant confidentiality.

The data collection process took place between August 5 and November 30, 2024. It employed a flexible interview format that included face-to-face (2), Zoom (3), and email-based (3) interviews to accommodate participant availability and geographic constraints. In total, thirteen individuals were initially approached, and all responded. However, after applying the inclusion criteria, only eight experts were retained for analysis. The remaining five were excluded for specific reasons: two submitted email responses that merely extracted content from published literature, without offering original insights.

The other three excluded participants were initially considered eligible based on their publicly available profiles, and after reviewing the study concept and instructions, accepted the invitation and demonstrated general expertise in Islamic finance. However, upon closer engagement, it became evident that their expertise did not extend to the specific scope of this study, particularly the challenges or market dynamics of *Green Sukuk*, thus rendering their contributions outside the intended focus. This selective filtering ensured that the final dataset was grounded in authentic practice-based expertise, thereby enhancing the credibility and relevance of the thematic findings, and not redundant with existing secondary data already reviewed in Chapter Two.

To ensure consistency and methodological rigor, a detailed profile was developed to guide the selection of *Green Sukuk* experts and practitioners. Table 5 presents the core criteria used to identify and validate the suitability of expert interviewees. Participants were required to have a minimum of three years' experience in Islamic finance, with direct involvement in *Green Sukuk* issuance, policy formulation, or academic research. The selection emphasized technical competence, practical engagement, and regulatory awareness. Experts were drawn from diverse institutional backgrounds, including regulatory bodies, development banks, academia, and consultancy, to ensure a multidimensional perspective on *Green Sukuk* practices across jurisdictions.

Table 5: Expert Selection Criteria

Criteria	Criteria Summary
Professional Background	Minimum 3 years' experience in Islamic finance, with direct involvement in <i>Green Sukuk</i> .
Technical Expertise	Knowledge of Sukuk structuring, Shariah compliance, and environmental sustainability.
Table 5 (continued)	
Practical Involvement	Hands-on experience in <i>Green Sukuk</i> issuance or evaluation; stakeholder engagement.
Academic Contribution	Authored publications or participated in relevant research and innovation initiatives.
Communication & Access	Proficient in English; available for interview and follow-up discussion.

Source: Author's Compilation.

The final pool of interviewees met these criteria and represented diverse professional and geographical backgrounds, as detailed in Table 6. This strategic selection was pivotal in ensuring the richness and credibility of the qualitative findings. The interviews were guided by a semi-structured protocol (see Appendix 3: Expert Interview Protocol), which explored core themes including regulatory fragmentation, Shariah compliance, market awareness, and the sustainability performance of *Green Sukuk*.

Interviews lasted between 50 and 70 minutes for synchronous sessions. The data collected were immediately transcribed, anonymized, and coded for analysis. Importantly, data saturation—the point at which no new themes or patterns emerged—was reached after the eighth accepted interview. This confirmed the adequacy of the expert sample, consistent with best practices in qualitative research (Guest et al., 2006). Reaching saturation was particularly critical given the study's eventual use of BWM, which requires clear and convergent expert input to construct reliable prioritization models (Rezaei, 2015; Mohammadi & Rezaei, 2020).

The insights from this phase were essential for informing both the thematic synthesis and the development of the BWM decision criteria, which will be further elaborated in the next chapter.

Table 6: Profile of Informants

Number Assigned	Professional Background	Interview Date	Country	Venue
I1	Managing Director at Stellar Consulting Group, consulting multi-lateral organizations and SMEs on various projects.	August 05, 2024	Singapore	Online (Zoom)
I2	Associate Professor at International Islamic University Malaysia (IIUM), with over 10 years in Islamic finance education and research, specializing in Islamic sustainable finance, Sukuk development, and maqasid al-Shari'ah applications in capital markets.	October 19, 2024	Malaysia	Online (Zoom)
Table 6 (continued)				
I2	Associate Professor at International Islamic University Malaysia (IIUM), with over 10 years in Islamic finance education and research, specializing in Islamic sustainable finance, Sukuk development, and maqasid al-Shari'ah applications in capital markets.	October 19, 2024	Malaysia	Online (Zoom)
I3	Adjunct Professor and Managing Partner with over 21 years of expertise in corporate governance, risk management, and <i>green sukuk</i> . Chartered Accountant and Six Sigma specialist.	September 14, 2024	Malaysia	Email
I4	Deputy Director of Islamic Financing at Indonesia's Ministry of Finance, overseeing <i>Green Sukuk</i> issuance, impact reporting, and funding across nine sustainable sectors.	August 11, 2024	Indonesia	Email
I5	Director at Islamic Development Bank Institute, specializing in Islamic finance and sustainable development. Pioneered <i>Green Sukuk</i> initiatives aligning Shari'ah principles with global sustainability goals.	August 15, 2024	Saudi Arabia	Face-to-face (Jeddah)
I6	Senior Advisor at the Islamic Development Bank, with over 15 years in Islamic banking and finance, specializing in sustainable finance, <i>Green Sukuk</i> structuring, and Shari'ah-compliant investments.	August 18, 2024	Saudi Arabia	Face-to-face (Jeddah)
I7	Research Fellow at IIUM, focusing on Islamic finance, wealth management, and sustainability, with extensive research on SMEs and waqf financing.	September 24, 2024	Malaysia	Online (Zoom)
I8	Vice Dean at Universitas Airlangga, with over 15 years in Islamic banking and finance, specializing in risk management and Islamic capital markets.	November 14, 2024	Indonesia	Email

Source: Author's Compilation.

4.1.1.1. Interview and Coding Process

Following the completion of the expert interviews, the qualitative data underwent a systematic transcription and coding process to ensure clarity, traceability, and rigour in thematic development. The entire process was guided by Braun and Clarke's (2022) six-step framework for thematic analysis, which provided a flexible, yet methodologically robust structure suited to this inductive qualitative study. The six steps include: (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. This process enabled the researcher to construct themes grounded in the participants' actual words, insights, and experiences, consistent with the bottom-up logic of thematic analysis.

To begin with, each recorded interview, whether conducted face-to-face, via Zoom, or through email, was transcribed verbatim. This included all spoken content, as well as pauses, fillers (e.g., "um," "uh"), repetitions, and other linguistic nuances. Such detail preserved the authenticity of the responses and allowed for richer interpretation during the coding phase. Transcriptions were double-checked against the original recordings for accuracy and completeness.

The transcribed files were then imported into MAXQDA (version 24.9), a qualitative data analysis software that facilitated the systematic organization, coding, and retrieval of data. Within MAXQDA, a Discourse Unit (DU) coding protocol was applied: each utterance, whether a statement, question, or elaboration, was treated as a discrete unit of analysis. DUs were assigned a unique identifier consisting of three components: speaker identity (e.g., "R" for researcher or "I1" for Informant 1), interview date, and the sequential number of the discourse unit. This identifier system ensured precision in tracking the origin of quotes and enabled efficient referencing throughout the analysis.

For example, a statement by Informant 3 on September 14, 2024, might be labeled as "I3_20240914_DU23", representing the 23rd discourse unit from that interview. This meticulous system enhanced the transparency and reproducibility of the coding process, which is essential for maintaining reliability in qualitative research (Flick, 2014; Creswell, 2014).

Initial codes were generated inductively from the data, based on meaningful patterns, keywords, and emerging categories that related to the study's research questions,

particularly those concerning regulatory barriers, market challenges, Shariah compliance, and solutions for *Green Sukuk* development. Codes were descriptive at first and later refined through iterative rounds of reading, collapsing redundant labels and clarifying distinctions. Codes that shared similar underlying ideas were grouped into preliminary themes. These themes were later developed and validated through constant comparison with existing literature and further cross-interview analysis.

A sample of the coding structure is presented in Table 7, demonstrating how discourse units were identified and thematically coded using the MAXQDA for one participant. For transparency and auditability, full transcripts and coded outputs are provided in the Appendix 4, supporting the credibility and traceability of the qualitative findings.

Table 7: Sample of Data Transcription and Coding

NAME: Informant 1 (I1) DATE: August 5, 2024 TIME: 09:35 AM (Istanbul Time) DURATION: 1:00:56		
Discourse Unit	Researcher (R) / Interviewee (I1)	Transcription
1	R	<i>Assalam alaikum wa rahmatullahi wa barakatuhu again. First of all, thank you for allowing me to conduct interviews with you</i>
2	I1	You are welcome
3	R	<i>In the beginning, could you please provide background on your expertise and projects related to environmental sustainability and/or Green Sukuk in which you have been involved?</i>
4	I1	<i>I've been a consultant for at least 15 years now and I've been working for 25 years. On sustainability, some of the projects that I've been worked on are from my clients. 1 of the bigger ones is ... (this response has been anonymised due to ethical and privacy considerations)</i>
5	R	<i>Okay, that is great. ii. How would you describe the current state and potential of Green Sukuk in promoting environmental sustainability in Islamic sustainable finance? Just briefly, please.</i>

Source: Author's Compilation

4.2. Data Analysis Approach

Building on the transcription and coding process described in the previous section, this part of the chapter details the thematic analysis procedure used to extract, refine, and present insights from the expert interviews. The analysis followed Braun and Clarke's (2006, 2022) six-phase framework for thematic analysis, presented in Figure 7, which is particularly well-suited for inductive, theory-building qualitative studies such as this. This

structured yet flexible approach allowed the researcher to move iteratively from data familiarization to theme construction, while maintaining fidelity to the research questions and allowing patterns to emerge naturally from the data.

The themes derived through this process form the analytical backbone of the qualitative findings. These themes represent the perceptions, experiences, and knowledge shared by the experts regarding the current challenges, structural gaps, stakeholder concerns, and possible solutions related to GS issuance and development. The process not only helped identify the most salient qualitative dimensions but also provided the empirical grounding for refining the conceptual framework and designing the quantitative instrument in the subsequent Bayesian Best-Worst Method (BWM) phase.

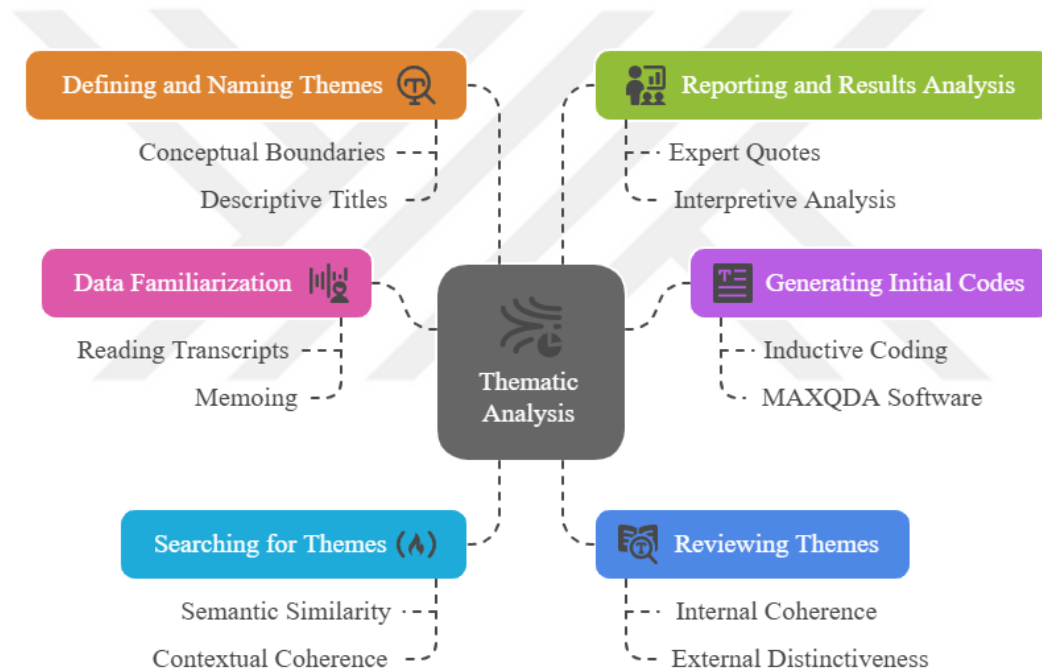


Figure 7: Six Phases of Thematic Analysis

Source: Braun & Clarke (2006)

4.2.1. Step 1: Familiarization with the Data

The thematic analysis began with the process of deep familiarization. After transcription, the researcher read and re-read each transcript multiple times to immerse in the narratives of the participants. This step involved not only passive reading but also active engagement through initial memoing, where early reflections, potential patterns, and emerging ideas were noted in analytic memos attached to each transcript. These memos served as early

signals of areas warranting deeper exploration and were later used to trace the evolution of concepts throughout the analysis.

4.2.2. Step 2: Generating Initial Codes

The second step involved generating initial codes using MAXQDA software. A total of over 600 discrete discourse units were coded across the eight validated interviews. Each segment of text that captured a meaningful idea, challenge, recommendation, or observation was assigned a code. The coding was inductive and open, meaning that codes were not derived from a predetermined list but instead emerged from the language and content of the transcripts. This open coding strategy enabled the discovery of unexpected insights and details that might not have been captured under a deductive framework.

Codes included both descriptive elements (e.g., "Shariah Compliance Screening") and interpretive insights (e.g., "Greenwashing Risk"). As coding progressed, duplicate or redundant codes were merged, and broader categories began to form organically based on conceptual proximity.

4.2.3. Step 3: Searching for Themes

In this stage of analysis, the research progressed from discrete codes toward the identification of broader conceptual patterns. Following Braun and Clarke's third step, the researcher systematically grouped similar codes into candidate themes based on semantic similarity, contextual coherence, and alignment with the study's core research objectives. This process was not merely a mechanical categorization, but an interpretive exercise driven by inductive reasoning and theoretical sensitivity to the landscape of Islamic sustainable finance and *Green Sukuk* development.

Using MAXQDA's coding sets and memoing features, preliminary themes were developed to encapsulate the core dimensions of the discourse. Codes addressing shared challenges such as institutional barriers, awareness gaps, and ethical alignment were clustered together, while those highlighting opportunities—like strategic partnerships or financial innovations—were mapped accordingly. Each theme was crafted to reflect a meaningful area of concern or advancement articulated by the experts.

As a result, seven preliminary themes were formed, capturing the breadth of perspectives shared in the expert interviews. These themes included: Investor Dynamics and Market

Perception, Regulatory and Structural Challenges, Environmental and Climate Integrity, Shariah Alignment and Ethical Governance, Financial Structures and Capital Constraints, Monitoring, Reporting, and Assurance, and Strategic Collaboration and Stakeholder Engagement. In addition, an eighth theme, Greenwashing and Integrity Risks, was delineated to capture discourse around risks of manipulation, opacity, and performance ambiguity in the *Green Sukuk* landscape.

Each theme is composed of multiple underlying indicators (codes), as summarized in Table 8. These themes not only emerged from the content but also echoed recurring patterns identified across multiple informants and contexts. They formed the analytical backbone for the remaining stages of analysis, including thematic refinement, definition, and results presentation.

Table 8: Preliminary Themes and Indicators from Expert Interviews

Preliminary Theme	Codes (Indicators)
Investor Dynamics and Market Perception	Investor Allocation, Investor Concerns, Investor Confidence, Investor Influence, Investor Interest, Investor Motivations, Investor Segmentation, Investor Behavior Analysis, Investor Unfamiliarity, Investor Awareness, Retail Investor Awareness, Retail Investor Participation, Market Awareness and Education, Market Demand Uncertainty, Market Confidence, Improved Investor Outreach (gap), Awareness, Awareness Building, Low Stakeholder Awareness, Issuers Awareness, Tailored Investment Strategies, Democratization of Investments, Millennial Investors, Limited Attractiveness, Widespread Adoption.
Regulatory and Structural Challenges	Regulatory Framework, Regulatory Environment, Regulatory Uncertainty, Regulatory Fragmentation, Regulatory Framework Gap, Regulation Burden, Regulatory and Policy Challenges, Enhanced Regulatory Clarity, Legal Frameworks, Unified Framework (Local and Global), National Development Plans, Compliance Mechanisms, Compliance Challenges, Standards Harmonization (Green & Sharia), Shariâ€™ah and Green Standards, Shariah Board Evaluation, Sharia Interpretation Challenges, Sharia Requirements, Inconsistent Sharia Application, Lack of Standards and Support, Lack of Universal Green Standards, Need for Universal Criteria, Standardized Metrics Development, Standardized Criteria, Global Standards, Government Support, Government Regulation, Government Incentives, Tax Incentives, Institutional Frameworks, Structural Interdependencies
Environmental and Climate Integrity	Environmental Impact, Environmental Impact Assessment (EIA), Environmental Goals, Environmental Preservation, Environmental Screening, Environmental Metrics, Environmental Standards, Environmental Sustainability Requirements, Environmental Benefit, Environmental Considerations, Climate Risk, Climate Goals, Climate Change Adaptation, Carbon Emission Reduction, Carbon Tax, Carbon Market, Carbon Footprint, Pollution Prevention and

**Shariah Alignment
and Ethical
Governance**

Control, Biodiversity Conservation, Sustainable Projects, Sustainable Water, Sustainable Agriculture, Clean Transportation, Circular Economy, Energy Access, Renewable Energy, Renewable Energy Projects, Green Buildings, Urban Greening Projects, Disaster Risk Reduction, Climate Commitments, Environmental-Religious Alignment, Reduced Emissions and Energy Independence, Green Definition, Green Shading Scores, Tangible Environmental Benefits, Unclear Green Standards, Lifecycle Impact Assessments

Shariah Compliance Screening, Shariah Compliance, Shariah Certification, Shariah Principles, Shariah Knowledge, Shariah Awareness, Dual Compliance, Dual Compliance Check, Dual Compliance Complexity, Dual Eligibility Criteria, Maqasid al-Shari'ah Integration, Ethical Commitment, Integration of Shari'ah

Table 8 (continued)

	and Environmental Criteria, Harmonization of Objectives, Holistic Wealth Management, Socio-Economic Benefits, Wealth Redistribution, Balancing Shari'ah and Green Criteria, Balancing Economy and Environment, Interest-based Financing, Interest-based Financial Practices, Ideological Tensions, Short-Term Jobs and Revenue, Social Impact Values
Financial Structures and Capital Constraints	Issuance Costs, High Issuance Costs, High Transaction Costs, Transaction Costs, Inflated Costs of Capital, Cost Reduction, Low Profit Margin Difference, Long Profitability Period, Low Return Advantage, Lack of Investment Flexibility, Lack of Long-term Investment Incentives, Lack of Pricing Incentives, Capital Gaps for Large Projects, Liquidity Constraints, Market Liquidity, Funding Allocation, Financial Literacy, Financial Strategies, Financial Challenges, Profit-and-loss Sharing Mechanisms, Risk Sharing Mechanisms (Solution), Risk-Return Profiles, Credit Risk, Debt Obligations, Dominance of Interest Rates, Embedded Interest Rates, Asset Financing, Asset Scarcity, Securitization Mechanism, Pricing Incentives, Diverse Green Investment (Solution), Public-Private Partnerships (PPPs) (solution), Blended Finance (solution), Multilateral Development Bank Credit Enhancements, Multilateral Grants and Loans (Solution), Sovereign <i>Green Sukuk</i> Guarantee Funds, Tranche-Based Issuance (Solution)
Monitoring, Reporting, and Assurance	Impact Measurement Models, Impact Measurement, Project Evaluation, Projects Evaluation, Project Performance Metrics, Project Performance, Initial Project Screening Framework, Detailed Evaluation (Structure and Assets), SPV Certificates (Documentation), Standardized Impact Assessment Tools, Standardization of Environmental Metrics (Solution), Green Standards Certification, Certification and Validation, Ensuring Transparency, Transparency and Accountability, Third-Party Certification, Third-Party Evaluation, Continuous Monitoring, Reporting, and Audits, Regular Reporting, Independent Evaluation and Audits, Ongoing Monitoring, Traceability Enhancement, Issuer Credibility and Track Record, Past Performance and Investor Satisfaction

Strategic Collaboration and Stakeholder Engagement	Collaboration Between GS Stakeholders, Collaborative Market Education, Stakeholder Dynamics, Stakeholder Engagement, Stakeholder Education and Outreach, External Reviews, Cross-Sector Coordination, Public Literacy, International Partnerships, Capacity Building and Market Education (solution), Co-creation with Regulators, Collaborative Issuance (Gap), Private Placement/Targeted Marketing Options (Gap)
Greenwashing and Integrity Risks	Greenwashing, Greenwashing Concerns, Greenwashing Risk, Fraud in <i>Green Sukuk</i> , Issuer Bias and Disclosure Manipulation, Risk Aversion, Risk Mitigation Planning, Risk Mitigation Tools, Complexity of the Issuance, Instrument Success, Unforeseen Future Challenges, Alignment Uncertainty, Performance Uncertainty, Difficulty Comparing Projects

Source: Author's Compilation.

4.2.4. Step 4: Reviewing Themes

Following the initial construction of themes, each candidate theme underwent a systematic review to evaluate its internal coherence and external distinctiveness. This involved a careful re-examination of the coded data segments to determine whether the content grouped within each theme was conceptually aligned and whether any significant insights had been misclassified or omitted. Themes that appeared weak, inconsistent, or only loosely related were either refined, merged with others, or excluded based on their relevance, prevalence, and conceptual clarity.

Throughout this process, continuous comparison was made between the emerging thematic structure and the original data units to ensure that the themes remained grounded in the empirical material and preserved interpretive integrity.

4.2.5. Step 5: Defining and Naming Themes

Following a comprehensive review and refinement process, the final thematic framework was constructed, comprising *eleven well-defined themes* that represent the core conceptual dimensions of the *Green Sukuk* (GS) ecosystem. These themes were distilled from expert interviews using Braun and Clarke's sixth phase of thematic analysis and reflect the diversity and depth of stakeholder perspectives.

The eleven themes are structured across three interrelated clusters:

Nine themes represent key challenges and barriers in the *Green Sukuk* market, ranging from informational and structural impediments to ethical, environmental, and technological constraints.

One theme captures the critical research gaps and measurement limitations, functioning as a *meta-challenge* that underlies or exacerbates other barriers.

One theme highlights actionable solutions and innovations, drawing from expert proposals and reform-oriented perspectives aimed at strengthening *Green Sukuk* adoption and impact.

Each theme was defined with clear conceptual boundaries and labelled with a concise, descriptive title that accurately reflects its focus. Where necessary, sub-themes were used to categorize granular but related ideas under broader thematic umbrellas. The final thematic structure reflects not only a taxonomy of barriers but also the latent potential within the *Green Sukuk* ecosystem, revealing enablers that remain underutilized due to activation constraints.

Table 9 presents the complete list of themes, their types, and descriptive memos. This thematic architecture serves as the analytic foundation for the subsequent discussion (Section 4.5), where each theme is explored in depth through expert narratives, interpretive insights, and empirical coding.

Table 9: Final Set of Thematic Dimensions in the *Green Sukuk* Ecosystem

#	Theme Title	Theme Type	Description (Memo)
1	Investor Awareness and Market Readiness	Stakeholder Barrier	Lack of investor education, demand uncertainty, and insufficient promotion of <i>Green Sukuk</i> opportunities.
2	Regulatory and Institutional Fragmentation	Structural and Governance Barrier	Absence of unified frameworks, regulatory misalignment, and fragmented institutional roles.
3	Environmental and Climate Integrity	Environmental Challenge	Concerns over actual environmental benefits, climate relevance of projects, and alignment with green taxonomies.
4	Shariah Alignment and Ethical Foundations	Faith-based Compliance Challenge	Tensions between green project financing and Shariah compliance, including avoidance of <i>gharar</i> or unethical assets.
5	Financial Structuring and Cost Constraints	Financial and Operational Barrier	High transaction costs, complexity of structuring, and lack of financial viability in early-stage projects.
6	Monitoring, Reporting, and Assurance	Governance and Transparency Challenge	Weak assurance mechanisms, lack of third-party verification, and inconsistent impact reporting standards.

7	Stakeholder Coordination and Engagement	Institutional Enabler Challenges	Limited collaboration between issuers, regulators, and civil society, with poor feedback loops and co-creation practices.
8	Greenwashing and Integrity Risks	Ethical and Disclosure Risk	Risks of exaggerated claims, reputational issues, and lack of transparency in project selection and use of proceeds.
9	Technological Leverage and Digital Innovation	Strategic Enabler (Barrier)	Opportunities for digital platforms, blockchain-based reporting, and data-driven ESG monitoring to enhance trust and efficiency.
10	Research Gaps and Measurement Limitations	Knowledge and Evidence Gap	Lack of longitudinal impact studies, inconsistent metrics, and insufficient academic engagement in assessing <i>Green Sukuk</i> effectiveness.
11	Solutions and Strategic Innovations	Action-Oriented Theme	Proposals and innovations from stakeholders, such as blended finance, regulatory sandboxing, and localized green criteria frameworks.

Source: Author's Compilation.

4.3. Trustworthiness, Reliability and Validity

To ensure the rigor and quality of this qualitative inquiry, the study adhered to established criteria for trustworthiness in qualitative research, as proposed by Lincoln and Guba (1985). These include *credibility*, *transferability*, *dependability*, and *confirmability*, each representing a qualitative counterpart to traditional notions of reliability and validity in quantitative research.

- Credibility was addressed through a combination of purposive sampling, expert triangulation, and iterative validation of emerging themes. All interviewees were carefully selected based on their professional engagement in *Green Sukuk* markets, ensuring that the insights reflected lived experiences and domain expertise. Member checking was employed informally during the interviews, where participants were asked to clarify, elaborate, or verify their statements in real-time to enhance the accuracy of interpretation.
- Transferability was supported by providing rich, contextual descriptions of participants' backgrounds, institutional roles, and jurisdictions of practice. While generalization is not the aim of qualitative research, the study offers sufficient detail

to allow readers and practitioners to assess the applicability of the findings to other settings, particularly within Islamic finance and sustainable investment ecosystems.

- Dependability was maintained through a transparent and consistent research process. All stages—from expert selection and interview scheduling to coding and thematic development—were systematically documented. The use of MAXQDA software further ensured procedural traceability, allowing for an audit trail of analytical decisions and codebook development. A reflexive journal was also maintained to record methodological choices and researcher reflections throughout the data collection and analysis process.
- Confirmability was reinforced by minimizing researcher bias and maintaining analytic neutrality. The inductive thematic process allowed themes to emerge from the data rather than being imposed a priori. Expert quotations are presented to support analytical interpretations, ensuring that findings are rooted in participants' own words and perspectives. Additionally, the research received ethical approval from Sakarya University's Social and Human Sciences Ethics Committee, which required adherence to principles of integrity, confidentiality, and informed consent.

Taken together, these measures enhance the overall trustworthiness of the study and ensure that its qualitative findings are robust, ethically grounded, and relevant to real-world *Green Sukuk* practices.

4.4. Thematic Presentation of Findings

This section presents the core themes that emerged from the expert interviews using Braun and Clarke's six-phase thematic analysis approach. The eleven themes identified reflect the multifaceted barriers, gaps, and enabling factors that shape the current landscape of *Green Sukuk* development. Each theme captures a specific dimension of stakeholder experience, structural limitations, or solution-oriented suggestions shared during the interviews. The thematic structure does not merely catalog challenges but maps the interconnections between regulatory gaps, investor behaviors, project credibility, governance needs, ethical alignment, and innovation pathways. A comprehensive summary of these themes, sub-themes, solutions, and related codes is provided in Appendix 5.

Figure 8 presents a visual synthesis of the most frequently recurring terms, concerns, and conceptual anchors raised by the eight expert participants, as coded and analysed in MAXQDA. For analytical clarity, explicit terms such as “*Green Sukuk*” and “*Sukuk*” were deliberately excluded from the word cloud. This exclusion ensures that the figure reflects the underlying thematic content of the interviews, capturing the substantive issues, priorities, and challenges discussed rather than simply reproducing the central topic of the study. In this way, visualisation provides a more accurate representation of the conceptual density and diversity of stakeholder discourse.

The relative size of each term indicates the frequency and centrality of the dataset. Prominent words such as “environmental”, “projects”, “Islamic”, “financial”, “sustainability”, and “market” emerge as dominant anchors in shaping the conversation. Other frequently cited concepts, “regulatory”, “standards”, “principles”, “transparency”, “investment”, “reporting”, “risks”, and “awareness”, reflect persistent concerns over compliance, market credibility, and readiness.

The recurrence of terms such as “framework”, “criteria”, “certification”, “education”, “goals”, “climate”, and “ethical” points to the dual requirement of robust governance structures and the integration of Islamic finance principles with environmental imperatives. Meanwhile, words like “private”, “cost”, “incentives”, and “resources” signal operational and financing constraints that must be addressed for market expansion. Based on the literature reviewed earlier, this lexical pattern reaffirms previous findings that the growth of Islamic sustainable finance hinges on (i) strengthening regulatory and institutional capacity through harmonised standards (for example, IFSB, AAOIFI, ICMA alignment), (ii) enhancing market education and investor segmentation to close behavioural and awareness gaps, and (iii) developing rigorous impact assessment and reporting systems to strengthen credibility (Shafii et al., 2021; Alam et al., 2023; Md Zahir, 2024).

Although this qualitative mapping provides an overview of expert concerns, it does not show the relative importance of each challenge or opportunity. The next sections present more details from the interview findings, including themes, sub-themes, and key patterns, before moving to Chapter 5, where the Bayesian Best–Worst Method (BWM) is used to prioritise, these factors based on expert judgment and provide a solid basis for targeted policy and strategic actions.

Overall, these phrases not only reflect lexical density but also offer a condensed summary of the most salient themes discussed, thereby enhancing the validity and coherence of the qualitative findings presented in this chapter.

Table 10: Most Frequent Word Combinations in *Expert Interviews on GS*

Word combination	Frequency	Percentage	Rank	Documents
<i>Green Sukuk</i> Project	35	233.33	1	8
<i>Green Sukuk</i> Issuance	26	173.33	2	8
<i>Green Sukuk</i> Market	16	106.67	3	4
Implement <i>Green Sukuk</i>	14	93.33	4	8
Islamic Sustainable Finance	14	93.33	4	7
Islamic Financial Principle	13	86.67	6	8
Islamic Finance Principle	12	80.00	7	5
Align <i>Green Sukuk</i>	11	73.33	8	8
High Transaction Cost	10	66.67	9	2
Balance Short-Term Economic	9	60.00	10	8

Source: Author's Compilation.

4.4.1. Theme 1: Investor Awareness and Market Readiness

Investor awareness and market readiness emerged as one of the most pressing challenges facing the global *Green Sukuk* market. The lack of investor education, limited public understanding, and low market responsiveness were consistently highlighted by experts as fundamental barriers to broader adoption and long-term viability. This theme reflects not only knowledge gaps among key stakeholders but also structural weaknesses in market development, segmentation strategies, and the perceived appeal of *Green Sukuk* instruments.

To better understand this barrier, the theme is organized into four interconnected sub-themes, as illustrated in Figure 9: (i) Awareness, Education, and Familiarity, (Shafii et al.) Market Structure, Dynamics, and Responsiveness, (iii) Investor Behavior, Segmentation, and Targeting, and (iv) Product Appeal and Perceived Potential. Each sub-theme captures a specific dimension of the *Green Sukuk* investment environment, shedding light on structural limitations and stakeholder challenges. These are further elaborated through thematic codes and selected expert quotations.

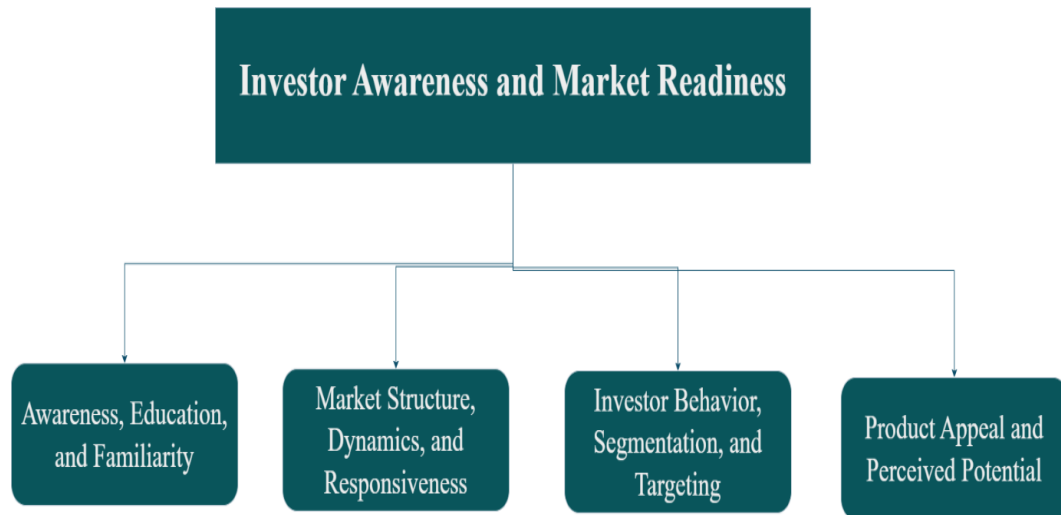


Figure 9: Thematic Structure of Investor Awareness and Market Readiness

Source: Author's Compilation.

The first sub-theme, *Awareness, Education, and Familiarity*, highlights a foundational challenge: the widespread unfamiliarity with *Green Sukuk* among financial stakeholders. Experts emphasized that many investors, issuers, and regulators lack even a basic understanding of how *Green Sukuk* differ from conventional sukuk or green bonds.

One expert stated: “Many stakeholders in the Islamic finance industry are unfamiliar with how Green Sukuk can be structured or how it differs from conventional green bonds” (I7, Pos. 17).

This unfamiliarity extends across both public and private sectors and impedes market confidence. To address this, interviewees called for more structured educational efforts and joint initiatives between regulators, financial institutions, and academic bodies. As one participant explained: “Financial institutions, regulators, and educational bodies must collaborate to highlight the ethical and financial benefits of Green Sukuk... to attract a wider and more diverse pool of investors” (I7, Pos. 35).

Another respondent stressed the need for practical learning tools: “Workshops, case studies, and best practices can help build a shared understanding of how Islamic finance and sustainability principles converge, paving the way for broader acceptance” (I5, Pos. 33). The codes associated with this sub-theme include *Green Sukuk* Literacy, Investor Unfamiliarity, Awareness Building, and Retail Investor Awareness.

The second sub-theme, *Market Structure, Dynamics, and Responsiveness*, reveals more systemic constraints that limit the scalability and inclusiveness of the *Green Sukuk* market. Respondents noted the lack of competitiveness and limited attractiveness of

current offerings, especially in markets with weak regulatory support or limited institutional coordination. One expert noted: “Market acceptance also remains a hurdle... Green Sukuk is a relatively new concept that requires greater awareness and education to attract investors” (I2, Pos. 23).

