

World Sustainability Series

Vikas Sharma
Ewelina Idziak
José Braga de Vasconcelos
Attila Kurucz *Editors*

Infrastructure Finance and Sustainable Governance

 Springer

World Sustainability Series

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Walter Leal Filho, European School of Sustainability Science and Research,
Research and Transfer Centre “Sustainable Development and Climate Change
Management”, Hamburg University of Applied Sciences, Hamburg, Germany

Due to its scope and nature, sustainable development is a matter which is very interdisciplinary, and draws from knowledge and inputs from the social sciences and environmental sciences on the one hand, but also from physical sciences and arts on the other. As such, there is a perceived need to foster integrative approaches, whereby the combination of inputs from various fields may contribute to a better understanding of what sustainability is, and means to people. But despite the need for and the relevance of integrative approaches towards sustainable development, there is a paucity of literature which address matters related to sustainability in an integrated way.

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Vikas Sharma · Ewelina Idziak ·
José Braga de Vasconcelos · Attila Kurucz
Editors

Infrastructure Finance and Sustainable Governance

Editors

Vikas Sharma 
University School of Business
Chandigarh University
Mohali, Punjab, India

José Braga de Vasconcelos 
Lusófona University
Porto, Portugal

Ewelina Idziak 
Department of Law and Economics
Kazimierz Wielki University
Bydgoszcz, Poland

Attila Kurucz 
Kautz Faculty of Business and Economics
Széchenyi István University
Győr, Hungary

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This book is dedicated to the visionary planners, policymakers, and innovators in infrastructure finance and governance whose commitment to sustainable development continues to reshape our built environment for the better. Your work lays the foundation for a more inclusive, resilient, and future-ready world.

To our families and loved ones, especially Seshan and Danika Sharma, whose unwavering support, patience, and encouragement have been a constant source of strength. Your belief in us has given purpose and meaning to this journey.

And to the future generations of change makers, researchers, and leaders—may you continue to innovate with integrity, govern with responsibility, and champion sustainability in all forms, ensuring that infrastructure serves not just economies, but the well-being of people and the planet a like.

Preface I

Infrastructure is the backbone of economic development and societal progress. As the global community confronts pressing challenges such as climate change, urbanization, and resource constraints, the need for sustainable, well-governed infrastructure has never been more critical. *Infrastructure Finance and Sustainable Governance* explores how innovative financing models and effective governance frameworks can drive sustainable infrastructure development aligned with long-term environmental, social, and economic goals.

This volume brings together diverse expert insights on how to mobilize resources, manage risks, and design inclusive and resilient infrastructure systems. Through real-world case studies and actionable frameworks, it highlights the pivotal role of governance in ensuring transparency, accountability, and alignment with sustainability principles.

We hope this work serves as a valuable resource for policymakers, researchers, and practitioners, inspiring forward-thinking strategies and collective action toward building infrastructure that truly supports sustainable development and global well-being.

Mohali, India
Bydgoszcz, Poland
Porto, Portugal
Győr, Hungary

Dr. Vikas Sharma
Dr. Ewelina Idziak
Dr. José Braga de Vasconcelos
Dr. Attila Kurucz

Preface II

Infrastructure Finance and Sustainable Governance explores the critical intersection of infrastructure development, innovative financing, and governance frameworks essential for achieving sustainability in today's rapidly changing world. This volume addresses how strategic financial instruments and sound governance can shape resilient, inclusive, and future-ready infrastructure systems.

The book examines diverse financing approaches—such as public-private partnerships, blended finance, green bonds, and climate funds—that are being leveraged to close infrastructure gaps while meeting environmental, social, and governance (ESG) standards. It also highlights the role of governance in ensuring transparency, accountability, and alignment with long-term sustainability goals.

Through theoretical insights, policy analysis, and real-world case studies, the volume critically engages with the regulatory, institutional, and operational challenges faced in financing and managing infrastructure sustainably. Topics such as climate-resilient infrastructure, digital infrastructure finance, fiscal risk management, and stakeholder collaboration are addressed in depth.

This work aims to guide researchers, policymakers, and practitioners committed to advancing infrastructure that not only supports economic development but also upholds principles of equity, environmental stewardship, and good governance.

We hope this book contributes meaningfully to the ongoing dialogue on sustainable development and inspires actionable strategies for resilient infrastructure and responsible governance.

Mohali, India
Bydgoszcz, Poland
Porto, Portugal
Győr, Hungary

Dr. Vikas Sharma
Dr. Ewelina Idziak
Dr. José Braga de Vasconcelos
Dr. Attila Kurucz

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We extend our sincere gratitude to all who contributed to the creation of *Infrastructure Finance and Sustainable Governance*.

Special thanks to our chapter contributors for sharing their valuable insights, enriching this volume with diverse perspectives on sustainable infrastructure and governance.

We are deeply grateful to my co-editors for their steadfast support, valuable collaboration, and encouragement throughout this journey. Their dedication and shared vision have been instrumental in shaping the direction and quality of this volume.

Our appreciation goes to the publisher for their guidance and belief in this project, and to the peer reviewers whose feedback helped refine the manuscript.

Finally, we acknowledge the ongoing efforts of professionals, scholars, and policymakers working toward resilient infrastructure and responsible governance. Your work continues to inspire.

Thank you all for making this book possible.

Dr. Vikas Sharma
Dr. Ewelina Idziak
Dr. José Braga de Vasconcelos
Dr. Attila Kurucz

About This Book

Infrastructure Finance and Sustainable Governance delves into the evolving landscape of infrastructure financing with a strong emphasis on the role of governance in achieving long-term sustainability. This thought-provoking volume brings together leading academics, industry practitioners, and policy experts to examine how innovative financial frameworks and governance mechanisms are transforming the infrastructure sector.

The book explores the shift from traditional public-led financing models to dynamic approaches involving public-private partnerships, blended finance, green bonds, and digital financial instruments. It emphasizes how effective governance through transparency, accountability, regulatory coherence, and stakeholder engagement is essential for ensuring the sustainability, efficiency, and resilience of infrastructure projects.

Special attention is given to the integration of sustainability principles into infrastructure planning and execution. Topics such as climate-resilient infrastructure, ESG (Environmental, Social, and Governance) compliance, and adaptive regulatory frameworks are thoroughly explored. The book also investigates how governance innovation can mitigate risks, close infrastructure gaps, and align investments with the Sustainable Development Goals (SDGs).

