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Türkiye's Global Standing in the Issuance of Green Sukuk for the Advancement of Islamic Green Finance

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Abstract

This study offers a comprehensive examination of the green sukuk concept and assesses Türkiye's role and potential within the Islamic green finance sector. Green sukuk, an instrument aligned with Islamic finance principles, is utilized to finance projects aimed at achieving environmental sustainability objectives. This financial instrument has emerged as a critical tool in addressing global environmental policy requirements and has secured a significant position within the Islamic finance domain. The literature review underscores the increasing prominence of green sukuk in global financial markets and provides an extensive discussion of its economic and environmental impacts. Although Türkiye's engagement with the green sukuk market is still in its nascent stages, it is recognized for its considerable growth potential. The study indicates that despite the relatively few green sukuk issuances in Türkiye, there is a rising global interest and a discernible trend of market expansion in this area. The findings advocate for the enhancement of green sukuk as an effective instrument for financing green projects within Türkiye. Furthermore, the study explores how green sukuk issuances can contribute to Türkiye's economic development objectives and environmental sustainability strategies. In conclusion, this study serves as a guide for identifying the strategic measures necessary for Türkiye to establish itself as a competitive player in the global green sukuk market and makes a significant contribution to the existing academic literature on this topic.

Key words: Islamic Finance, Green Sukuk, Green Finance

JEL Code: F65, B17, P33

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1. Introduction

As of 2024, it is estimated that the number of individuals identifying as Muslim has surpassed 2 billion. With the global population standing at 8,125,807,609 (https://timesprayer.com/en/muslim-population/), Muslims represent over 25% of the world's population, establishing Islam as the second largest religion worldwide. Furthermore, the growth rate of the Muslim population is considerably higher compared to other religious groups. The Muslim demographic, which exhibits a broad distribution, is primarily concentrated in the Asia-Pacific region. Table 1 provides a summary of the countries with the largest Muslim populations.

Table 1. Countries with the Largest Muslim Populations (2024)

Country	Muslim Population	Percentage of Total Population
Indonesia	231,506,000	84.64
Pakistan	212,545,000	96.27
India	200,000,000	15
Bangladesh	148,630,000	88.87
Nigeria	98,558,000	53
Egypt	94,776,000	90.87
Iran	82,000,000	96.26
Türkiye	74,915,000	88.83
Algeria	34,890,000	76.82
Morocco	33,240,000	89.57
Malaysia	32,000,000	64.5

Source: Table compiled by the authors.

As depicted in Table 1, Indonesia possesses the largest Muslim population, while Pakistan is notable for having the highest proportion of Muslims relative to its total population. Despite having a lower percentage of Muslims in its overall population, India is home to approximately 200 million Muslims. An analysis of these nations indicates that Indonesia, India, and Türkiye are categorized as developing countries and are perceived as having the potential to economically converge with developed nations in the future. The rapid growth rates of these countries are a key factor in their prominence. In classical economic theory, growth is traditionally measured by the percentage increase in real GDP, and countries are classified as developed or developing based on their GDP figures. To maintain and sustain growth, it is essential to enhance both production levels and market share. However, this often results in the inefficient utilization of production resources. Many economists argue that reliance on conventional energy sources in production leads to resource depletion, environmental degradation due to waste, and exacerbates climate change and ecological imbalances through increased global greenhouse gas emissions, thereby threatening sustainable development (Ewing et

al., 2010; Rashid et al., 2018; Solarin & Bello, 2018). Given that energy production through fossil fuel consumption leads to substantial carbon emissions, monitoring and controlling these emissions have become imperative. Countries have started tracking their carbon emissions and their share of global carbon emissions to manage and mitigate their carbon footprints. Additionally, carbon emission trading has emerged, enabling countries with lower emissions to sell excess quotas to those with higher emissions. This mechanism not only enhances the standing of countries adopting green economy principles but also provides them with revenue-generating opportunities. The countries listed in Table 1 contribute significantly to carbon emissions due to their large populations and the high energy consumption associated with their production activities.