Experts linked the slow growth of the market to fragmented awareness and the absence of targeted strategies for enhancing market depth. A recurring concern was the limited participation of the private sector, with one expert observing: “Green Sukuk financing is still less attractive for private sector” (I8, Pos. 23). Another interviewee emphasized the need to gauge market conditions prior to issuance: “Before you issue something, you have to understand that there has to be people who buy the Sukuk... it has to be credible with green credentials” (I1, Pos. 30–32).

Commonly cited codes for this sub-theme included Market Growth Slower, Market Demand Uncertainty, Market Confidence, Niche Market, and Limited Attractiveness.

Building on this, the third sub-theme, Investor Behavior, Segmentation, and Targeting, addresses the diversity and evolving expectations of different investor groups. Experts indicated that the *Green Sukuk* market has yet to effectively segment or engage key demographics, particularly socially conscious retail investors and millennial investors. One participant explained: “Many investors, particularly retail investors, may not fully understand the concept of Green Sukuk or its potential benefits” (I7, Pos. 33).

Despite this gap, the same respondent acknowledged an opportunity: “Millennial investors, however, show a greater inclination toward ESG-compliant investments, representing a significant opportunity for growth” (I7, Pos. 33).

Another expert proposed technological innovation as a strategic entry point: “It would be beneficial to explore how Islamic fintech solutions could democratize Green Sukuk investments, making them accessible to a broader range of retail investors” (I6, Pos. 36). Codes such as Investor Segmentation, Investor Interest, Investor Confidence, and Retail Investor Participation reflect the depth of this behavioral sub-theme.

Finally, the sub-theme Product Appeal and Perceived Potential focus on how *Green Sukuk* are viewed in terms of long-term value and novelty. Despite growing interest in sustainable finance, some investors remain hesitant due to the absence of a proven track record. Experts acknowledged this challenge, noting that: “Green Sukuk must be

accompanied by robust governance structures, independent audits, and transparent reporting systems... to help establish it as a credible and reliable instrument” (I5, Pos. 54). Others viewed the long-term orientation of *Green Sukuk* positively, particularly in relation to their alignment with national climate targets. One expert elaborated: “The structure of Green Sukuk enables projects to focus on creating long-term value rather than achieving short-term financial gains” (I5, Pos. 28).

Still, the novelty of the product and the lack of empirical impact data remain concerns. Codes such as Long-Term Orientation, Untapped Potential, and Novelty and Lack of Precedent are indicative of this discussion.

To visually synthesize the insights discussed above, Figure 10 presents a conceptual progression of investor engagement stages in the *Green Sukuk* ecosystem, developed by the researcher based on expert perspectives. It illustrates how stakeholders transition from initial unfamiliarity to full market readiness, highlighting the layered challenges of awareness-building, market education, and behavioral preparedness.

This pathway underscores the importance of targeted interventions at each stage to enhance investor understanding, stimulate demand, and support a more inclusive and resilient *Green Sukuk* market.

Building on experts’ perspectives, the existing literature reinforces that investor awareness and market readiness are not merely outreach or promotion issues, but structural constraints linked to underdeveloped market segmentation, limited empirical evidence of performance, and insufficiently articulated value propositions (Khalilzadeh, 2025 #135). Prior studies emphasise that without transparent post-issuance reporting and verifiable ESG impact data, potential growth segments—such as millennial and socially responsible investors, remain cautious, a pattern consistent with the BWM finding that awareness ranks high but not as the sole binding constraint. The literature also points to the risk that investor education initiatives, if not accompanied by credible certification and governance mechanisms, may raise expectations without addressing trust deficits (Fahad, 2022).

In this respect, the qualitative insights identify relevant behavioural and structural gaps, while the BWM results strengthen the evidence by situating awareness within a broader hierarchy of barriers, aligning with and refining the conclusions of earlier research.



Figure 10: Stages of Investor Progression Toward *Green Sukuk* Market Readiness

Source: Author's Compilation.

4.4.2. Theme 2: Regulatory and Institutional Fragmentation

The second key barrier identified through the interviews relates to the fragmented and often inconsistent regulatory and institutional frameworks that govern the issuance and governance of *Green Sukuk*. Experts pointed to this fragmentation as a fundamental constraint that not only complicates implementation but also undermines investor confidence and market credibility. The theme encompasses a broad range of interrelated regulatory and governance issues, including legal ambiguity, institutional misalignment, Shariah integration challenges, and the absence of universally accepted standards.

Experts frequently highlighted that regulatory frameworks for *Green Sukuk* are still evolving and often inadequate to address the dual compliance demands of Shariah principles and environmental standards. References to codes such as Regulatory Fragmentation, Regulatory and Policy Challenges, and Enhanced Regulatory Clarity reflected these concerns. One expert explained that: “When it’s something new, the regulations are not in place... regulators must work with industry practitioners to create a credible regulatory framework” (I1, Pos. 25–26).

This lack of pre-existing regulation often leads to confusion, delays in issuance, and hesitancy from both investors and issuers. Moreover, while certain national authorities

have taken steps to support *Green Sukuk* through development plans and incentive mechanisms, several respondents noted that such policies remain sporadic or insufficiently coordinated, contributing to regulatory uncertainty and higher compliance burdens.

Compounding these regulatory gaps are the institutional misalignments and weak interdependencies that characterize much of the *Green Sukuk* ecosystem. Codes such as Institutional Frameworks, Regional and Country Context, and Sustainable Finance Ecosystem revealed concerns about the limited coordination among key institutions, both domestically and internationally. Although international standards—such as those issued by ICMA, the Climate Bonds Initiative (Climate Bonds Initiative), and ASEAN Green Bond Standards—provide useful templates, many of the experts noted that their adaptation into Islamic finance contexts is inconsistent or underdeveloped.

One interviewee stressed the need for regional contextualization, arguing that: “More research is required to understand how [Green Sukuk] can be adapted to specific regional needs” (I5, Pos. 46).

The lack of integration between institutional mandates and operational procedures was cited as a structural gap that weakens the enabling environment for *Green Sukuk* to thrive. Another layer of complexity arises from the need to reconcile Shariah compliance with green finance objectives. Experts pointed to the inherent tension between conventional environmental financing models, often built around interest-based systems, and Islamic finance principles grounded in risk-sharing and ethical investment. This friction is captured in codes such as Shariah and Green Standards, Inconsistent Sharia Application, and Shariah Board Evaluation. As one participant explained: “While Shariah compliance emphasizes risk-sharing and equity, many environmental standards were designed within conventional frameworks... this misalignment complicates structuring” (I5, Pos. 18).

In practice, varying interpretations of Shariah across jurisdictions lead to inconsistencies in project evaluation and approval, further undermining standardization. Several interviewees called for unified guidance on Shariah-compliant green investments and emphasized the need for collaborative efforts between Islamic regulatory bodies such as IFSB and AAOIFI.

In parallel, the absence of standardized eligibility frameworks and metrics emerged as a recurrent theme. Codes such as Standardized Metrics Development, Eligible Projects for

Green Sukuk, and Lack of Universal Green Standards pointed to the urgent need for harmonized evaluation criteria that can support project selection, reporting, and impact verification. One expert emphasized that: “You have to have a standardized criteria for the issuance so that it gives transparency, confidence and comparability moving forward” (I1, Pos. 27).

Other participants underscored the lack of Islamic ESG rating systems and the need to develop standards that integrate both environmental benchmarks and the ethical objectives of Maqasid al-Shariah. For example, one expert noted that: “Major gaps include the lack of a clear framework combining Maqasid al-Shariah with environmental sustainability” (I6, Pos. 29).

Without such frameworks, issuers and investors alike face significant difficulties in assessing the credibility, impact, and acceptability of green-labeled sukuk.

Together, these sub-dimensions of regulatory and institutional fragmentation illustrate a deeply interwoven set of structural limitations that challenge the scalability and credibility of the *Green Sukuk* market. From ambiguous regulations and fragmented policy mandates to interpretive inconsistencies in Shariah rulings and the absence of universal standards, this theme reveals that institutional readiness is as critical as financial innovation for achieving market depth and investor confidence.

Addressing these issues requires cross-sectoral alignment, international collaboration, and decisive policy reform, efforts that are necessary to move *Green Sukuk* from niche experimentation to mainstream adoption.

In addition to the gaps highlighted by experts, the literature reviewed in earlier chapters indicates several dimensions of regulatory and institutional fragmentation that appear underexplored in the interview discourse. First, past studies have shown that definitional ambiguity, particularly around what constitutes a “green” project in Islamic capital markets, remains a central weakness (Khalilzadeh et al., 2025; Alam et al., 2023). While some jurisdictions have recently advanced clearer taxonomies, they have yet to gain universal traction, meaning that in certain markets, the challenge may gradually diminish, whereas in others, it persists as a primary deterrent to cross-border issuances.

Second, the literature has long pointed to the role of cross-recognition and mutual equivalence agreements between regulators as critical enablers for market scaling (Shafii, 2017 #117). The absence of such mechanisms forces issuers to navigate multiple approval

processes, increasing costs and timelines, issues not strongly stressed by experts, but still materially relevant for policy design. Likewise, earlier empirical reviews have argued that regional standard-setting bodies, such as IFSB and AAOIFI, could be more proactive in embedding environmental metrics into Shariah compliance templates, rather than leaving this to ad hoc national initiatives (Fahad, 2022 #85).

Third, while experts emphasised the need for unified standards, the literature has raised caution that over-standardisation without flexibility can risk excluding locally relevant project types, particularly in underdeveloped markets (Zahir, 2024 #81). This tension, between the drive for harmonisation and the need for contextual adaptation, was not explicitly discussed in the interviews, yet it is crucial to design frameworks that are both credible and inclusive.

These observations reinforce the view that regulatory and institutional barriers are deeply structural, with some elements already evolving in certain markets while others remain entrenched. The persistence of these challenges and their relative weight compared to other barriers will be examined in greater depth in Chapter 5 through Bayesian Best–Worst Method (BWM) prioritisation. This phase quantifies how experts rank these issues against other Green Sukuk constraints, allowing for a clearer picture of whether the regulatory and institutional fragmentation identified here is perceived as the most urgent area for reform or one of several competing priorities.

4.4.3. Theme 3: Environmental and Climate Integrity

A core theme emerging from the expert interviews was the critical importance of environmental and climate integrity in shaping the credibility, functionality, and global legitimacy of *Green Sukuk*. Experts consistently emphasized that *Green Sukuk* must not only comply with Islamic financial principles but also demonstrate genuine, measurable environmental benefits.

This dual requirement necessitates a complex evaluation process that integrates environmental science, climate policy, and Islamic jurisprudence. Four interlinked dimensions frame this theme: climate response and carbon transition, environmental screening and eligibility, sustainable resource allocation, and strategic project design with long-term sustainability goals.

A central issue discussed was the new layer of environmental and climate risk inherent in *Green Sukuk* structures. Experts described these risks as distinct from conventional market or credit risks, pointing out that investors must now consider factors such as carbon emissions, environmental degradation, and compliance with climate commitments. These concerns were coded under *Environmental Risk*, *Climate Risk*, *Carbon Footprint*, and *Climate Change Adaptation*. One expert stated “So, a normal bond or Sukuk risk is market risk, credit risk. Now you have environmental risk or climate risk... the green, the additional risk that's associated with this greenness, which is either environmental risk or climate risk.” (I1, Pos. 60)

Another emerging topic was the controversial yet increasingly discussed *Carbon Market*, which sparked ethical debates among interviewees. One respondent reflected “Carbon trading or carbon markets is not the way to go from a Sharia perspective... He may be a sustainability expert, but he’s not a Sharia expert... if you have all expertise, then you know.” (I1, Pos. 117) This highlights the tension between environmental mechanisms that are widely accepted in global climate finance and the ethical imperatives within Islamic finance.

The intersection between *Green Sukuk* and national climate strategies also featured prominently, particularly in contexts such as Malaysia and Indonesia. Codes like *Alignment with National Climate Agenda*, *Reduced Emissions and Energy Independence*, and *Climate Commitments* reflect the experts’ consensus on the need for regulatory alignment and government stewardship. As one expert noted “the evaluation process in Malaysia often involves third-party environmental consultants who assess the project's environmental impact, including carbon emissions reduction, energy efficiency, and alignment with Malaysia’s national climate goals.” (I2, Pos. 25–26)

In tandem with climate priorities, eligibility criteria and environmental screening mechanisms were seen as essential to prevent greenwashing and improve project credibility. Interviewees discussed the use of *Environmental Screening*, *ESG Metrics*, *Environmental Sustainability Requirements*, and *Green Shading Scores* to validate project quality. The lack of harmonized frameworks that integrate both environmental and Islamic standards was cited as a major obstacle. As one expert explained: “One of the primary challenges in implementing Green Sukuk is the lack of standardized guidelines

that accommodate both Sharia and environmental sustainability requirements.” (I5, Pos. 18)

Beyond screening, experts stressed that environmental project selection should prioritize high-impact sectors. This includes *Renewable Energy Initiatives*, *Pollution Prevention*, *Sustainable Water*, and *Green Buildings*, among others. Several respondents emphasized the need for *Green Sukuk* to fund infrastructure aligned with *Circular Economy* principles and *Biodiversity Conservation*. For example: “Funds raised through Green Sukuk are allocated to various green projects, including renewable energy, sustainable agriculture, and disaster risk reduction, aligning with the country’s Nationally Determined Contributions (NDC) and Sustainable Development Goals (SDGs).” (I4, Pos. 20)

Interviewees also addressed the issue of environmental project viability, highlighting that not all green-labelled initiatives are economically or technically sound. Hence, rigorous assessments such as *Lifecycle Impact Assessments*, *Environmental Impact Assessments (EIA)*, and ongoing monitoring are essential to ensure that *Green Sukuk* deliver long-term value. This was echoed in the following quote: “You have to do an independent assessment, hopefully a third-party evaluation, to ensure that when they say this green project is going to cut emissions... whatever they claim is true.” (I1, Pos. 51)

Additionally, the long-term sustainability of *Green Sukuk* was linked to broader strategic concerns, including *Environmental and Social Justice*, *Food Security*, and *Sustainability for Future Generations*. These reflect a deeper ethical orientation consistent with both Maqasid al-Shariah and the global Sustainable Development Goals (SDGs). For example: “Green Sukuk ensures that financing mechanisms are free from interest and speculative activities, making them a more ethical choice for investors who prioritize both environmental and social justice.” (I5, Pos. 14)

Ultimately, the theme of Environmental and Climate Integrity illustrates that *Green Sukuk* must go beyond labels and financial compliance. They must embody a real and verifiable commitment to environmental sustainability. Without clearly defined eligibility frameworks, third-party verification systems, and alignment with national and global climate objectives, the credibility and effectiveness of *Green Sukuk* will remain contested. Strengthening this dimension is essential for bridging the gap between faith-based investing and science-based environmental finance, ensuring *Green Sukuk* can evolve into a truly impactful tool for sustainable development.

4.4.4. Theme 4: Shariah Alignment and Ethical Foundations

The fourth theme centres on the complex but foundational role of Shariah alignment and ethical integration in the development and credibility of *Green Sukuk*. Experts stressed that for *Green Sukuk* to gain legitimacy within Islamic financial systems, they must not only fulfill environmental standards but also comply with the moral and legal precepts of Shariah. This theme captures a multifaceted set of barriers and conceptual opportunities around dual compliance, the integration of Islamic ethics with sustainability, social equity, and the philosophical tensions that arise from blending Islamic and conventional finance paradigms.

At the core of this theme lies the requirement for Shariah compliance and screening mechanisms, which are distinct from typical ESG filters used in conventional green finance. Interviewees noted the complexity of dual compliance processes, particularly when determining whether a project meets both environmental and Shariah standards. This dual requirement introduces layers of screening and verification that can affect eligibility, timelines, and investor confidence. For example, one expert explained: “For us, not only must it meet the green criteria or the environmental standards—first and foremost, but it must also meet the Islamic or Sharia principles. So, it cannot deal with *riba*, it cannot have elements of speculation or ambiguity, especially deceptive ambiguity.” (I1, Pos. 44)

These dual demands, reflected in codes such as *Dual Compliance*, *Shariah Compliance Screening*, and *Dual Eligibility Criteria*, add complexity to product design. Another expert emphasized the institutional side of this challenge: “Ensuring that projects funded by Green Sukuk adhere to Sharia principles while also meeting environmental standards can be complex.” (I4, Pos. 26)

Such complexity underscores the need for robust *Shariah certification* protocols and for enhanced *Shariah awareness* among investors and issuers. The challenge is not simply technical but epistemological—requiring Islamic finance practitioners and environmental experts to collaborate on new forms of ethical due diligence.

A closely related dimension is the integration of ethics and sustainability into Islamic finance frameworks, where principles such as *maqasid al-Shariah* (objectives of Islamic law) are being actively considered as anchors for evaluating sustainability. The interviews revealed strong support for this integrative approach, though many noted that it remains

underdeveloped in both theory and practice. For instance: “Major gaps include the lack of a clear framework combining maqasid al-Shari’ah with environmental sustainability and limited Islamic ESG rating systems tailored to Green Sukuk evaluation.” (I6, Pos. 29)

This integration calls for a *harmonization of objectives*, ensuring that environmental aims and Shariah objectives are not only compatible but mutually reinforcing. One interviewee captured this dual ambition succinctly: “This unique ability to harmonize immediate and future objectives makes Green Sukuk a critical tool in the transition toward sustainable development.” (I5, Pos. 29)

However, several respondents noted that the current *Shariah-Green Guidelines* are fragmented, with no standardized criteria for reconciling environmental goals with Islamic jurisprudence. These concerns are captured in codes such as *Integration of Shariah and Environmental Criteria* and *Sustainability Frameworks*.

The third sub-theme reflects the emphasis on social equity and ethical investment values embedded in Islamic finance. *Green Sukuk*, by design, offer opportunities not only for environmental improvement but also for *wealth redistribution*, *productive investment*, and *socio-economic benefits* aligned with Islamic principles. Several experts articulated this broader moral appeal. For example: “They want to have some kind of social elements that they are needing or they're helping... Helping the poor, making the world a better place, improving the green environment... you have to have something that appeals to their need.” (I1, Pos. 57)

This social consciousness is embedded in the codes *Social Impact Values*, *Holistic Wealth Management*, and *Socio-Economic Benefits*. The idea is not just to *balance economy and environment*, but to anchor finance in service of justice and intergenerational equity. Another respondent noted: “Green Sukuk is an important avenue for redistribution of wealth and achievement of social justice.” (I3, Pos. 62)

Finally, several experts raised *philosophical and structural critiques* of current financial models, highlighting *ideological tensions* between interest-based practices and Islamic ethics. One particularly strong commentary identified the global debt system as antithetical to sustainability: “Interest creates an unsustainable burden on governments... Green Sukuk, with its interest-free model, provides a unique solution by allowing

governments and institutions to pursue development goals without the crippling constraints of debt servicing.” (I5, Pos. 53)

This line of critique was echoed in codes such as *Interest-Based Financial Practices*, *Short-Term Profitability*, and *Balancing Shariah and Green Criteria*. Experts also stressed the *behavioral aspects of stakeholders*, including trust, perception, and confidence, which affect investment behaviour and institutional adoption.

In sum, this theme reveals that the true potential of *Green Sukuk* lies in their ability to bridge ethical finance with environmental justice. However, to move from promise to practice, there is a pressing need to institutionalize dual compliance mechanisms, integrate Islamic ethical values into environmental screening, and resolve the philosophical tensions between Islamic and conventional paradigms. Without these steps, the ethical authenticity and investor trust essential to the success of *Green Sukuk* will remain limited.

4.4.5. Theme 5: Financial Structuring and Cost Constraints

A core theme that emerged across the expert interviews was the structural and financial limitations constraining the development of *Green Sukuk* as a viable and competitive financing tool. These challenges span from the capacity and preparedness of issuers to systemic cost burdens and market-level barriers to access. The insights discussed under this theme reveal a persistent tension between ambition and affordability, where Islamic financial ideals and environmental objectives often clash with economic realities, risk structures, and market immaturity.

A foundational sub-theme concerns *issuer capacity and structural readiness*. Several interviewees observed that while *Green Sukuk* holds considerable momentum and promise, the market remains nascent and structurally fragmented. Issuers often lack technical expertise in structuring Shariah-compliant and environmentally sound instruments, with many still navigating dual compliance and project viability assessments. According to one respondent: “The current state of Green Sukuk is both promising and challenging. While the concept has gained momentum in recent years, particularly after the first issuance in Malaysia in 2017, it remains a relatively nascent market” (I7, Pos. 15).

The need for issuer guidance, innovative financing models, and hybrid sukuk structures is evident. Institutional support and technical hand-holding can be vital in developing green financing instruments tailored to local contexts. This is particularly important given that many prospective issuers, especially in developing markets, are not yet equipped to meet the procedural and documentary requirements of Green Sukuk issuance.

Closely linked to issuer capacity is the sub-theme of *capital access and market participation*, particularly the limited role of private sector actors and the fragmented supply of eligible green projects. Several experts pointed out that the availability of *diversified funding sources, sustainable capital access*, and support from *multilateral development banks* is critical to scaling *Green Sukuk* adoption: “You have this kind of financing usually coming from the multilateral development banks... they supplement with concessional grants and loans to help fund green projects.” (I1, Pos. 89)

Despite the growing *market demand*, the *limited green project supply* and lack of *private sector participation*, especially in oil-dependent economies, pose major roadblocks. Sovereign actors have led the way, but the *establishment of sovereign Green Sukuk guarantee funds* remains a necessary strategic innovation for market-wide scale-up.

Another important set of constraints arises from the *asset structure and risk exposure* inherent in *Green Sukuk* models. Unlike conventional bonds, sukuk must be asset-backed or represent profit-and-loss sharing mechanisms. This can complicate project financing in sectors lacking *clear asset identification* or where *securitization mechanisms* are underdeveloped. As one expert noted: “Reducing the costs and risks associated with Green Sukuk requires an overhaul of traditional financial practices that are heavily influenced by interest-based systems... Replacing these structures with profit-and-loss sharing mechanisms ensures that risks are equitably distributed” (I5, Pos. 35).

Furthermore, *embedded interest rate influences, debt obligations*, and *credit risk perceptions* continue to inflate costs and undermine Islamic ethical principles. Experts stressed the urgent need for *pricing incentives*, such as “*greenium*,” to improve *risk-return profiles* and encourage broader market engagement.

Compounding these issues is the sub-theme of *financial literacy and strategic design*. Experts emphasized the *financial literacy* gap among stakeholders—including investors, government agencies, and private issuers, which limits effective structuring, investment appraisal, and allocation. The *Green Sukuk* market suffers from *liquidity constraints* and

capital gaps for large projects, particularly when *economic conditions* are volatile or unstable. One participant remarked: “The market of Green Sukuk is relatively small, and with limited supply, it also makes it illiquid as compared to other asset classes” (I3, Pos. 25). Strategic design, including *funding allocation* toward high-impact projects and *financial strategies* that pool risks and reduce transaction costs, is vital to address these structural deficiencies.

The final and perhaps most urgent sub-theme concerns the *cost burden and incentive deficiency* that continues to discourage many potential issuers. Across interviews, the *high transaction costs* associated with dual certification, environmental reporting, and Shariah compliance were cited as formidable hurdles. These challenges are exacerbated by the *lack of government incentives*, absence of *long-term investment frameworks*, and *low profit margin differentials* compared to conventional sukuk. One expert outlined: “The cost of issuance is another barrier. Green Sukuk often involves higher transaction costs due to the additional requirements for environmental verification and Sharia certification. Financial strategies, such as subsidies, pooled resources, or technological interventions like blockchain, can help mitigate these costs” (I7, Pos. 83). Another added: “Without a clear pricing advantage, the added costs and effort needed for green sukuk issuance can seem like more of a burden than a benefit” (I8, Pos. 21).

Collectively, these structural and cost-related barriers hinder the scalability and competitiveness of *Green Sukuk*. Although aligned with Islamic principles and global sustainability ambitions, their success depends heavily on reforms in financial design, targeted incentive systems, and deeper ecosystem literacy.

4.4.6. Theme 6: Monitoring, Reporting, and Assurance Mechanisms

A recurring concern across expert narratives was the need for robust governance and evaluation mechanisms to ensure that *Green Sukuk* issuances deliver both environmental impact and Shariah compliance in practice—not merely in intention. This theme highlights the foundational role of monitoring, reporting, and assurance systems in fostering market integrity, investor confidence, and regulatory accountability.

Within the broader discourse, experts emphasized the importance of *governance and accountability frameworks*. These include standardized transparency norms, contractual enforcement, and harmonization of Shariah and green standards. Experts repeatedly noted

the inadequacy of existing practices, pointing to weaknesses in issuer credibility, inconsistent reporting, and the persistent risk of greenwashing. One expert remarked: “Inadequate green contractual protection for investors, the quality of reporting metrics and transparency, issuer confusion and fatigue, greenwashing, and pricing” (I3, Pos. 60). The imperative to align transparency with accountability was also articulated: “Transparency is vital. Clear and consistent reporting on project outcomes builds trust among investors, while robust governance frameworks prevent fraud or mismanagement.” (I5, Pos. 37)

To address this, experts called for unified guidelines that harmonize Islamic and environmental standards, preferably under international regulatory bodies such as IFSB or AAOIFI. Without such harmonization, they warned, investor confidence may erode due to interpretive inconsistencies:

“Another critical challenge is the absence of harmonized standards for Green Sukuk... The solution lies in developing unified guidelines, possibly under the auspices of international organizations like the Islamic Financial Services Board (IFSB) or the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI).” (I7, Pos. 82)

These concerns are further compounded by issuer performance history. As one respondent stated: “That means if there was a five-year bond tenure from before, green or not, they have met the 5 years, and all the investors were happy.” (I1, Pos. 62)

The role of *monitoring and reporting tools* was also discussed as central to ensuring transparency in both environmental and financial performance. Experts emphasized that sustainability-linked investments require more than one-off assessments—they demand continuous, verifiable updates throughout the project lifecycle. As one expert put it: “Issuers should also commit to clear and regular reporting on their projects, sharing detailed updates on how funds are being used, what environmental benefits are being achieved... and the progress of the projects” (I8, Pos. 40).

Technological interventions such as blockchain were cited for their potential to enhance traceability and mitigate manipulation: “Leveraging technology, such as blockchain, can streamline transaction processes and improve traceability, further reducing costs and enhancing efficiency.” (I5, Pos. 37)

The consensus was clear: robust frameworks of *ongoing monitoring, adaptive practices, and periodic disclosures* must underpin every *Green Sukuk* issuance.

Moving beyond process-oriented tools, experts highlighted the indispensable role of *evaluation and impact verification*. *Green Sukuk* credibility hinges on whether issuers can validate that their proceeds are allocated to genuinely green and Shariah-compliant initiatives. For this reason, independent oversight emerged as a dominant recommendation. As one expert insisted: “Implementing independent certification mechanisms can ensure that Green Sukuk projects are not only compliant with Shari’ah principles but also deliver measurable environmental benefits.” (I5, Pos. 32)

This view was echoed in the call for non-aligned evaluators: “There has to be an independent evaluation by a third party... an independent party that evaluates and then say, okay, whatever they claim is true.” (I1, Pos. 51) “Because when you have an independent party not connected to the investor or the issuer, he has no vested interest to favor anyone.” (I1, Pos. 82)

Such evaluations must also be technically rigorous, encompassing financial, structural, and operational dimensions: “Whether it’s the project’s financial structure, whether the underlying asset for this sukuk meets the criteria or not... what’s the valuation of the asset... and then what are the operating mechanisms toward meeting the financial obligation.” (I1, Pos. 47)

Experts emphasized that *standardized impact assessment models, green standards certification, and SPV-based documentation* can significantly enhance market trust. Certifications such as green shading and lifecycle-based impact models were recommended to validate outcomes, reduce greenwashing risks, and provide evidence of genuine environmental contributions. One expert emphasized: “Certifications like ‘green shading’ or bond certification help confirm that the projects meet high environmental standards.” (I8, Pos. 40).

Further, Islamic ethical imperatives call for a more comprehensive model of impact analysis that accounts not only for environmental outcomes but also social and faith-based dimensions: “Impact measurement models based on Islamic ethics and expanding into social sukuk that combine environmental and socio-economic benefits.” (I6, Pos. 31).

In summary, this theme underscores the pivotal function of monitoring and assurance mechanisms in ensuring the integrity and credibility of *Green Sukuk*. Without harmonized

standards, independent verification, and transparent disclosures, the promise of Shariah-compliant environmental finance risks being undermined by implementation gaps and investor skepticism.

4.4.7. Theme 7: Stakeholder Coordination and Engagement

A coherent and resilient *Green Sukuk* ecosystem relies not only on sound financial structuring and regulatory frameworks but also on meaningful engagement across stakeholders. This theme explores the extent to which stakeholder coordination, public awareness, and cross-sector collaboration shape the development and implementation of *Green Sukuk* markets. Experts emphasized that without deliberate strategies for inclusivity, outreach, and dialogue, even the most promising instruments risk underutilization or systemic failure.

A critical dimension that emerged from the interviews was the *importance of public awareness and capacity building*. Despite notable interest among institutional actors, experts observed a persistent gap in broader stakeholder literacy, particularly among the general public, private sector participants, and some national regulators. One expert emphasized the necessity of proactive engagement: “We have to communicate that very clearly to the government, to the regulators, so that we gain support from them. And then of course, we together with the authorities and the people who are involved, we have to educate the market.” (I1, Pos. 39)

This insight points to the broader challenge of market immaturity—an issue exacerbated by the technical nature of *Green Sukuk* and the dual requirement of compliance with both environmental and Islamic finance norms. Public familiarity with the instrument remains limited in many jurisdictions: “Challenges remain, including low public literacy about Green Sukuk and the need for enhanced outreach and education efforts to fully capitalize on its potential.” (I4, Pos. 21)

To overcome this constraint, experts advocated for multi-level strategies, combining market education, institutional capacity building, and curriculum development targeting finance professionals and Shariah experts alike. One expert proposed: “Education, capacity building, and collaboration between governments, Shari’ah scholars, and sustainability experts are crucial to building a strong Green Sukuk ecosystem globally.” (I6, Pos. 34)

Beyond general awareness, the interviews stressed the necessity of *strategic stakeholder engagement and dialogue* as a means of forging collective responsibility and shared governance. The complexity of *Green Sukuk* demands more than parallel expertise—it calls for deliberate cross-sector integration. Stakeholders identified the need for regulators, Islamic finance experts, environmental scientists, and project developers to co-create policy, evaluation, and assurance frameworks. As one expert noted: “Usually, what the regulators do is they will work with the industry practitioners and together they will come up with a credible regulatory framework so that when you move forward there's a framework that everybody works with.” (I1, Pos. 26)

This coordinated framework facilitates not only standardization but also policy alignment, streamlining the path from concept to issuance. Stakeholder coordination also affects investor confidence and public legitimacy, particularly when accompanied by independent oversight. One expert elaborated: “Advised on the role of independent third-party reviews, convened international certifiers, and facilitated the participation of local institutions to provide external reviews at low cost.” (I3, Pos. 43)

Moreover, fostering collaboration among Islamic scholars and environmental regulators was seen as a pathway to resolving conceptual ambiguities and strengthening legitimacy: “Addressing these challenges requires collaboration between Shari'ah scholars and environmental experts, fostering a dialogue that promotes mutual understanding.” (I2, Pos. 35)

Experts also highlighted that stakeholder dynamics extend beyond institutional processes. Coordination improves when performance expectations—such as carbon reduction or energy efficiency—are clearly defined and disclosed. As one participant suggested: “Issuers should be encouraged to disclose metrics on key environmental indicators, such as carbon reduction and energy efficiency gains.” (I2, Pos. 41).

Finally, the development of *Green Sukuk* must be situated within a broader economic and ecological context, recognizing the interdependence of sectors and actors. As one expert summarized: “It creates a financial environment where stakeholders, governments, investors, and project managers, can collaborate effectively, achieving both economic growth and ecological preservation.” (I5, Pos. 29).

In conclusion, stakeholder engagement in the *Green Sukuk* space is not a secondary concern but a foundational condition for success. Coordinated efforts across government,

academia, religious authorities, and financial actors are essential to mobilize capital, strengthen credibility, and ensure that *Green Sukuk* instruments fulfil their dual mandate of ethical financing and environmental stewardship.

4.4.8. Theme 8: Greenwashing and Integrity Risks

As *Green Sukuk* instruments grow in prominence within sustainable finance markets, concerns about integrity risks—especially greenwashing—have become increasingly salient. This theme examines the structural, procedural, and ethical vulnerabilities that can undermine the credibility of *Green Sukuk*, focusing on three sub-areas: structural complexity and design, risk management and prevention, and ethical misconduct including disclosure manipulation.

Experts consistently identified *structural complexity and design* as a key barrier to *Green Sukuk* integrity. The dual compliance requirements with both Shariah principles and environmental standards introduce technical intricacies that many investors find difficult to navigate. A leading expert noted: “The perceived complexity of Green Sukuk compared to conventional investment options can deter potential investors. Simplifying the issuance process and providing clear, accessible information can help address this barrier.” (I7, Pos. 34).

Complex structuring not only hampers market participation but may obscure risks or mask underlying performance concerns. As one interviewee cautioned: “If you make it as simple as possible, easy to understand, more likely people will want to invest. Because the less complex it is, the less problems you will come. If you think about the 2008 financial crisis... it was actually very, very complex and they hid it under this product.” (I1, Pos. 58).

In the absence of unified standards, investors often face *difficulty comparing projects*, especially regarding their environmental performance or alignment with Shariah objectives: “Investors are often concerned because there are no clear, unified standards for what qualifies as 'green'... making it difficult to compare Green Sukuk from different issuers.” (I8, Pos. 28).

This confusion is further exacerbated by *alignment uncertainty*, where the perceived distance between environmental goals and Islamic principles generates hesitation: “A major concern for investors lies in the relative unfamiliarity with Green Sukuk...

particularly in its alignment with both environmental goals and Shari'ah principles.” (I5, Pos. 24).