Through practical case studies, comparative policy analysis, and forward-looking strategies, readers gain critical insights into designing sustainable financing systems that balance economic growth with social equity and environmental protection.

Infrastructure Finance and Sustainable Governance is an essential resource for policymakers, infrastructure planners, financiers, academics, and sustainability leaders committed to building inclusive, green, and well-governed infrastructure for the future.

Dr. Vikas Sharma
Dr. Ewelina Idziak
Dr. José Braga de Vasconcelos
Dr. Attila Kurucz

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Contributors

Adil Azizoglu Department of Islamic Economics and Finance, Istanbul Sabahattin Zaim University, Istanbul, Türkiye

Kayenaat Bahl School of Management, IILM University, Gurugram, India

Boglárka Barsi Széchenyi István University, Győr, Hungary;
ELTE CERS IRS, Győr, Hungary

Larissa M. Batrancea Department of Business, Babes-Bolyai University,
Cluj-Napoca, Romania

Felipe de Jesús Bello Gómez Department of Economics, Universidad de las
Américas Puebla, Puebla, Mexico

Pritpal Singh Bhullar University Business School, Maharaja Ranjit Singh
Punjab Technical University, Bathinda, India

Maryla Bieniek-Majka Department of Law and Economics, Kazimierz Wielki
University, Bydgoszcz, Poland

Ural Gökay Çiçekli Ege University, Department of Business Administration,
Bornova, Türkiye

Csongor Czipf Széchenyi István University, Győr, Hungary

Iulian Bogdan Dobra Faculty of Economics, “1 Decembrie 1918” University of
Alba Iulia, Alba Iulia, Romania

Larisa Dragolea Faculty of Economics, “1 Decembrie 1918” University of Alba
Iulia, Alba Iulia, Romania

M. Mustafa Erdoğan Faculty of Business and Administrative Sciences, Beykoz
University, Istanbul, Türkiye

Deepika Ghai School of Electronics and Electrical Engineering, Lovely
Professional University, Jalandhar, Punjab, India

Mehak Grover University School of Business, Chandigarh University, Mohali, India

Gábor Gyura Robert Schuman Centre, European University Institute, Florence, Italy

Barbara Eszter Huszár Department of International and Applied Economics, Széchenyi István University, Győr, Hungary

Ewelina Idziak Department of Law and Economics, Kazimierz Wielki University in Bydgoszcz, Bydgoszcz, Kujawsko-Pomorskie Region, Poland;

Women Researchers Council, Azerbaijan State University of Economics, Sabail, Baku, Azerbaijan;

Banking Department, Faculty of Economics, Vilniaus Kolegija - Higher Education Institution, Vilnius, Lithuania;

Shinawatra University (Thailand), Amphoe Sam Khok, Pathum Thani, Thailand

Margarita Išoraitė Vilniaus Kolegija/Higher Education Institution, Vilnius, Lithuania

Megha Jain Shyam Lal College, University of Delhi, New Delhi, India; Pahle India Foundation, New Delhi, India

Amandeep Kaur Advanced Centre of Research and Innovation (ACRI), Chandigarh School of Business, CGC University, Mohali, Punjab, India

Gaganpreet Kaur Advanced Centre of Research and Innovation (ACRI), Chandigarh School of Business, CGC University, Mohali, Punjab, India

Ramandeep Kaur University School of Business, Chandigarh University, Mohali, India

Ranjeet Kaur University School of Business, Chandigarh University, Mohali, India

Rupinder Kaur USB, Chandigarh University, Mohali, India

Murat Kocamaz Ege University, Department of Business Administration, Bornova, Türkiye

Ruchi Malhotra Sri Guru Granth Sahib World University, Fatehgarh Sahib, India

Md. Mehedi Hasan Khulna University, Khulna, Bangladesh

Naman Mishra School of Management, Bennett University, Greater Noida, India

Vandna Misra Manipal University, Jaipur, India

Aishwarya Nagpal Kirori Mal College, University of Delhi, New Delhi, India

Anca Nichita Faculty of Economics, “1 Decembrie 1918” University of Alba Iulia, Alba Iulia, Romania

Arvind Kumar Pandey Department of Management Studies, G. L. Gajaj Institute of Technology and Management, Greater Noida, India

Nitin Pathak University School of Business, Chandigarh University, Mohali, India

Surbhi Rani Department of Commerce, Punjabi University, Patiala, India

Dipayan Roy NICMAR Business School, NICMAR University, Pune, India

Özge Uysal Şahin Department of Health Management, Çanakkale Faculty of Applied Sciences, Çanakkale Onsekiz Mart University, Çanakkale, Türkiye

Ramandeep Sandhu School of Computer Science and Engineering, Lovely Professional University, Jalandhar, Punjab, India

S. M. Shafeeul Islam Khulna University, Khulna, Bangladesh

Pardeep Bawa Sharma University School of Business, Chandigarh University, Mohali, India

Rasna Sharma University School of Business, Chandigarh University, Mohali, India

Vikas Sharma Department of Law and Economics, Kazimierz Wielki University, Bydgoszcz, Poland;
University School of Business, Chandigarh University, Mohali, India

Tejinder Singh University School of Business, Chandigarh University, Mohali, India

Jyoti Thakur USB, Chandigarh University, Mohali, India

Rishabh Tomar University Institute of Computing, Chandigarh University, Mohali, India

Burhan Uluyol Department of Islamic Economics and Finance, Istanbul Sabahattin Zaim University, Istanbul, Türkiye

Silky Valecha University School of Business, Chandigarh University, Mohali, India

Renu Vij Department of AIT Management, Chandigarh University, Mohali, India

Dagna Wlekińska Uniwersytet Kazimierza Wielkiego, Bydgoszcz, Poland

Ibrahim Güren Yumuşak Department of International Trade and Finance, Istanbul Sabahattin Zaim University, Istanbul, Türkiye

Financing Infrastructure Development in Emerging Markets: Bonds or Sukuk?



Burhan Uluyol, Adil Azizoglu, and Ibrahim Güren Yumuşak

Abstract Development of infrastructure is one of the main catalysts for economic growth, but funding mega-projects is one of the main issues for most developing countries. Traditional debt-based financing more often than not equals economic instability, increased debt obligations, as well as vulnerability to currency fluctuations—especially for financially limited countries. In this article, we propose alternative financing arrangements with specific focus on Islamic finance instruments like sukuk. We conclude that Shariah-compliant financing structures like *Istisna-Mudarabah* Sukuk offer a credible alternative to conventional debt by tying financial obligations to physical assets and incorporating risk-sharing mechanisms. Our research invites governments, policymakers, and institutional investors to give Islamic financial instruments serious consideration in their infrastructure plans. By leveraging the synergies between Islamic capital markets and ethical investment principles, this can result in more sustainable and inclusive financial systems in emerging markets.