Table 2. Carbon Emissions of Muslim-majority Countries

Rank	Country	CO2 Emissions (tons)	Annual Change (%)	Population	Per Capita CO2 Emissions (tons)	Global Share (%)
3	India	2,533,638,100	4.71	1,338,636,340	1.89	7.09
8	Iran	642,560,030	2.22	83,306,231	7.71	1.80
10	Indonesia	530,035,650	6.41	261,850,182	2.02	1.48
11	Saudi Arabia	517,079,407	0.92	33,416,270	15.47	1.45
16	Türkiye	368,122,740	5.25	81,019,394	4.54	1.03
23	Malaysia	266,251,542	6.54	31,526,418	8.45	0.74
27	Egypt	219,377,350	4.72	99,784,030	2.20	0.61
31	Pakistan	178,013,820	9.13	213,524,840	0.83	0.50
35	Algeria	156,220,560	0.17	40,339,329	3.87	0.44
43	Nigeria	82,634,214	0.70	188,666,931	0.44	0.23
48	Bangladesh	74,476,230	4.50	159,784,568	0.47	0.21
54	Morocco	57,694,464	0.54	35,107,264	1.64	0.16

Source: https://www.worldometers.info/co2-emissions/co2-emissions-by-country

As presented in Table 2, twelve Muslim-majority countries collectively contribute 15.74% to global carbon emissions. Among the top ten highest carbon-emitting nations, India is ranked 3rd, Iran is 8th, and Indonesia is 10th. Türkiye, with a carbon emission share of 1.03%, holds the 16th position. This ranking correlates with Türkiye's 17th place among G20 countries in terms of carbon emissions. India and Indonesia also exhibit relatively stable positions within this context. However, despite its relatively low economic growth, Iran ranks 8th in carbon emissions with a 1.80% share. Additionally, Saudi Arabia has the highest per capita carbon emissions at 15.47 tons. Given these countries' substantial petroleum resources, the significant carbon emissions resulting from fossil fuel consumption are evident. Moreover, an analysis of annual changes in carbon emissions indicates that no country has reduced its emissions. Notably, Pakistan (9.13%), Indonesia (6.41%), Türkiye (5.25%), and India (4.71%) have all

substantially increased their carbon emissions compared to the previous year. This scenario underscores the significance of using Green Growth metrics instead of GDP figures to assess a country's progress in achieving sustainability goals such as the Sustainable Development Goals, the Paris Agreement, and the Aichi Biodiversity Targets. Green Growth metrics are crucial for evaluating efficient and sustainable resource use, the preservation of natural capital, green economic opportunities, and social inclusion. However, when considering green growth metrics, the performance of Muslim-majority countries is particularly concerning. For example, India, despite being one of the largest economies among G20 countries (https://www.investopedia.com/insights/worlds-top-economies/), is ranked 18th in green growth metrics (https://ggindex-simtool.gggi.org/). Türkiye does not report its green growth metrics. Nonetheless, within the framework of the European Green Deal, many countries have set targets for zero carbon emissions by 2050 and have initiated relevant investments.

Countries investing in various sectors such as environmental protection, biodiversity conservation, pollution reduction, waste management, water management, and renewable energy sources face a critical challenge: securing adequate financing for these initiatives. While these countries already encounter difficulties in sourcing funds for economic investments due to insufficient savings, they are particularly constrained when it comes to allocating resources for high-cost environmental investments. Although investments in renewable energy, one of the most favored environmental investment types—can reduce a country's energy dependence over the long term, their extended payback periods have prevented them from achieving the desired outcomes in the short term. Despite receiving support from organizations such as the European Union and the World Bank, countries struggling with high capital costs have been unable to resolve the issue of inadequate financing. In response, financial institutions have developed new financial instruments to support environmentally sustainable investments. These instruments include green bonds, green venture capital, green loans, green insurance, green funds, and green securitization. Among these, green bonds are the most widely used. The highest issuance of green bonds has been observed in European countries, with Germany leading at $60.77 billion, followed by France at $20.56 billion, the United Kingdom at $18.28 billion, and Italy at $14.91 billion. In the Asia-Pacific region, China has issued nearly the entire regional total, amounting to $76.25 billion. The United States, with $50.90 billion in green bond issuance, stands out as the leading issuer in North America (S&P Global, 2023). In the context of Islamic finance, the prohibition of interest (riba) and the requirement for investments to be limited to Sharia-compliant activities have necessitated the adaptation of green bonds into a new financial instrument that adheres to Islamic principles. This adaptation has resulted in the emergence of green sukuk.