To address these structural risks, stakeholders emphasized the need for *comprehensive risk management and prevention mechanisms*. While *Green Sukuk* are inherently aligned with Islamic finance's emphasis on risk-sharing, investors still seek protection against unforeseen challenges and potential failure. One expert observed: “One of the cornerstones of Islamic finance is risk sharing. We always share the risk.” (I1, Pos. 65)

Practical tools such as insurance schemes, hedging, and green certification plans were cited as effective ways to mitigate project-specific risks: “To further minimize risks, tools like insurance or hedging can be used to protect against potential challenges such as project delays, budget overruns, or unexpected environmental issues.” (I8, Pos. 38)

Effective risk mitigation must be forward-looking and linked to implementation strategies, as highlighted by another expert: “They will have to be monitoring. So once they issue the Green Sukuk... there has to be a plan for transparent reporting and stakeholder engagement.” (I1, Pos. 53)

In parallel, experts stressed the *persistent threat of ethical misconduct and disclosure manipulation*, particularly greenwashing. The manipulation of environmental claims—intentionally or through weak verification processes—was seen as a major risk to the credibility of the *Green Sukuk* market: “What are the risks? Not only what they think, or they see the benefits and risks... there has to be an independent evaluation by a third party... If not, you fall into greenwashing problems.” (I1, Pos. 51–52)

This risk is not limited to negligence. It may involve intentional misrepresentation, often by overstating environmental benefits and concealing structural weaknesses: “You say the good parts of the project, you make it bigger than it is, but the weak parts... you make it smaller than it is. That's greenwashing... that's ghara.” (I1, Pos. 79).

Experts argued that independent third-party verification mechanisms, Shariah screening, and consistent disclosure practices are essential for deterring such behaviors. However, reliance on issuer self-reporting creates significant exposure: “They will always try to magnify the positives and then try to diminish the negatives.” (I1, Pos. 80)

These practices not only distort market signals but also erode trust, deterring ethically motivated investors: “Greenwashing remains a critical issue. Investors want assurance that their funds are contributing to genuine environmental benefits.” (I2, Pos. 29).

Finally, the risk of *fraudulent practices* further compounds the challenge. Weak contractual protection, vague reporting frameworks, and low issuer accountability were flagged as common vulnerabilities: “Inadequate green contractual protection for investors, the quality of reporting metrics and transparency, issuer confusion and fatigue, greenwashing, and pricing.” (I3, Pos. 60).

In response, technological interventions such as blockchain and robust governance structures were proposed: “Blockchain and other digital tools could enhance transparency and traceability, reduce fraud and streamline the reporting process.” (I5, Pos. 49). Then, he added that: “Clear and consistent reporting on project outcomes builds trust among investors, while robust governance frameworks prevent fraud or mismanagement.” (I5, Pos. 37)

In sum, Theme 8 reveals that while *Green Sukuk* offer an ethical and sustainable alternative to conventional instruments, their structural and integrity risks—especially the threat of greenwashing—must be addressed proactively. Simplification, certification, independent assessment, and investor protection are not just enhancements but necessities to ensure long-term credibility and impact.

4.4.9. Theme 9: Technological Leverage and Digital Innovation

The evolving landscape of *Green Sukuk* necessitates not only regulatory refinement and stakeholder engagement but also technological integration. This theme highlights the instrumental role of technology in optimizing *Green Sukuk* processes, enhancing transparency, reducing costs, and improving environmental impact measurement. It is structured into two interconnected dimensions: automation and efficiency tools, and the integration of advanced technologies and digital systems.

The sub-theme of *automation and efficiency tools* captures how digital innovations are being used to improve the issuance and monitoring processes. Experts emphasized the benefits of early-stage screening tools that could expedite the project evaluation process and ensure greater compliance with sustainability and Shariah standards. One expert offered a clear vision for this potential: “If we can automate it by using an AI algorithm to ensure that you have a quick and efficient way to evaluate at the initial stage.” (I1, Pos. 46)

Beyond screening, digitalization promises cost-efficiency across the sukuk lifecycle. Automation—particularly through blockchain infrastructure—was frequently mentioned as a solution to administrative bottlenecks and verification burdens: “Leveraging technology, such as blockchain, can streamline transaction processes and improve traceability, further reducing costs and enhancing efficiency.” (I5, Pos. 37)

These advancements are particularly significant for market inclusivity. By lowering entry barriers through automation and efficiency, even smaller issuers such as SMEs could access the *Green Sukuk* market. As one interviewee noted: “Research in this area could demonstrate how technology can make Green Sukuk more efficient and accessible, particularly for small and medium-sized enterprises seeking to implement sustainable projects.” (I5, Pos. 49)

In the second sub-theme, *advanced technologies and systems*, participants discussed how cutting-edge tools such as artificial intelligence (AI), blockchain, and data analytics could further revolutionize the sector. These technologies offer a multi-layered impact—not only making transactions smoother but also enabling real-time environmental performance tracking and ethical governance: “Blockchain can facilitate real-time tracking of funds, while AI can analyze project performance and environmental outcomes.” (I7, Pos. 76)

Blockchain emerged repeatedly as a cornerstone of technological integration. Its potential spans across transparency, automation, and accountability—all vital to combating fraud and greenwashing: “Blockchain, for example, can streamline the issuance process by automating documentation, tracking transactions, and enhancing transparency. This reduces administrative overhead and ensures efficient monitoring of fund allocation.” (I7, Pos. 53)

This efficiency is not merely operational; it supports stronger ethical foundations by embedding traceability and minimizing human error or manipulation. As one expert stressed: “Technological advancements, such as blockchain, can be leveraged to enhance transparency and reduce transaction costs.” (I5, Pos. 56)

The role of AI also gained traction in expert insights. Beyond automation, AI offers predictive capabilities and smarter risk profiling, paving the way for dynamic environmental impact measurement: “The role of blockchain, artificial intelligence, and

data analytics in improving the transparency, efficiency, and impact measurement of Green Sukuk projects warrants detailed exploration.” (I7, Pos. 76)

While enthusiasm for innovation is evident, it is accompanied by calls for responsible adoption. Experts warned against uncritical technological determinism and highlighted the need for a balanced, value-aligned approach to innovation: “The balance shall be moderate and responsible use within the economic activity of the limited resources of our planet, whereas economic growth does not limit the resource exploitation... being mainly focused on productivity increase.” (I3, Pos. 28)

In summary, Theme nine reveals how technology is not only an enabler but also a strategic necessity for the *Green Sukuk* market. From reducing issuance costs and strengthening governance to enhancing environmental reporting and enabling SME participation, digital tools—if used prudently—can transform *Green Sukuk* into a fully integrated and future-ready instrument of Islamic sustainable finance.

4.4.10. Theme 10: Research Gaps and Measurement Limitations

This theme captures the perspectives of experts on the critical research limitations and areas requiring scholarly advancement to strengthen the theoretical and empirical foundations of *Green Sukuk*. Insights were drawn from two core interview questions focusing on the integration of environmental sustainability within Islamic finance and anticipated future research directions. Responses were categorized into three sub-themes: standardization and measurement frameworks, institutional and market integration gaps, and limitations in empirical and socio-economic research.

The first sub-theme, *Gaps in Standardization and Measurement Frameworks*, underscores the absence of universally recognized metrics and indicators for assessing the environmental and financial performance of *Green Sukuk*. A consistent concern among experts was the lack of clear, quantifiable indicators, particularly in measuring carbon reduction and ESG outcomes. One expert emphasized: “If you want to improve your carbon footprint, you have to be able to measure it... So, we have to define those first. Because if you don't have clear measurables or clear indicators, then you won't have a clear way to measure the carbon footprint.” (I1, Pos. 83)

This concern was echoed in broader discussions on measurement clarity: “Another challenge is the absence of standardized performance indicators and measurement frameworks for green projects.” (I8, Pos. 43)

Without such benchmarks, it becomes difficult for investors and regulators to assess the credibility and comparability of *Green Sukuk* offerings: “As the Green Sukuk market grows globally, having universally accepted criteria to assess the environmental and financial impact of these projects would be incredibly valuable.” (I8, Pos. 43)

The need for advanced synthesis was also highlighted, suggesting a role for systematic reviews in identifying thematic knowledge clusters and empirical gaps: “A methodical literature review is essential... to synthesize the data on Green Sukuk into thematic clusters, providing a more comprehensive understanding of the subject and contribution strategies for future research.” (I3, Pos. 51)

The second sub-theme, Institutional and Market Integration Gaps, focuses on structural limitations that hinder the *Green Sukuk* market's scalability. Experts called attention to the absence of regulatory alignment across jurisdictions and the need for more inclusive issuance mechanisms: “You have to work with the regulators... together they will come up with a credible regulatory framework so that when you move forward there's a framework that everybody works with.” (I1, Pos. 26)

Another concern lies in the insufficient investor diversification and inadequate outreach to different market segments: “Tapping a wider range of investors and increasing demand [is needed].” (I4, Pos. 55)

Tailored strategies such as private placements were suggested to mitigate broad-market-related risks: “Offering private placement options allows issuers to tailor offerings to specific institutional investors, potentially securing better terms and reducing broad-market-related risks.” (I4, Pos. 57)

Simultaneously, cost-related barriers persist and require systemic responses: “Reducing the costs and risks associated with Green Sukuk requires an overhaul of traditional financial practices that are heavily influenced by interest-based systems.” (I5, Pos. 35).

The third sub-theme, *Empirical and Socio-Economic Research Limitations*, reveals a clear gap in real-world impact studies. While the theoretical frameworks of *Green Sukuk* are well explored, practical assessments remain limited: “Most of the current research

tends to be theoretical or qualitative, leaving a gap in practical insights into how Green Sukuk are actually implemented and their real-world impact” (I8, Pos. 43).

Scholars are increasingly expected to move beyond environmental metrics and include socio-economic outcomes: “More research is needed to explore the tangible benefits of Green Sukuk financed projects, especially how they affect local communities and households in terms of socio-economic outcomes.” (I8, Pos. 43).

Carbon reduction, in particular, stands as a critical indicator needing rigorous empirical tracking: “Researchers will likely focus on how Green Sukuk projects help reduce carbon emissions, support renewable energy initiatives, and improve community wellbeing.” (I8, Pos. 45)

Future research should also delve into investor psychology and preferences: “More research on the psychological and financial factors influencing investor behaviour in Green Sukuk would provide valuable insights for issuers and regulators alike.” (I2, Pos. 45). Understanding generational and ethical investment trends could further enhance product-market fit: “Future research can examine how millennials, socially responsible investors, and institutional stakeholders perceive Green Sukuk and what factors influence their investment decisions.” (I7, Pos. 77)

In conclusion, Theme 10 brings to light the multifaceted knowledge gaps that must be addressed for *Green Sukuk* to evolve into a mature, evidence-backed instrument of Islamic sustainable finance. From the operationalization of carbon metrics to behavioural finance studies and institutional integration models, there is substantial room, and urgency, for further inquiry. Addressing these gaps will be essential for policymakers, academics, and market actors striving to position *Green Sukuk* as a reliable and impactful tool in the global transition toward ethical and climate-resilient finance.

While the expert interviews in this study frequently highlighted the potential of blockchain, smart contracts, and digital verification in the Green Sukuk space, particularly their capacity to enhance transparency, traceability, and operational efficiency, a growing body of scholarship cautions against adopting an overly optimistic view of these technologies.

Elasrag (2019) notes that despite blockchain’s promise to enhance trust and reduce intermediaries, integration into Islamic finance, particularly Sukuk structures, faces substantial obstacles including regulatory fragmentation, scalability limitations, and

unresolved Shariah compliance questions. Ayodeji and Abiodun Ayodeji (2024) further warns that without robust oversight, blockchain could inadvertently enable illicit activities such as tax evasion and money laundering, or even destabilise fiat currency systems, challenging the ethical and systemic stability of Islamic capital markets.

Beyond Islamic finance, broader critiques of the financial market offer relevant lessons. The Jamie (2025) highlights structural risks in tokenising real-world assets, such as unclear legal ownership, governance concentration, and jurisdictional arbitrage, which could undermine investor protection in digitised Sukuk issuances. From a technical standpoint, Alharby and Moorsel (2017) demonstrated that smart contracts remain vulnerable to coding errors, security breaches, and performance inefficiencies, raising questions about their readiness for high-value, compliance-sensitive transactions.

Similarly, Capponi et al. (2023) identified systemic vulnerabilities in decentralised finance ecosystems, including oracle manipulation, frontrunning, and governance flaws, which could compromise operational reliability if transplanted into Green Sukuk platforms. From a more sector-specific perspective, Ayodeji and Abiodun Ayodeji (2024) reminds us that while fintech innovations may align with Islamic finance principles in form, they often risk ethical and regulatory misalignment in substance, particularly if commercial imperatives overshadow *maqasid-al-Shariah* objectives.

Taken together, these critiques underline that the effective application of blockchain and related technologies in Green Sukuk demands not only technical innovation but also a deliberate governance architecture, harmonised regulatory frameworks, and rigorous Shariah–ESG integration to safeguard both market integrity and ethical authenticity.

4.4.11. Theme 11: Solutions and Strategic Innovations

Unlike other themes in this study, solutions were not elicited through a dedicated interview question. Instead, experts were encouraged to offer recommendations and practical remedies as part of their responses to broader questions concerning challenges, market integration, or research priorities. In several instances, the researcher prompted follow-up inquiries to explore proposed solutions in more depth.

This organic approach allowed participants to suggest innovations and pathways they deemed most urgent and realistic, given their institutional roles and experience. Their insights have been thematically grouped into three sub-themes: financial structuring and

capital access innovations, regulatory and framework standardization, and governance and assurance mechanisms.

The first sub-theme, *Financial Structuring and Capital Access Innovations*, captures a range of adaptive financing models designed to enhance both accessibility and resilience in the *Green Sukuk* market. One of the most recurrently mentioned strategies was the use of *public-private partnerships (PPPs)* to distribute financial risk and technical burden: “Public-private partnerships, for example, allow governments and private entities to pool resources, spreading risks and sharing expertise.” (I5, Pos. 36)

This approach was complemented by the call for *blended finance mechanisms*, which combine concessional grants, loans, and market-based instruments: “Blended finance is when you have a hybrid of different financial instruments, and you take the best of both worlds... examples of blended finance are public and private partnerships or PPPs.” (I1, Pos. 86)

Such strategies, including *multilateral funding and government guarantees*, were viewed as crucial for supporting capital-intensive green infrastructure projects: “You get public funds involved and then you combine that with private funds and then you fund this mega project. And then another example is concessional loans or grants.” (I1, Pos. 88)

A further innovation highlighted was the use of *tranche-based issuance* and *project aggregation*, which can make smaller projects more attractive by bundling them into diversified, risk-mitigated portfolios. This enables *diverse green investment*, creating space for both near-term impact and long-term sustainability: “Green Sukuk can support both short-term economic gains and long-term environmental goals by investing in a variety of green projects.” (I8, Pos. 31)

The second sub-theme, *Regulatory and Framework Standardization*, reveals that standardization remains both a challenge and a solution. Multiple experts argued for *clear, robust Green Sukuk frameworks*, ideally aligned with existing *green bond principles* and adapted to Islamic finance: “They don’t have to rebuild the wheel. You already have green criteria from green bonds. So you can leverage from there and adapt it for Islamic use case.” (I1, Pos. 29)

Another respondent emphasized the need for environmental measurement tools to be explicitly defined within Islamic financial operations: “If you don’t have clear measurables or clear indicators, then you won’t have a clear way to measure the carbon

footprint... and when you don't have clarity, then it's very difficult to improve.” (I1, Pos. 84)

A more system-wide solution pointed to harmonization as a strategic imperative: “The market's success hinges on raising awareness, enhancing standardization, and fostering collaboration between Islamic scholars, environmental experts, and financial institutions.” (I7, Pos. 18)

The third sub-theme, *Governance and Assurance Mechanisms*, focuses on institutional innovations that enhance credibility and reduce perceived risks. One widely supported solution was the implementation of *independent evaluations and audits* to mitigate greenwashing and reinforce trust: “Independent evaluations, like CICERO 'green shading,' can help verify that projects genuinely contribute to environmental goals. Regular audits and transparent reporting can also ensure accountability and build trust.” (I8, Pos. 35)

Several experts also highlighted *risk-sharing mechanisms* as central to both Shariah compliance and ethical investment: “The benefit of profit and loss sharing, which is the foundation of Islamic finance, ensures long-term viability and long-term vision type of work.” (I1, Pos. 71)

Additionally, the integration of *Shariah governance frameworks* was viewed as inherently aligned with ESG (Environmental, Social, and Governance) principles: “With the Shariah governance framework, the G is definitely higher than if it was a conventional financing... You purposely make it ambiguous because you want to hide certain things. That's deception. That's not allowed.” (I1, Pos. 78)

Lastly, capacity building emerged as a cross-cutting requirement to operationalize these solutions. Education and institutional training are foundational for enabling all stakeholders—from regulators to issuers—to navigate the dual-layered demands of Shariah compliance and environmental accountability:

“Capacity building is another area that requires attention. The implementation of Green Sukuk often necessitates a deep understanding of both Islamic finance principles and sustainability frameworks.” (I5, Pos. 55), and ... “Educating stakeholders, including issuers, investors, and regulators, about the dual requirements of Green Sukuk is crucial... through workshops, training programs, and collaborative research initiatives.” (I7, Pos. 48)

In conclusion, Theme 11 offers a rich repository of actionable solutions and forward-thinking innovations. These proposals highlight the need for blended capital models, standardized regulatory frameworks, trustworthy certification systems, and capacity-building infrastructures. If implemented strategically, these interventions can help transform *Green Sukuk* from a niche market instrument into a mainstream pillar of Islamic sustainable finance.

4.5. Conclusion of Thematic Findings

The thematic analysis presented in this chapter offers a comprehensive and multidimensional understanding of the challenges, gaps, and opportunities that define the current landscape of the global *Green Sukuk* market. The eleven interconnected themes—spanning investor behavior, regulatory fragmentation, environmental integrity, ethical alignment, financial structuring, assurance systems, stakeholder coordination, integrity risks, technological integration, research limitations, and strategic solutions—collectively reflect the ecosystemic nature of *Green Sukuk* development. Rather than existing in isolation, these themes interact to reveal a layered architecture of constraints and enablers that influence the credibility, scalability, and resilience of *Green Sukuk* as instruments of Islamic sustainable finance.

At the core of these findings is the recognition that *Green Sukuk* face dual compliance demands they must satisfy the ethical imperatives of Shariah law while simultaneously delivering demonstrable environmental value. This dual requirement introduces unique design, governance, and verification complexities not typically present in conventional green finance instruments. Across all themes, a recurring emphasis emerged on the need for harmonization—whether in regulatory standards, stakeholder roles, impact measurement, or ethical frameworks—suggesting that market maturity will depend on systemic coherence as much as financial innovation.

Equally notable is the role of strategic solutions identified organically through the interviews. These solutions, addressed in Theme 11, offer actionable pathways for overcoming structural barriers, including innovations in financial design (e.g., blended finance and tranche-based issuance), institutional reforms (e.g., standardized Shariah-green criteria), and ecosystem-level enablers (e.g., capacity building, third-party verification, and blockchain applications). These proposals not only address current

market inefficiencies but also point toward the future of *Green Sukuk* as fully integrated tools for climate-resilient development within Islamic economies.

Taken together, the findings detailed in this chapter form the empirical backbone of the dissertation. They set the stage for the synthesis and discussion chapters that follow, which will integrate these qualitative insights with existing literature, policy imperatives, and quantitative prioritization outcomes derived from the Bayesian Best-Worst Method (BWM).

4.6. Comparison with Literature Review

This section compares the qualitative findings from expert interviews with the results of the systematic literature review (SLR) conducted earlier in the study. The objective is twofold:

- 1) To validate the empirical relevance and practical resonance of the themes that emerged inductively from stakeholder perspectives.
- 2) To identify key points of convergence and divergence between practice-based insights and existing academic discourse on the *Green Sukuk* market.

A structured synthesis is presented in Table 11, which maps each major challenge identified in the literature against thematically aligned findings from the interviews. This comparative framework highlights areas of thematic overlap, offers extensions to previously documented issues, and uncovers novel dimensions that remain underexplored in current scholarship.

Overall, there is a strong alignment between the thematic structure derived from the interviews and the six challenge categories synthesized in the SLR. Both sources confirm that regulatory fragmentation, legal uncertainty, and policy volatility remain foundational constraints across jurisdictions. For instance, the expert theme *Regulatory and Institutional Fragmentation* reinforces the SLR's findings regarding the absence of unified Green Sukuk frameworks and the procedural burdens caused by dual compliance systems. Similarly, issues related to *Investor Awareness and Market Readiness*, the most prominent qualitative theme, mirror the SLR's conclusion that investor-related barriers, such as limited engagement (Siswantoro & Surya, 2021; Supriyadi & Fidhayanti, 2023; Timur et al., 2025), perceived risk (Xia et al., 2022; Zahir, 2024), and weak benchmark

inclusion (Siswantoro, 2018; Siswantoro & Surya, 2021), are dominant impediments to Green Sukuk uptake.

The interviews further validate the SLR's concern with *Shariah-Green alignment* but go beyond theological interpretations to explore deeper philosophical tensions and stakeholder behaviours. Whereas the literature often emphasizes doctrinal fragmentation (Faizi et al., 2024; Hasan et al., 2022), the qualitative data reveals how dual compliance burdens, competing priorities, and a lack of ethical literacy impede harmonization efforts. Moreover, experts highlighted the institutional disconnect between Shariah boards and environmental agencies, a nuance underexplored in previous research.

In terms of *market infrastructure and liquidity constraints*, the SLR identifies structural bottlenecks including high issuance costs (Chavarría-Flores & Warren, 2024; Siswantoro, 2018) and limited secondary markets (Alnabulsi & Jreisat, 2024; Billah & Adnan, 2024; Delle Foglie & Keshminder, 2022). These are echoed in Theme 5 (*Financial Structuring and Cost Constraints*), where experts described asset scarcity, issuer capacity gaps, and pricing inefficiencies in detail. Yet, the qualitative data adds a critical practitioner perspective by identifying real-world operational and incentive failures, such as the lack of tailored instruments for corporate or retail investors, that are often absent from purely academic treatments.

The SLR's findings on *greenwashing and ESG ambiguity* (Corapi, 2023; Liu & Lai, 2021) are also substantiated by Theme 7 (*Environmental and Climate Integrity*) and Theme 10 (*Monitoring, Reporting, and Assurance Mechanisms*). Both sources highlight the risks posed by inconsistent environmental metrics and opaque impact assessments. However, expert interviews add practical insights into the credibility gaps faced by issuers and the pressing need for third-party verification systems that align with both Shariah and environmental standards.

Where the qualitative findings extend the literature most significantly is in their articulation of *stakeholder coordination, technological innovation, and solution-oriented thinking*. While these areas are underdeveloped in the existing SLR (Akinde et al., 2025; Mahomed & Mahbot, 2024; Syed Azman et al., 2022), appearing only sporadically or indirectly, the interviews provided detailed accounts of cross-sector collaboration needs, potential for digital tools (e.g., blockchain and AI), and forward-looking proposals such as blended finance models and regional certification hubs. These dimensions form the

basis of Theme 11 (*Solutions and Strategic Innovations*), which complements and advances the academic discourse with empirically grounded, practitioner-informed strategies.

In summary, the expert findings not only reinforce the robustness of the SLR categories but also enhance them by providing contextual depth, operational clarity, and forward-looking policy insights. This triangulation between literature and lived experience strengthens the conceptual framework of the study and lays the foundation for the subsequent quantitative phase, which prioritizes these themes through the Bayesian Best-Worst Method (BWM).

Table 11: Synthesis of Literature and Expert Findings on GS Challenges

SLR Challenge Category	Overlapping Expert Theme	Common Insights	Expert Contributions (Extensions)
Regulatory Fragmentation & Legal Uncertainty	Regulatory and Institutional Fragmentation	Fragmented legal regimes, lack of unified standards, dual compliance burden	Institutional disconnect, cross-border misalignment, regulatory clarity gaps
Structural and Liquidity Constraints	Financial Structuring and Cost Constraints	High issuance costs, illiquid secondary markets, lack of infrastructure	Issuer capacity challenges, asset scarcity, pricing disincentives, hybrid structuring needs
Shariah-Green Alignment Challenges	Shariah Alignment and Ethical Foundations	Divergent fatwas, Shariah screening inconsistencies	Philosophical tensions, dual mandate complexity, Maqasid integration needs
Investor-Related Barriers	Investor Awareness and Market Readiness	Low awareness, perceived risks, weak inclusion in indices	Retail segmentation, democratization strategies, demand-side readiness
ESG Ambiguity & Greenwashing Risks	Environmental and Climate Integrity + Monitoring, Reporting and Assurance	Inconsistent ESG frameworks, vague green definitions, greenwashing risk	Need for Islamic ESG models, verification gaps, third-party audit alignment
Certification & Verification Deficiencies	Monitoring, Reporting, and Assurance Mechanisms	Weak post-issuance monitoring, informal certification	Proposal of integrated Shariah–green certification, need for standardized evaluation
(Not explicitly covered in literature)	Stakeholder Coordination and Engagement	–	Identifies coordination failures among market actors and need for cross-sector dialogue

Table 11 (continued)

(Not explicitly covered in literature)	Technological Leverage and Digital Innovation	–	Highlight's role of AI, blockchain, and fintech for GS efficiency
(Rare in SLR)	Solutions and Strategic Innovations	–	Provides reform strategies: blended finance, PPPs, ESG-Shariah synergies

Source: Author's Compilation.

4.7. Contribution to BWM Questionnaire Development

The qualitative themes derived from expert interviews serve as a foundational input for the design of the Bayesian Best-Worst Method (BWM) questionnaire in the subsequent quantitative phase of this study. Drawing on the comprehensive thematic analysis conducted in Section 4.7, each of the eleven major themes—along with their associated sub-themes and coded indicators—was systematically translated into measurable dimensions for prioritization. This translation process ensures that the BWM model captures stakeholder-informed, empirically grounded criteria reflective of real-world challenges and enablers in the *Green Sukuk* market.

The criteria selection for the BWM instrument was not arbitrary; rather, it was guided by three key considerations. First, only themes that reflect direct, structural implications for the development, credibility, and adoption of *Green Sukuk* instruments were retained. This ensures alignment between qualitative insights and the decision-analytic objectives of the BWM. Second, sub-themes were evaluated based on their frequency, salience, and interpretive coherence across multiple expert interviews, providing a basis for selecting robust and representative indicators. Third, overlap with barriers identified in the systematic literature review was taken into account to preserve theoretical consistency and enhance the generalizability of the framework.

As a result, the finalized list of dimensions incorporated into the BWM questionnaire includes both enduring challenges (e.g., regulatory fragmentation, investor awareness, Shariah alignment) and emergent concerns (e.g., verification gaps, digital innovation readiness). Each criterion was carefully defined using terminology derived from the interview coding schema, ensuring clarity and traceability for respondents in the next research phase.

This integrative process strengthens the methodological rigour of the study by linking qualitative depth with quantitative structure, ultimately enabling a more valid and context-sensitive prioritization of barriers in the global *Green Sukuk* ecosystem.

Table 12 summarizes the main challenge categories and their associated sub-criteria, derived from the thematic analysis. These categories form the basis of the Bayesian Best-Worst Method (BWM) questionnaire design in the next chapter, where expert-based prioritization is applied to assess their relative importance.

To ensure cognitive manageability and methodological consistency, three representative sub-criteria were selected under each main challenge, except for RPC (5). This structure balances thematic coverage with expert evaluation efficiency, in line with BWM design best practices (Rezaei, 2015).

The final themes and sub-themes presented above serve as the foundation for developing the prioritization criteria and strategic solution indicators used in the subsequent Bayesian Best-Worst Method (BWM) questionnaire. The next chapter provides a detailed explanation of how these dimensions were operationalized for quantitative analysis.

Table 12: Criteria and Indicators for BWM Prioritization of GS Barriers

Main Theme	Sub Theme Code	Sub-Theme Description
Regulatory and Policy Constraints (RPC)	RPC1	Absence of a comprehensive <i>green sukuk</i> regulatory framework
	RPC2	Lack of standardized national guidelines
	RPC3	Weak legal enforcement mechanisms
	RPC4	Limited fiscal incentives (e.g., tax exemptions)
	RPC5	Misalignment with international green finance standards
Market Access Barriers (MAB)	MAB1	Limited secondary market for <i>green sukuk</i>
	MAB2	Low investor base and demand
	MAB3	High transaction and compliance costs
Financial Viability Barriers (FVB)	FVB1	Lack of economically viable green projects
	FVB2	Perceived higher risks for green projects
	FVB3	Absence of financial guarantees/subsidies
	FVB4	Lack of blended finance mechanisms and risk-sharing structures
Institutional Capacity Barriers (ICB)	ICB1	Limited technical expertise in sukuk structuring
	ICB2	Lack of inter-agency collaboration
	ICB3	Institutional resistance to innovation
Awareness and Engagement Barriers (Khalilzadeh et al.)	AEB1	Low awareness among issuers/investors
	AEB2	Misunderstanding of <i>green sukuk</i> principles
	AEB3	Limited engagement platforms between stakeholders

Table 12 (continued)

Shariah-Green Alignment Barriers (SGA)	SGA1	Divergent views on Shariah screening for green assets
	SGA2	Limited integration of ESG with Maqasid al-Shariah
	SGA3	Lack of unified fatwas and interpretative frameworks
Certification and Verification Barriers (CVB)	CVB1	Lack of accredited <i>green sukuk</i> certifiers
	CVB2	Inconsistent post-issuance reporting standards
	CVB3	Costs and delays in obtaining certification
Environmental and Ethical Integrity Risks (Fahad & Areeba)	EEB1	Greenwashing risks
	EEB2	Low climate impact or environmental additionality
	EEB3	Ethical concerns over project impacts (e.g., displacement)
Definitional and Eligibility Ambiguity (DEA)	DEA1	Lack of clarity on what qualifies as a green project
	DEA2	Inconsistent sectoral eligibility criteria
	DEA3	Divergence in taxonomy and assessment standards

Source: Author's Compilation.

In summary, this chapter presents qualitative findings derived from expert interviews on the challenges and solutions in the *Green Sukuk* (GS) market. Eleven key themes emerged through thematic analysis, confirming and extending SLR insights, particularly regulatory fragmentation, Shariah alignment, and market readiness.

The results informed the design of the subsequent Bayesian BWM phase, with five solution domains, Legal-Regulatory, Financial Enablement, Institutional Coordination, Shariah-Green Integration, and Market Awareness, highlighted as strategic reform areas. These findings provide a grounded empirical basis for prioritising reforms aimed at strengthening the global GS ecosystem.

CHAPTER 5: QUANTITATIVE PRIORITISATION USING THE BAYESIAN BEST-WORST METHOD

This chapter marks the transition from a qualitative exploration of the *green sukuk* market challenges to their quantitative validation. Building on the expert-driven themes identified in Chapter 4, a structured decision-making process was applied to determine which barriers are most critical for stakeholders. The analysis directly responds to Research Question 4 (RQ4):

Which of the identified barriers are regarded as most critical by experts and what do these priorities reveal about current market readiness and systemic bottlenecks?

The following sections detail the expert survey design, respondent characteristics, and implementation of the prioritisation model using Bayesian BWM.

To provide a visual overview of the methodological flow and data processing steps adopted in this study, Figure 11 illustrates the proposed research framework, integrating expert elicitation, Bayesian BWM modelling, and result validation procedures.

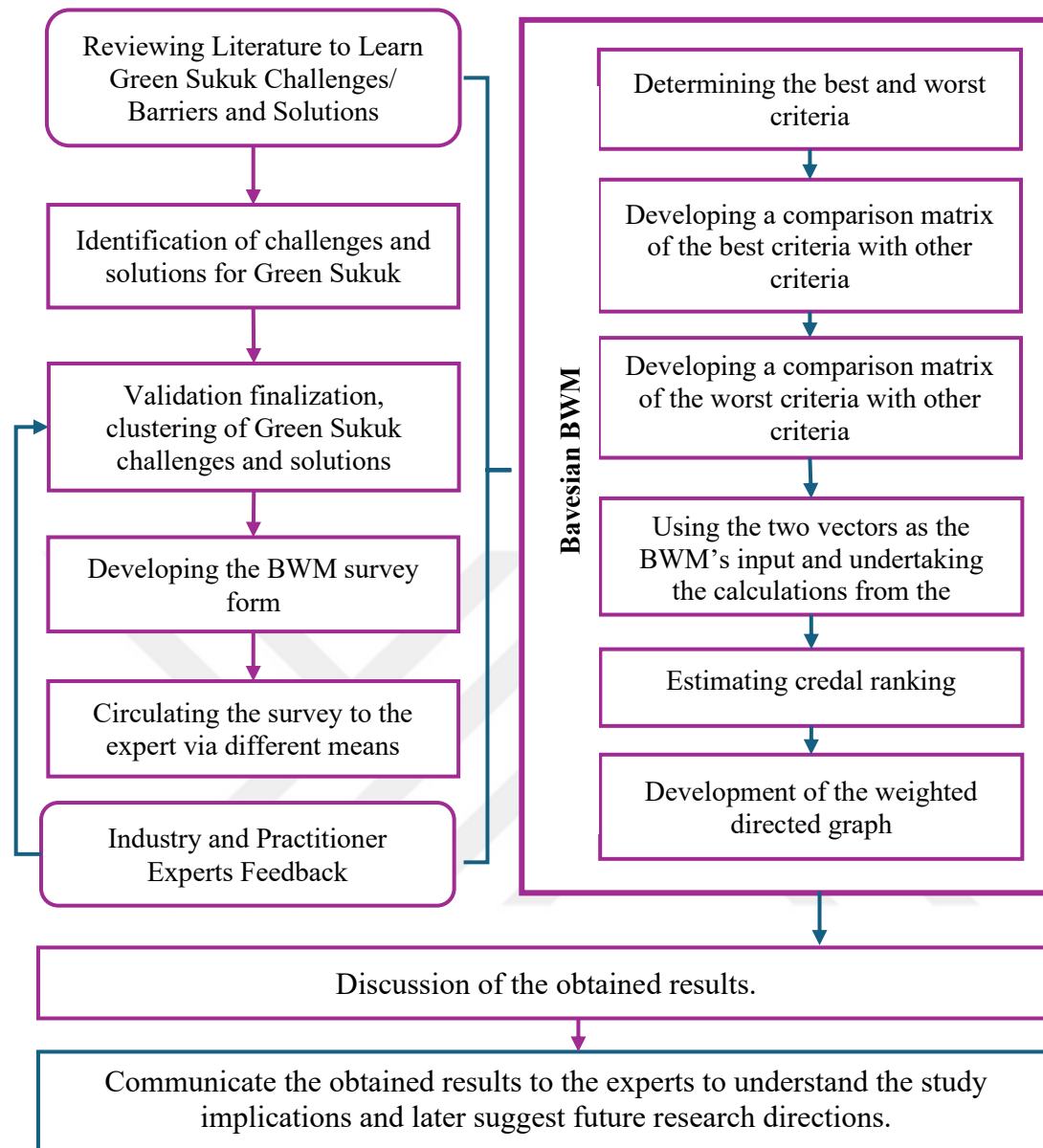


Figure 11: Bayesian BWM Research Implementation Framework

Source: Adapted from Mohammadi and Rezaei (2020)'s work.