Keywords Islamic finance · Sukuk · Infrastructure financing · Debt sustainability · Special purpose vehicles (SPVs) · Stock exchange listing · Shariah-compliant investment · Public-private partnerships (PPPs)

1 Introduction

The financing of infrastructure development continues to be a challenging issue for developing economies. Building roads, bridges, energy systems, and other critical infrastructure requires massive upfront investment—typically far more than the governments of these economies are capable of mustering (Smaoui et al. 2021).

B. Uluyol (✉) · A. Azizoglu
Department of Islamic Economics and Finance, Istanbul Sabahattin Zaim University, Istanbul,
Türkiye
e-mail: borhanseti@gmail.com

I. G. Yumuşak
Department of International Trade and Finance, Istanbul Sabahattin Zaim University, Istanbul,
Türkiye

Because such large costs are involved, traditional financing methods tend to be insufficient, forcing governments to seek other ways of financing these critical projects. However, relying too much on debt financing has caused considerable skepticism over long-term fiscal sustainability, economic stability, and exchange rate risks (Panizza 2020). In the absence of access to other financing sources, most developing nations have incurred massive sovereign debt, making them more vulnerable to financial crises and exchange rate volatility (Mbate 2021).

The biggest issue is foreign debt over-reliance to finance infrastructure spending. Even though private companies can hedge the financial risk of their firms through the issuance of debt and equity, governments do not have that capacity (Walter 2016). In the case where funds cannot be raised with the help of equity markets, government finances suffer tighter liquidity requirements and lower future investment flexibility (Baldacci and Kumar 2010). More often than not, borrowing too much to fund infrastructures has initiated debt crises recurring continuously, hindering economic expansion as well as dissipating fiscal integrity (Reinhart and Rogoff 2010).

To address such issues, researchers and policymakers are working on the creation of alternative financing mechanisms that reduce excessive lending while ensuring long-term sustainability. One of the possible approaches includes the use of Islamic finance products, particularly sukuk (Islamic bonds), which offer a tool for raising infrastructure funds without boosting debt levels (Ismath Bacha and Mirakhor 2018). The developing economies can go ahead to build the infrastructure they need without compromising fiscal balance by integrating such new funding sources. Sukuk structures are inherently asset-backed, ensuring that financing is linked to tangible economic activities rather than speculative borrowing. This feature aligns with principles of risk-sharing and financial stability, making it a particularly suitable tool for infrastructure financing in developing economies (Ahmed 2022a, b).

The paper reviews the inherent problems and organized issues in debt-based financing frameworks that guide infrastructure development in emerging economies. Governments and corporate organizations suffer enormous fiscal pressures from debt instruments like traditional bonds and loans because the debt instruments lead to high interest expenses and exchange rate volatilities and expose entities to macroeconomic risks. Utilization of interest-bearing debt has harmful effects that bring about excess debt accumulation which creates both financial instability as well as destroys the possibility of long-run economic growth prospects.

The paper proposes Sukuk—Shariah-compliant financial instruments that hold potential as a better sustainable and effective financing mode for infrastructure development. Sukuk instruments operating on asset-based or equity-derived structures offer risk-proportionate returns and wide-based financing while fulfilling ethical investment guidelines. The research explains how Sukuk excels over conventional debt instruments by rendering capital markets more accessible to a diverse investor base while facilitating market liquidity in parallel with spreading financial risks in an equitable manner.

The paper presents strategic recommendations and main structural modifications necessary to augment the usage of Sukuk-based funding mechanisms in financing activities. The paper seeks to provide constructive contribution to the continuous

study of financial solutions that harmonize economic advancement with financial stability and social equity in emerging markets.

The remaining of the paper is organized as follows: Sect. 2 reviews the importance of infrastructure in economic development and issues and challenges of existing debt-based financing structures after this introduction Section. Section 3 provides the overview of the alternative model while Sect. 4 proposes the alternative model—convertible *Istisna*-Mudarabah sukuk. The concluding remarks, implications and limitations of the study are presented in Sect. 5.

2 Literature Review

2.1 *The Critical Role of Infrastructure in Economic Development*

Infrastructure development lies at the heart of economic progress and societal transformation. Roads, bridges, energy grids, water systems, and digital infrastructure are foundational elements that support economic productivity, enhance connectivity, and improve overall quality of life (Calderón and Servén 2010). However, the financing of such large-scale infrastructure projects remains a formidable challenge, particularly in resource-constrained developing countries. Given the capital-intensive nature of infrastructure investments, governments must secure substantial funds upfront, a requirement that is often difficult to meet through domestic revenue generation alone (Walter 2016).

While private sector firms can leverage a combination of debt and equity to finance large projects, governments face institutional constraints that limit their financing options primarily to debt issuance. One of the biggest challenges facing emerging economies is financing big infrastructure projects. Failure to access different funding channels leaves governments with no option but to resort to high levels of public debt, which undermines their fiscal stability (Mendoza and Oviedo 2018). Over-reliance on debt-financed schemes has, in most cases, come with fiscal discomfort, leading governments to adopt austerity measures that reduce essential public spending (Eichengreen et al. 2005). Therefore, policymakers are now looking more towards alternative financing structures that reduce reliance on debt while offering long-term infrastructure development.

2.2 *Existing Financing Structures: Debt-Based Models and Challenges*

Governments of developing countries typically employ two primary channels to finance infrastructure projects:

Foreign Borrowing—Governments borrow from foreign financial institutions such as the World Bank, the International Monetary Fund (IMF), and regional development banks. Others borrow bilaterally from foreign lenders. While these sources of funds bring much-needed capital, they also expose economies to currency risk, high debt-servicing charges, and tight loan terms that can limit fiscal flexibility (Merna and Njiru 2002; Panizza 2020).

Public-Private Partnerships (PPPs)—In a bid to alleviate budgetary burdens, the majority of governments have turned to PPPs, which allow private financiers to finance, build, and operate infrastructure projects. The arrangements are alluring with advantages including risk sharing and efficiency enhancement but are also complex, requiring robust regulatory and legal systems. Contingent liabilities and revenue guarantees in PPP contracts can also confer concealed fiscal expenses on governments (Engel et al. 2014; Ehlers 2014).