Green sukuk represent a critical financial instrument, facilitating investments by the predominantly Muslim population in projects that align with both Islamic principles and environmental sustainability. Despite their significance, green sukuk have not achieved substantial demand, primarily due to insufficient

promotion and concerns regarding the adherence of issuing entities to both Islamic and environmental standards. This study aims to address these issues by initially elucidating the concept of green sukuk and their associated oversight mechanisms. Following a comprehensive review of the literature on green sukuk, the study will analyze investments made through green sukuk issuances in Türkiye. By providing a quantitative assessment based on empirical data, this research seeks to evaluate whether sukuk investments meet their intended objectives, thereby contributing to the academic discourse on green sukuk.

2. The Concept and Scope of Green Sukuk

While green finance is often synonymous with climate finance, its scope extends well beyond this narrow focus. Green finance addresses a broad array of environmental investments, including industrial pollution control, water sanitation, biodiversity preservation, and the reduction of greenhouse gas emissions (Abubakar & Handayani, 2019, p. 985). Considering that the primary objective of Islamic finance is to achieve long-term benefits and engage in activities that provide continuous value to society (Alam et al., 2023, p. 62), it is essential to integrate green finance within the framework of Islamic finance. According to the Asian Development Bank, the Islamic community requires infrastructure investments amounting to $210 billion annually from 2016 to 2030 to achieve regional development, sustain growth, alleviate poverty, and address climate change. Of this amount, $26 billion is earmarked for infrastructure projects aimed at reducing carbon emissions and enhancing regional resilience to climate change (Abdullah & Keshminder, 2022, p. 986). This allocation is directly aligned with the impact and objectives of green financing instruments.

As previously noted, green bonds are the most widely utilized instruments within green finance. Unlike traditional bonds, which involve a debtor-creditor relationship wherein the issuer commits to repaying the principal along with interest to the bondholder at maturity, sukuk operate differently. Sukuk do not establish a lender-borrower relationship based on a credit agreement. Instead, sukuk are based on real economic activities aimed at generating profit (Rahman et al., 2024, p. 819). Consequently, sukuk are Islamic financial instruments that conform to the principles of Islamic law, specifically the prohibitions of riba (interest), gharar (excessive uncertainty), and maysir (gambling). The term "sukuk" is the plural form of "sakk," which means "legal document, bond, or check" in Arabic. While it represents the Arabic term for a financial certificate, sukuk can also be viewed as the Islamic equivalent of traditional bonds (Rojman & Azmi, 2021, p. 4; Duku & Tsanyawa, 2023, p. 47). Sukuk confers partial ownership in assets, or the returns derived from those assets. Investors who acquire sukuk receive a certificate from the issuer as proof of ownership and are entitled to periodic profit payments based on the invested principal amount. At the end of the term, sukuk holders receive the return of their principal investment (Abdullah & Nayan, 2020, p. 15).

Similar to green bonds, green sukuk are instrumental in financing assets or projects essential for fostering a low-carbon economy and achieving the 2°C global

warming target established by the Paris Agreement (Abdullah & Keshminder, 2022, p. 988). Consequently, the scope of green sukuk is extensive. They can be utilized not only for financing the construction of green facilities or infrastructure but also for refinancing existing construction or project debt, or for funding payments related to green subsidies provided by the government. According to the International Climate Bond Standards, suitable assets for green sukuk include solar parks, bioenergy plants, wind energy projects, clean water infrastructure, hydroelectric projects, agricultural irrigation systems, energy efficiency measures, low-carbon buildings, low-carbon land use, geothermal energy projects, maritime environmental initiatives, electric vehicles, and associated infrastructure (Abdullah & Nayan, 2020, p. 17). In this regard, green sukuk represent a crucial investment financing mechanism for the Islamic community.