5.1. Methodological Overview and Rationale

This dissertation adopts Bayesian BWM as its primary multi-criteria decision-making (MCDM) approach to prioritise barriers in the *Green Sukuk* market. Building on the classical BWM introduced by Rezaei (2015), the Bayesian extension proposed by Mohammadi and Rezaei (2020) allows for a probabilistic representation of expert judgment, thereby accounting for uncertainty, variability, and cognitive inconsistency across decision makers. This is especially relevant in the domain of Islamic sustainable

finance, in which complex decisions must reconcile regulatory, ethical, and market-based considerations.

Unlike deterministic methods that rely on single-point estimates, the Bayesian BWM produces *posterior distributions* for each criterion, offering a more robust and transparent ranking framework. This enhances the reliability of expert-based prioritisation, supports confidence estimation, and accommodates diverse stakeholder perspectives, all of which are essential in policy-sensitive fields, such as sustainable finance. As detailed in Appendix 7, this approach is increasingly recognised in both global and Turkish applications of MCDM for its methodological rigor and suitability in contexts marked by ethical complexity and limited data environments.

5.1.1. Global Methodological Landscape: Applications and Gaps

A systematic examination of ten recent international studies demonstrates how the BWM and its fuzzy or Bayesian variations have become standard in sustainability-related decision analysis. In India, Bansal et al. (2023) and Mangla et al. (2021) applied classical BWM to identify strategic enablers and barriers in the green-bond sector using expert panels of 12 and 15, respectively, offering methodological comparability and thematic overlap with the *Green Sukuk* context.

Roy (2025) used fuzzy BWM and TOPSIS with 8 experts to assess sustainable creditworthiness of borrowers, a model particularly relevant to Sukuk issuer selection and ethical lending. Wang et al. (2022) employed BWM under a neutrosophic environment alongside CRITIC to evaluate supply chain finance risk in China, although the expert sample was unspecified. Wang et al. (2025) further expanded this approach using a 10-expert panel in a hybrid BWM–TOPSIS–VIKOR–CPT framework to prioritise sustainability initiatives in supply chain finance, demonstrating the utility of hybrid approaches under uncertainty.

Xia et al. (2022) examined green agriculture finance using a neutrosophic-enhanced BWM and COCOSO. Zarrinpoor and Khani (2023) designed a robust, multi-objective biofuel supply chain model integrating sustainability, financial decisions, and global market dynamics under uncertainty. Methodologically rigorous, the study employed fuzzy BWM and TOPSIS for supplier selection, with input from ten experts, and applied possibilistic programming to handle uncertainty. A real-world case study in Iran validated

the model's applicability. Li et al. (2021) demonstrated the use of fuzzy BWM with group decision-making in innovation management with 6 participants, highlighting its suitability in context-specific product design like *Green Sukuk* structuring.

In the same vein, Erdmann et al. (2024) applied fuzzy BWM and CoCoSo with five (5) experts to evaluate sustainable AI-driven pricing in Germany, while Hashemkhani Zolfani et al. (2022) used Bayesian BWM and MARCOS for plant location decisions in South America with 12 experts.

These studies confirmed a typical panel size range of 6–15 experts and showed a wide range of integrative applications in finance, infrastructure, and risk analysis. Although rich in methodological layering, none of these studies addresses Islamic finance or explores the intersection of faith-based ethics and sustainability.

In addition to the global methodological landscape, several Turkish studies demonstrate how Bayesian BWM has been effectively applied to diverse sustainability-related decision contexts. While these applications are not within the scope of Islamic finance, they provide relevant methodological parallels and validation for the robustness of our approach.

Saner et al. (2022) applied Bayesian BWM with VIKOR to prioritise hospital disaster preparedness using ten (10) experts, offering a transferable model for health-focused Sukuk financing. Gul et al. (2022) explored occupational safety risks in the oil industry using eight (8) experts, applying Bayesian BWM and fuzzy VIKOR, aligning well with the energy transition goals of *Green Sukuk*.

Similarly, Demirci and Isik (2024) used Bayesian BWM and fuzzy VIKOR in post-disaster contractor selection with a ten (10) expert panel, introducing resilience and social responsiveness metrics that are often missing in Sukuk project evaluation. Güner et al. (2023) applied Bayesian BWM, MOORA, and entropy with seven (7) experts to measure public sentiment, a novel direction relevant to gauging investor awareness and behavioural dynamics in the *Green Sukuk* ecosystem. Gul and Yucesan (2022) applied Bayesian BWM and TOPSIS using 11 experts to rank Turkish universities, showing methodological robustness in impact-oriented ranking, informing potential Sukuk project evaluation.

These studies reinforce the adaptability of Bayesian BWM in complex socio-technical systems and validate the appropriateness of our expert sample (n=21) in this dissertation,

which is in the upper range of existing studies while offering more geographical and disciplinary diversity.

5.1.2. Bridging the Gap: Contribution of This Study

Despite the breadth of applications, no study to date has applied the Bayesian BWM to Islamic finance or the *Green Sukuk* market especially. The current study fills this gap by integrating stakeholder insights, regulatory nuances, and ethical constraints unique to faith-driven sustainable finance. While earlier works evaluated risks in supply chains, project selection, and public sentiment, none have investigated the operationalisation of *Maqasid al-Shariah*, Shariah-sustainability alignment, or policy bottlenecks in the context of Sukuk.

By adapting Bayesian BWM to prioritise nine empirically validated challenges, this dissertation not only extends the method to a novel domain but also introduces sector-specific criteria reflecting the dual spiritual–developmental mandate of Islamic green finance. The model’s outputs provide actionable insights into where policy, market readiness, and ethical alignment must converge to scale the *Green Sukuk* issuance, particularly in emerging regions such as Sub-Saharan Africa, Southeast Asia, and MENA, where infrastructure and climate finance gaps remain critical.

5.2. Questionnaire Design and Data Collection

To prioritise key barriers in the *Green Sukuk* market, this study employed a structured expert elicitation process using a customised questionnaire based on the (BWM) principles. Informed by prior qualitative insights (Chapter 4) and MCDM best practices (Rezaei, 2015), the questionnaire was distributed globally via email, LinkedIn, WhatsApp, and Google Forms. Consistent with established standards in the literature, the use of small expert panels, typically between 8 and 20, is methodologically sound and cognitively efficient (De Brito & Evers, 2016; Passos Neto et al., 2023; Siraj et al., 2023). The instrument captured both expert prioritisation of the nine challenge criteria and assessment of solution domains, providing an empirical foundation for the subsequent Bayesian analysis (Appendix 6).

5.2.1. Survey Structure and Content

The questionnaire consisted of three main sections:

Background: Experts were asked to provide demographic and professional details, including affiliation, years of experience, educational background, and area of expertise. This ensured that a diverse and credible panel aligned with the *green sukuk* ecosystem.

Criteria Prioritisation: The core of the survey applied the Bayesian Best-Worst Method (Bayesian BWM). Respondents selected the most and least critical challenges from a list of nine validated criteria and then performed two sets of pairwise comparisons: best-to-others and others-to-worst.

Solution Rating: In a complementary task, participants assessed the relevance of five strategic solution clusters derived from earlier qualitative findings, enabling the cross-validation of challenges with the proposed interventions.

5.2.2. Expert Sampling and Recruitment Strategy

Expert sampling and recruitment in this study followed a rigorous four-step process: a purposive sampling strategy targeting global *Green Sukuk* experts, a multi-channel recruitment campaign, careful screening of responses for validity, and sample size justification based on established Bayesian MCDM standards.

5.2.2.1. Sampling Strategy

This dissertation employed a purposive sampling strategy to identify and engage experts with demonstrable knowledge and practical experience in Islamic finance, green finance, ESG policy, or multi-criteria decision-making. Purposive sampling is particularly appropriate for structured expert elicitation techniques such as the Bayesian Best-Worst Method (BWM), as it prioritises the inclusion of individuals with specialised domain knowledge rather than aiming for statistical representativeness (Rowe & Wright, 1999; Keeney et al., 2011).

Given the global scope of the *Green Sukuk* market, experts were selected from countries with demonstrated activity in *Green Sukuk* issuance, regulation, and academic research, including Malaysia, Indonesia, Saudi Arabia, Türkiye, the UAE, the UK, and Nigeria. This cross-regional representation ensures diversity in institutional perspectives and

policy environments, a key consideration in eliciting credible and contextually grounded judgments for multi-criteria analysis (Ayyub, 2001).

5.2.2.2. Recruitment Process

Experts were recruited over a two-month period through multiple professional and academic channels. Invitations were distributed via email, LinkedIn, and WhatsApp, and the respondents accessed the survey through a dedicated Google Forms link. The outreach message clearly stated the purpose of the research, the role of expert participation, and the confidentiality protection afforded to all contributors. An explicit withdrawal clause was included in the introduction of the questionnaire, giving participants the right to discontinue participation at any point without consequences. This design ensured compliance with the ethical standards of informed consent and voluntary participation, as outlined in the institutional clearance granted by the Ethics Committee of Sakarya University.

5.2.2.3. Response Screening and Final Sample

A total of 160 experts were initially contacted. Of these, 27 participants responded to the survey. Two respondents chose to discontinue participation after reviewing the instructions, an outcome anticipated by the ethical withdrawal clause. Of the remaining 25, four responses were excluded from the final analysis because of data quality concerns, including repetitive or uniform values across the comparison matrix, which indicated either misunderstanding or non-engagement with the ranking task. Accordingly, three respondents from Malaysia and one from Türkiye were excluded. Ultimately, 21 responses were deemed valid and retained for analysis.

All the included experts provided complete pairwise comparisons, and their responses passed the consistency, and variance checks typical of Bayesian BWM calibration (Mohammadi & Rezaei, 2020).

While traditional surveys aim for large, statistically representative samples to enable population-level inference, the Bayesian Best–Worst Method (BWM) differs in several important ways:

- **Purpose:** The BWM focuses on eliciting informed judgments from subject-matter experts to prioritise criteria under uncertainty, rather than measuring general opinions (Rezaei, 2015).
- **Sample Size Norms:** Methodological literature shows that BWM applications commonly involve 6–15 expert participants because depth and expertise are more critical than breadth (Saner et al., 2020; Saner et al., 2022).
- **Quality over Quantity:** The robustness of BWM results is ensured through consistency and variance checks in pairwise comparisons, making methodological rigor possible, even with smaller panels (Wang et al., 2025).

In this study, the final sample of 21 valid experts exceeded the typical ranges reported in comparable BWM applications, thereby reinforcing the reliability of prioritisation outcomes.

5.2.2.4. Justification of Sample Size

The final sample of 21 expert participants aligns well with established norms in the structured expert elicitation and Bayesian MCDM literature. Siraj et al. (2023), for example, used 8–12 experts for BWM-based fire risk prioritisation, whereas Khalilzadeh et al. (2025) applied the Fuzzy Delphi method with 10–15 domain specialists. Methodological reviews by De Brito and Evers (2016) and Passos Neto et al. (2023) confirmed that most high-quality MCDM studies involving expert input operate within the 8–20 participant range. These sample sizes are supported by a balance between cognitive manageability, methodological consistency, and diminishing returns of larger panels in elicitation exercises (Liang et al., 2025; Toffano et al., 2022).

In this context, the 21 validated responses collected for this study are not only within the acceptable methodological threshold but also benefit from cross-regional and interdisciplinary diversity. This lends credibility and robustness to expert judgments underpinning Bayesian analysis, strengthening the interpretive and policy relevance of the results.

5.2.3. Profile of Respondents

As illustrated in Table 13, the sample exhibits notable diversity across sectors and seniority levels. Approximately 29% of respondents were affiliated with academic

institutions or research centres, followed closely by experts from financial institutions (19%), government and policy bodies (14%), ESG consultants (14%), and multilateral development organisations (14%). While academic expertise is prominent, high representation from the market-based and regulatory sectors underscores the practical relevance of the input.

More than 76% of the experts had over 10 years of professional experience, with one-third having 11–15 years of experience. This indicated a mature and experienced sample. In terms of education, the majority (52.4%) held doctoral degrees, further affirming the depth of insight brought into the evaluation. Disciplinary expertise leans heavily toward Islamic finance and banking (38.1%), followed by sustainability, regulatory affairs, and public policy, all critical domains in understanding GS market dynamics.

Table 13: Expert Demographic and Professional Profile

Category	Frequency	Percentage
<i>Job Status/Affiliation</i>		
Academic/Researcher	6	28.57
Financial Institution Professional	4	19.05
Government/Policy Maker	3	14.29
ESG / Sustainability Consultant	3	14.29
Multilateral/Development Organisation	3	14.29
Independent Expert / Consultant	1	4.76
Legal / Regulatory Professional	1	4.76
<i>Years of Experience</i>		
1-5 years	1	4.76
6-10 years	4	19.05
11-15 years	7	33.33
16-20 years	5	23.81
> 20 years	4	19.05
<i>Level of Education</i>		
Doctorate (Ph.D)	11	52.38
Master's Degree	6	28.57
Professional Certification	4	19.05
<i>Area of Expertise</i>		
Islamic Finance / Banking	8	38.10
Environmental Studies / Climate Finance	3	14.29
Economics / Development Studies	3	14.29
Legal / Regulatory Affairs	3	14.29
Academic Research / Higher Education	2	9.52
Public Policy / Government	2	9.52

Source: Author's Compilation

5.2.4. Geographic Distribution of Experts

As reflected in Table 14, the majority of respondents are from Southeast Asia and the Middle East, which are the two global hubs of Islamic finance. Notably, Indonesia alone accounts for one-third (33.3%) of the expert panel, consistent with its position as a leading GS issuer. Experts from Türkiye, Saudi Arabia, and Malaysia followed, each representing 14.29% of the sample. Participants from Singapore, Nigeria, and the UAE add global diversity, ensuring multiregional insights.

Table 14: Overview of Participating Experts by Country

Country	Frequency	Percentage
Indonesia	7	33.33
Türkiye	3	14.29
Saudi Arabia	3	14.29
Malaysia	3	14.29
Singapore	2	9.52
Nigeria	2	9.52
United Arab Emirates	1	4.76

Source: Author's Compilation

5.2.5. Self-Assessment of Subject Familiarity

As an internal validity check, experts self-rated their familiarity across three domains: the GS market (GSM), Islamic finance principles and instruments (IFPI), and sustainable finance/ESG. Table 15 reports high mean scores across all areas, with the highest familiarity with Islamic finance (8.35/9) and GS (7.76/9), indicating high confidence in their judgments. Even the ESG dimension scored well (6.71/9), despite being more specialised.

Table 15: Self-Assessed Expertise Summary

Domain	Average Score	Min	Max
GS Market (GSM)	7.76	3	9
Islamic Finance Principles & Instruments (IFPI)	8.35	3	9
Sustainable Finance / ESG	6.71	3	9

Source: Author's Compilation

The final dataset reflects diverse expert-level inputs, with a strong representation across the GS ecosystem. Notably, over 70% of the respondents come from professional and institutional settings, including financial institutions, regulatory bodies, sustainability consultancies, and multilateral organisations, while academic voices comprise less than

one-third of the sample. This industry-centric composition reinforces the applied validity of the findings, particularly as they build upon the conceptual and scholarly insights presented in previous chapters.

The following section describes the prioritisation process using a probabilistic decision model based on these expert judgments.

5.3. Model Specification

This section outlines the mathematical and procedural foundation of the Bayesian Best-Worst Method (Bayesian BWM) as applied in this study to prioritise key challenges in the GS market. The approach is grounded in the probabilistic model developed by Mohammadi and Rezaei (2020) and operationalised through the structured implementation steps proposed by Li et al. (2020).

Bayesian BWM extends the classical Best-Worst Method (Rezaei, 2015, 2016) by introducing a Bayesian framework that models expert-derived weights as probability distributions. This enhances the robustness of the method in contexts with limited sample sizes and uncertainty, as was the case in this study involving 21 expert participants.

5.3.1. Procedural Overview of the Bayesian BWM

This section outlines the practical application steps of Bayesian BWM, as adapted in this study, following Li et al. (2020), focusing on the sequence of decision-making and comparison inputs.

Step 1: Defining the Objective and Scope of the Green Sukuk Challenge Prioritisation

The objective of this study is to prioritise the most critical barriers to the development of the *Green Sukuk* market through expert-based judgment under uncertainty. The decision context falls under the broader domain of *policy evaluation*, where the goal is not to select individuals or rank institutions but rather to *evaluate and rank systemic challenges* within a complex financial ecosystem. As such, this study adopts the *ranking goal* of the Bayesian BWM, which is to assess the *relative importance of each challenge criterion* as perceived by professionals actively engaged in the Islamic finance and sustainable investment sectors (Mohammadi & Rezaei, 2020).

The scope of the analysis was carefully defined to ensure its contextual relevance. The analytical “*environment*” here is the *global GS market*, which integrates Islamic financial

principles with environmental sustainability objectives. This environment is characterised by regulatory diversity, ethical foundations, and structural immaturity across jurisdictions. Hence, the actors engaged in this environment, including regulators, Shariah scholars, bankers, ESG consultants, and policymakers, serve as conceptual equivalents for personnel in the original competence model. Their professional knowledge and insights shape the identification and evaluation of key criteria.

Before proceeding to the evaluation, it is essential to understand the institutional, ethical, and market-based dimensions of the *green sukuk* landscape. This involved synthesising findings from an extensive bibliometric and systematic literature review (chapter 2) and in-depth expert interviews (Chapter 3), which collectively informed the *nine challenge criteria* (appendix 5) in the prioritisation stage. These criteria reflect critical barriers, such as regulatory fragmentation, limited market access, certification ambiguities, and misalignment between Shariah principles and environmental standards.

By clearly articulating this objective and scope, the Bayesian BWM model is effectively grounded in a decision-making environment that is both *multidimensional* and *stakeholder-driven*, supporting the validity and policy relevance of the results generated in subsequent steps.

Step 2: Identifying the Evaluation Criteria for Green Sukuk Market Prioritisation

In the second step of the BWM process, the aim is to define the evaluation criteria that will serve as the basis for expert comparison and prioritisation. In this study, these criteria represent the main challenges impeding the growth and environmental integrity of the *Green Sukuk* market. These challenges are multidimensional and originate from diverse stakeholder experiences spanning regulatory, financial, institutional, ethical, and environmental domains.

The identification of these evaluation criteria followed a rigorous multistage process grounded in both theory and empirical input. First, a comprehensive literature review was conducted (Bibliometric and SLR), covering 155 documents for the bibliometric analysis, and 43 scholarly articles, for the SLR, from 2017 to 2025. This review helped consolidate recurring themes related to barriers to *Green Sukuk* development. Second, the insights were triangulated and refined through *expert interviews* (Chapter 4) with seasoned professionals from Islamic finance institutions, regulatory bodies, ESG certification

entities, and academia. This dual-method approach ensured that the criteria were not only theoretically sound, but also practically relevant.

As a result, nine evaluation main criteria were selected, each representing a distinct barrier within the GS ecosystem:

C₁: Regulatory and Policy Constraints (RPC)

C₂: Institutional Capacity Barriers (ICB)

C₃: Certification and Verification Barriers (CVB)

C₄: Shariah-Green Alignment Barriers (SGA)

C₅: Definitional and Eligibility Ambiguity (DEA)

C₆: Market Access Barriers (MAB)

C₇: Financial Viability Barriers (FVB)

C₈: Awareness and Engagement Barriers (Khalilzadeh et al.)

C₉: Environmental and Ethical Integrity Risks and Barriers (Fahad & Areeba)

Each of these criteria reflects a core obstacle that could reduce the credibility, scalability, or ethical authenticity of the *Green Sukuk* instruments. In the original multi-criteria competence assessment (MCCA) model, these criteria are denoted by the following set:

$$C = \{c_1, c_2, \dots, c_9\} \quad (1)$$

Unlike the original MCCA where personnel $P = \{p_1, p_2, \dots, p_m\}$ are evaluated against competence criterion C , in our study, expert respondents are not being evaluated themselves. Instead, their judgments are used to assess the *relative importance* (challenge) of each criterion c_j , based on their professional experience and market knowledge.

To facilitate consistency and transparency in later stages, a structured decision matrix was developed. Although it is not required to compute performance scores here, as in classical MCDM frameworks, the conceptual structure remains similar, as shown below:

$$S = \begin{pmatrix} s_{11} & s_{12} & \dots & s_{1n} \\ s_{21} & s_{22} & \dots & s_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ s_{m1} & s_{m2} & \dots & s_{mn} \end{pmatrix} \quad (2)$$

where each element s_{ij} symbolises the perception of expert p_i regarding the relative influence of criterion c_j as expressed through the pairwise comparisons in the subsequent BWM stage.

By establishing this foundation, this study ensures that the Bayesian BWM prioritisation process is built on robust, expert-informed criteria that reflect the *real-world complexities* of Islamic green finance.

Step 3: Collecting and Preparing Expert Comparison Inputs

In the third step of the Bayesian BWM process, the objective is to collect consistent and structured expert judgments that reflect the perceived importance of each of the nine *Green Sukuk* challenge criteria. Unlike traditional MCCA, where competence scores are directly obtained from performance or statistical records, our study relied on informed *expert-based pairwise comparisons* using a structured BWM questionnaire.

These expert inputs were obtained via a decision-focused survey instrument that asked respondents to evaluate two sets of comparisons.

Best-to-Others (B–O) vector: Experts selected what they considered the *most critical challenge* (Regulatory and Policy Constraints for example) and then rated their relative importance over each of the other eight criteria using a 1–9 scale, where 1 indicates equal importance and 9 indicates extreme importance over the compared criterion.

Others-to-Worst (O–W) vector: Experts then selected the *least critical challenge* (for example, Awareness Barriers) and rated how strongly the other criteria were preferred over the least important one using the same 1–9 scale.

These comparisons form the structured inputs for the BBWM process, denoted mathematically as follows:

Best-to-Others vector for decision maker k

$$A_B^k = (a_{B1}^k, a_{B2}^k, \dots, a_{Bn}^k)$$

where a_{Bj}^k is the degree to which the best criterion is preferred over criterion j by expert k .

Others-to-worst vector for decision-maker k

$$A_W^k = (a_{W1}^k, a_{W2}^k, \dots, a_{Wn}^k)$$

where a_{Wj}^k is the degree to which criterion j is preferred over the worst criterion.

The quality of these pairwise comparisons is critical for the robustness of the BBWM results. Therefore, the survey design ensured that:

- A complete comparison with no missing values (required field settings enforced in Google Forms).
- Logical consistency through guided definitions and practical examples for each criterion.
- Clear instructions to avoid flat or mechanical ratings (for example uniform 5–5–5 patterns) were screened and excluded from the dataset (4 out of 25 responses were removed on this basis).

Although Bayesian BWM does not require traditional numerical data normalisation, as in performance-based models, conceptual analogy is still relevant. In classical MCDM models, raw scores s_{kj} are normalized to allow fair comparisons across different scales. This is often performed using the following transformation:

$$s_{kj}^{norm} = \begin{cases} \frac{s_{kj}}{\max_{s_{ij}}} & \text{for positive correlation} \\ 1 - \frac{s_{kj}}{\max_{s_{ij}}} & \text{for negative correlation} \end{cases} \quad (3)$$

However, in our case, each criterion was treated as equally measurable on a scale of 1–9, so no mathematical transformation was needed. Instead, comparability and internal consistency were ensured through expert screening and the methodological structure.

By gathering these expert inputs in a structured and transparent manner, Step 3 lays the groundwork for the Bayesian estimation of weights and uncertainty, as detailed in the following steps.

Step 4: Estimating the Optimal Weights of the Green Sukuk Challenges

Once the nine key challenge criteria in the *Green Sukuk* market are identified and expert pairwise comparisons are collected (Step 3), the next step is to estimate the *optimal relative importance weights* for each criterion.

While traditional MCDM techniques such as SMART, AHP, and ANP can be used for this task, this study adopts the Bayesian BWM, which provides a probabilistic estimation of weights rather than fixed-point values. This is particularly suitable for small expert samples and accommodates *the uncertainty* in expert judgments (Mohammadi & Rezaei, 2020).

Formally, given the input vectors for Best-to-Others $\mathbf{A}_B^k$ and Others-to-Worst $\mathbf{A}_W^k$ from each expert k , the model aims to estimate the *posterior distribution* of individual weights

W^k and their aggregated version W^{agg} , as shown in the probabilistic graphical model (see Fig. 12).

Unlike the classical BWM, the Bayesian BWM does not rely on consistency ratios or exact linear programming. Instead, it treats the weight vector $W^k = (w_1^k, w_2^k, \dots, w_n^k)$ as a random variable with an associated Dirichlet prior distribution and updates it using Bayes' theorem based on the observed expert comparisons.

Therefore, this step transforms subjective pairwise inputs into *robust and interpretable weights*, reflecting both expert consensus and uncertainty, which forms the basis for ranking *Green Sukuk* challenges in the next stage.

Step 5: Aggregating the Challenge Weights to Derive Final Prioritisation

The final stage of the Bayesian BWM procedure involves aggregating the optimally estimated weights of the nine *Green Sukuk* challenges to determine their overall prioritisation. Once each expert's weight vector $W^k = (w_1^k, w_2^k, \dots, w_n^k)$ is computed through Bayesian inference, the final aggregated weights W^{agg} are obtained by averaging across all experts:

$$W^{agg} = \frac{1}{K} \sum_{k=1}^K w_1^k, \text{ for } j=1, \dots, n \quad (4)$$

where K denotes the number of valid expert responses. These aggregated weights represent the relative importance of each challenge criterion under uncertainty, thereby forming a ranked prioritisation list.

A higher weight indicates a greater perceived barrier to *Green Sukuk* development, enabling both policymakers and practitioners to allocate attention and resources. This step completes the Bayesian MCDM pipeline by transforming subjective pairwise comparisons into a structured data-informed decision hierarchy.

5.3.2. Formal Specification of the Bayesian Best-Worst Model

The Bayesian BWM, introduced by Mohammadi and Rezaei (2020), enhances the classical BWM by modelling expert-derived weights as probability distributions rather than fixed values. This probabilistic formulation captures uncertainty and allows for a more robust inference, especially under small-sample conditions, as is the case in this study ($n = 21$).

Instead of yielding single-point estimates, the model generates posterior distributions for both the individual and aggregated weights using Bayes' theorem. Experts identified the most and least important, (challenging in this study), criteria and provided structured pairwise comparisons, which were then used to derive these distributions. This approach integrates heterogeneity across expert judgments and reflects the probabilistic nature of group decision making.

The following subsection outlines the formal mathematical structure and computational steps used in this study, adapted from Mohammadi and Rezaei (2020) and operationalised through Li et al.'s (2020) empirical framework.

Step 1: Defining the Decision Criteria

Let $C = \{c_1, c_2, \dots, c_n\}$ represent the set of n challenges (criteria) to be evaluated. In this study, we defined nine keys *Green Sukuk* market challenges (C_1 to C_9) based on expert interviews and literature synthesis.

Step 2: Identifying the Best and Worst Criteria

Each expert was asked to select from C the most significant challenge (best criterion c_B) and the least significant challenge (worst criterion c_W). No pairwise comparisons were involved at this stage; only the identification of extremes was required.

Step 3: Pairwise Comparison – Best-to-Others

Each expert then evaluated how much more important the best criterion c_B is compared to all other criteria $c_j \in C$, using a scale from 1 to 9. These evaluations form a **Best-to-Others vector**.

$$A_B^k = (a_{B1}^k, a_{B2}^k, \dots, a_{Bn}^k)$$

where a_{Bj}^k represents the preference of criterion c_B over criterion c_j by expert k .

Step 4: Pairwise Comparison – Others-to-Worst

Similarly, the expert provides ratings of how much each criterion $c_j \in C$ is preferred over the worst criterion c_W . This forms the **others-to-worst vector**.

$$A_B^k = (a_{B1}^k, a_{B2}^k, \dots, a_{Bn}^k)^T$$

Step 5: Posterior Weight Distribution Estimation

Let $w^k = (w_1^k, \dots, w_n^k)$ be the latent weight vector for expert k , and let w^{agg} be the aggregate weight across all K experts. The *joint posterior distribution* of the weight vectors is formulated as follows:

$$P(\mathbf{w}^{agg}, \mathbf{w}^{1:K} | \mathbf{A}_B^{1:K}, \mathbf{A}_W^{1:K}) \quad (5)$$

To compute marginal probabilities, we apply the following sum rule:

$$P(x) = \sum_y P(x, y) \quad (6)$$

Based on the probabilistic graphical model (Figure 12), the hierarchical relationship is as follows:

$$P(\mathbf{A}_W^K | \mathbf{w}^{agg}, \mathbf{w}^k) = P(\mathbf{A}_W^K | \mathbf{w}^k) \quad (7)$$

Bayes' theorem provides the following:

$$P(\mathbf{w}^{agg}, \mathbf{w}^{1:K} | \mathbf{A}_B^{1:K}, \mathbf{A}_W^{1:K}) \propto \left(\prod_{k=1}^K P(\mathbf{A}_B^k | \mathbf{w}^k) P(\mathbf{A}_W^k | \mathbf{w}^k) P(\mathbf{w}^k | \mathbf{w}^{agg}) \right) P(\mathbf{w}^{agg}) \quad (8)$$

Each input vector $\mathbf{A}_B^k$ and $\mathbf{A}_W^k$ follows a multinomial distribution:

$$\mathbf{A}_B^k, \mathbf{A}_W^k \sim \text{multinomial}(\mathbf{u}^k), \forall k = 1, \dots, K \quad (9)$$

The *individual weights* $\mathbf{w}^k$ are sampled from a *Dirichlet distribution* centered around $\mathbf{w}^{agg}$:

$$\mathbf{w}^k \sim \text{Dir}(\gamma \cdot \mathbf{w}^{agg}), \forall k = 1, \dots, K \quad (10)$$

where γ is the concentration parameter that controls the closeness of each expert's weight to the aggregated weight. It is modelled using a gamma distribution:

$$\gamma \sim \Gamma(a, b), \text{ where typically } a = b = 0.1 \quad (11)$$

To close the model, an **uninformative Dirichlet prior** was assumed for the aggregated weights.

$$\mathbf{w}^{agg} \sim \text{Dir}(1) \quad (12)$$

5.3.3. Probabilistic Graphical Structure

Bayesian BWM operates within a probabilistic graphical model that captures the hierarchical relationship between individual expert preferences and aggregated group-level weights. As shown in Figure 12, each expert k provides two structured vectors based on pairwise comparisons.

- $\mathbf{A}_B^k = (a_{B1}^k, a_{B2}^k, \dots, a_{Bn}^k)$: the *Best-to-Others* comparison vector, where the best criterion is compared against all others.
- $\mathbf{A}_W^k = (a_{W1}^k, a_{W2}^k, \dots, a_{Wn}^k)^T$: the *Others-to-Worst* comparison vector, where all other criteria are compared to the worst.

From these inputs, an individual latent weight vector $\mathbf{w}^k$ is inferred for each expert. These local weights are then assumed to be drawn from a common group distribution $\mathbf{w}^{agg}$, which represents the aggregated consensus of all experts. In this hierarchical model, the observed pairwise comparisons $(\mathbf{A}_B^k, \mathbf{A}_W^k)$ are conditionally independent of $\mathbf{w}^{agg}$ given $\mathbf{w}^k$, reflecting the assumption that expert judgments are influenced by their personal weighting profiles, not directly by the group average.

This structure enables a rigorous Bayesian estimation process that incorporates expert heterogeneity and uncertainty in a coherent and computationally tractable manner.

5.4.3 Probabilistic Graphical Structure

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In this dissertation, it is crucial to clarify that when experts identify the "*best*" and "*worst*" criteria, they are specifically referring to the most and least obstructive challenges to the development of the *Green Sukuk* market, rather than their abstract importance or

conceptual relevance (Rezaei, 2015, 2016). A criterion labelled as "*worst*" in the pairwise comparison signifies that it is perceived as the least hindering among the listed options, not that it is unimportant or fully resolved. This distinction is vital for accurately interpreting the Bayesian BWM results.

By focusing on relative barriers rather than absolute significance, the model offers a pragmatic and operational ranking that mirrors stakeholder perceptions of urgency and difficulty in real-world implementations. In doing so, it provides a probabilistic, consensus-driven approach to policy and market prioritisation amid expert uncertainty.

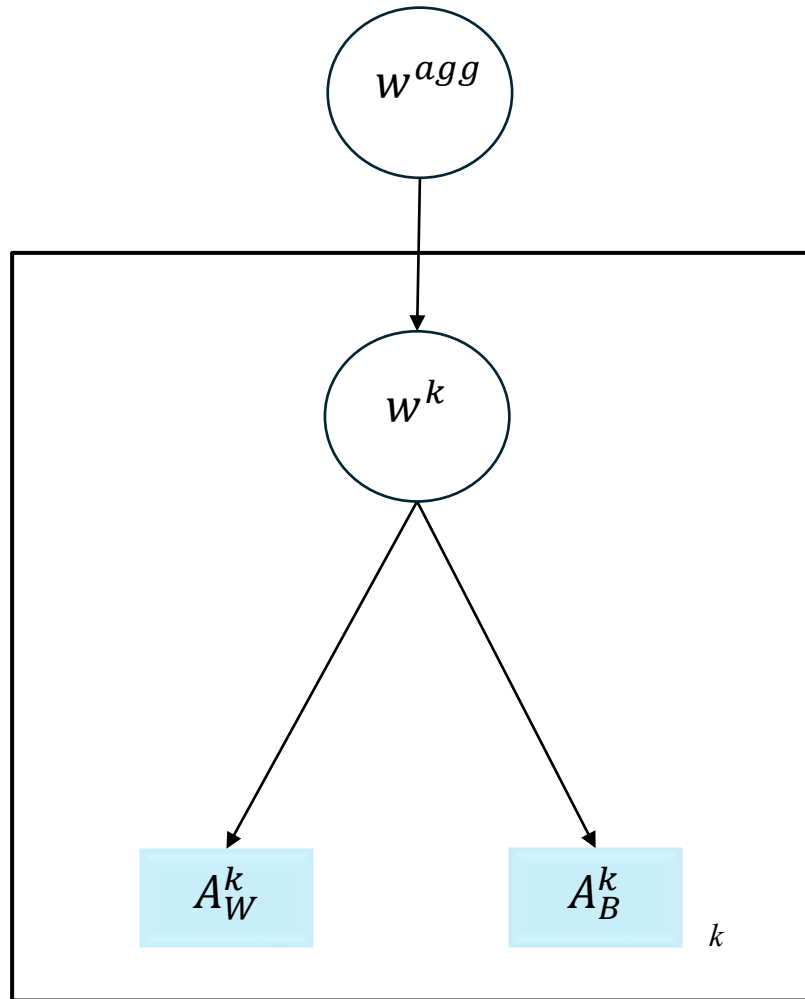


Figure 12: Probabilistic Graphical Model of the Bayesian Best-Worst Method

Source: Adapted from Mohammadi and Rezaei (2020), this figure visually represents the hierarchical dependency between expert-level preferences and aggregated group-level weight distribution.