The increasing reliance on debt finance has led to grave macroeconomic problems, especially for developing countries. Rising world interest rates have also further destabilized already fragile economies, with further borrowing no longer viable (Tran 2022). In a context where sovereign debt concerns are on the rise (Heller 2003), the need for alternative, non-leveraged financial instruments is more pronounced than ever.

While these financial instruments bridge the infrastructural financing gaps, they are not exempt from challenges. Excessive dependence on debt funding poses financial threats, and PPPs, although beneficial, should be managed well to avoid imposing long-term financial burdens. Since governments cannot raise funds from equity markets like private companies, they rely heavily on debt financing to implement infrastructure projects (Ismath Bacha and Mirakhor 2018).

According to Ismath Bacha and Mirakhor (2018), many Muslim-majority countries face substantial challenges in financing infrastructure development due to a lack of adequate domestic financial resources. Despite the urgent need for large-scale infrastructure investment to support economic growth, these countries often find themselves unable to raise sufficient funds from domestic sources. Given that governments are not in a position to raise capital from equity markets such as private firms, they largely depend on debt capital for financing infrastructure development (Ismath Bacha and Mirakhor 2018). Although borrowing supplies the initial working capital for massive investments, it comes with long-term implications that may erode economic stability as well as financial viability. The application of debt-funded mechanisms involves a number of major issues:

Increased Debt Burden and Diminished Fiscal Flexibility: Government over-borrowing can lead to elevated debt levels, making public finances harder to manage and implement effectual responses to any future economic crises. When debt is unsustainable, governments have reduced fiscal space to invest in key services like health, education, and social welfare programs (Jarmuzek and Rozenov 2019). It has been proven through research that beyond a threshold, high public debt slows down economic growth since it crowds out private sector investment and raises the cost of borrowing (Reinhart and Rogoff 2010; Mbate 2021). Highly indebted nations are

also unable to secure new loans on concessionary terms, creating a debt dependence trap that can lead to long-term economic stagnation (Panizza 2020).

Higher Vulnerability to Economic Shocks: A high debt-to-GDP ratio makes economies more vulnerable to external shocks, global financial trends, and shifting investor sentiment. When governments borrow in large amounts of foreign currency, they expose themselves to exchange rate risk—if their local currency weakens, their debt burden becomes even heavier (Alesina et al. 1992). This issue, known as “original sin,” occurs when emerging economies cannot denominate debt in their local currency, so they must resort to foreign-denominated debt that becomes more expensive as local currencies depreciate (Eichengreen et al. 2005). As a result, these economies face a greater risk of capital flight, sudden stops in foreign investment, and liquidity shortages during periods of global financial instability (Reinhart and Rogoff 2010; Mendoza and Oviedo 2018).

Higher Debt Servicing Cost: As interest rates rise globally, it becomes more expensive to service debt, putting additional pressure on public finances. This provides governments with even less fiscal space to invest in priority development projects (Blanchard 2019). Higher debt servicing costs can force governments to cut spending on infrastructure or implement austerity measures, which can slow down economic growth and hurt social welfare. Higher interest rates increase debt servicing costs, diverting government revenues from productive investments toward debt repayment obligations (Baldacci and Kumar 2010). For many developing economies, this dynamic exacerbates fiscal imbalances, making it increasingly difficult to finance new infrastructure projects without deepening existing debt burdens.

Resilience to Commodity Price Shocks: Since sukuk financing is linked to real assets and economic activities, it provides a more stable source of long-term capital compared to commodity-dependent revenue streams. By diversifying funding sources and reducing reliance on volatile commodity markets, governments can create a more resilient economic framework that is less susceptible to external shocks (Ahmed 2022a, b).

To address these challenges, the growing popularity of Islamic bonds (sukuk) offers a highly viable alternative. While conventional debt instruments are based on interest-bearing debt, sukuk provide Shariah-compliant, asset-backed financing, reducing reliance on interest-based loans and enhancing financial stability. In incorporating sukuk in national infrastructure investment programs, governments can choose to diversify sources of funding, enhance economic resilience, and mitigate the systemic risks associated with external borrowings.

3 Overview of the Alternative Model

Due to the limitation of conventional finance, Islamic finance, especially sukuk (Islamic bonds), has been a compelling alternative model in financing infrastructure within developing economies. Unlike traditional bonds, sukuk are structured under risk-sharing and asset-backed finance concepts, which ensure less over-debt burden and reduce financial instability (Ahmed 2022a, b). Sukuk investors acquire partial ownership of real assets or projects and thus enjoy sharing risk as well as returns. The practice promotes long-term infrastructure development and financial sustainability (Ismath Bacha and Mirakhor 2018).

Most countries have already managed to use sukuk in the financing of large infrastructure projects. Sukuk is different from traditional bonds in that it is rooted in real economic activities, and this reduces speculative financial risks and excessive borrowing (Ismath Bacha and Mirakhor 2018). Malaysia, Indonesia and the GCC countries, for example, have issued sovereign sukuk to fund transport, energy, and housing projects, and have successfully used sukuk to finance large-scale infrastructure developments without compromising fiscal prudence (Smaoui and Khawaja 2017). Yet another significant advantage of sukuk is its structured nature—money is tied to a specific project directly, and financial mismanagement risk is accordingly reduced (Obaidullah and Khan 2020).

Funding the construction of infrastructure remains a significant challenge for emerging economies due to the huge expense and lack of fiscal space to fund it by governments (Panizza 2020; Reinhart and Rogoff 2010). Even as debt is an acceptable means, its utilization comes with implications for financial sustainability and macroeconomic stability (Jarmuzek and Rozenov 2019). Foreign borrowing and PPPs mobilize much-needed financing but introduce complexity and fiscal risks (Engel et al. 2014; Ehlers 2014). In this context, Islamic finance instruments like sukuk offer a sustainable and efficient alternative, tying financial resources to real economic activities without creating excessive debt burdens (Ismath Bacha and Mirakhor 2018; Smaoui and Khawaja 2017). As global infrastructure investment needs continue to rise, adopting a diversified and sustainable financing approach will be crucial to ensuring economic resilience and long-term growth (Ahmed 2022a, b; Arora et al. 2024). By adding this alternative into the national development strategies, the government is able to diversify funding sources, enhance economic stability, and also avoid risks associated with excessive dependency on debt.