Green sukuk are considered Sharia-compliant bonds, where all revenue is allocated to financing or refinancing projects that support climate change mitigation, adaptation, and biodiversity conservation. As a result, two key criteria govern the issuance of green sukuk: the projects must comply with Sharia principles and sustainable development goals, incorporating environmental, social, and governance (green infrastructure) aspects (Abubakar & Handayani, 2019, p. 984). Furthermore, green sukuk play a crucial role in advancing financial inclusion and fulfilling social responsibility, particularly by supporting Islamic countries in achieving their Sustainable Development Goals (Araminta & Timur, 2022, p. 251).

Compared to conventional sukuk, the issuance of green sukuk involves a more complex process due to the elevated requirements for governance and disclosure. Issuers must undergo a "greenness" assessment conducted by an external opinion provider. This process necessitates comprehensive disclosure of the issuer's objectives, strategies, policies, and processes that substantiate the green designation of the project. Prior to granting a green certification, rigorous activities such as social impact assessments, environmental evaluations, reporting, and inquiries must be completed (Keshminder et al., 2022, p. 78). Despite the challenges, this rigorous process offers a significant advantage, as green sukuk are well-positioned to attract both environmentally conscious investors and those seeking Sharia-compliant financial instruments (Abdullah & Keshminder, 2022, p. 986; Araminta & Timur, 2022, p. 251). While Malaysia, Indonesia, the UAE, and to a lesser extent Türkiye dominate the conventional sukuk market, Türkiye remains relatively underdeveloped in the green sukuk sector compared to other nations. Malaysia (2017), Indonesia (2018), and the UAE (2019) have adopted and implemented green sukuk extensively. In the Islamic finance sector, Malaysia plays a pivotal role in the continuous advancement of innovative ideas, policies, and techniques, as well as in the ongoing education of key stakeholders. According to the Capital Markets Malaysia Report, Malaysia has successfully developed and issued sixteen sustainable and responsible investment sukuk (Rahman et al., 2024, p. 827). Indonesia achieved a significant milestone in March 2018 by issuing a $1.25 billion green sukuk, marking the world's first government-issued sukuk of this type (Abubakar & Handayani, 2019, p. 983; Ramadhan, 2020, p. 96). The

Islamic Development Bank is notable as the first multilateral development bank to issue green sukuk (Keshminder et al., 2022, p. 77). An examination of these green sukuk reveals that many are hybrid sukuk, incorporating multiple sukuk types. Thus, it is beneficial to briefly describe the various sukuk types, including ijarah, murabaha, and wakalah.

The green sukuk issued by Tadau Energy is structured with maturities ranging from two to sixteen years and is based on the principles of istisna (contract for production) and ijarah (leasing). This hybrid sukuk, known as ijarah mawsufah fi al-zimmah, involves a forward leasing contract for a project under construction, covering the sale of either completed or yet-to-be-constructed underlying assets for future delivery. In this arrangement, the sukuk issuer makes financial payments during the construction phase, while investors provide payments over a specified period until the project is completed (Abdullah & Nayan, 2022, p. 21). Although the ijarah sukuk was the first of its kind to be issued globally, it has faced considerable criticism from numerous Islamic scholars due to its provision of guaranteed returns (Al-Amine, 2008, p. 4). Despite these criticisms, it remains a widely preferred financial instrument.

The Sarawak Green Hydro Sukuk was issued using a murabaha sukuk contract. The term "murabaha" is derived from the Arabic word "ribh," which means profit. Technically, murabaha sukuk represents a sales and purchase contract characterized by a fixed cost and profit margin. It is a type of exchange agreement. There are two methods for generating profit under a murabaha contract. The first method is Bay Al-Musawamah, where the price of the goods is stated, and the Musawamah (price negotiation) approach is used without disclosing the seller's cost. The second method is Bay Al-Amanah, in which the buyer, relying on the seller's honest disclosure of the actual cost, offers a fair price based on that cost. The majority of Islamic scholars recognize murabaha as a legitimate Islamic trust contract, with its acceptance grounded in the Quranic verses, Hadith, customary practices, and the overarching principles of Shariah (Saad et al., 2016, p. 1).