5.3.4. Software and Implementation

Bayesian BWM analysis was conducted using a hybrid computational setup. Excel was used for data entry, validation, and preliminary processing, including normalisation and respondent screening. The core Bayesian computations were executed in MATLAB, utilising the open-source Bayesian BWM toolbox developed by Mohammadi and Rezaei (2020)¹.

This package supports the full probabilistic modelling pipeline, including pairwise data transformation, specification of Dirichlet priors, and likelihood construction. Since the posterior distribution defined in the model lacks a closed-form solution, the Markov Chain Monte Carlo (MCMC) method, specifically, the Just Another Gibbs Sampler (JAGS), was used to estimate the posterior distributions of weights. The final outputs were visualised and compared with classical BWM results to assess robustness and enhance interpretability.

5.4. Analysis and Results

This section presents the results of the Bayesian BWM analysis, which ranks nine GS market challenges based on expert-derived probabilistic weights. A total of 21 multidisciplinary experts participated in the survey, producing robust and credible inputs for group-level inference. The analysis yielded both global priority weights and a visual representation of the uncertainty associated with each criterion.

5.4.1. Aggregated Weights and Ranking of Green Sukuk Challenges

Table 16 presents the aggregated global weights derived using the Bayesian inference. Each criterion was represented by its posterior mean, reflecting the average importance assigned by the expert group across 21 responses.

¹ Open-source Bayesian BWM toolbox by Mohammadi and Rezaei (2020), available at: <https://github.com/Majeed7/BayesianBWM>.

Table 16: Bayesian BWM Results: Ranking of *Green Sukuk* Barriers

Rank	Criteria	Average Weight
1	Market Access Barriers (MAB)	0.1312
2	Regulatory and Policy Constraints (RPC)	0.1270
3	Environmental and Ethical Integrity Risks and Barriers (Fahad & Areeba)	0.1122
Table 16 (continued)		
4	Definitional and Eligibility Ambiguity (DEA)	0.1102
5	Awareness and Engagement Barriers (Khalilzadeh et al.)	0.1093
6	Financial Viability Barriers (FVB)	0.1092
7	Certification and Verification Barriers (CVB)	0.1029
8	Institutional Capacity Barriers (ICB)	0.1004
9	Shariah-Green Alignment Barriers (SGA)	0.0977

Source: Author's Compilation.

The results indicate that Market Access Barriers (0.1312) and Regulatory and Policy Constraints (0.1270) are the most critical impediments to *Green Sukuk* market development. This finding is consistent with the qualitative evidence presented in Chapter 4, where experts emphasised fragmented market ecosystems, limited product diversity, and regulatory inconsistency across jurisdictions.

Environmental and Ethical Integrity Risks (0.1122) ranked third, underscoring expert concerns about greenwashing, unclear environmental taxonomies, and the lack of reliable impact validation. Interestingly, Shariah-Green Alignment Barriers (0.0977), although highlighted as conceptually significant in the literature, were ranked lowest by the experts. This may reflect a growing level of implicit confidence in the ability of Shariah frameworks to evolve and accommodate sustainability concerns, a theme supported by the interview data.

The relatively small differences between the mid-ranked criteria (DEA, AEB, and FVB) reflect the complex, interdependent nature of the barriers in the *Green Sukuk* ecosystem. These tightly clustered weights (between 0.109 and 0.110) signal a perceived balance in their influence and may require integrated policy responses rather than isolated interventions.

5.4.2. Visualising Uncertainty Through Credal Ranking Analysis

To enrich the interpretation of expert judgment beyond average weight estimations, this section introduces the Credal Ranking Graph (CRG) presented in Figure 13, which is derived from the Bayesian Best-Worst Method (BWM). Unlike classical deterministic

models that offer static rankings, the CRG presents a probabilistic preference structure among the nine *Green Sukuk* (GS) challenge criteria by visualising the full posterior dominance relationships between them.

In this network graph, each red square node represents a *Green Sukuk* barrier, and each directed arrow encodes a pairwise dominance probability, that is, the likelihood that one barrier is ranked more critical than another, based on expert assessments. Technically, values approaching 1.00 indicate a strong and consistent preference for one criterion over another, while values near 0.50 suggest expert indecision, preference overlap, or contextual divergence in ranking. These posterior probabilities were calculated from the judgments of 21 domain experts using a Bayesian extension of the BWM framework, which accommodates uncertainty and inconsistency.

To support reader comprehension, Table 17 provides a breakdown of the graph's visual elements, nodes, arrows, probabilities, and colour groupings, used to represent the underlying expert decision logic.

Table 17: Key Components of the Bayesian BWM Credal Ranking Graph

Graph Element	Description	Visual Indicator
Nodes (Criteria)	Each red square node represents one of the nine <i>Green Sukuk</i> barrier criteria.	Red squares
Directed Arrows	Arrows show pairwise dominance relationships between criteria (i.e., which barrier is ranked higher).	Curved arrows with arrowheads
Edge Weights (Probabilities)	Numerical values on arrows indicate the posterior probability that one criterion is preferred over another.	Numbers such as 0.99, 0.85, 0.59, etc.
Arrow Direction	Arrows point from the more dominant to the less dominant criterion.	Arrows from top-ranked to lower-ranked nodes
Thick Arrow Clusters	Densely connected nodes suggest zones of ranking ambiguity or interdependence among criteria.	Seen in the lower area of the graph
Color-Coded Arrows	Different arrow colors group or distinguish pathways among clusters of criteria. Each color typically represents comparisons involving a single node.	Cyan, Pink, Orange, Brown, Blue, etc.
Dominant Criteria	Criteria with many outgoing arrows and high probabilities (e.g., RPC, MAB), indicating widespread expert consensus on their priority.	Position at the top of the graph

Subordinate Criteria	Criteria with many incoming arrows, meaning they are often ranked lower (e.g., SGA, ICB).	Position near the bottom of the graph
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Source: Author's Compilation

5.4.2.1. Interpreting the Graph: Dominance, Consensus, and Divergence

The structure and density of the arrows in Figure 13 communicate two critical aspects: (i) dominance strength and (Shafii et al.) ranking confidence.

Market Access Barriers (MAB), positioned in the upper-right, is highly dominated by other criteria, as indicated by multiple inbound arrows with very high probabilities (e.g., 0.94, 0.98, 0.99). While this visually suggests a lower preference, in the Bayesian graphing convention used here, the dominant arrows point from the higher-ranked criterion to the lower. Thus, the concentration of incoming edges with values close to 1 implies that experts overwhelmingly agree on the top-priority status of the MAB. This confirms earlier findings (Section 5.3 and 5.5.1) that MAB is viewed as the most binding constraint on *Green Sukuk* scalability because of issues such as weak secondary markets, investor base limitations, and liquidity concerns.

Regulatory and Policy Constraints (RPC) appear in the upper-left with numerous outbound arrows, almost all above 0.98, reinforcing their dominant position across the decision space. It systematically outranks lower-tier criteria, such as Institutional Capacity Barriers (ICB), Certification and Verification Barriers (CVB), and Shariah-Green Alignment Barriers (SGA). This strong ranking support signals broad expert agreement on the foundational role of legal clarity, regulatory harmonisation, and enabling policy frameworks, consistent with Stakeholder Theory and the qualitative insights from Chapter 4.

In contrast, mid-ranked criteria, such as Definitional and Eligibility Ambiguity (DEA), Awareness and Engagement Barriers (Khalilzadeh et al.), and Financial Viability Barriers (FVB), exhibit cross-cutting arrows with moderate probabilities (ranging from 0.53 to 0.77). These symmetrical relationships suggest that expert judgments diverged significantly in their relative importance. Such ambiguity or uncertainty may stem from institutional exposure, regional market maturity, or individual prioritisation logic, aligning with the contextual details that surfaced during the expert interviews.

Despite being ranked third in average global weight, environmental and Ethical Integrity Risks (EEBs) show a connector-like role in the network. It has outgoing arrows to most mid-tier and low-tier nodes with probabilities between 0.60 and 0.86, suggesting that it is generally perceived as important, but not as critical as MAB or RPC. This result reflects the varying salience of environmental safeguards and greenwashing risks across the markets and sectors.

At the bottom of the dominance hierarchy, Shariah-Green Alignment Barriers (SGA) received the lowest aggregate weight, with most incoming dominance probabilities exceeding (0.88). This suggests that while experts acknowledge the conceptual importance of SGA, they perceive it as less obstructive than other barriers at this stage of *Green Sukuk* market development. Rather than indicating irrelevance, this result likely reflects growing confidence in existing Shariah governance practices, increasing standardisation efforts in green standards integration, and the wider institutionalisation of hybrid ethical finance structures. As such, the lower ranking of SGA should be interpreted not as diminished significance but as a sign that it is currently viewed as a relatively less urgent constraint, consistent with prior qualitative insights discussed in Chapter 4.

5.4.3. Methodological Significance and Policy Insight

The Bayesian BWM graph, as adapted from Mohammadi and Rezaei (2020), offers a visually intuitive and statistically robust way to represent expert-based prioritisation. The credal dominance structure not only reveals which barriers are most critical but also the confidence level behind such rankings. For example, when a criterion such as RPC is consistently preferred over SGA with a probability of 0.99, it suggests a near-certain consensus suitable for high-priority policy actions.

Equally, areas with dominance probabilities close to 0.5–0.7, such as between DEA and FVB, flag zones of uncertainty where expert preferences diverge, and where more contextual or empirical studies may be warranted.

In policy terms, these insights allow regulators, financial institutions, and standard-setters to focus their efforts strategically. Top-tier consensus areas (for example RPC and MAB) demand structural reforms, whereas mid-tier ambiguity suggests the need for market-specific diagnostics, pilot programs, or capacity-building initiatives.

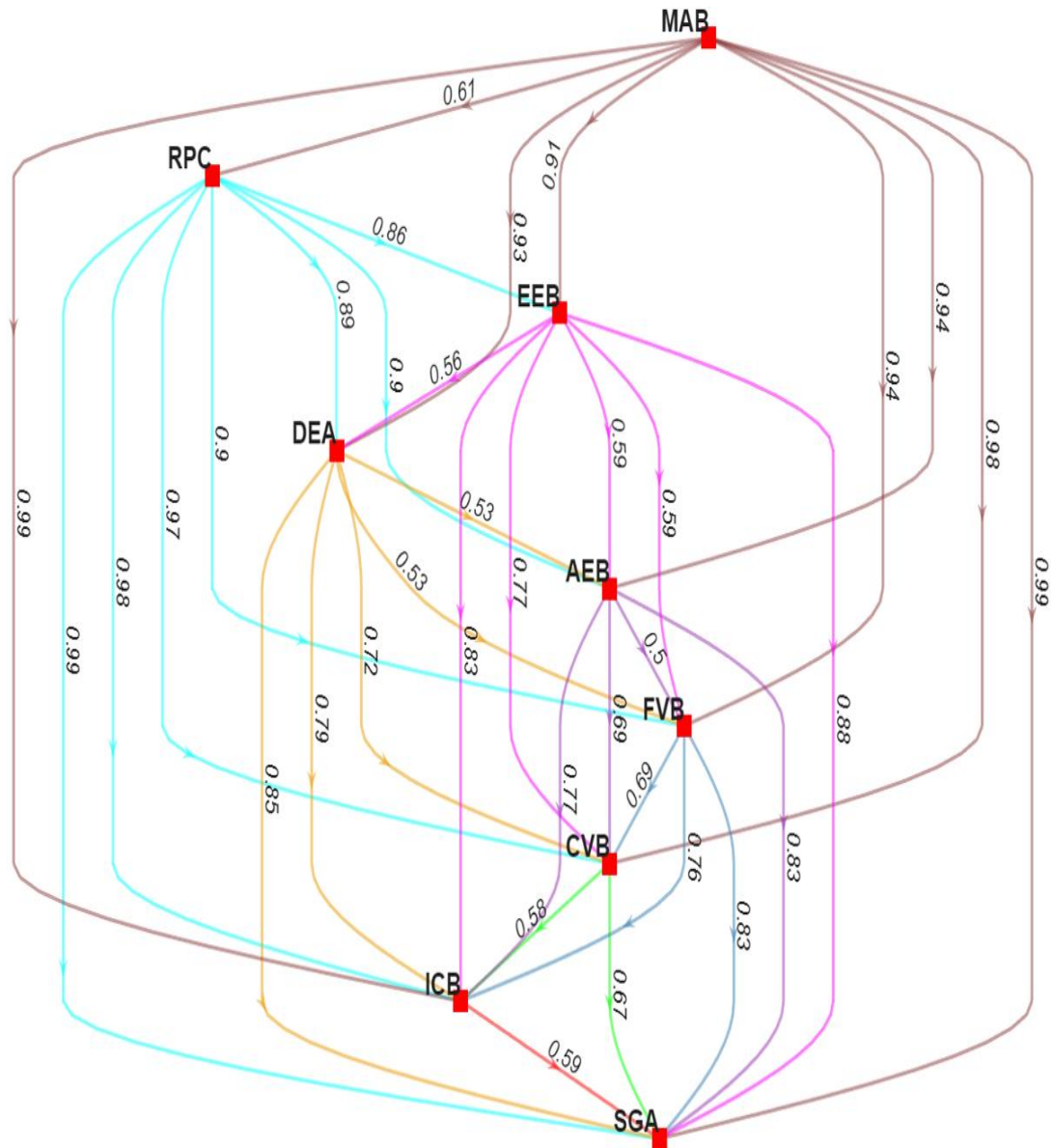


Figure 13: Bayesian BWM Credal Ranking of *Green Sukuk* Challenges.

Source: Author's computation based on the Bayesian BWM model adapted from Mohammadi and Rezaei (2020) and implemented via Majeed's (2020) MATLAB toolbox.

Note. **RPC:** Regulatory and Policy Constraints; **MAB:** Market Access Barriers; **FVB:** Financial Viability Barriers; **EEB:** Environmental and Ethical Integrity Risks and Barriers; **DEA:** Definitional and Eligibility Ambiguity; **AEB:** Awareness and Engagement Barriers; **CVB:** Certification and Verification Barriers; **ICB:** Institutional Capacity Barriers; **SGA:** Shariah-Green Alignment Barriers.

5.4.4. Strategic Solutions Evaluation

This section presents an expert-based evaluation of five strategic solution clusters developed to address the most critical barriers in the Green Sukuk market. Building on the prioritised challenge criteria established in the preceding section, the analysis empirically aligns targeted interventions with specific structural constraints through systematic expert judgment. In doing so, it responds directly to Research Question 5 (RQ5), which calls for the proposal and assessment of strategic policy directions, institutional innovations, and practical measures to strengthen Green Sukuk ecosystems and enhance their alignment with Islamic financial principles and sustainability objectives.

As the final component of the mixed-methods model, this evaluation not only identifies and structures the proposed solutions, but also appraises their relevance, feasibility, and potential impact, thereby reinforcing the dissertation's practical and policy contributions. Thus, the strategic solutions were structured into five integrated clusters, each reflecting a thematically distinct reform domain:

1. **Framework Reform and Legal Integration (FRL)** focused on harmonising regulatory, disclosure, and Shariah-aligned legal infrastructure.
2. **Incentives and Capital Mobilisation (ICM)** aimed at reducing costs and risks through sovereign incentives, blended finance, and fiscal measures.
3. **Institutional Strengthening and Partnerships (ISP)** centred on building implementation capacity, multi-actor collaboration, and cross-sector governance.
4. **ESG and Value-Based Assurance Tools (Azhgaliyeva et al.)**: proposed ESG-scoring mechanisms and Shariah-compatible screening aligned with Maqasid al-Shariah.
5. **Education, Awareness, and Market Engagement (EAM)** targeting knowledge gaps, public education, digital access, and investor trust building.

Each expert ($n = 21$) was asked to rate the effectiveness of these five strategies across the nine previously prioritised *Green Sukuk* challenge areas (C_1 – C_9), using a 9-point Likert scale ranging from “1 – not effective at all” to “9 – extremely effective and well-suited.” This approach enables a multidimensional mapping of solution effectiveness that goes beyond simple preference ordering to capture practical applicability across policy domains.

Data were collected using the validated Bayesian BWM solution-rating format and analysed using the solver template developed by Mohammadi and Rezaei (2020). Two forms of evaluation outputs were generated: global weights for each solution cluster and an interaction matrix linking each solution to specific barriers (Table 18). These outputs provide both vertical and horizontal perspectives, which strategies are most preferred overall and how effectively they map onto the most critical structural challenges identified earlier in Chapter 5.

The next subsection presents and interprets the global weight distributions of five solution clusters.

Table 18: Priorities for *Green Sukuk* Categories

Respondent	FRL	ICM	ISP	EVA	EAM
R1	0.4475	0.4940	0.4108	0.5372	0.3440
R2	0.7850	0.9900	0.8450	0.7547	0.8915
R3	0.7428	0.6043	0.6080	0.6690	0.6303
R4	0.6680	0.6740	0.7897	0.7543	0.7953
R5	0.8465	0.7989	0.6401	0.6898	0.8583
R6	0.8328	0.7603	0.6476	0.6509	0.8499
R7	0.5545	0.4829	0.5541	0.7126	0.7437
R8	0.7738	0.6905	0.6326	0.7314	0.6626
R9	0.7199	0.8939	0.8478	0.9061	0.8986
R10	0.3824	0.5318	0.6807	0.4892	0.7386
R11	0.7098	0.5548	0.7604	0.6880	0.7652
R12	0.7746	0.7525	0.8352	0.7976	0.8145
R13	0.6595	0.8262	0.7602	0.7905	0.8707
R14	0.6646	0.7835	0.7877	0.7755	0.8383
R15	1.0575	1.2241	1.1753	1.1753	1.2098
R16	0.8334	0.7961	0.8139	0.7665	0.8258
R17	0.4309	0.5351	0.5553	0.5827	0.5617
R18	0.2697	0.5265	0.4721	0.3714	0.2742
R19	0.9469	0.7177	0.5589	0.4842	0.5427
R20	0.6664	0.7516	0.6226	0.6976	0.5986
R21	5.6369	6.1618	5.9586	5.7437	5.9377
Global Weight	0.6990	0.7290	0.7261	0.7336	0.7823

Source: Author's Compilation

5.4.4.1. Global Prioritisation of Strategic Solutions

Figure 14 presents the aggregated global weights of the five strategic solution clusters, reflecting expert perceptions of their overall effectiveness in overcoming barriers to *Green Sukuk* market development. These weights were derived by synthesising the

individual respondent scores using the normalised output of the Bayesian BMW-compatible Solver template. The chart offers a macroscopic view of the interventions that are perceived as the most impactful across the *Green Sukuk* ecosystem.

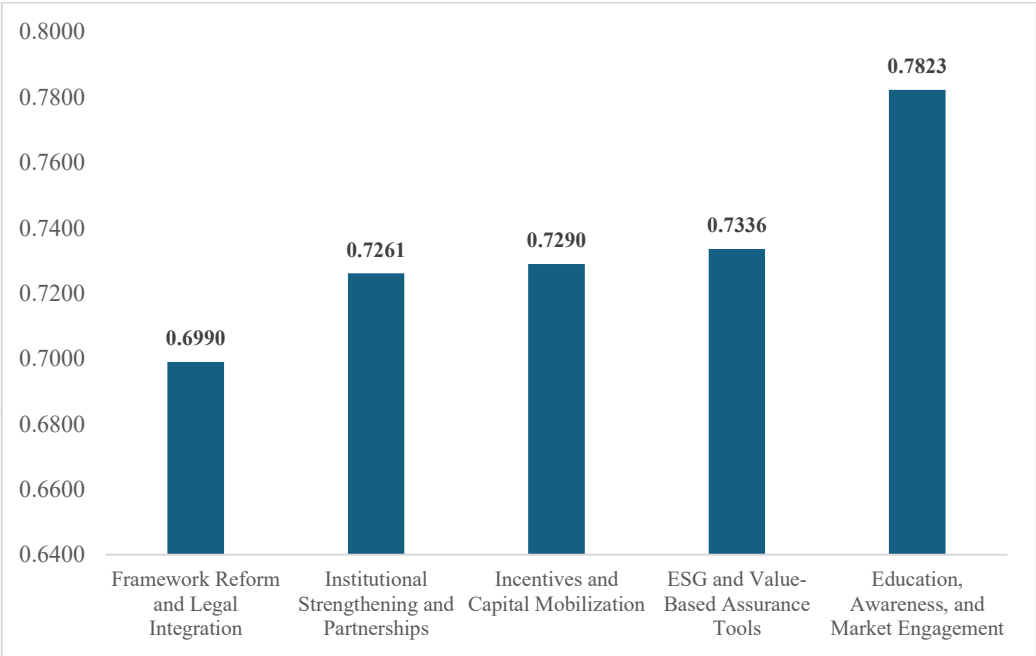


Figure 14: Prioritised Strategic Solutions for *Green Sukuk* Challenges

Source: Author’s computation using BBWM-compatible Solver template based on Mohammadi and Rezaei (2020)

As shown in Figure 14, Education, Awareness, and Market Engagement (EAM) emerged as the most preferred strategic solution, with a global weight of (0.7823), indicating broad consensus among experts that the *Green Sukuk* market suffers not only from technical constraints but also from widespread informational and engagement deficits. This reflects the pervasive theme in both the literature (Bananuka et al., 2022; Alam et al., 2023) and qualitative insights (Chapter 4) regarding insufficient Islamic green literacy, fragmented investor communication, and limited market readiness.

The following are ESG and Value-Based Assurance Tools at (0.7336), and Incentives and Capital Mobilisation (ICM) at (0.7290), both reflecting high utility in addressing systemic credibility gaps and financial structuring barriers. These solutions resonate with stakeholder calls for transparency, a verifiable green impact, and fiscal mechanisms to attract broader investment, especially from risk-averse or ethically driven institutional players.

Institutional Strengthening and Partnerships (ISP) also scored favourably (0.7261), underlining the recognised importance of institutional capacity, coordination mechanisms, and multi-stakeholder engagement, particularly in jurisdictions where regulatory enforcement and market orchestration are still nascent.

Interestingly, Framework Reform and Legal Integration (FRL), while essential from a long-term structural standpoint, received the lowest relative weight (0.6990). While still considered important, this suggests that legal harmonisation and standardisation efforts may be perceived as slow-moving or constrained by geopolitical and jurisdictional fragmentation, making other strategies more immediately actionable and context responsive.

Overall, the ranking shows strong convergence with the challenge prioritisation outcomes, reaffirming that informational asymmetries, lack of assurance tools, and investment bottlenecks are considered more pressing than purely legal or regulatory fixes. This global prioritisation lays the foundation for the next subsection, which explores how each solution aligns with specific challenge areas in a cross-impact matrix.

5.5. Cross-Solution Effectiveness Matrix and Challenge Mapping

To provide a granular understanding of how each strategic solution maps onto the specific barriers identified in the *Green Sukuk* market, Table 19 presents the average expert ratings across a 1–9 scale for each solution–challenge pair. This matrix reflects the aggregate preference for each solution and its perceived effectiveness in addressing the distinct nature of each challenge category.

Table 19: Average Ratings of Strategic Solutions by GS Challenge

Solutions	C1	C2	C3	C4	C5	C6	C7	C8	C9
FRL	5.90	6.14	5.00	5.10	5.10	5.81	5.90	6.76	5.86
ICM	6.29	5.71	5.95	5.76	5.29	5.90	6.43	6.10	5.81
ISP	6.10	6.19	5.43	6.38	6.14	6.05	5.86	6.48	5.76
EVA	6.10	5.76	5.76	6.05	5.71	6.14	5.81	6.14	6.29
EAM	5.95	6.10	6.24	6.10	6.33	6.29	5.81	6.76	5.95

Source: Expert Questionnaire Data; Author's calculations using Solver Tool

This matrix provided several important insights. First, Education, Awareness, and Market Engagement (EAM) scores highest in addressing *Awareness and Engagement Barriers* (C8) and is also highly rated for *Definitional Ambiguity* (C5) and *Market Access Barriers* (C6). This reinforces its role as a crosscutting enabler of demand-side development and

investor inclusion, consistent with its top position in the global priority chart (see Figure 14).

Second, Incentives and Capital Mobilisation (ICM) scored highest for *Financial Viability Barriers (C7)* (6.43), which validates the view that bridging cost-related and investment risks are best achieved through sovereign de-risking and capital access mechanisms. Similarly, the ICM performs well in addressing *Regulatory Constraints (C1)*, suggesting that fiscal policy complements legal reform.

Institutional Strengthening and Partnerships (ISP) show balanced performance across all categories but are particularly effective in addressing *Institutional Capacity Barriers (C2)* and *Shariah-Green Alignment Barriers (C4)*. This is in line with the qualitative findings (Chapter 4), in which interviewees frequently stressed the importance of collaboration between Shariah boards, ESG certifiers, and governmental authorities.

ESG and Value-Based Assurance Tools (Azhgaliyeva et al.) stand out for *Environmental and Ethical Integrity Risks (C9)*, and *Certification and Verification Barriers (C3)*. These findings confirm the vital role of Maqasid-compliant ESG frameworks and external audits in mitigating greenwashing and bolstering trust, echoing concerns expressed in both the literature and expert interviews.

In contrast, Framework Reform and Legal Integration (FRL) received relatively lower effectiveness scores across most challenges, especially for *the certification* and *Shariah-Green alignment* dimensions. This suggests that while FRL may be necessary for foundational coherence, its direct efficacy is perceived as lower than that of more operational or incentive-based solutions.

Overall, solution–challenge mapping reveals a strategic complementary architecture. No single solution optimally addresses all challenges. However, combining EAM and ICM offers both immediate demand-side engagement and long-term financial viability, whereas EVA and ISP offer structural integrity and collaborative strength. These findings serve as the empirical basis for further discussion in the subsequent section.

5.6. Discussion of Quantitative Findings

The Bayesian BWM analysis presented in this chapter offers an empirically grounded prioritisation of the most pressing barriers hindering the growth of the GS market. Anchored in structured expert judgments from 21 validated respondents, the results

provide a multidimensional view of the challenges that are most critical to address in both the short- and medium-term. This section interprets these findings by examining the implications of the top-ranked challenges, reflecting on convergence with prior literature and expert insights and highlighting noteworthy divergences that merit further scholarly attention.

5.6.1. Binding Constraints and Structural Priorities

The consistently highest-weighted barrier, *market access barrier (MAB)*, reflects an urgent concern among experts regarding the structural immaturity of *Green Sukuk* ecosystems, particularly in terms of limited issuer diversity, underdeveloped secondary markets, and constrained retail investor pathways. This echoes widespread observations in both the academic and policy literature (Securities Commission Malaysia, 2019) that market infrastructure and liquidity constraints remain among the most binding constraints in Islamic green capital mobilisation. The credal dominance of MAB, as observed in Figure 13, further confirms the robustness of expert consensus on this point, consistent with the thematic concern of “Investor Awareness and Market Readiness” identified in Chapter 4.

Closely following are *Regulatory and Policy Constraints (RPC)* and *Environmental and Ethical Integrity Risks (Fahad & Areeba)*, both of which receive high posterior weight and low-ranking uncertainty. This reinforces the notion that the GS market suffers from fragmented regulatory ecosystems and a lack of harmonised standards for environmental credibility and Shariah compliance. The literature on Islamic finance frequently notes the dual compliance requirements of both strength and vulnerability (Hassan et al., 2022; El-Gamal, 2020). Quantitative prioritisation affirms that stakeholders perceive regulatory predictability and environmental authenticity as foundational enablers of long-term GS viability.

5.6.2. Mid-Tier Challenges and Expert Divergence

The intermediate-ranking barriers *defined and eligibility ambiguity (DEA)*, *Awareness and Engagement Barriers (Khalilzadeh et al.)*, and *Financial Viability Barriers (FVB)*, exhibit broader posterior distributions, indicating higher disagreement among experts. This variation may stem from contextual differences in *green sukuk* implementation

across jurisdictions. For instance, while some experts argue that definitional ambiguity is being addressed through international taxonomies and sustainability reporting protocols (ICMA, 2022), others stress a persistent lack of clarity in Shariah-based environmental screening mechanisms (Chapter 4). Similarly, although financial viability is not the most urgent concern, its close proximity to other mid-ranked barriers reflects concerns about issuance costs, limited incentives, and uncertain return structures.

This divergence aligns with studies highlighting context-sensitive barriers to *Green Sukuk* uptake in emerging markets (Zulkhibri, 2015), where fiscal space, market size, and institutional support vary significantly. The observed variation also reinforces the value of Bayesian inference in capturing the spectrum of expert opinions, rather than relying on single-point estimates or deterministic ranks.

5.6.3. Lower-Ranked but Normatively Important Issues

Interestingly, the *Shariah-Green Alignment Barriers (SGA)* and *Institutional Capacity Barriers (ICB)* ranked at the bottom of the aggregated weight scale. However, this should not be interpreted as irrelevant. Rather, it reflects a pragmatic prioritisation: while scholars and regulators frequently highlight Shariah–environmental alignment as a conceptual cornerstone (Mansour et al., 2021), experts appear to view it as less of an immediate operational bottleneck than structural and regulatory issues. The results in Chapter 4 similarly showed that such challenges were often mentioned in normative terms without being cited as the primary obstacles to market expansion.

Moreover, the low weighting of ICB may stem from the growing support of multilateral institutions and technical advisory platforms that have enhanced local *Green Sukuk* implementation capacities in countries such as Indonesia, Malaysia, and the UAE. These findings invite further enquiry into whether soft infrastructure such as training, policy dialogues, and institutional learning has matured more rapidly than expected in certain contexts.

5.7. Strategic and Policy Implications

Taken together, the results of the Bayesian BWM provide a prioritised roadmap for stakeholders seeking to enhance the scalability and integrity of the *Green Sukuk* market. The high consensus around structural and regulatory bottlenecks indicates that reforms

should prioritise integrated legal frameworks, tax incentives, and credible environmental verification mechanisms. Furthermore, the nuanced divergence in mid-tier challenges suggests that country-specific strategies remain vital, with contextual tailoring required for awareness campaigns, blended finance tools, and definitional standardisation.

Finally, the Bayesian model's probabilistic treatment of expert judgment offers not only a credible ranking of challenges, but also a transparent reflection of uncertainty, thereby providing a stronger empirical foundation for the integrative discussion and policy recommendations to follow in the subsequent chapters.

To conclude, this chapter addressed *Research Question 4* of the dissertation by applying the Bayesian best–worst method to prioritise key *Green Sukuk* challenges based on expert input. Drawing on 21 expert judgments, the analysis ranked nine barriers, with Market Access Barriers (MAB), Regulatory and Policy Constraints (RPC), and Environmental and Ethical Integrity Risks emerging as the most critical.

The Bayesian framework enables a detailed view of ranking confidence through credal distributions and dominance graphs. Strategic solutions were also evaluated, with Education and Market Engagement (EAM) and ESG-based Assurance Tools identified as versatile responses, whereas Incentives and Capital Mobilisation (ICM) stood out for structural reform.

These findings validate the themes from the earlier chapters and provide an empirical foundation for integrated analysis and policy recommendations in the next chapter.

CHAPTER 6: INTEGRATING FINDINGS AND POLICY FRAMEWORKS

This section introduces the study to a critical interpretation point. Having completed both qualitative and quantitative analyses of *Green Sukuk* challenges, the aim is to synthesise these findings and reflect on their broader theoretical and practical implications. Rather than introducing new data, this section revisits insights from expert interviews and the Bayesian BWM, bringing them together to develop a clearer understanding of the global *green sukuk* landscape (Mohammadi & Rezaei, 2020; Rezaei, 2015).

Given the study's interdisciplinary foundation, spanning Islamic finance, sustainability, and decision science, this integration is essential. As outlined earlier, this research is grounded in a theoretical framework that combines *Maqāṣid al-Sharī'ah*, Stakeholder Theory (Akinde et al., 2025; Donaldson & Preston, 1995; Freeman et al., 2021), Green Growth Theory, and Bayesian Decision Theory. Each lens offers a different entry point into the GS ecosystem: ethical, institutional, economic, and probabilistic, requiring careful synthesis of perspectives.

The empirical base includes two complementary data streams. First, qualitative insights from eight experts representing regulators, academics, multilateral bodies, and practitioners were analysed using Braun and Clarke's method. This revealed 11 core themes, including investor awareness, institutional fragmentation, Shariah–ESG tensions, and digital innovation. Second, the structured prioritisation from the Bayesian BWM quantified expert judgment on nine key market barriers under uncertainty, reinforcing the value of the Bayesian lens.

The broader literature supports this hypothesis. The review of 43 peer-reviewed studies provided a critical context, highlighting well-covered issues such as regulatory fragmentation (Alnabulsi & Jreisat, 2024; Zain & Muhamad Sori, 2020) and investor gaps (Billah & Adnan, 2024; Keshminder et al., 2019; Mahomed & Mahbot, 2024), while also revealing underexplored areas, such as technological innovation and civil society engagement. These blind spots re-emerged in the primary data, prompting deeper analysis.

The following sections present a meta-synthesis of the findings, revisit the theoretical framework in light of the evidence, and identify emerging cross-stakeholder themes, such

as credibility and institutional trust. Practical and conceptual implications are outlined for policymakers, investors, issuers, and scholars, followed by a reflection on the limitations and summary of key insights.

Ultimately, this section not only integrates the findings but also reflects on their significance for the development of *Green Sukuk*, Islamic sustainable finance, and broader ethical investment.