3.1 *How Sukuk Works: A Shariah-Compliant Alternative to Bonds*

Islamic finance, and sukuk specifically, offers a sound alternative, with financial sustainability anchored to real economic growth (El-Gamal 2006). Along with PPPs, sovereign wealth funds, and other non-debt financing products, sukuk can finance

infrastructure projects without generating unsustainable debt burdens (Jobst et al. 2008). As fiscal constraint challenges governments, embracing an array of diversification and balancing in the choice of financing mechanisms will be indispensable to long-term economic resilience as well as to sustainable development (Dusuki and Mokhtar 2010).

Unlike conventional bonds, which provide fixed interest returns (*riba*) and contribute to debt accumulation, sukuk represents ownership of tangible assets or income-generating activities. This approach helps the funding remain closely attached to productive economic activity, which in turn helps contain financial risk and speculation (Ismath Bacha and Mirakhor 2018). Sukuk offers a robust solution for developing economies in that it allows them to reduce their reliance on foreign debt while helping ensure the mobilization of funds sustainably (Uluyol 2023). By shifting away from conventional debt-based instruments and towards equity-based, risk-sharing financial instruments, countries are better positioned to manage fiscal risks and raise the necessary funds for priority infrastructure projects.

Keeping in mind benefits of sukuk, policymakers and governments can create a stable and sustainable financial environment and maintain long-run economic growth. Islamic finance is grounded in a system of ethical and financial principles that set it apart from conventional practices in financing. Essentially, it is premised on fairness, transparency, and shared risk, with investments tied to genuine economic activity and not speculative trade (Ahmed 2022a, b; Ismath Bacha and Mirakhor 2018). This positions it particularly well for the development of infrastructure, where long-term sustainability and financial soundness are key considerations (Smaoui and Khawaja 2017).

One of the most vivid differences between Islamic and conventional finance is the source of return. Instead of earning fixed interest (*riba*), Islamic financiers share both risk and reward, aligning their success with the success of the project (Reinhart and Rogoff 2010). Lastly, all contracts must be clearly outlined, transparent, and free of excessive uncertainty (*gharar*)—exactly why Engineering, Procurement, and Construction (EPC) contracts and turnkey transactions are hugely popular in Islamic infrastructure financing (Obaidullah and Khan 2020).

Along with financial structures, Islamic finance also implements ethical investment through the prohibition of funds to be invested in certain sectors like gambling, alcohol, or weapons. This makes sure that infrastructure development is socially accountable and contributes to economic development at a broader level (Engel et al. 2014). The Table 1 illustrates prominent Islamic finance practices and how they affect infrastructure project structure, rendering it one which combines profit and justice and long-term sustainability.

We can infer the following key findings from Table 1:

Risk Sharing—Instead of fixed interest, investors share profit and loss, which encourages better alignment of interests.

Ethical Financing—Investments are limited to socially responsible and Shariah-compliant businesses and do not include activities with negative externalities for society.

Table 1 Comparison of Islamic finance principles and project features

Principles of Islamic finance	Corresponding project features	Explanation
Returns linked to earnings and derived from commercial risk taken by the financier	Projects allow for risk to be shared among parties	In Islamic finance, profits must come from actual economic activity and business performance rather than fixed interest (<i>riba</i>). Projects funded under this system are structured in a way that financiers share both risks and rewards, ensuring alignment of interests
Financiers should become partners in the project	Projects can be designed for financiers to be partners and not just lenders	Unlike conventional finance, where lenders earn fixed interest regardless of project success, Islamic finance encourages equity-based structures (e.g., <i>Musharakah</i> and <i>Mudarabah</i>), where financiers act as partners. This promotes responsible financing and project sustainability
Transactions should be free from speculation or gambling (<i>maysir</i>)	Projects are by nature free from speculation or gambling	Speculation (<i>maysir</i>) and excessive uncertainty (<i>gharar</i>) are prohibited. Therefore, Islamic finance projects focus on real economic activity and tangible assets, avoiding high-risk ventures, such as derivatives trading or speculative investments
Existence of uncertainty/looseness of contract is prohibited	Projects are generally well-defined with no uncertainty (such as lump sum, turn-key, EPC contracts)	To prevent disputes and ensure transparency, Islamic finance requires contracts to be clear and specific. Engineering, Procurement, and Construction (EPC) contracts, lump-sum agreements, and turnkey projects align with this principle by defining scope, timeline, and costs upfront
Investments in alcohol, drugs, gambling, weapons, and other prohibited activities are not permitted	Development infrastructure typically excludes these areas	Islamic finance follows Shariah-compliant investment guidelines, restricting funds from being used in industries such as alcohol, gambling, pork production, and arms manufacturing. This ensures ethical and socially responsible investment choices

Sources Compiled by authors

Transparency and Fairness—Financial contracts are designed to be transparent, equitable, and free from exploitative conditions, reducing uncertainty and unfairness.

Real Economy Focus—Investment is directed into real assets and productive activities, eliminating speculative transactions and financial instability.

Based on these principles, Islamic finance is positioning itself as a credible and sustainable alternative for emerging economies to finance their infrastructure needs and mitigate financial risks (Chapra 2016). In a world where uncontrollable debt is a threat to economic stability, Islamic finance positions itself as a long-term solution that emphasizes real economic growth and fiscal strength (Mirakhor and Smolo 2010). By integrating sukuk and other morality-based financial instruments into their infrastructure financing frameworks, governments are able to build a more secure, diversified, and future-proof economy—one that is based on ethical investment, financial inclusion, and long-term economic sustainability (Dusuki and Mokhtar 2010; Sharma et al. 2024).

4 Proposed Alternative Model

To be able to finance its infrastructure needs successfully, the government must be able to identify sustainable financing channels that are aligned with its general fiscal policy and economic objectives. A plausible alternative is the 10-year convertible *Istisna-Mudarabah* sukuk—a Shariah hybrid financial product that combines the strengths of *Istisna* (construction-based financing) and *Mudarabah* (profit-and-loss-sharing partnership).

Not only does this new approach ensure compliance with Islamic finance, but it also introduces financial flexibility, promotes risk-sharing, and offers long-term economic sustainability. Through using *Istisna* for financing the development of projects and *Mudarabah* for profit-sharing contracts, the government can tap ethical investors, raise financial inclusion, and establish a more sustainable infrastructure financing model—one that reduces dependency on conventional debt and promotes sustainable development.

4.1 Structure of the Convertible *Istisna-Mudarabah* Sukuk

***Istisna*(Construction Contract):** Under the *Istisna* structure, sukuk proceeds are used to finance infrastructure development (e.g., roads, power plants, transportation systems, or water projects). The issuer (government or a state-owned entity) acts as the project owner, contracting a developer to construct the asset. Investors (sukuk holders) provide funds for construction, and ownership of the project remains with the issuer until completion.