6.1. Meta-Synthesis of Qualitative and Quantitative Insights

This section presents a meta-synthesis of the two empirical phases of this dissertation: the qualitative expert interviews and the quantitative BWM prioritisation. By integrating these perspectives, we aim to construct a fuller, more nuanced understanding of the key barriers constraining the *Green Sukuk* market.

While the qualitative data provided contextual richness, stakeholder perspectives, and emerging insights, the quantitative BWM analysis introduced structure, precision, and prioritisation based on comparative judgements. Importantly, this synthesis does not simply compare lists of findings. Rather, it seeks to understand how and why certain challenges are perceived as more significant—and how these perceptions vary across contexts and stakeholder roles.

6.1.1. Convergence Across Phases: Key Reinforced Barriers

The most striking convergence between both phases lies in the consistent centrality of three interlinked barriers:

- Investor Awareness and Market Readiness
- Regulatory and Institutional Fragmentation
- Shariah–Green Alignment and Certification Gaps
- These challenges were not only dominant in expert narratives but also ranked highest in the BWM output, reinforcing their systemic weight.

From a qualitative perspective (Chapter 4), experts consistently described investor-side constraints, especially low awareness, lack of segmentation, and weak value communication, as a “missing demand narrative.” Experts from regulatory and private sectors alike emphasised that investors, particularly retail and regional institutions, remain unclear about how *Green Sukuk* differ from conventional Sukuk or green bonds.

These insights were validated by the BWM findings, where *Investor Awareness and Engagement* (Khalilzadeh et al.) received one of the highest aggregated priority scores across respondents.

This convergence between qualitative insights and quantitative rankings is consistent with earlier literature identifying investor awareness as a critical enabler of the Green Sukuk market growth (Mangunjaya, 2023; Rahman et al., 2020; Shalhoob, 2023). As discussed in the literature review, limited differentiation from conventional instruments and insufficient value communication have been cited as factors constraining retail and institutional uptake, aligning with Stakeholder Theory to highlight the role of targeted engagement strategies. Furthermore, the emphasis on demand-side activation resonates with the Islamic Moral Economy perspective, where informed participation is essential to realising the *maqāṣid al-sharī'ah* objectives of ethical and socially beneficial finance (Asutay, 2012; Harun & Rahmat, 2025).

Similarly, *Regulatory and Policy Constrains (RPC)* emerged as both a qualitative theme and a top-ranked BWM challenge. Experts spoke of fragmented oversight, overlapping jurisdictional mandates, and the absence of unified taxonomies or disclosure templates. This fragmentation not only delays issuance but also fuels uncertainty for both issuers and investors. These perceptions directly correlate with the high BWM scores assigned to this barrier across diverse regions.

The SLR likewise identifies Regulatory and Policy Constraints as systemic: dual/overlapping oversight and procedural complexity (Noordin et al., 2018), volatile or shifting policy signals (Endri et al., 2022), and the absence of harmonised standards/taxonomies and consistent disclosure templates that raise transaction costs and deter cross-border issuance (Azhgaliyeva et al., 2020; Rozman & Azmi, 2022; Faizi et al., 2024). Therefore, the high BWM scores for this barrier are consistent with the literature's portrayal of governance fragmentation as a first-order- constraint.

The third area, initially flagged as a strong convergence point, requires a more detailed interpretation. While expert interviews underscored the complex interplay between Shariah compliance, ESG standards, and certification, often described as 'two separate languages of ethics, the quantitative phase revealed a more tempered urgency. Specifically, the Shariah–Green Alignment (SGA) received lower aggregate weights in the Bayesian BWM, suggesting that although conceptually relevant, it is not currently

viewed as the most binding constraint by experts. This does not imply diminished importance; rather, it reflects growing institutional familiarity with hybrid ethical instruments, improved cross-jurisdictional Shariah coordination, and enhanced ESG awareness among Shariah scholars.

However, it is also possible that in some cases, Green Sukuk projects may still lean toward form-based Shariah compliance meeting contractual and structural requirements, while not fully embodying the deeper *maqasid*-driven substance of Islamic ethical finance. Although this cannot be confirmed definitively from the current data, such a possibility warrants attention, as it may reflect a stage in market maturity where alignment is technically achieved, but still open to debate regarding depth and intent.

Notably, the Certification and Verification Barriers (CVB) still received higher prioritisation, indicating that practical implementation concerns persisted. Together, these findings indicate that, while ethical integration remains a foundational concern, experts may see the alignment process as relatively more resolved than other operational or market-centric barriers. This interpretation refines the study's institutional triangle, demand-side engagement, governance coherence, and ethical legitimacy by situating SGA as an evolving, but comparatively less urgent obstacle.

A closer link to the literature reveals that the moderated urgency of SGA in the quantitative phase contrasts with its more prominent position in earlier academic discourse, where studies such as Alam et al. (2023) and Kunhibava et al. (2021) frame ESG–Shariah harmonisation as a critical prerequisite for scaling Islamic green finance. From the Maqasid al-Shariah perspective, which emphasises the preservation of life, wealth, and the environment, alignment with sustainability frameworks is not merely a procedural formality, but a moral imperative. The stakeholder Theory also suggests that perceived alignment shapes legitimacy and trust among diverse actors, implying that residual doubts, whether about form-based or substance-driven compliance, can influence investor confidence and policy support.

The SLR conducted in this dissertation further revealed that while many jurisdictions highlight Shariah–ESG compatibility in principle, few operationalise it with unified taxonomies, standardised reporting, and integrated certification pathways. In contrast, the qualitative interviews uncovered a more nuanced practitioner view, recognising progress in cross-jurisdictional coordination and scholar engagement, whereas the Bayesian BWM

rankings shifted the emphasis toward operational bottlenecks such as certification, verification, and regulatory fragmentation.

This divergence underscores the contribution of the mixed-methods approach: the literature establishes the conceptual centrality of SGA, but the empirical evidence generated in this study differentiates between its perceived urgency and its practical embedding in market operations, offering a more layered, context-sensitive understanding of where the Green Sukuk ecosystem stands.

6.1.2. Divergence and Interpretation: Contextual Sensitivities

Beyond convergence, the meta-synthesis also reveals important divergences in how certain barriers were ranked or perceived, offering clues to contextual variations and hidden tensions.

For instance, *Technological Leverage and Innovation*, discussed in Chapter 4 as an emerging theme, particularly blockchain and digital verification, was described enthusiastically by younger and private-sector experts. Yet in the BWM analysis, this barrier ranked significantly lower across most respondents. This contrast may reflect an implementation gap: while innovation is seen as promising, it is still perceived as aspirational or secondary compared to foundational issues like regulation and investor confidence. It may also signal generational or institutional differences in perceived urgency.

The literature reflects this duality. Recent studies for example (Liang et al., 2025; Timur et al., 2025)) emphasise blockchain, smart contracts, and AI-driven verification as transformative tools for enhancing transparency, reducing transaction costs, and mitigating greenwashing risks in Islamic capital markets, others caution against overreliance on untested or fragmented technological solutions. From a critical standpoint, scholars such as El-Gamal (2006) warn that technological adoption in Islamic finance can sometimes prioritise operational novelty over substantive ethical outcomes, echoing concerns in Stakeholder Theory about aligning innovation with the needs and trust of diverse beneficiaries.

The SLR in this dissertation also found that while technological leverage is often cited as an enabler in policy and industry reports, few empirical studies provide robust evidence of its large-scale, successful integration into Green Sukuk frameworks (Faizi et al., 2024;

Harun & Rahmat, 2025). Against this backdrop, the qualitative findings capture the aspirational discourse surrounding technology, while the quantitative results temper this with a market-wide realism that foundational regulatory, governance, and awareness barriers remain immediate priorities.

A second area of divergence is *Greenwashing and Integrity Risks*. This issue featured prominently in the interviews, especially among ESG and GS consultants and regulators, who warned of reputational damage and ethical dilution. However, in the BWM rankings, this challenge appeared in the *middle tier* (Fahad & Areeba), suggesting that while recognised, it is not uniformly prioritised across all stakeholder groups. One possible explanation is that greenwashing is often embedded within broader concerns, such as weak certification or transparency, thus leading some experts to indirectly capture it through other prioritised barriers.

These divergences do not diminish the importance of the issues; instead, they highlight the importance of triangulation. What may be conceptually significant in expert reasoning may not always translate into immediate operational priority, and vice versa. Thus, this synthesis underscores the added value of combining qualitative and quantitative approaches, especially in navigating multi-stakeholder ecosystems such as the *Green Sukuk* market.

The reviewed literature reinforces this positioning. For instance, several studies (Alam et al., 2023; Fadzli, 2024; Khalilzadeh et al., 2022) explicitly identify greenwashing as a reputational and market-integrity risk for Green Sukuk, particularly in jurisdictions with fragmented oversight and inconsistent reporting practices. Others, such as Abdullah et al. (2021) and Hanif et al. (2023), link greenwashing risks to the absence of standardised taxonomies and verification protocols, echoing the Certification and Verification Barriers (CVB) framework used in this dissertation. Notably, existing research also highlights that market actors may downplay direct references to greenwashing in favour of discussing it under broader themes such as transparency or disclosure quality, a trend mirrored in the quantitative findings where it was indirectly subsumed under higher-priority operational barriers. This alignment between prior studies and empirical results illustrates how perceived urgency can shift depending on framing, with the qualitative phase capturing conceptual salience and the quantitative phase revealing relative operational positioning.

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6.1.3. Enriching the BWM Criteria Through Qualitative Depth

Another strength of this mixed-method design lies in how the qualitative phase enriched the structure of the quantitative Bayesian BWM instrument itself. The expert interviews did not merely inform broad categories but helped identify detailed sub-indicators, such as segmentation strategies for investor outreach, or the absence of post-issuance reporting standards under certification.

For example, *Institutional Capacity Barriers (ICB)*, though ranked lower overall in the BBWM phase, were detailed in the qualitative data through issues such as limited structuring skills, lack of green project pipelines, and insufficient training. These detailed insights enabled the Bayesian BWM to capture not just “*what matters*,” but also “*what this challenge means on the ground*.”

Thus, the Bayesian BWM did not operate in isolation. It was built upon and interpreted in light of expert narratives. This reciprocal relationship between qualitative exploration and quantitative precision is central to the philosophical foundation of this dissertation, namely, a pragmatist, stakeholder-driven approach to problem-solving in complex, value-laden markets.

6.1.4. Building an Integrated View of *Green Sukuk* Challenges

Taken together, the synthesis affirms that the most pressing *Green Sukuk* barriers are not purely technical or financial. Rather, they reflect *relational and institutional dynamics*, the ability to build trust, coordinate across ethical and regulatory domains, and communicate clearly to diverse investor bases.

This resonates with *Stakeholder Theory*, as discussed in Chapter 2, which positions market development as a function of coordinated governance and inclusive engagement, not merely product design. It also validates the relevance of *Bayesian Decision Theory*, whose probabilistic logic is well suited for capturing expert judgement under uncertainty, particularly in emerging markets with evolving norms.

Moreover, this integration reaffirms the key bibliometric and SLR insights from Chapter 3. As shown in the published bibliometric paper (Fodol & Aslan, 2025), *Green Sukuk* remains under-theorised in relation to ESG integration, certification, and regional disparities. The systematic literature review expanded this by highlighting how Africa, the GCC countries, and non-sovereign Southeast Asian issuers face context-specific challenges that are underexplored in current models. These gaps are reflected in both the qualitative richness and the variations observed in BWM responses.

Building on this theoretical linkage, the findings also align closely with *Maqāṣid al-Sharī'ah*, which frames financial instruments such as *Green Sukuk* not merely as tools for capital mobilisation but as vehicles for preserving essential values, such as the protection of life, wealth, and the environment (Dusuki & Bouheraoua, 2011; Chapra, 2008). The observed tensions between form-based and substance-based Shariah compliance as well as between local and global sustainability standards directly engage with this maqasid-driven imperative for holistic ethical alignment.

Likewise, the application of the Green Growth Theory (OECD, 2011; Hallegatte et al., 2012) is evident in the way identified barriers, such as regulatory fragmentation and limited investor awareness, impede the simultaneous pursuit of economic development and environmental protection. By linking these theoretical perspectives, this study underscores that overcoming *Green Sukuk* barriers requires integrating the moral-ethical objectives of Islamic finance with the policy and market instruments required for sustainable growth.

Therefore, the empirical contributions of both the qualitative and quantitative phases extend the literature by operationalising these theories in a decision-making framework that directly addresses the interplay between ethical legitimacy, market functionality, and environmental impact.

6.2. Revisiting the Theoretical Framework in Light of Findings

The findings of this study offer a valuable opportunity to re-engage with the theoretical framework introduced at the outset, particularly the principles of Islamic finance (*maqāṣid al-sharī'ah*), stakeholder theory, green financial economics, and Bayesian decision analysis. Rather than viewing these theories as fixed templates, the empirical results encourage us to reconsider how theory responds to lived realities, especially when financial instruments are expected to serve both spiritual and sustainability purposes.

A key insight emerges from the relatively low weighting assigned to the (SGA) in the Bayesian Best-Worst Method (BBWM) results. While classical Islamic financial theory treats Shariah compliance as a foundational requirement, emphasising ethical investment, risk sharing, and *maqāṣid al-sharī'ah*, experts in this study often framed these concerns as operationally resolved or institutionally embedded within existing issuance structures. In this context, SGA was selected by several respondents as the “worst” criterion (least challenging) not due to its irrelevance, but because it was perceived as the least obstructive barrier relative to more urgent regulatory, market, or verification constraints. This aligns with observations from Wahid et al. (2023), where practitioners acknowledged that legal, structural, or environmental hurdles tend to delay *Green Sukuk* long before any theological misalignment becomes a concern.

Importantly, this institutional confidence in procedural Shariah compliance does not suggest that the ethical depth of Shariah is consistently reflected in *Green Sukuk* design. In contrast, several experts interviewed in Chapter 4 expressed concern that *maqāṣid*-based thinking is often sidelined during technical structuring phases. Therefore, a low BWM score for SGA should not be interpreted as diminishing its theoretical weight or ethical relevance. Instead, it reflects an evolving market reality where Shariah compliance is increasingly viewed as a routine or assumed dimension, while other systemic issues such as inconsistent regulation, limited market participation, or weak certification exert greater friction.

This shift calls for a reconceptualisation of Shariah from a passive compliance mechanism to an active, value-generating principle embedded in sustainability evaluation. In this regard, emerging frameworks such as the Maqāṣid-based ESG (Aziz et al., 2022) may offer a bridge between normative ideals and applied green finance practices.

Stakeholder theory, as originally embedded in the conceptual framework, gains strong empirical validation (Donaldson & Preston, 1995; Freeman, 2010; Freeman et al., 2021). Many of the most critical barriers, such as institutional fragmentation (Ali et al., 2024), inconsistent certifications (Corapi, 2023), and investor hesitation (Billah & Adnan, 2024; Chavarría-Flores & Warren, 2024; Marwan et al., 2024), are not merely technical flaws, but coordination failures across stakeholder groups. Experts repeatedly pointed to the lack of effective dialogue between Shariah scholars, ESG verifiers, regulators, and financial institutions (Chapter 4), mirroring Donaldson and Preston (1995) assertion that market legitimacy arises from shared accountability and inclusive governance. This resonates with the high prioritisation of barriers like Market Access (MAB) and Regulatory Constraints (RPC) in Chapter 5, suggesting that what slows *Green Sukuk* development is not ideological disagreement, but weak infrastructure for relational and operational cooperation.

Green financial economics (GGT) also finds support in the data, though not without complication. Theoretically, models like the Green Growth Theory predict that sustainable finance should expand with institutional maturity and economic development (Akinde et al., 2025; Ali et al., 2024). Yet, our findings, especially the dominance of MAB and Financial Viability Barriers (FVB), show that even well-intentioned jurisdictions face practical blockages in scaling issuance.

Experts in emerging markets (for example Nigeria, Indonesia, Türkiye) noted that access to capital markets remains limited, and project pipelines are often underdeveloped. This calls for further policy and academic attention to mechanisms that de-risk investment and localise green finance ecosystems, as reflected in the high ratings of incentive-based solutions.

Finally, the application of Bayesian decision theory in this study offered both conceptual and computational strengths. The probabilistic output, credal ranking, posterior distributions, and pairwise dominance matrices, allowed us to capture not only central tendencies but also degrees of certainty and divergence among expert opinions (Li et al.,

2020; Mohammadi & Rezaei, 2020). This reflects a fundamental shift in how decision science is applied in Islamic finance research, rather than forcing consensus or flattening complexity, we modelled uncertainty as part of the system. Such a methodology aligns with the nature of sustainability dilemmas, where information is incomplete, stakeholders are diverse, and trade-offs are inevitable.

In sum, the theoretical framework proposed at the outset remains relevant but requires nuanced updating. Islamic finance must move from compliance to principled integration, stakeholder theory must inform institutional co-creation, green finance models must accommodate contextual readiness, and Bayesian thinking must become a core tool for participatory financial decision-making. The empirical evidence presented in this dissertation provides the foundations for such an interdisciplinary and future-facing approach. Figure 15 illustrates the study's transition from its initial conceptual assumptions to an empirically refined, multidisciplinary framework.

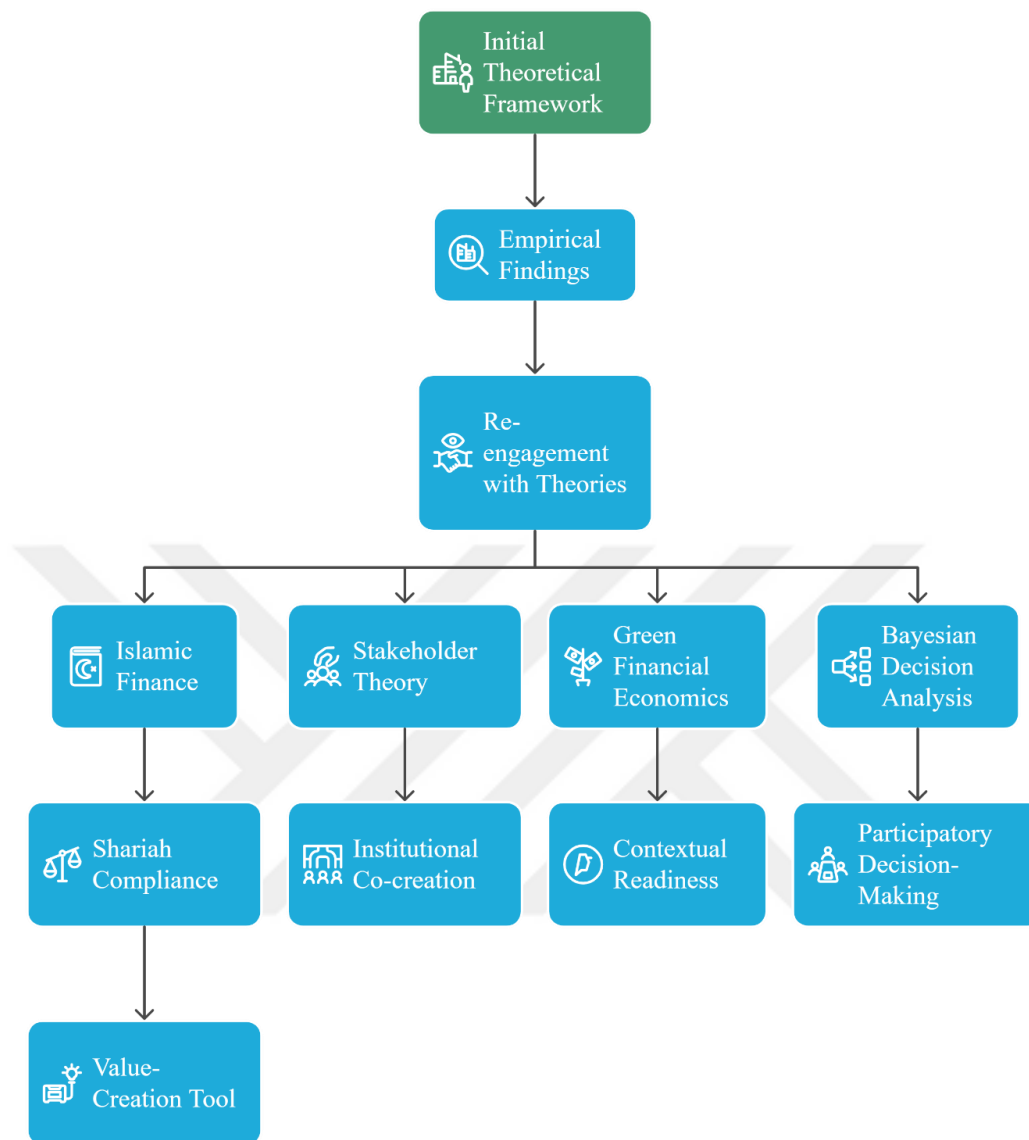


Figure 15: Theoretical Framework Evolution in *Green Sukuk* Research

Source: Author's elaboration using Napkin.ai.

While Figure 15 offers a visual synthesis of how the theoretical framework evolved throughout the research, Table 20 systematically links each theory to specific empirical reinterpretations. This structured mapping enables clearer articulation of how findings extend, confirm, or nuance existing paradigms in Islamic finance, stakeholder theory, and green economics.

Table 20: Theoretical Reinterpretation and Extensions from Empirical Findings

Theoretical Lens	Key Concepts	Empirical Insights	Implications
Islamic Finance Theory	Maqāṣid al-Sharī‘ah, Shariah compliance, ethical finance	Shariah–Green Alignment (SGA) ranked lowest (9th) in BWB despite normative significance; seen as operationally routinised, not a pressing bottleneck.	Calls for stronger integration of Maqāṣid in ESG, beyond formal compliance (Aziz et al., 2022).
Stakeholder Theory	Multi-actor governance, inclusivity, legitimacy	Top-ranked barriers (MAB, RPC) reflect institutional fragmentation, weak coordination, and communication gaps.	Supports multi-stakeholder platforms and trust-building as strategic priorities.
Green Financial Economics	EKC, green growth, market readiness	Barriers like FVB and DEA highlight underdeveloped green project pipelines and definitional ambiguity in emerging markets.	Suggests context-specific incentives and blended finance tools for GS scaling.
Bayesian Decision Theory	Probabilistic inference, uncertainty modelling	BWBM credal rankings revealed high certainty on top/bottom ranks, divergence in mid-ranked barriers (FVB, AEB).	Validates BWBM’s utility in small expert panels; offers richer policy prioritisation insights.

Source: Author’s Compilation.

6.3. Cross-Cutting Themes and Emerging Insights

As this study integrates diverse forms of evidence, from expert interviews and Bayesian prioritisation to bibliometric and systematic reviews, certain overarching patterns emerge that are not confined to any single barrier or stakeholder. These cross-cutting themes reflect deeper tensions and opportunities within the *Green Sukuk* ecosystem and hold implications for both practice and theory. Their relevance cuts across markets and jurisdictions, indicating foundational shifts required to align GS with its ethical, financial, and environmental promises.

One of the most salient insights is the *credibility–transparency nexus*. Both the literature (Kassim & Abdullah, 2017; Rozman & Azmi, 2022) and expert interviews pointed to a widening gap between the sustainability claims made during *Green Sukuk* issuance and the post-issuance verification of environmental or ethical impacts. Monitoring and

reporting mechanisms remain fragmented, particularly in low-capacity contexts, enabling risks of greenwashing and reputational damage.

This was strongly echoed in the Bayesian BWM results, where monitoring and assurance challenges received higher importance scores than Shariah-specific issues. From a Stakeholder Theory perspective, this suggests a loss of trust not merely in technical metrics, but in the relationships and accountabilities embedded within the *Green Sukuk* process. For *Green Sukuk* to maintain its legitimacy, the market must invest in credible, standardised, and enforceable impact reporting mechanisms, what Faizi et al. (2024) referred to as "ethical audit trails."

A second insight revolves around *the tension between institutional capacity and innovation*. While digital tools such as blockchain, smart contracts, and AI-driven verification systems have been proposed as solutions for *Green Sukuk* traceability and impact tracking (Corapi, 2023), many jurisdictions lack the technical, legal, or human resource capacities to operationalise these innovations. Experts interviewed repeatedly highlighted the paradox of overburdening weak systems with complex expectations, leading to ineffective implementation.

This tension echoes themes from the systematic review, where emerging markets, particularly in Africa and parts of the GCC, struggle with limited infrastructure but face growing demand for ESG-aligned instruments. The challenge here is to tailor innovation to context, advocating not for technological maximalism, but for "fit-for-purpose" systems that balance ambition with feasibility. From a *Maqasid al-Shariah* perspective, this aligns with the principle of *raf' al-haraj* (alleviating undue hardship), suggesting that ethical innovation must be grounded in local realities.

A third, more philosophical, insight concerns the *risk of proceduralism overtaking ethical intent*, what some experts termed the "tick-box effect." Although *Green Sukuk* are often marketed as morally grounded instruments, their operationalisation sometimes reduces them to conventional green bonds with superficial Islamic features. This aligns with critiques found in the literature (e.g., Jaafar & Brightman, 2022; Liu & Lai, 2021) that question whether many *Green Sukuk* truly embody a maqasid-based vision or simply mimic conventional models for market acceptability. The Bayesian BWM results, which gave lower importance to Shariah-alignment barriers, may reflect not a dismissal of their

importance, but a perception that these issues are either being treated as cosmetic or are too underdeveloped for meaningful evaluation.

This presents a risk: if Shariah compliance is seen as secondary or symbolic, the *Green Sukuk* market could drift into procedural compliance without ethical substance, undermining its distinctiveness and long-term trust. Revisiting the theoretical roots in *Maqasid al-Shariah*, particularly the elevation of *hifz al-bi'ah* (environmental preservation), this study reaffirms that *green sukuk* must be more than instruments of formal legitimacy, they must act as vehicles for genuine value creation and transformation.

Finally, the study highlights an urgent need for greater investor segmentation and inclusive design. Both the literature and interviews confirmed that *Green Sukuk* instruments are disproportionately tailored to institutional investors, often neglecting retail participants, civil society actors, and beneficiaries. Timur et al. (2025) and Mangunjaya (2023), for instance, pointed to the information asymmetries and low financial literacy that limit participation from broader communities. This bias is also reflected in issuance structures, where few instruments are adapted to micro-scale or localised impact.

In light of Stakeholder Theory, this exclusion represents not only a design flaw but a missed opportunity to democratise Islamic sustainable finance. Inclusive *Green Sukuk* ecosystems, those that intentionally design for diverse investor profiles, risk appetites, and knowledge levels, can foster deeper legitimacy and broader capital mobilisation. They can also revitalise the ethical and participatory spirit of Islamic finance, aligning more closely with the maqasid imperative of *hifz al-nasl* (social continuity) and *hifz al-māl* (wealth preservation).

These four cross-cutting themes reveal the deeper anatomy of *Green Sukuk* challenges and their institutional underpinnings. They also pave the way for the final sections of this chapter, where the focus shifts toward practical implications and a refined contribution to theory.

Figure 16 illustrates four overarching tensions identified through the integrated qualitative–quantitative analysis, highlighting systemic trade-offs between trust, capacity, ethical alignment, and inclusivity in the *Green Sukuk* market.

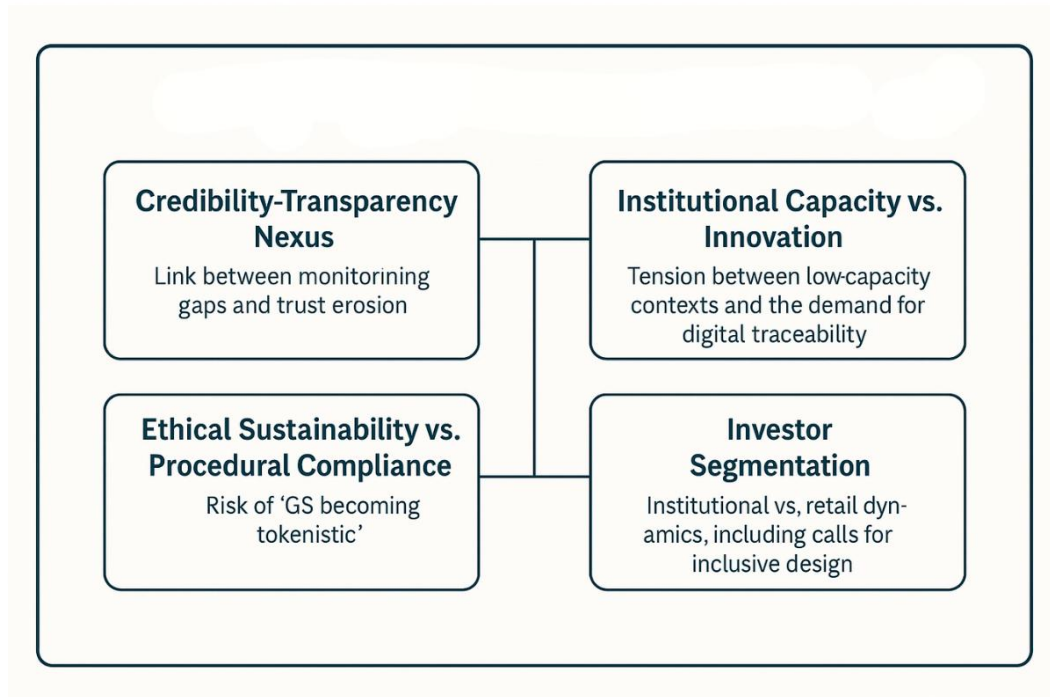


Figure 16: Cross-Cutting Themes in *Green Sukuk* Stakeholder Dynamics

Source: Author's Compilation.

6.4. Implications for Practice, Policy, and Knowledge

This section synthesises the empirical insights of the study into actionable implications across four key stakeholder groups: regulators, issuers, investors (including Sukuk holders), and scholars. These implications are grounded in the ranked challenges from the Bayesian Best-Worst Model (Chapter 5), the qualitative themes (Chapter 4), and the systematic gaps identified in earlier chapters. In doing so, the section bridges the dissertation's empirical findings with the broader landscape of Islamic sustainable finance.

6.4.1. Regulatory Institutions

The high ranking of *Regulatory and Policy Constraints* (RPC: Rank 2, Mean Weight = 0.1270) signals that fragmented legal frameworks, unclear taxonomies, and jurisdictional inconsistencies remain among the most pressing barriers to *Green Sukuk* development. These challenges, echoed strongly in the qualitative interviews (Theme 2: Institutional Fragmentation), hinder both cross-border investment flows and market legitimacy.

To address this, regulatory bodies in OIC countries and beyond must prioritise harmonised *green sukuk* issuance frameworks, aligned with both ESG and Shariah standards. Malaysia's SRI Sukuk Framework (Securities Commission Malaysia, 2020) and the joint AAOIFI–IFSB initiatives offer promising precedents. Greater collaboration between financial regulators, central banks, and national Shariah boards is essential to develop cross-border templates, mutual recognition protocols, and streamlined ESG, Shariah screening procedures. Without such institutional coherence, the GS market risks remaining fragmented and investor averse.

6.4.2. Issuers and Structuring Institutions

Market Access Barriers ranked highest in the Bayesian model (Rank 1, Mean Weight = 0.1312), underscoring that prospective issuers, particularly in emerging markets, face significant hurdles related to asset identification, technical structuring, and high issuance costs. *Financial Viability Barriers* (Rank 6) further complicate this landscape by adding the dimension of limited fiscal incentives or risk mitigation tools.

These findings indicate a clear need for capacity-building at the issuer level, especially for municipalities, SMEs, and state-linked entities in low-capacity jurisdictions. Public–private partnerships (PPPs), de-risking instruments by multilateral bodies (for example IsDB, ICD), and issuance cost subsidies can serve as enablers. At the same time, digital innovations, such as blockchain-based issuance platforms and automated ESG screening, can lower transaction costs and improve traceability. These recommendations align with expert suggestions in Chapter 4, Theme 5 (Cost Structuring and Financial Readiness).

6.4.3. Investors and Sukuk Holders

Despite their central role in sustaining the *green sukuk* ecosystem, investors, especially retail and diaspora, remain insufficiently engaged. This is reflected in the prioritisation of *Awareness and Engagement Barriers* (Rank 5, Mean Weight = 0.1093), and further elaborated in Chapter 4 under Theme 1. Stakeholders highlighted knowledge asymmetries, product unfamiliarity, and weak outreach efforts as major demand-side obstacles.

In response, *tailored investor literacy initiatives* should be developed, particularly for Islamic retail markets in Southeast Asia and the Gulf regions. Publicly accessible *green*

sukuk performance dashboards, Shariah–ESG ratings, and investor apps (for instance, SukukNow) could facilitate transparency and broaden participation.

In parallel, *Sukuk holders*, particularly institutional investors, have an important role in influencing *secondary market liquidity*, *holding periods*, and *performance disclosures*. Their advocacy for open data and pricing benchmarks can improve market depth and foster trust in *Green Sukuk* as a credible ethical investment vehicle.

6.4.4. Shariah Scholars and Ethical Finance Thinkers

A notable divergence in the dissertation is the comparatively low ranking of Shariah–Green Alignment Barriers (rank 9, Mean Weight = 0.0977) in the Bayesian BWM results. While *Maqāṣid al-Sharī'ah* remains a philosophical cornerstone in Islamic finance, this criterion is frequently perceived by experts as the least constraining relative to other market or institutional challenges. This outcome reflects not a dismissal of Shariah's relevance, but a shift in perception; stakeholders largely view compliance mechanisms as already institutionalised, resulting in SGA being treated as operationally manageable.

However, this perceived sufficiency in procedural Shariah oversight raises deeper concerns. There is a risk that *Green Sukuk* could remain ethically shallow and technically Shariah-compliant yet lacking integrative depth across environmental and social dimensions. This underscores the need for Shariah scholars to adopt more proactive roles in sustainable governance. Beyond issuing fatwas, their involvement is essential in developing hybrid Shariah–Green and ESG standards, co-defining ethical screening criteria, and designing evaluative tools that uphold both the spirit and the substance of Islamic ethics.

Forward-looking approaches, such as *Maqāṣid-driven ESG* frameworks (as highlighted in Chapter 5: Strategic Solutions – EVA), can offer practical pathways to reintegrate ethical purposes into GS design. In doing so, scholars and thinkers can ensure that Islamic sustainable finance remains not only permissible, but also principled, impactful, and truly aligned with the broader goals of environmental stewardship and social justice.

6.4.5. Research and Knowledge Production

Building on the empirical synthesis and policy implications discussed earlier, this section reflects on the dissertation's broader contributions to academic knowledge production in Islamic finance, sustainability research, and decision science.