Mudarabah (Profit/Loss Sharing Contract): Once the construction phase is completed, the sukuk transitions into a Mudarabah agreement, where investors become equity partners in the revenue-generating project. The project's revenues are shared between the investors and the government based on a predetermined profit-sharing ratio. In the event of losses, investors bear the financial risks, aligning the financing model with the principles of Islamic equity-based finance.

Convertible Feature: The convertibility option allows sukuk holders to convert their investment into equity ownership in the project after a certain period (e.g., 10 years), providing an alternative to conventional debt repayment. This reduces the government's future debt obligations and encourages private-sector participation in infrastructure financing.

4.2 *Advantages of the Convertible Istisna-Mudarabah Sukuk Model*

Risk-Sharing and Debt Reduction: Unlike conventional sovereign bonds, which increase leverage, this sukuk structure distributes risk between investors and the government (Ahmed and Khan 2020). The convertibility feature allows the government to reduce its long-term liabilities, improving fiscal sustainability (Chapra 2016).

Asset-Backed Financing with Real Economic Activity: The sukuk is directly linked to physical infrastructure projects, ensuring that investments are rooted in productive economic activities and not speculative transactions (Jobst et al. 2008). This alignment with Shariah-compliant investing brings greater confidence among investors since it guarantees the money being utilized for real development projects (El-Gamal 2006).

Diversification of Funding Sources: This sukuk hybrid structure is attractive to a broad base of investors, from conventional and Islamic investors to sovereign wealth funds, pension funds, and ethical investment funds (Siddiqui 2008). It increases the Islamic capital market, fostering financial inclusion and providing a substitute for traditional sovereign debt instruments, reducing dependence on interest-based borrowing (Dusuki and Mokhtar 2010).

Foreign Investment Attraction and Currency Stability: Selling sukuk in the domestic currency eliminates foreign exchange risk and currency mismatches, protecting the economy from exchange rate risks (Mirakhor and Smolo 2010). It also appeals to foreign direct investors (FDIs) in search of stable, Shariah-based investment yields in developing economies (Iqbal and Mirakhor 2013).

The launch of a convertible *Istisna-Mudarabah* sukuk offers a novel, non-obligatory financing vehicle for massive infrastructure development. By merging construction-based financing (*Istisna*) with profit-and-loss-sharing arrangements

(Mudarabah), this dual sukuk facilitates financial stability, stimulates economic progress, and fosters investor confidence (Obaidullah 2005). Its greatest uniqueness lies in the convertibility option, which offers a strategic vehicle to level out public debt liabilities and foster increased private sector engagement in national development (Wilson 2008). With the world markets increasingly recognizing the benefits of Islamic banking, cash-strapped governments seeking sustainable and non-debt financing must look at creative sukuk structures to support long-term economic growth alongside robust infrastructure building (Zaher and Hassan 2001).

4.3 The Convertible *Istisna*-Mudarabah Sukuk Model

How a Convertible *Istisna*-Mudarabah Sukuk Works in Infrastructure Financing? The following figures outline the step-by-step application of a convertible *Istisna*-Mudarabah sukuk, a Shariah-compliant financing instrument for giant infrastructure projects. The procedure involves key players including the government, investors (sukuk holders), a special purpose vehicle (SPV), a project contractor, and a trustee.

The steps in Fig. 1 outline how this sukuk structure works in the construction (*Istisna*) phase of the infrastructure project in a simple and practical manner:

Step 1: Establishment of Special Purpose Vehicle (SPV): The SPV is then established by the government, and it is legally a separate and independent entity charged with running the sukuk. The SPV assumes possession of the principal assets of the project, such as land, seed capital, and development rights, which are made collateral to sukuk issuance. This serves the purpose of being asset-backed for the finance in line with the Islamic finance mechanism, rather than being on a debt-based setup.

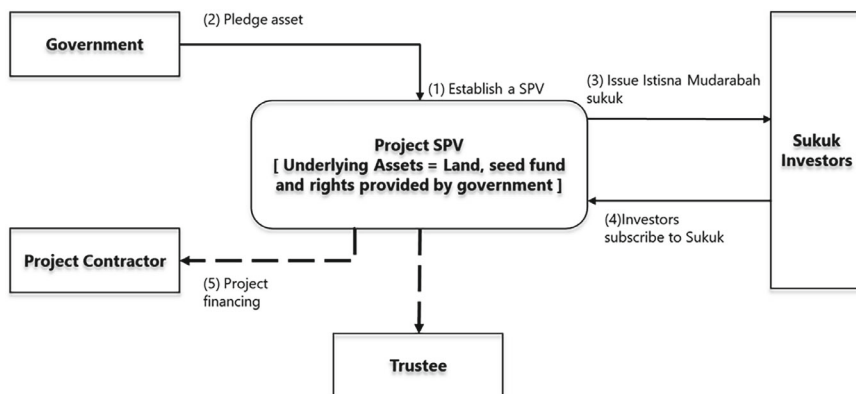


Fig. 1 The construction (*Istisna*) phase of the infrastructure project

Step 2: Government commits an asset: To support the issuance of sukuk, the government commits an asset (public property, infrastructure rights, or asset-generating assets, for example). The committed asset provides the underlying collateral, increasing investors' confidence and ensuring that the structure of sukuk does not depart from Shariah principles in the sense that it is backed by real, tangible assets. The asset commitment also improves the project's financial sustainability while facilitating avoidance of the problem of excessive leverage.

Step 3: Issuance of Sukuk and Raising Capital: The SPV sells sukuk (Islamic bonds) to investors, who invest capital in exchange for a share of the future revenue of the project. Unlike conventional bonds with fixed interest payments, sukuk holders get returns according to a pre-defined profit-sharing arrangement (Mudarabah contract). The funds raised from sukuk investors are utilized to finance the infrastructure project.

Step 4: Construction Phase under an Istisna Contract: The SPV enters an *Istisna* (building contract) with a project contractor. The agreement assures that the contractor constructs and designs the infrastructure asset within an approved budget and timeline. Payment stages are provided by the SPV as development milestones are attained for ensuring responsibility and adherence to Islamic finance provisions.

Step 5: Overseeing and Legal Provisions: For ensuring Shariah principles and regulatory compliance, one trustee is actually appointed to oversee the overall structure of sukuk. The trustee regulates fund disbursement, project implementation, and distribution of revenue, and safeguards sukuk holders' interests while ensuring transparency.

Once construction is completed, the subject infrastructure project starts generating revenue. In this stage, the project is transformed from *Istisna* stage (construction) to Mudarabah stage (profit-sharing), where revenues begin flowing back to investors (Fig. 2).

Revenue generated from the project is distributed to sukuk holders as per the pre-agreed profit-sharing mechanism. Unlike conventional bonds, sukuk holders do not earn fixed interest (*riba*) but instead receive returns linked to the actual project performance. According to the Mudarabah contract, profit resulting from the infrastructure asset is shared between the government (via the SPV) and sukuk holders based on a pre-agreed profit-sharing ratio. This removes interest-based obligations such that the profit is commensurate with the project's performance (Fig. 3).

At the end of the sukuk tenure (e.g., 10 years), the government/SPV repurchases the sukuk, or investors may convert their investment into equity ownership since it is structured as convertible sukuk. The government may choose to refinance the project through new sukuk issuance, ensuring continued infrastructure funding. Among the distinguishing characteristics of this sukuk structure is its convertibility, permitting investors to switch their investment to equity participation in the project after a number of years (e.g., 10 years). This optionality at the time of exit allows investors to switch from a debt-like sukuk structure to direct equity participation in the infrastructure asset. Alternatively, investors may choose to:

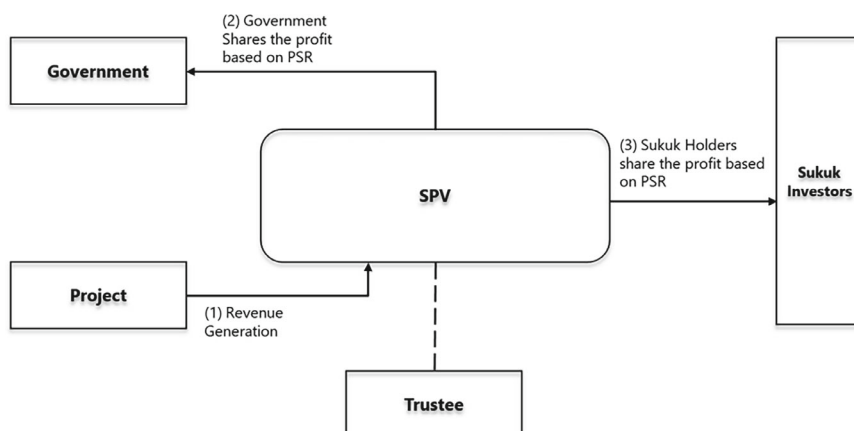


Fig. 2 The revenue generation phase of the infrastructure project

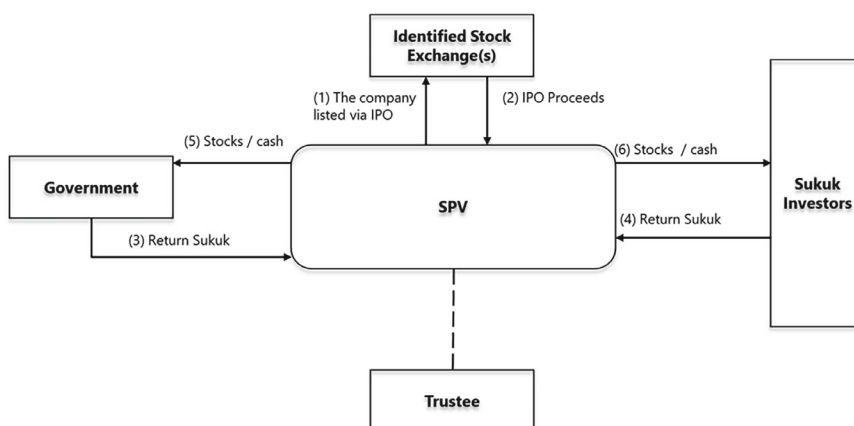


Fig. 3 The listing phase of the infrastructure project

Exit with their returns, or convert their sukuk into equity ownership in the project, ensuring long-term investment. This updated SPV-based Sukuk structure includes an identified stock exchange(s), indicating that the sukuk is structured for listing and secondary market trading. The key execution steps for this structure are as follows:

Step 1: Transition to a Publicly Listed Entity: Upon completing earlier funding rounds (e.g., sukuk issuance or private equity financing), the infrastructure project/company undergoes an Initial Public Offering (IPO). The IPO process transfers ownership from the government and early investors to a broader market base, allowing public investors (shareholders) to participate. The company is formally listed on a stock exchange, ensuring market liquidity and facilitating future capital raises.

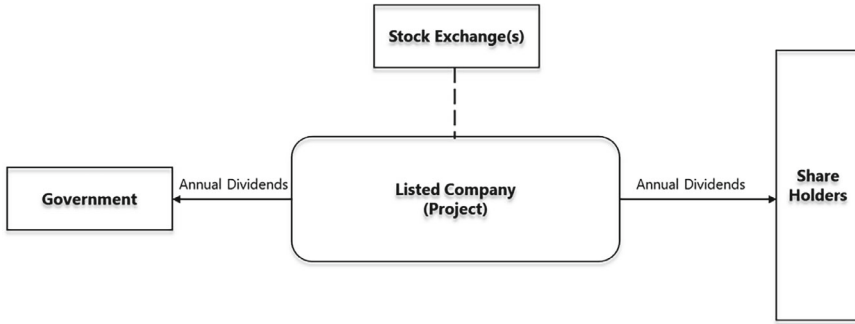


Fig. 4 The infrastructure project post listing

Step 2: Listing on the Stock Exchange: The listed company’s shares are traded on the stock exchange, increasing accessibility for institutional and retail investors. Regulatory authorities and Shariah-compliant listing standards (if applicable) ensure transparency and corporate governance. The company’s valuation fluctuates based on market performance, investor sentiment, and project profitability.

Figure 4 illustrates the infrastructure project after listing, representing the transition of an infrastructure project or government-backed entity into a publicly listed company. The model involves key stakeholders: the government, stock exchange(s), shareholders, and the listed company (project itself). The listed company generates revenue from the infrastructure project. Profits are distributed annually in the form of dividends to shareholders based on their shareholding percentages. The government retains partial ownership, ensuring that it also receives annual dividends as a stakeholder. Dividends are distributed proportionally between private shareholders and the government, providing both with long-term financial returns.