This study makes four (4) interrelated contributions to the research and scholarly practice as follows:

First, it provides a systematic and bibliometric literature review of Green Sukuk (GS), offering the most comprehensive mapping of the field to date. By tracing methodological patterns, regional gaps, and conceptual blind spots across 43 peer-reviewed studies, the review established a structured evidence base for theory development and policy dialogue, especially in underrepresented contexts, such as Sub-Saharan Africa and the GCC corporate sector.

Second, the application of stakeholder-oriented thematic analysis using qualitative expert interviews adds new empirical depth to the GS discourse. Previous research has often relied on descriptive or conceptual analysis; in contrast, this dissertation systematically captures practitioner insights using a transparent coded framework (Appendices 4–6). This not only refines the understanding of GS market dynamics but also enhances the trustworthiness and replicability of qualitative Islamic finance research.

Third, the Bayesian BWM introduced in Chapter 5, represents a significant methodological contribution. As one of the earliest uses of Bayesian BWM in Islamic sustainable finance, this study demonstrates how expert prioritisation under uncertainty can be modelled with probabilistic precision. The inclusion of credal dominance graphs and posterior distributions allows future scholars to visualise and interrogate preference structures more rigorously than with conventional MCDM techniques.

Finally, by adopting an embedded mixed-methods design grounded in pragmatism, this study advances novel research logic that links theory, data, and decision-making tools across thematic chapters. This integrated approach offers a replicable template for other researchers exploring complex multidimensional problems in ethical finance, climate investment, and religiously grounded sustainability transitions.

Together, these contributions aim to stimulate more methodologically diverse, regionally inclusive, and policy-relevant research on *Green Sukuk* and broader Islamic environmental finance. The next and final chapter extends these insights into a forward-

looking agenda for future research, highlighting thematic frontiers, empirical opportunities, and interdisciplinary possibilities.

Figure 17 illustrates the recommended roles and actions for key stakeholder groups, regulators, issuers, investors, scholars, and Shariah thinkers, to enhance the *Green Sukuk* (GS) market. It emphasises coordinated reforms, ethical-financial alignment, and systemic knowledge integration as critical enablers of sustainable Islamic finance.

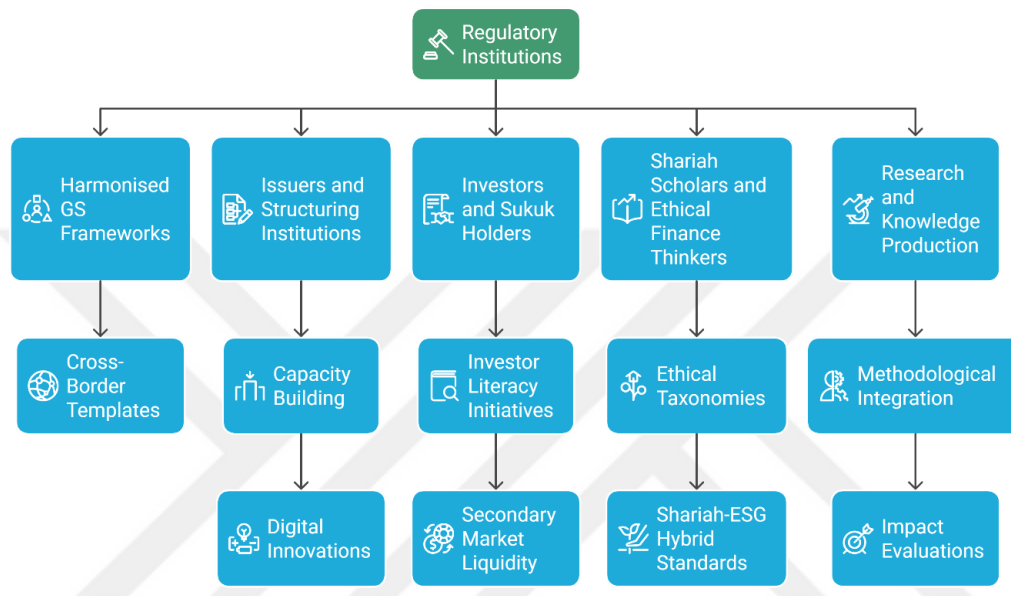


Figure 17: Strategic Pathways to Strengthen the *Green Sukuk* Ecosystem

Source: Developed by the author using Napkin.ai, based on empirical findings and strategic solution mappings (Chapter 5 and Chapter 6).

6.5. Limitations of Integration

While the integration of qualitative and quantitative insights in this dissertation offers a comprehensive understanding of the *green sukuk* market's challenges and strategic pathways, it is necessary to acknowledge certain methodological and epistemological limitations that shape the interpretation of the findings.

First, the *data sources for the two empirical phases differ in both scope and scale*. The qualitative phase, as discussed in Chapter 4, relied on in-depth interviews with eight purposively selected experts, offering rich, contextualised insights. In contrast, the quantitative phase (Chapter 5) incorporated responses from 21 experts via structured Bayesian BWM questionnaires.

Although both groups were drawn from overlapping professional domains, Islamic finance, green investment, policy, and development, the differing sample sizes and data modalities introduce potential asymmetries in generalisability. As such, direct one-to-one comparisons between the qualitative themes and quantitative rankings must be approached with detail.

Second, the *interpretive nature of expert interviews* inherently carries the possibility of subjective bias. While thematic saturation was pursued, and MAXQDA-assisted coding ensured consistency, expert perspectives remain influenced by geographic, institutional, or professional affiliations. For instance, a regulator from Malaysia may prioritise standardisation differently from a consultant in Türkiye or a scholar from Nigeria. Although such heterogeneity enriches the analysis, it also introduces context dependency that may limit broader generalisation without further empirical testing.

Third, the *Bayesian BWM approach*, despite its statistical robustness and capacity to model uncertainty, is still rooted in expert-subjective judgments. The selection of best and worst criteria, and subsequent pairwise ratings, reflect personal prioritisation logic. Even though probabilistic inference mitigates some biases, the final weights are shaped by the structure of the model, prior assumptions (Dirichlet priors), and the consistency of responses. Additionally, some level of computational abstraction in BWM modelling may obscure the deeper social or institutional nuances captured in narrative data.

Finally, the process of integrating both data strands, particularly in mapping qualitative codes to quantitative challenge criteria, required thematic synthesis and categorisation that may not capture all the complexity or intersectionality of certain issues. While every effort was made to validate this mapping through conceptual and empirical alignment, some boundary-blurring between themes (for example, between awareness and institutional capacity) inevitably occurs.

Despite these limitations, the integrative approach adopted in this study provides a unique and balanced view of the GS ecosystem, combining empirical richness with analytical rigour. The limitations acknowledged here also highlight opportunities for future research to refine and triangulate these insights across broader datasets, diverse jurisdictions, and evolving market realities.

In conclusion, this chapter synthesises the core findings by integrating expert perspectives and statistical insights to illuminate the most pressing challenges in the *Green Sukuk*

market. It clarified the interplay between regulatory, technical, and ethical dimensions, contextualised surprising patterns such as the lower prioritisation of Shariah alignment and reflected on their theoretical and practical implications. The next section presents the discussion with key conclusions, targeted policy recommendations, and directions for future research.



CONCLUSION

This final section brings the dissertation to a close by synthesising its key insights, reaffirming its contributions to theory and practice, and identifying future directions for research. The preceding chapters have sequentially explored the landscape, challenges, and potential of the *Green Sukuk* (GS) market through a multi-method empirical lens, beginning with bibliometric and systematic reviews, progressing through qualitative thematic exploration, and culminating in a quantitative expert-driven prioritisation using the Bayesian Best-Worst Method (BWM).

Together, these stages provided a comprehensive and rigorous answer to the overarching research problem: how to understand and strategically prioritise the challenges constraining the development and credibility of *Green Sukuk* globally.

While Chapter 6 addressed the implications of these findings for regulators, issuers, investors, and scholars, this chapter focuses on broader reflections. It begins by summarising the research process and main results, then discusses the dissertation's theoretical and methodological contributions. The final sections present reflective insights on the dissertation's scholarly relevance and lay out a forward-looking research agenda to guide the next generation of studies on Islamic sustainable finance. In doing so, the chapter not only concludes the current inquiry but also signals its potential to shape emerging debates, policymaking, and market practice.

Summary of the Research

This dissertation set out to investigate a central and timely problem: the underdevelopment and fragmentation of the global *Green Sukuk* (GS) market, despite the growing urgency of sustainable finance and Islamic environmental ethics. Specifically, the study aimed to identify, categorise, and prioritise the most critical challenges impeding *Green Sukuk* issuance, adoption, and credibility, while also exploring viable strategic solutions from the perspective of domain experts.

To achieve this, a four-phase mixed-method design was employed, progressing from macro-level scoping to micro-level prioritisation. Each method contributed uniquely to answering one or more of the dissertation's guiding research questions. Table 21 outlines

the methodological trajectory adopted in this dissertation, mapping each phase to the corresponding research questions and outputs.

Table 21: Methodological Trajectory and Corresponding Research Questions

Phase	Method	Purpose	Main Output	RQ Addressed
Phase 1	Bibliometric Analysis	Map the intellectual landscape of Islamic green finance research	Thematic clusters, publication trends, citation networks	RQ1: What are the emerging themes in Islamic Green Finance literature?
Phase 2	Systematic Literature Review (SLR)	Identify reported GS challenges, definitions, and research gaps	Taxonomy of barriers, gap map, PICO framework synthesis	RQ2: What challenges and gaps are documented in the GS literature?
Phase 3	Expert Interviews (Qualitative)	Elicit practitioner insights on GS constraints and solutions	Thematic analysis across 11 major themes	RQ3: How do experts interpret GS challenges and opportunities?
Phase 4	Bayesian Best-Worst Method (BBWM)	Quantitatively prioritise challenges and rate solutions under uncertainty	Credal ranking, probabilistic weights, solution effectiveness heatmap	RQ4: Which GS challenges are most critical, and how should they be addressed?

Source: Author's Compilation.

This integrated trajectory ensured both theoretical depth and empirical relevance. By combining bibliometric mapping, literature synthesis, qualitative interviewing, and probabilistic decision modelling, the study not only answered its research questions but also generated a replicable and multidisciplinary framework for analysing *Green Sukuk* development.

Key Findings and Synthesis

This dissertation yielded several important insights that advance both the academic understanding and practical development of the GS market. These findings are the result of a sequentially layered investigation, combining theory, evidence, and expert judgement. Four central findings emerge as the most significant:

First, the study identified and empirically prioritised the *dominant barriers* impeding *green sukuk* development. Among the nine (9) challenge categories, *Market Access Barriers* (MAB) and *Regulatory and Policy Constraints* (RPC) ranked as the most critical across 21 expert respondents using the Bayesian Best-Worst Method. These were followed by concerns around *Environmental and Ethical Integrity Risks* (Fahad &

Areeba), highlighting credibility and transparency as core priorities. In contrast, challenges such as *Shariah–Green Alignment* and *Institutional Capacity* were consistently ranked lower, not because they are normatively unimportant, but likely due to their perceived indirect impact on immediate market functioning.

Second, the study revealed clear *expert consensus on strategic solutions*. Among five tested interventions, *Education, Awareness, and Market Engagement (EAM)* received the highest global weight in expert ratings, followed by *ESG and Value-Based Assurance (Azhgaliyeva et al.)*. These findings underscore a growing recognition that technical fixes alone are insufficient; demand stimulation, stakeholder literacy, and ethical assurance must be central to GS growth strategies.

Third, the results provide *empirical validation for the conceptual framework* developed in Chapter 3. Each of the hypothesised barriers, from definitional ambiguity to certification issues, was both recognised and prioritised by practitioners. Furthermore, the framework’s integration of Islamic finance, sustainability economics, and Bayesian decision analysis proved effective in structuring expert reasoning and capturing uncertainty.

Finally, a core contribution of the study is the *integration of Islamic ethical reasoning with decision science*. The research demonstrated how *Maqasid al-Shariah* principles, particularly hifz al-bi’ah (preservation of the environment), can be operationalised within a rigorous, probabilistic decision model. This alignment offers a methodological bridge between Islamic normative ethics and contemporary tools for sustainability prioritisation. Table 22 summarises key findings derived from the literature review, expert interviews, and Bayesian BWM, highlighting how each insight is supported by data and its broader implication for theory, practice, and policy.

These findings position the dissertation as both a theoretical contribution to Islamic sustainable finance and a practical tool for policymakers, issuers, and scholars.

Table 22: Cross-Phase Synthesis of Core Insights, Evidence, and Implications

Insight	Evidence Source	Implication
Market access and regulatory gaps are most binding	Bayesian BWM (Chapter 5)	Structural reforms and de-risking mechanisms needed
Strategic solutions require ethical and social engagement	Expert ratings (Chapter 5)	Build investor trust through awareness and ESG integrity
Conceptual model validated by expert judgment	Framework vs. BWM output	Theorised categories match lived constraints
Shariah principles can guide decision science	BWM + Maqasid lens	Integrate ethics with multi-criteria analysis

Source: Author's Compilation.

This dissertation offers a multi-layered contribution to the evolving discourse on Islamic sustainable finance, specifically within the context of the *Green Sukuk* (GS) market. Its contributions span four domains: theoretical development, methodological innovation, empirical enrichment, and practical relevance.

Theoretical Contribution

At the theoretical level, the study advances the intersection of *Islamic finance*, *green financial economics*, and *stakeholder theory*. It integrates *Maqasid al-Shariah*, particularly *hifz al-bi'ah* (environmental stewardship), into the broader logic of ethical investment and sustainability prioritisation. This elevates GS from a mere financing tool to a value-driven instrument rooted in both ecological and ethical objectives. By embedding Islamic principles into decision-making structures, the study addresses a gap in the literature where normative Islamic values are often discussed abstractly but rarely operationalised.

Furthermore, the dissertation extends *stakeholder theory* by applying it to a multi-jurisdictional, Shariah-compliant green finance setting. It emphasises co-creation and shared accountability across fragmented institutional landscapes, thus reframing sustainability challenges not merely as technical or regulatory barriers, but as relational coordination failures among diverse stakeholders.

Methodological Innovation

Methodologically, the study pioneers the application of the *Bayesian Best-Worst Method* (*Bayesian BWM*) in the Islamic finance context. While classical BWM has seen growing adoption, this is one of the first known uses of its Bayesian variant to capture expert

uncertainty, especially in sustainability-related domains. The probabilistic model not only allows for distributional weight estimates but also visualises expert consensus and credal ranking through posterior sampling, adding both analytical depth and transparency to decision-support systems.

This methodological contribution is particularly notable because Islamic finance, with its ethical constraints and normative pluralism, often resists reductionist or deterministic modelling. The Bayesian BWM provides a way forward: it respects epistemic uncertainty and expert heterogeneity while delivering structured, replicable outputs.

Empirical Contribution

Empirically, the study contributes one of the most comprehensive data-driven explorations of the GS ecosystem to date. It synthesises insights from:

- *A bibliometric analysis* of over 130 publications, charting thematic and methodological trends.
- *A systematic literature review (SLR)* of 43 peer-reviewed studies (2017–2025), identifying key barriers and research gaps.
- *Eight expert interviews*, producing grounded qualitative themes on GS implementation challenges and potential reforms.
- *Twenty-one expert-based prioritisation surveys*, resulting in probabilistic rankings of GS barriers and solution effectiveness.

This triangulated approach ensures a well-rounded understanding of the market that goes beyond conceptual debates or single-country case studies, offering rare cross-regional insights from Southeast Asia, the Gulf, Africa, and beyond.

Practical and Policy Relevance

The practical and policy implications of this dissertation extend across the full spectrum of Green Sukuk stakeholders, offering a targeted roadmap for advancing market functionality and ethical credibility.

For Regulators and Policymakers: The prioritised barrier taxonomy developed in this study provides a clear, evidence-based basis for regulatory reform. Urgent measures include harmonising definitional and eligibility criteria across jurisdictions, establishing integrated Shariah–green taxonomies, and streamlining certification to reduce transaction

costs. Regulatory bodies, both domestic and transnational, can use these insights to address market fragmentation, build cross-border issuance capacities, and enhance legal certainty, thereby improving investor confidence and international credibility.

For Issuers (Sovereign and Corporate): The findings identify specific operational and structural bottlenecks that issuers can address to accelerate issuance and market uptake. These include improving internal readiness for complex project structuring, integrating transparent post-issuance reporting systems, and embedding measurable sustainability outcomes into the Sukuk framework. By addressing these gaps, issuers can reduce issuance friction, strengthen investor trust, and enhance their competitive positioning in both the Islamic and global green finance markets.

For Investors (Institutional and Retail): The dissertation highlights that ethical integrity, transparency, and accessibility are decisive factors shaping investor participation, particularly among retail segments and regional institutions unfamiliar with Green Sukuk. Investment promotion strategies should focus on clarifying the differentiation between Green Sukuk, conventional Sukuk, and green bonds, while providing verifiable evidence of environmental and social impacts. Enhanced disclosure standards and standardised ESG–Shariah reporting can directly support informed decision-making.

For Standard-Setting Bodies and Industry Platforms: The results emphasise the critical role of aligning multiple standards, local green criteria, international environmental benchmarks, and Shariah compliance frameworks, into coherent, mutually reinforcing guidelines. Organisations such as the AAOIFI, IFSB, and Climate Bonds Initiative can leverage these findings to promote interoperability, thereby reducing the regulatory burden for cross-border issuances and ensuring the consistent quality of labelled Green Sukuk.

For the Academic and Research Community: This dissertation contributes a methodological and conceptual template for studying Islamic green finance through integrated qualitative and quantitative decision frameworks. Future research can extend this approach to sector-specific Green Sukuk (e.g. renewable energy and transport) and underexplored regions (e.g. Africa and GCC corporations), as identified in the literature review. In doing so, academia can support the evidence base for policy advocacy and market innovation.

Combining rigorous theoretical grounding with structured empirical evidence, this dissertation offers a bridge between scholarly discourse and practical market interventions. It provides actionable intelligence that is immediately relevant to policymakers, issuers, investors, and standard setters, while also advancing the academic understanding of how Islamic green finance can scale sustainably and with integrity.

Reflective Synthesis and Scholarly Outlook

This study began with a fundamental question: what are the most critical barriers hindering the global growth of *Green Sukuk*, and how can they be strategically addressed? In answering this, the dissertation has evolved into more than just a mapping exercise of challenges—it has become a bridge. A bridge between conceptual frameworks and market realities; between Islamic ethics and global sustainability standards; and between the structured logic of decision science and the contextual richness of expert narratives. At its core, the research affirms that *Green Sukuk* is not simply financial instruments, they are value-laden, multi-stakeholder tools for ethical investment in environmental futures. Yet, as this dissertation has shown, the journey from normative aspiration to practical execution is fraught with technical, institutional, and perceptual obstacles. This work reveals that such obstacles are not insurmountable, but they must be systematically understood, prioritised, and addressed in a way that resonates with both *Islamic principles* and *contemporary sustainability practices*.

By synthesising *qualitative insights* from expert interviews with the *Bayesian BWM*, the study has demonstrated the value of mixed-method integration in Islamic finance research. It showcases how *quantitative rigour*, when combined with qualitative details, can yield a decision-making framework that is both empirically robust and contextually sensitive. This methodological stance is especially crucial in Islamic finance, where value-based considerations often require interpretive depth and stakeholder empathy.

More broadly, this dissertation contributes to the re-imagining of Islamic finance as a field not limited to compliance and instrument innovation, but as an ethical system capable of engaging with global challenges such as climate change, energy transition, and social justice. The emerging role of *Green Sukuk* in *mobilising climate-aligned capital*, while grounded in Shariah—shows promise as a converging space where Islamic and conventional sustainability logics can learn from one another.

Ultimately, the findings reaffirm that the future of *Green Sukuk* depends not only on refining structures and frameworks, but also on building trust, capacity, and shared meaning across geographies and stakeholder groups. As global demand for ethical, green, and inclusive finance continues to grow, *Green Sukuk* stand as a compelling vehicle—if challenges are addressed, and opportunities strategically harnessed.

Future Research Agenda

Building on the empirical evidence and methodological innovations of this study, several promising avenues emerge for advancing the field of Islamic sustainable finance and scaling up the global *Green Sukuk* (GS) ecosystem. These opportunities are especially urgent in the context of accelerating climate risks, rising demand for ethical investments, and evolving convergence between Shariah principles and environmental governance frameworks.

First, future research should extend to geographical regions that remain empirically underrepresented, particularly sub-Saharan Africa, Central Asia, and Latin America. These contexts offer fertile grounds for investigating the institutional fit and social reception of *Green Sukuk*, especially in jurisdictions in which Islamic finance is emerging alongside acute green financing needs. Comparative case studies across countries, regions, and income levels can illuminate how local regulatory environments, stakeholder structures, and climate vulnerabilities shape the structure, adoption, and impact of GS instruments.

Second, there is a strong need for country- and project-level empirical analyses, including deep dives into specific *Green Sukuk* issuances. These may include transport, renewable energy, or climate-resilient infrastructure projects in Malaysia, Indonesia, the GCC, or newly issued jurisdictions. Such studies should assess not only issuance dynamics but also post-issuance environmental performance and governance outcomes. This would close the current gap in impact evaluations and improve transparency and accountability in Islamic green finance.

Third, research on investor behaviour is an important frontier. Understanding the motivations, risk preferences, and decision criteria of institutional and retail investors in *Green Sukuk* markets, whether in the Middle East, Europe, Southeast Asia, or emerging African markets, would help calibrate product design, marketing strategies, and

certification protocols. Behavioural experiments, eye-tracking studies, and choice-based conjoint analysis can offer granular insights into how investors perceive Shariah compliance versus environmental performance and which signals (e.g. third-party green certification vs. fatwa endorsement) most influence their investment decisions.

Fourth, the Shariah–Green Alignment (SGA) barrier, initially assumed to be a core constraint, received notably low prioritisation in both the qualitative themes and Bayesian BWM results. Rather than signalling irrelevance, this de-emphasis likely reflects perceived institutional maturity in managing Shariah compliance within the *Green Sukuk* ecosystem. Experts may view existing fatwa coordination, ESG familiarity among Shariah scholars, and standardised ethical screening processes to mitigate the operational risks associated with SGA. However, this surface-level comfort may obscure deeper, unresolved questions about the substantive integration of Islamic ethical values into green finance practices.

To address this complexity, future research should probe whether SGA's lower ranking results from genuine progress in harmonisation and practice, or whether it conceals normative tensions between environmental imperatives and Islamic jurisprudential interpretations. Ethnographic enquiries into Shariah boards, content analysis of *fatwas* on environmental finance, and comparative studies across jurisdictions such as Malaysia, Saudi Arabia, and the UK could shed light on how ethical intentions are translated into institutional action. Particular attention should be paid to how principles like *hifz al-bi'ah* (preservation of the environment) are operationalised within sukuk structuring, asset screening, and impact measurement processes.

Fifth, carbon finance and Shariah alignment remain critical areas that require conceptual clarification and operational innovation. Researchers are encouraged to explore the design of carbon-linked Sukuk, Shariah-compatible carbon credit mechanisms, and the use of pricing instruments, such as carbon taxes and cap-and-trade, in Islamic jurisdictions. Interdisciplinary work linking Maqasid al-Shariah with carbon market principles can generate pioneering models of Islamic ecological finance that balance environmental integrity with ethical risk-sharing norms.

Sixth, methodological innovation should be a continued priority. Bayesian extensions of existing MCDM models can be further enhanced using *Bayesian networks*, *agent-based modelling*, or *Monte Carlo simulations* to test the dynamic interplay between stakeholder

actions, regulatory interventions, and climate finance flows. The integration of machine learning algorithms, such as decision trees, clustering techniques, and natural language processing (NLP), can also aid in predicting market trends, classifying Sukuk structures, and automating the green screening of projects based on textual disclosures.

Seventh, regulatory experimentation and digital innovation deserve scholarly attention. Studies examining blockchain-based issuance platforms, smart contracts in Sukuk lifecycle management, and fintech-enabled investor onboarding contribute to digital inclusivity and transaction transparency. Researchers may also assess the institutional and legal challenges of implementing such innovations within Islamic jurisdictions.

Lastly, there is a need to reconceptualise evaluative frameworks for GS by developing integrated models that bridge Islamic ethical finance, ESG norms, and Sustainable Development Goals (SDGs). This includes the creation of hybrid performance metrics, Shariah-ESG taxonomies, and contextualised impact assessment tools that can be tailored for diverse markets while preserving Islamic financial identity.

In summary, these research directions offer a roadmap for both theoretical advancement and practical transformation. By addressing existing knowledge gaps and experimenting with interdisciplinary tools, future studies can contribute significantly to building a robust, credible, and inclusive *Green Sukuk* architecture. Such work will not only reinforce the ethical legitimacy of Islamic finance but also strengthen its role as a strategic lever for environmental and developmental justice in the era of global sustainability transitions.

Figure 18 maps eight strategic research clusters for advancing the *Green Sukuk* field, including methodological, regional, ethical, and financial dimensions. Each cluster highlights actionable sub-themes identified through this study's findings and proposed research agenda.

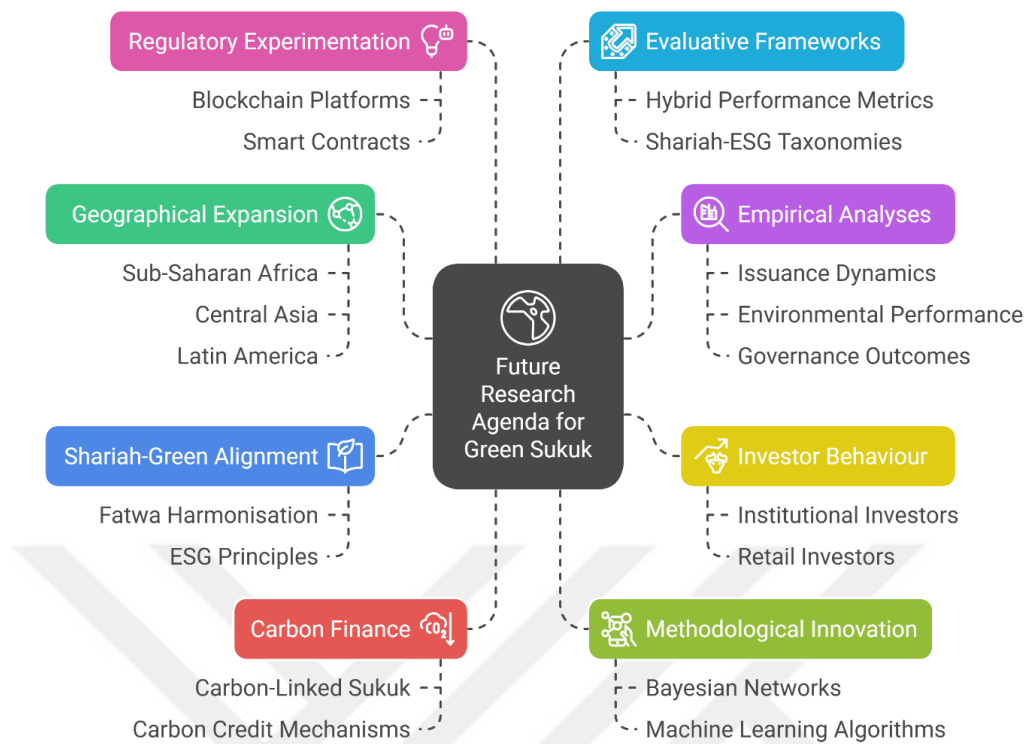


Figure 18: Future Research Directions in *Green Sukuk* Studies

Source: Author's elaboration based on the dissertation's findings and synthesis of expert interviews and Bayesian BWM results. Visual created using Napkin.ai, July 2025.

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APPENDIX

Appendix 1: Search Queries Used for *Green Sukuk* Literature Retrieval in Scopus and WOS

Database	Queries
Scopus	<i>TITLE-ABS-KEY</i> ((" <i>Green Sukuk</i> " OR "Islamic Green Bonds" OR "Green Islamic Bonds" OR "Green Sustainable and Responsible Investment Sukuk" OR " <i>SRI Green Sukuk</i> " OR "Green SRI Sukuk" OR "SRI Sukuk" OR "ESG Sukuk" OR "Environmental Sukuk" OR "Sustainable Sukuk" OR "Shariah-Compliant Green Bonds" OR "Ethical Sukuk" OR "Green Waqf Sukuk" OR "Renewable Energy Sukuk" OR "Climate Sukuk" OR "Carbon Sukuk" OR "Green Investment Sukuk" OR "Sustainable Development Sukuk"))
WOS	<i>TS</i> =(" <i>Green Sukuk</i> " OR "Islamic Green Bonds" OR "Green Islamic Bonds" OR "Green Sustainable and Responsible Investment Sukuk" OR " <i>SRI Green Sukuk</i> " OR "Green SRI Sukuk" OR "SRI Sukuk" OR "ESG Sukuk" OR "Environmental Sukuk" OR "Sustainable Sukuk" OR "Shariah-Compliant Green Bonds" OR "Ethical Sukuk" OR "Green Waqf Sukuk" OR "Renewable Energy Sukuk" OR "Climate Sukuk" OR "Carbon Sukuk" OR "Green Investment Sukuk" OR "Sustainable Development Sukuk")

Appendix 2: Full List of Included Studies (SLR): Methodologies, Regions, and Key Findings

Author(s) and Year	Country / Region	Methodology	Key Findings
(Timur et al., 2025)	Indonesia	Quantitative	Religious and value-based motivations are key for retail investor uptake in GS.
(Akinde et al., 2025)	Nigeria	Predictive modeling using machine learning	Investor behaviour and information drive GSII; ML supports prioritisation.
(Tepeli & Mirgen, 2024)	Türkiye, Indonesia, Malaysia, and GCC	Descriptive statistics	Türkiye's GS sector is emerging; requires policy, education, and structural reform.
(Suriani et al., 2024)	Indonesia, Malaysia, Saudi Arabia, UAE	Panel ARDL (PMG), Granger Causality Test,	Global GS lower emissions long-term, with impact varying by context.
(Riaz et al., 2024)	Malaysia, Saudi Arabia, Bangladesh, UAE	Event Study	GS announcements trigger strong stock gains, outperforming green bonds.
(Raimi et al., 2024)	Brunei, Malaysia, Nigeria	Literature review	Strong theory–practice gap limits Islamic finance's sustainability impact.
(Rahman et al., 2024)	Malaysia, Indonesia, UAE	Doctrinal research with content analysis.	GS use remains narrow; broader application needed to meet Islamic and green goals.
(Muhamat et al., 2024)	Malaysia	Qualitative (interviews)	USPSB's GS case shows strong appeal but issuer hurdles around credibility, risk, and uncertainty.
(Faizi et al., 2024)	Indonesia	Qualitative analysis	Indonesia's Islamic green finance shows promise but is hindered by weak regulation and institutional gaps.
(Chavarria-Flores & Warren, 2024)	Indonesia and Seychelles	Case study	Indonesia's GS is impactful but limited by equity, cost, and access issues.
(Billah & Adnan, 2024)	Malaysia, Indonesia, UAE, Saudi Arabia, Bahrain	Quantitative (DCC-GARCH)	GS offer short-term risk diversification but underperform during long-term crises.
(Ali et al., 2024)	Indonesia	Quantitative	GS boosts national finance and development indicators in Indonesia
(Suriani et al., 2023)	Indonesia	Quantitative (time series econometrics)	GS contribute positively to long-term climate mitigation in Indonesia.
(Supriyadi & Fidhayanti, 2023)	Indonesia	Qualitative analysis (Conceptual reasoning)	GS law in Indonesia needs ESG-driven reform to realize its sustainable investment potential.

Appendix 2 (continued)			
(Shalhoob, 2023)	Saudi Arabia	Qualitative / Descriptive analysis	SEC's GS vision is promising, but faces definitional, institutional, and regulatory barriers
(Pirgaip & Arslan-Ayaydin, 2024)	Global sample 2017–2022	Quantitative	GS offer a “greenium” — a cost-of-capital benefit for issuers.
(Mangunjaya, 2023)	Indonesia	Qualitative (Descriptive documentation)	GS and Islamic environmental ethics together offer a culturally embedded pathway for climate action in Indonesia
(Hariz et al., 2023)	Malaysia	Quantitative (Quantile Regression)	Malaysian GS spreads hedge well but are highly volatile under financial stress and negative sentiment.
(Faisal et al., 2023)	Indonesia	Quantitative	Functional and religious values significantly shape GS purchase intention
(Corapi, 2023)	Europe, Italy, Middle East	Qualitative (Normative policy analysis)	Regulatory clarity is key to stopping greenwashing in green finance markets
(Bin-Armi & Riana, 2023)	Indonesia	Mixed methods	GS lacks impact and coherence between its spiritual principles and environmental goals.
(Suroso et al., 2022)	Indonesia	Qualitative policy analysis	International climate finance could support Indonesia's energy transition but access remains limited
(Rozman & Azmi, 2022)	Malaysia	Qualitative (secondary data analysis)	GS is promising but ineffective without targeted incentives and measurable environmental performance
(Raeni et al., 2022)	Indonesia	Case study	Indonesia's climate tagging improves GS transparency; traceability gaps still hinder accountability.
(Narayan et al., 2022)	Indonesia	MGARCH-DCC	GS provided diversification and acted as safer assets during COVID-19 for Indonesian investors.
(Keshminde et al., 2022)	Malaysia	Qualitative (Thematic analysis)	Issuers face definitional, structural, and investor-side challenges; a coordinated framework is needed
(Jaafar & Brightman, 2022)	Malaysia	Qualitative (Ethnography)	Malaysia's Islamic finance shift to value-based tools faces normative and definitional hurdles.
(Endri et al., 2022)	Indonesia	Analytic Network Process (ANP)	Corporate GS is viable but hindered by regulation and awareness gaps
(Abdullah & Keshminder, 2022)	Malaysia	Qualitative (Interviews)	GS issuance is driven by cost efficiency, reputational gains, stakeholder legitimacy, and moral ecology.
(Siswantoro & Surya, 2021)	Indonesia	Quantitative yield and trend analysis.	Indonesia's second GS performed better than the first, but challenges remain in liquidity, maturity length, and macro resilience

Appendix 2 (continued)

(Noordin et al., 2018)	Malaysia	Qualitative (Document analysis)	Sukuk Ihsan illustrates high compliance with Malaysia's SRI standards, surpassing international counterparts in some areas
(Ebrahim et al., 2021)	Bahrain	Qualitative (Institutional review)	Bahrain's Islamic finance sector supports SDGs, but GS remains an emerging tool needing deeper integration
(Liu & Lai, 2021)	Malaysia	Qualitative (interviews + document analysis)	Malaysia's GS success is constrained by greenwashing and lack of local green standards
(Santoso, 2020)	Indonesia	Qualitative (descriptive)	GS in Indonesia offer a viable tool to finance climate-resilient, Shariah-compliant infrastructure projects
(Rahman et al., 2020)	Malaysia	Qualitative (Interviews)	SRI Sukuk holds strong value proposition but faces cost, awareness, and ESG credibility challenges.
(Ibrahim & Shirazi, 2020)	OIC countries	Conceptual ecosystem framework development.	Islamic finance can anchor circular business investments through Maqasid, GS, and ecosystem coordination.
(Azhgaliyeva et al., 2020)	ASEAN	Qualitative Analysis	GS and bonds are growing in ASEAN but face impact and transparency limitations
(Keshmin der et al., 2019)	Malaysia	Qualitative Analysis	Malaysia's GS market is expanding but constrained by awareness and transparency issues
(Siswanto, 2018)	Indonesia	Correlation analysis with descriptive statistics.	Indonesia's GS underperformed post-issuance due to macro volatility and limited investor climate focus.
(Oktaviani et al., 2018)	Indonesia	BIOFIN-based policy analysis and scoring framework.	GS offers untapped potential for biodiversity funding in Indonesia but faces feasibility and trust issues.
(Rahim & Mohamad, 2018)	Malaysia	Case Study	GS structures successfully finance Malaysian renewable energy projects
(Morea & Poggi, 2017)	Italy	Feasibility analysis and sensitivity modelling.	GS may support wind project financing in Europe through Shariah-compliant structures
(Kassim & Abdullah, 2017)	Global	Case study	SRI Sukuk show strong potential but need better ESG integration and outcome accountability.