As a publicly traded entity, the company can raise additional funds through follow-on equity offerings or issuing Shariah-compliant financial instruments. The company reinvests profits into infrastructure expansion, modernization, or debt repayment, ensuring long-term sustainability. The model allows for private-sector participation in infrastructure financing, reducing the government’s direct fiscal burden.

4.4 Key Advantages of This Sukuk Model

Asset-Backed Financing: The proposed model ensures that funds are linked to a tangible infrastructure project, reducing speculative risks. Asset-backed financing ensures that the funds mobilized in sukuk are against physical infrastructure or real economy investments. Unlike conventional bonds, which are mere debt instruments with pre-specified interest payments, sukuk are equity in underlying assets,

generating returns based on the performance of the assets. Such a structure lessens speculative risks (*gharar*) and links finance with productive economic endeavors.

Risk Sharing: Risk-sharing is one of the fundamental principles of sukuk, which distinguishes it from conventional bonds, in which investors receive fixed interest regardless of whether the project succeeds or fails. Instead of being creditors, sukuk holders are essentially partners in the project and share both the risks and the rewards. Investors bear risks related to project performance rather than receiving fixed interest payments.

Shariah Compliance: The suggested model is Shariah compliant and avoids interest (*riba*), unconscionability (*gharar*), and speculation. For this reason, they are immensely appealing to ethical investors and Islamic financial institutions.

Government Debt Reduction: As opposed to conventional sovereign bonds that form part of a nation's debt, sukuk structures are not necessarily government debt. They are actually asset-based financing in which payments are made from the underlying asset rather than government obligations. Through this approach, the proposed model structure does not contribute to public debt liabilities.

Diversified Investor Base: Sukuk have a broad investor base, including Islamic financial institutions, ethical funds, pension funds, and sovereign wealth funds. This diversification provides liquidity and reduced reliance on traditional debt markets.

The *Istisna-Mudarabah* sukuk convertible provides a long-lasting, interest-free financing alternative for infrastructure projects. Through the combination of *Istisna* (construction financing) and *Mudarabah* (profit-sharing), this vehicle minimizes the application of debt, allocates risk among investors, and promotes financial sustainability. The convertibility aspect also boosts investor confidence with a desirable, long-term financing tool in line with economic growth and budgetary sustainability. This sukuk structure offers an innovative Shariah-compatible model of finance for funding large-scale infrastructure initiatives without escalating dependence on sovereign credit. The structured mechanism delivers clean management of money, management of risk, and long-term fiscal stability.

5 Conclusion

This study addresses new ways of financing infrastructure in developing economies, with a focus on Islamic finance tools like sukuk. It focuses on the shortcomings of traditional debt financing, such as macroeconomic volatility, exposure to foreign exchange risk, and fiscal crisis due to over-leverage (Panizza 2020; Reinhart and Rogoff 2010).

Through Shariah-compliant financial instruments—such as *Istisna-Mudarabah* sukuk and listed infrastructure institutions—governments can reduce reliance on foreign borrowings, encourage greater investor participation, and facilitate risk-sharing (Ismath Bacha and Mirakhor 2018; Smaoui and Khawaja 2017). Such

financing mechanisms not only align with Islamic finance principles but also represent a sustainable means of infrastructure development that encourages long-term economic stability.

Shifting from debt-based mechanisms to equity and risk-sharing instruments enhances fiscal sustainability and renders public-private partnerships in infrastructure more effective. In addition, the participation of capital markets, sovereign wealth funds, and institutional investors in infrastructure financing reduces the burden on government balance sheets and renders financial stability deeper (Ehlers 2014; Ahmed 2022a, b).

5.1 Implications of the Study

The study's findings have significant theoretical, policy, and practical implications for the financing of infrastructure:

- **Contributions to Theory:** the paper makes contributions to Islamic finance and infrastructure investment literature by demonstrating that sukuk is a promising substitute for conventional bonds (Jobst et al. 2008; Ahmed 2022a, b). It makes contributions to capital market development theory by including Islamic financial innovations and stock exchange instruments in the financing of public infrastructure (Engel et al. 2014). It affirms the equity-based and risk-sharing financing necessities for infrastructure development in line with Shariah-compliant financial principles (Obaidullah and Khan 2020).
- **Policy Implications:** our model can be thought as diversification of the source of finance—Governments should transcend debt finance and employ Islamic financial instruments to ensure long-term sustainability of infrastructure. It encourages stock market listings of infrastructure projects—Policymakers should promote stock exchange listings to access market-led capital while minimizing fiscal burdens. The regulatory bodies need to strengthen Shariah supervision in sukuk markets and publicly traded infrastructure ownership to improve investor confidence (Smaoui and Khawaja 2017).
- **Practical Implications:** Institutional investors and sovereign wealth funds need to invest more into Shariah-compliant infrastructure investment, improving financial inclusivity. Governments need to introduce specialized SPVs for issuing sukuk to improve the degree of transparency and governance of public-private partnerships (PPPs) (Ehlers 2014). Banks must design hybrid sukuk structures (e.g., convertible *Istisna-Mudarabah* sukuk) in order to attract a broad base of investors, such as ethical investors and conventional investors.

5.2 Limitations of the Study

While this study makes significant contributions to Islamic finance and infrastructure finance, there are limitations that must be taken into consideration.

The existing literature is reliant primarily on secondary data and theoretical models with minimal empirical testing. Case studies and quantitative analysis of sukuk performance in infrastructural ventures must be incorporated in future studies (Ahmed 2022a, b). There is a lack of historical data on Islamic infrastructure finance for emerging markets and hence making cross-country comparisons challenging (Panizza 2020). Furthermore, the viability of infrastructure financing through listed stocks on the stock exchange hinges on the development of capital markets and investors' appetite, which vary across regions. Additionally, the study is not exhaustive in addressing macroeconomic shocks such as global financial crises, geopolitical tensions, and commodity price volatilities that might affect the sustainability of sukuk issuance and long-term financing for infrastructure projects. Finally, comparative research in the future can identify the long-term sustainability of infrastructure project financing undertaken using sukuk in different regime economic changes.

Since issues of sovereign debt continue to plague the world, emerging countries must locate other non-debt financing mechanisms that ensure long-term financial stability and sustainability. Islamic financial products, such as convertible *Istisna-Mudarabah* Sukuk or other variants, provide a solution for governments that want to diversify infrastructure finance. Through equity-based and risk-sharing approaches, policymakers can reduce the fiscal burden, raise diversified investment flows, and set a more secure financial course.

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