Appendix 3: Expert Interview Protocol – Exploring Challenges and Solutions in the *Green Sukuk* Market

Opening Questions

- Thank you for giving me this opportunity to conduct an interview with you. Could you please provide background on your expertise and projects related to environmental sustainability and *Green Sukuk* in which you have been involved?
- How would you describe the current state and potential of *Green Sukuk* in promoting environmental sustainability in Islamic sustainable finance?

Main Questions

1. What are the challenges of implementing *Green Sukuk* regarding regulations, the government, compliance (Shari'a and Standards), market acceptance, and financial issues?
2. How can *Green Sukuk* projects be evaluated to ensure that they meet the Islamic financial and environmental criteria?
3. What are the primary investor concerns and factors affecting interest in and awareness of *Green Sukuk*?
4. How can *Green Sukuk* balance short-term economic goals with long-term environmental sustainability?
5. What are the challenges in aligning *Green Sukuk* with Shari'ah and the environmental criteria, and how can these be addressed?
6. What financial strategies can reduce the *Green Sukuk* issuance costs and risks?
7. What practices ensure transparency and prevent greenwashing and fraud in *Green Sukuk* projects?

Research-View Questions

1. In your opinion, what are the main research gaps in integrating environmental sustainability with Islamic financial principles in *Green Sukuk*?
2. How do you foresee future research directions for *Green Sukuk* and sustainable finance in the Islamic finance context?

Closing Questions

1. Based on the previous questions, is there anything further that you would like to add or address the challenges and solutions for *Green Sukuk*?
2. Are there any further enquiries you wish to make regarding the study of *Green Sukuk*?



Appendix 4: Sample Transcript with Thematic Coding and Analytical Annotations

NAME: Informant 3 (I3) DATE: September 14, 2024 TIME: 09:15 pm (Istanbul Time) DURATION: 43:58:52		
Discourse Unit	Researcher (R)/ Interviewee (I3)	Transcription
1	R	<i>Assalam alaikum wa rahmatullahi wa barakatuhu again. First of all, thank you for allowing me to conduct interviews with you</i>
2	I3	<i>You are welcome</i>
3	R	<i>In the beginning, could you please provide background on your expertise and projects related to environmental sustainability and Green Sukuk in which you have been involved?</i>
4	I3	<i>I am ... (This response has been anonymised due to ethical and privacy considerations)</i>
5	R	<i>How would you describe the current state and potential of Green Sukuk in promoting environmental sustainability in Islamic sustainable finance?</i>
6	I3	
7	R	<i>What are the challenges of implementing Green Sukuk regarding regulations, the government, compliance (Shari'a and Standards), market acceptance, and financial issues? Specifically in Malaysia?</i>
8	I3	Green projects shall be a project that makes products or develops technologies that are primarily aimed at reducing greenhouse gas emissions or supporting the use of clean energy. more issuers to finance green, social, and sustainability projects The issue of guarantee. Generally, in sukuk issuance, a third party who is normally the originator of the sukuk will provide a guarantee for the principal capital of the sukuk. Some disadvantages of the sukuk market include: As the key element for attracting investors is the credit standing of the obligor, it may be difficult to tap this market for corporates or sovereigns with an inadequate credit rating.
9	R	<i>How can Green Sukuk projects be evaluated to ensure that they meet the Islamic financial and environmental criteria?</i>
10	I3	Eligible Projects for <i>Green Sukuk</i> funding be effectively identified and evaluated, as follows; (i) renewable energy; (Shafii et al.) energy efficiency; (iii) pollution prevention and control; (iv) environmentally sustainable management of living natural resources and land use; (v) terrestrial and aquatic biodiversity conservation; (vi) clean transportation; (vii) sustainable water and wastewater management; (viii) climate change adaptation; (Li et al.) eco-efficient and/ or circular economy adapted products, production technologies and processes; and (Liang et al.) green buildings which meet regional, national or internationally recognised standards or certifications;
11	R	<i>What are the primary investor concerns and factors affecting interest in and awareness of Green Sukuk?</i>

Appendix 4: (continued)

12	I3	The market of <i>Green Sukuk</i> is relatively small and with limited supply also makes it illiquid as compared to other asset class. Investors rather embrace their <i>green Sukuk</i> because they fear not being able to replace any <i>green Sukuk</i> they sell. Moreover, the regulatory non-compliance, and poor incentives for local firms to adopt more ambitious climate goals.
13	R	<i>How can Green Sukuk balance short-term economic goals with long-term environmental sustainability?</i>
14	I3	The balance shall be moderate and responsible use within the economic activity of the limited resources of our planet, whereas economic growth does not limit the resource exploitation and energy, being mainly focused on productivity increase. Whereas short-term profitability focuses on immediate financial gains, and long- term sustainability considers the economic, social, and environmental impacts of business activities over an extended period. Specifically, although there is environmental degradation in the short term, in the long run economic growth will improve environmental quality. The global <i>green sukuk</i> can also reduce the adverse effects of climate change in the issuing country
15	R	<i>What are the challenges in aligning Green Sukuk with Shari'ah and the environmental criteria, and how can these be addressed?</i>
16	I3	<i>The issues include awareness and knowledge of Shariah practices, difference between conventional and Shariah compliance.</i> <i>Overall, after controlling for some variables and excruciating the sample into different time horizons and firm sizes, the Shari'ah principles consistently reveals that firms labelled as Islamic have better environmental and social performance, but not governance performance.</i> <i>Currently in Malaysia reference to Shariah compliance, ethical investment ensures funds aren't used in prohibited activities. Asset-backed nature provides an added layer of security to investors.</i> <i>Sukuk can offer portfolio diversification due to its unique structure and underlying principles.</i>
17	R	<i>What financial strategies can reduce the Green Sukuk issuance costs and risks?</i>
18	I3	Sukuk Al-ijarah: financing acquisition of asserts or raising capital through sale and lease back. Sukuk holders subscribe by paying an issue price to a special purpose vehicle (SPV) company. In return, the SPV issues certificates indicating the percentage they own in the SPV. Invest in green technology and automation to enhance production efficiency and reduce labor costs. over a larger output.
19	R	<i>What practices ensure transparency and prevent greenwashing and fraud in Green Sukuk projects?</i>
21	I3	Provided guidance on how the government could kick-start the local market through incentives to issuers Advised on the role of independent third-party reviews, convened international certifiers, and facilitated the participation of local institutions to provide external reviews at low cost Identified potential issuers for demonstration issuances (in collaboration with local Islamic Bank Financing, Innovations and Competitiveness Global Practice staff) and helped the first issuers navigate government policies and follow international best practices Increase investors' awareness of sukuk as an asset class in global fixed income markets.

Appendix 4: (continued)

		Enable a wider set of sukuk issuers around the world to access sustainable capital and thus help unlock further investment towards the achievement of the United Nations Sustainable Development Goals (U.N. SDGs); and Help to confirm the wide applicability of the principles across the global sukuk market and ensure that the market continues to develop with high standards and integrity. As a result of the Malaysian issuances, other Islamic countries have begun exploring the possibility of tapping the Islamic capital markets for sustainable climate investments, including Indonesia, which issued the first sovereign green sukuk in the world
21	I3	Provided guidance on how the government could kick-start the local market through incentives Advised on the role of independent third-party reviews, convened international certifiers, and facilitated the participation of local institutions to provide external reviews at low cost Identified potential issuers for demonstration issuances (in collaboration with local Islamic Bank Financing, Innovations and Competitiveness Global Practice staff) and helped the first issuers navigate government policies and follow international best practices Increase investors' awareness of sukuk as an asset class in global fixed income markets. Enable a wider set of sukuk issuers around the world to access sustainable capital and thus help unlock further investment towards the achievement of the United Nations Sustainable Development Goals (U.N. SDGs); and Help to confirm the wide applicability of the principles across the global sukuk market and ensure that the market continues to develop with high standards and integrity. As a result of the Malaysian issuances, other Islamic countries have begun exploring the possibility of tapping the Islamic capital markets for sustainable climate investments, including Indonesia, which issued the first sovereign green sukuk in the world
22	R	<i>In your opinion, what are the main research gaps in integrating environmental sustainability with Islamic financial principles in Green Sukuk?</i>
23	I3	A methodical literature review is essential and to synthesize the data on <i>Green Sukuk</i> into thematic clusters, providing a more comprehensive understanding of the subject and contribution strategies for future research.
24	R	<i>How do you foresee future research directions for Green Sukuk and sustainable finance in the Islamic finance context?</i>
25	I3	The influence of <i>green sukuk</i> is not only established by investors, but also will be beneficial to the community and society in general. Ultimately the sustainability of nature continues will be enjoyed by future generations. <i>Green sukuk</i> demands efficient management to be more viable, competitive, and attractive to investors if the operational area supports it. <i>Green sukuk</i> projects face expanding green funding, global climate financing, managing renewable energy, and validating greenhouse gas emissions. The green stock market reaction requires coordination amongst economic subsectors.
26	R	<i>Based on the previous questions, is there anything further that you would like to add or address the challenges and solutions for Green Sukuk?</i>
27	I3	Inadequate green contractual protection for investors, the quality of reporting metrics and transparency, issuer confusion and fatigue, greenwashing, and pricing.

28	<i>R</i>	<i>Are there any further inquiries you wish to make regarding the study of Green Sukuk?</i>
29	I3	Makes sukuk an important avenue for redistribution of wealth and achievement of social justice. The use of sukuk to fund large projects means that investors in sukuk are incentivized to help economies develop by creating and producing rather than by consuming or manipulating others.



Appendix 5: *Green Sukuk* Challenges: Main and Sub-Criteria for BWM Prioritization

This document outlines the finalized *challenge criteria* developed for the Bayesian Best-Worst Method (BWM) prioritization process, as part of the PhD research on barriers and solutions in the *Green Sukuk* (GS) market.

The criteria were derived through a dual-stage methodology:

- **Chapter 2 (Systematic Literature Review)** synthesized findings from 43 peer-reviewed studies (2017–2025), identifying key regulatory, institutional, market, and ethical barriers to *Green Sukuk* development.
 - **Chapter 4 (Qualitative Analysis)** used expert interviews and thematic analysis (Braun & Clarke, 2006) to validate and enrich these findings with field-based insights.
- Together, these stages produced a robust and empirically grounded framework comprising nine (9) main criteria, each broken into sub-criteria representing distinct but interrelated barriers. These are summarized in the table below:

Main and Sub-Criteria			
Code	Main Theme	Main Indicator	Description
C1	Regulatory and Policy Constraints (RPC)	Absence of a comprehensive <i>green sukuk</i> regulatory framework	No dedicated regulatory framework tailored for <i>green sukuk</i> issuance.
		Lack of standardized national guidelines	Absence of clear national guidelines for structuring and issuance.
		Weak legal enforcement mechanisms	Lack of effective legal enforcement for <i>green sukuk</i> compliance.
		Limited fiscal incentives (e.g., tax exemptions)	Insufficient fiscal tools to incentivize <i>green sukuk</i> adoption.
		Misalignment with international green finance standards	Poor alignment with global green finance norms and standards.
C2	Market Access Barriers (MAB)	Limited secondary market for <i>green sukuk</i>	No active or liquid secondary market for trading <i>green sukuk</i> .
		Low investor base and demand	Limited investor participation due to unfamiliarity or low demand.
		High transaction and compliance costs	Issuance costs and compliance burdens are too high.
C3	Financial Viability Barriers (FVB)	Lack of economically viable green projects	Shortage of financially feasible green projects for sukuk funding.
		Perceived higher risks for green projects	Green projects are perceived as riskier than conventional ones.
		Absence of financial guarantees/subsidies	Lack of guarantees or subsidies to make <i>green sukuk</i> more attractive.
		Lack of blended finance mechanisms and risk-sharing structures	Missing integrated models like PPPs or risk-sharing schemes.

Appendix 5: Main and Sub-Criteria's Table, (Continue)

C4	Institutional Capacity Barriers (ICB)	Limited technical expertise in sukuk structuring	Insufficient structuring expertise among key stakeholders.
		Lack of inter-agency collaboration	Poor coordination between regulatory, financial, and project bodies.
		Institutional resistance to innovation	Conservatism and rigidity in institutional adoption of <i>green sukuk</i> .
C5	Awareness and Engagement Barriers (Khalilzadeh et al.)	Low awareness among issuers/investors	Limited knowledge about <i>green sukuk</i> among market actors.
		Misunderstanding of <i>green sukuk</i> principles	Widespread misconceptions about <i>green sukuk</i> principles.
		Limited engagement platforms between stakeholders	Lack of interactive forums or platforms to engage stakeholders.
C6	Shariah-Green Alignment Barriers (SGA)	Divergent views on Shariah screening for green assets	Conflicting views on what constitutes Shariah-compliant green assets.
		Limited integration of ESG with Maqasid al-Shariah	Weak linkage between Islamic ethics and ESG implementation.
		Lack of unified fatwas and interpretative frameworks	Inconsistent religious rulings and interpretations across markets.
C7	Certification and Verification Barriers (CVB)	Lack of accredited <i>green sukuk</i> certifiers	No recognized bodies or institutions for GS certification.
		Inconsistent post-issuance reporting standards	Variation in how reporting is done post-issuance.
		Costs and delays in obtaining certification	Lengthy, costly, and complex certification processes.
C8	Environmental and Ethical Integrity Risks (Fahad & Areeba)	Greenwashing risks	Misrepresentation or exaggeration of environmental impact.
		Low climate impact or environmental additionality	Minimal additional environmental benefit of some GS projects.
		Ethical concerns over project impacts (e.g., displacement)	Moral concerns about negative outcomes of financed projects.
C9	Definitional and Eligibility Ambiguity (DEA)	Lack of clarity on what qualifies as a green project	Ambiguity about project eligibility under 'green' definitions.
		Inconsistent sectoral eligibility criteria	Lack of standard rules across sectors for GS eligibility.
		Divergence in taxonomy and assessment standards	Conflicting standards and taxonomies used globally.

These 30 sub-criteria will be ranked through BWM to determine their relative importance. In the next stage of the study, five solution categories (e.g., legal reform, institutional capacity, ESG integration, awareness-building) will be introduced as strategic alternatives to address these challenges.

Strategic Solutions to *Green Sukuk* Challenges

Following the identification of key barriers through the literature review (Chapter 2) and expert interviews (Chapter 4), this study also developed a corresponding set of strategic *solution criteria* to address these challenges. These solutions were synthesized from

scholarly recommendations, expert insights, and best practices from global sustainable finance and Islamic capital markets.

The solution criteria are grouped into five main categories (see the table below), each addressing a distinct dimension of the *Green Sukuk* ecosystem. Each category is broken into three practical interventions, resulting in a total of 15 sub-criteria. These solutions will be evaluated using the Bayesian Best-Worst Method (BWM) to assess their perceived effectiveness in overcoming the identified challenges.

Strategic and Solutions Innovation Criteria		
Code	Main Solution Category	Key Indicators / Interventions
FRL	Framework Reform and Legal Integration	Develop unified legal frameworks, standardize verification and disclosure, and Align Shariah and green policies.
ICM	Incentives and Capital Mobilization	Introduce sovereign GS incentives, reduce issuance cost, and mobilize private capital through de-risking instruments.
ISP	Institutional Strengthening and Partnerships	Strengthen institutional capacities, Build multi-stakeholder alliances, and Support cross-sector collaboration.
EVA	ESG and Value-Based Assurance Tools	Create Shariah-compliant ESG scoring, Develop harmonized screening tools, Promote Maqasid-based assurance.
EAM	Education, Awareness, and Market Engagement	Launch awareness campaigns, establish public GS indexes, and deploy digital education platforms.

These five categories will serve as the "*alternatives*" in the BWM model, assessed by experts based on their perceived effectiveness in addressing the multidimensional barriers previously identified. The results will guide both academic theory-building and real-world policy design for scaling *Green Sukuk* adoption.

Appendix 6: Bayesian Best-Worst Method (BWM) Questionnaire Instrument for Expert Prioritisation of *Green Sukuk* Barriers

Introduction to the Survey

Dear expert,

Thank you for taking the time to contribute to this study.

This survey is part of a PhD research project in Islamic economics and finance at Sakarya University (Türkiye). It focuses on identifying the most pressing challenges in the *Green Sukuk* market and evaluating strategic solutions to support its development.

Unlike traditional surveys, this one uses the **Best-Worst Method (BWM)**, a structured, decision-focused approach designed to capture expert judgments with greater clarity and consistency. Your input will help ensure the findings are practically relevant and theoretically grounded.

The survey consists of three brief parts:

- **Part 1:** Respondent Background
- **Part 2:** Ranking *Green Sukuk* Challenges
- **Part 3:** Rating Strategic Solutions

Estimated completion time is 15–25 minutes.

All responses are anonymous and will be used solely for academic research.

If you have any questions or would like more information, please contact the principal researcher, **Mohamed Zakaria Fodol**, at mohamed.fodol@ogr.sakarya.edu.tr or the academic supervisor, **Assoc. Prof. Dr. Hakan Aslan**, at hakanaslan@sakarya.edu.tr.

Part One: Respondent Background

1. Job Status/Affiliation	2. Experience	3. Level of Education
Academic / Researcher ()	1-5 years ()	Doctorate (PhD, DBA, etc.) ()
Financial Institution Professional ()	6-10 years ()	Master's Degree ()
Shariah Scholar / Advisor ()	11-15 years ()	Bachelor's Degree ()
Multilateral / Development Organisation (e.g., IsDB, UN, WB) ()	16-20 years ()	Professional Certification (e.g., CFA, AAOIFI) ()
Government / Policy Maker ()	> 20 years ()	Other (please specify) ()
ESG / Sustainability Consultant ()	4. Area of Expertise / Department	
Legal / Regulatory Professional ()		Islamic Finance / Banking ()

Part One: Respondent Background (continued)		
Independent Expert / Consultant()	Sustainable Finance / ESG	()
Other (please specify):	Shariah Advisory / Islamic Jurisprudence	()
	Public Policy / Government	()
	Economics / Development Studies	()
	Legal / Regulatory Affairs	()
	Environmental Studies / Climate Finance	()
	Accounting / Auditing	()
5. Country of Affiliation/Residence		
Please write the country where you are currently based or professionally affiliated.	Academic Research / Higher Education	()
Country:	Other (please specify):	

6. Expertise Self-Assessment

Kindly indicate your level of professional familiarity with the following areas using a scale from:

1 to 9, where 1 indicates no familiarity and 9 indicates extensive expertise.

#	Dimension	1	2	3	4	5	6	7	8	9
1	I have professional knowledge and familiarity with the <i>Green Sukuk</i> market.									
2	I have professional expertise in Islamic finance principles and instruments.									
3	I have professional familiarity with sustainable finance and ESG-related practices.									

Part 2: Ranking of Main and Sub-Challenges Criteria in the *Green Sukuk* Market

In this section, you will evaluate key challenges affecting the growth and integrity of the GS market. You'll be asked to identify the most and least critical barriers and compare them using a structured ranking scale.

Defining key challenges in the *Green Sukuk* market

Based on a comprehensive review of the literature and stakeholder consultations, we identified 9 main categories of challenges affecting the development of the *Green Sukuk* market. A short explanation of each category is provided below:

- **C1: Regulatory and Policy Constraints (RPC):** Refers to the absence or weakness of comprehensive legal and policy frameworks governing *Green Sukuk* issuance, including fragmented standards, inconsistent enforcement, and limited fiscal incentives—factors that undermine investor confidence and market scalability.
- **C2: Institutional Capacity Barriers (ICB):** Insufficient technical skills, poor inter-agency coordination, and resistance to innovation within institutions structuring or overseeing *Green Sukuk*.

- **C3: Certification and Verification Barriers (CVB):** Limited access to credible certification, inconsistent reporting standards, and high costs or delays in verification processes.
- **C4: Shariah-Green Alignment Barriers (SGA):** Challenges in aligning Islamic principles with environmental goals due to divergent fatwas, fragmented interpretations, and weak ESG–Maqasid integration.
- **C5: Definitional and Eligibility Ambiguity (DEA):** Unclear or inconsistent criteria on what qualifies as a ‘green’ project, creating confusion and increasing greenwashing risks.
- **C6: Market Access Barriers (MAB):** Structural issues like limited liquidity, low investor demand, and high issuance costs that restrict participation in the *Green Sukuk* market.
- **C7: Financial Viability Barriers (FVB):** Concerns over the financial feasibility of green projects, including lack of guarantees, subsidies, or blended finance options.
- **C8: Awareness and Engagement Barriers (Khalilzadeh et al.):** Low stakeholder awareness, widespread misconceptions, and insufficient platforms for education and market engagement.
- **C9: Environmental and Ethical Integrity Risks (Fahad & Areeba):** Risks of greenwashing, minimal climate impact, or ethically questionable outcomes that undermine credibility and long-term value.

Main Challenges in the *Green Sukuk* Market

1. *Green Sukuk* (GS) are Islamic financial instruments designed to fund environmentally sustainable projects while complying with Shariah principles. The following nine challenge criteria may influence the success and integrity of *Green Sukuk*. In your opinion, which is the

MOST CHALLENGING and which is the *LEAST CHALLENGING* factor?

#	Main Challenge Criteria	Most Challenging	Least Challenging
C1	Regulatory and Policy Constraints		
C2	Institutional Capacity Barriers		
C3	Certification and Verification Barriers		
Main Challenge Criteria (continued)			
C4	Shariah-Green Alignment Barriers		

C5	Definitional and Eligibility Ambiguity		
C6	Market Access Barriers		
Main Challenge Criteria (continued)			
C7	Financial Viability Barriers		
C8	Awareness and Engagement Barriers		
C9	Environmental and Ethical Integrity Risks		

1. identified [XX] as the *MOST* critical challenge criterion.

Please specify your preference ratio for this challenge over the other listed challenges by using a 1 to 9 measurement scale (where 1 indicates equal importance and 9 signifies that the selected challenge is extremely more significant)². Please refer to the details below for an explanation of the 1 to 9 scale:

#	Criteria \ Most Challenging	[.....]
C1	Regulatory and Policy Constraints	
C2	Institutional Capacity Barriers	
C3	Certification and Verification Barriers	
C4	Shariah-Green Alignment Barriers	
C5	Definitional and Eligibility Ambiguity	
C6	Market Access Barriers	
C7	Financial Viability Barriers	
C8	Awareness and Engagement Barriers	
C9	Environmental and Ethical Integrity Risks	

Note: When a criterion is compared with itself, the rating should always be 1 (equally important).

2. You identified [XX] as a significant *LEAST CHALLENGING*. Please specify your preference ratio for the other challenges over this one using a 1 to 9 measurement scale.

#	Criteria \ Least Challenging	[.....]
C1	Regulatory and Policy Constraints	
C2	Institutional Capacity Barriers	
C3	Certification and Verification Barriers	
C4	Shariah-Green Alignment Barriers	
C5	Definitional and Eligibility Ambiguity	

² **Definition of 1 to 9 measurement scale:**

1: Equal importance	7: Very strongly more important
3: Moderately more important	9: Extremely more important
5: Strongly more important	2,4,6,8: Intermediate values

C6	Market Access Barriers	
C7	Financial Viability Barriers	
C8	Awareness and Engagement Barriers	
C9	Environmental and Ethical Integrity Risks	

Note: When a criterion is compared with itself, the rating should always be 1 (equally important).

Part Three: Rating the Effectiveness of Strategic Solutions

This final section asks you to evaluate five strategic solutions proposed to address key challenges in the GS market. Based on your expertise, please rate how effective each solution is in supporting GS development and sustainability across nine major challenge areas.

Strategic Solutions Overview

- 1. Framework Reform and Legal Integration (FRL):** Develops unified legal frameworks, standardised disclosure, and Shariah–green alignment to strengthen GS credibility and regulatory consistency.
- 2. Incentives and Capital Mobilization (ICM):** Introduces sovereign incentives, lowers issuance costs, and mobilises private capital through de-risking tools for GS investment.
- 3. Institutional Strengthening and Partnerships (ISP):** Enhances institutional capacity and fosters multi-stakeholder collaboration to support effective GS structuring and oversight.
- 4. ESG and Value-Based Assurance Tools (Azhgaliyeva et al.):** Develops Shariah-compliant ESG scoring, harmonised screening tools, and Maqasid-based assurance to improve ethical alignment in GS.
- 5. Education, Awareness, and Market Engagement (EAM):** Drives GS awareness through campaigns, public indexes, and digital platforms to build stakeholder understanding and engagement.

Instructions

Please rate the effectiveness of each solution in addressing the listed challenges using a scale from **1 to 9**, where:

1 refers to Not effective at all | 9 refers to Highly effective and well-suited

C1: Regulatory and Policy Constraints (RPC)

Considering **C1: Regulatory and Policy Constraints**, how effective is each of the following strategic solutions in addressing this challenge within the GS market?

(1 refers to not effective at all, 9 refers to extremely effective)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C2: Institutional Capacity Barriers (ICB)

Considering **C2: Institutional Capacity Barriers**, how effective is each solution in addressing this challenge within the GS market? (1 refers to not effective at all, 9 refers to extremely effective)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C3: Certification and Verification Barriers (CVB)

Considering **C3: Certification and Verification Barriers**, how effective is each solution in addressing this challenge within the GS market? (1 refers to not effective at all, 9 refers to extremely effective)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C4: Shariah-Green Alignment Barriers (SGA)

Considering **C4: Shariah-Green Alignment Barriers**, how effective is each solution in addressing this challenge within the GS market? (1 refers to not effective at all, 9 refers to extremely effective)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Regulatory and Assurance Standardisation									

ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C5: Definitional and Eligibility Ambiguity (DEA)

Considering **C5: Definitional and Eligibility Ambiguity**, how effective is each solution in addressing this challenge within the GS market? (*1 refers to not effective at all, 9 refers to extremely effective*)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C6: Market Access Barriers (MAB)

Considering **C6: Market Access Barriers**, how effective is each solution in addressing this challenge within the GS market? (*1 refers to not effective at all, 9 refers to extremely effective*)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C7: Financial Viability Barriers (FVB)

Considering **C7: Financial Viability Barriers**, how effective is each solution in addressing this challenge within the GS market? (*1 refers to not effective at all, 9 refers to extremely effective*)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C8: Awareness and Engagement Barriers (Khalilzadeh et al.)

Considering **C8: Awareness and Engagement Barriers**, how effective is each solution in addressing this challenge within the GS market? (*1 refers to not effective at all, 9 refers to extremely effective*)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

C9: Environmental and Ethical Integrity Risks (Fahad & Areeba)

Considering **C9: Environmental and Ethical Integrity Risks**, how effective is each solution in addressing this challenge within the GS market? (*1 refers to not effective at all, 9 refers to extremely effective*)

Code	Criterion	1	2	3	4	5	6	7	8	9
FRL	Framework Reform and Legal Integration									
ICM	Incentives and Capital Mobilization									
ISP	Institutional Strengthening and Partnerships									
EVA	ESG and Value-Based Assurance Tools									
EAM	Education, Awareness, and Market Engagement									

If you have any comments or suggestions related to this study, please write them below:

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Thank you for your valuable comments. If you have any queries, please contact Mohamed Zakaria Fodol at [REDACTED] or the academic supervisor Assoc. Prof. Dr. Hakan Aslan at [REDACTED]

Your feedback is essential for developing effective strategies to overcome these challenges and to enhance the environmental sustainability of the *Green Sukuk* market. Thank you for your valuable time and insights.

.....End



Appendix 7: Benchmark Studies Employing BWM and Bayesian BWM Methods in Sustainability-Oriented Decision Models

#	Authors (Yea)	Application Domain	Country/Region	Sample Size (Exper)	Integration Method	Key Contribution
1	Bansal et al. (2023)	Green Bond Market	India	12	Best Worst Method (BWM)	Identifies key barriers and strategic enablers for green bond adoption using expert input.
2	Wang et al. (2022)	Supply Chain Finance Risk	China	Not specified	BWM + CRITIC + Neutrosophic MCGDM	Developed a robust framework for SSCF risk evaluation integrating subjective and objective criteria under uncertainty.
3	Wang et al. (2025)	Supply Chain Finance Strategy Planning	China	10	BWM + TOPSIS + CPT + VIKOR under Neutrosophic Sets	Introduced a hybrid MCDM method for prioritizing SSCF initiatives considering uncertainty and psychological behaviors.
4	Roy (2025)	Sustainable Credit Assessment	India	8	Fuzzy BWM + Fuzzy TOPSIS-Sorting	Created a tool for banks to assess borrower sustainability using MCDA techniques.
5	Xia et al. (2022)	Green Agriculture Finance	China	Not specified	Neutrosophic Enhanced BWM + COCOSO	Presents a risk assessment model tailored to green agriculture credit within SSCF.
6	Li et al. (2021)	Innovation Management	Hong Kong	6	Fuzzy BWM + Group Decision Making	A structured approach to innovation idea selection under uncertainty.
7	Zarrinpoor and Khani (2023)	Sustainable Bioenergy	Iran	10	Fuzzy BWM + Fuzzy TOPSIS + Possibilistic Programming	Integrated sustainable criteria into global supply chain design under uncertainty.
8	Mondal et al. (2023)	Circular Economy / Green Entrepreneurship	India	15	Mixed methods (Best-Worst Method (BWM) + Total Interpretive Structural Modeling (TISM))	Explores enablers of green entrepreneurship and digitalization in sustainable waste management, particularly among Indian MSMEs, using qualitative interviews and structured modeling techniques

Appendix 4 (continued)						
9	Erdmann et al. (2024)	Sustainable AI-Driven Pricing	Germany	5	Fuzzy BWM + CoCoSo	Evaluates AI-supported pricing models using sustainability criteria through expert-based multi-criteria decision-making.
10	Mangla et al. (2021)	Green Bond Market	India	15	Best-Worst Method (BWM)	Identifies and prioritizes barriers and strategic enablers for green bond development using structured expert judgment.
11	Hashemkhanian Zolfani et al. (2022)	Industrial Plant Location (Lithium Battery)	South America	12	Bayesian BWM + MARCOS	Developed a location selection strategy integrating social, environmental, and technical criteria.
12	Saner et al. (2022)	Healthcare Disaster Preparedness	Turkey	10	Bayesian BWM + VIKOR	Established a structured model to assess and prioritize hospital disaster readiness.
13	Gul et al. (2022)	Occupational Safety in Oil Industry	Turkey	8	Bayesian BWM + Fuzzy VIKOR	Refined control measure prioritization in high-risk energy sectors using hybrid MCDM.
14	Demirci and Isik (2024)	Post-Disaster Reconstruction	Turkey	10	Bayesian BWM + Fuzzy VIKOR	Introduces resilience and community responsiveness in contractor selection for infrastructure recovery.
15	Güner et al. (2023)	Social Media Analytics / Public Sentiment	Turkey	7	Bayesian BWM + Information Entropy + MOORA	Developed a sentiment and relevance-ranking system using engagement metrics.
16	Gul and Yucesan (2022)	Higher Education Evaluation	Turkey	11	Bayesian BWM + TOPSIS	Created a multi-criteria model for university ranking using performance indicators.

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1. Fodol, M. Z., Shikur, A. A., & Aslan, H. (2025). Determinants of green growth in Sub-Saharan Africa: A quantile regression analysis of renewable energy, FDI, and urbanization. <i>The Nigerian Journal of Economic and Social Studies</i>, 67(2), 311–340. 2. Fodol, M. Z., & Aslan, H. (2025). <i>Mapping the evolution of Islamic finance for sustainability: a bibliometric analysis</i>. <i>Sustainability Accounting, Management and Policy Journal</i>. 3. Shikur, A. A., Aslan, H., & Fodol, M. Z. (2025). <i>Factors influencing zakat payment among Ethiopian Muslims: a PLS-SEM analysis</i>. <i>International Journal of Islamic and Middle Eastern Finance and Management</i>. 4. Fodol, M. Z., & Dawai, A. A. (2025). Exploring the determinants of renewable energy consumption in Nigeria: an ARDL analysis from 1990–2022. <i>African Journal of Economic and Management Studies</i>. 5. Fodol, M. Z., & Aslan, H. (2023). The Impact of Covid-19 Pandemic on Islamic Health Insurance Market Returns: Empirical Evidence from Saudi Arabia. <i>Indonesian Capital Market Review</i>, 15(1), 2. 6. Fodol, M. Z. (2021). The Impact of Corruption on Nigerian Enterprises' Performance: An Empirical Study. <i>Bilgi Sosyal Bilimler Dergisi</i>, 23(2), 315-340. 7. Razak, D., Fodol, M., Jama, A. and Burhan, A., (2020). <i>Service Quality in Malaysian Islamic Banks: An Empirical Study</i>. <i>Turkish Journal of Islamic Economics</i>. 7(1), 13-42	