Sukuk wakalah involves the issuance of sukuk to finance projects or commercial activities that are managed based on wakalah contracts. In this structure, specific agents (representatives) are appointed to oversee the management of these operations on behalf of the sukuk holders. Essentially, sukuk wakalah involves investment funds entrusted by investors to representatives, who manage these funds either in various types of investments or within a single investment type (Farhand et al., 2020, p. 56). For instance, BEWG (M), a company specializing in water purification engineering, wastewater treatment engineering, water treatment, sewage treatment, and water recycling, issued green sukuk wakalah amounting to 400 million RM with an 8-year tenure to facilitate this project (Rahim & Mohamad, 2018, p. 137).

In a musharaka contract, two or more parties agree to invest in a partnership, contributing capital either in cash or in kind, and share profits and losses proportionally to their respective contributions. In a mudaraba contract, the investor

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or capital provider (rabbul mal) supplies the capital, while the manager (mudarib) offers business and management expertise in exchange for a portion of the profits, with the investor solely bearing any losses.

3. Literature Review

An examination of the literature indicates that a significant portion of research on green sukuk is concentrated on Indonesia and Malaysia, both of which are prominent global leaders in sukuk issuance. This body of research can be classified into three primary categories: studies that analyze green sukuk from the perspective of Maqasid al-Shariah, studies that investigate the potential and challenges associated with green sukuk issuance, and studies that explore the role of green sukuk in advancing the Sustainable Development Goals (SDGs). In the first category, Rohmah et al. (2020) emphasize the importance of environmental protection as highlighted in various verses of Surah Al-Baqarah (2:11, 2:22, 2:27, 2:60, 2:251). They argue that environmental conservation is a key aspect of implementing Islamic teachings for Muslims and assert that green sukuk, which integrate both Islamic and environmental principles, represent a significant tool in this context. Similarly, Nehal (2021) underscores the importance of green sukuk as a Sharia-compliant financing mechanism for environmental assets and renewable energy investments, particularly for the development of sustainable energy projects in Pakistan. Fitrah and Soemitra (2022) further support these perspectives by highlighting that Indonesia faces numerous environmental challenges, including pandemics and the underutilization of its hydroelectric potential. They argue that the funds raised through green sukuk could play a crucial role in addressing these issues.

Studies that focus on the potential and challenges of green sukuk issuance are categorized as the second type. Abdullah and Keshminder (2022) found through interviews with green sukuk issuers that companies opt for green sukuk issuance primarily to reduce financing costs, enhance their market reputation, and attract a broader investor base for project financing. Notably, issuers perceive green sukuk as an opportunity to broaden their investor base by integrating green investment with Islamic finance principles. Liu and Lai (2021) demonstrated in their study conducted in Malaysia that while green sukuk contributes to the expansion of green finance through the integration of various financial ecologies, there remain concerns regarding whether the proceeds are effectively allocated to green investments, due to shortcomings in the auditing mechanisms. Keshminder et al. (2022), in their multiple case studies conducted in Malaysia, identified that these concerns are largely attributable to inadequate green taxonomy, the challenges and costs associated with identifying green assets, the lack of compelling benefits, and the exposure to higher risk profiles. Supporting this view, Fitrah and Soemitra (2022) highlighted that the absence of precise definitions for "greenness" and established standards in green sukuk raises the risk of violating the principle of Gharar (uncertainty). To address these issues, Araminta and Timur (2022) recommend that governments support green sukuk through various strategic

policies, including the development of a more robust legal framework, provision of tax incentives, and enhancement of information and literacy.

The third category of studies primarily examines the effectiveness of green sukuk in achieving the Sustainable Development Goals (SDGs). For example, Rozman and Azmi (2022) highlight that Malaysia's environmental challenges extend beyond issues related to clean energy and green buildings. They point out that traffic congestion is a significant source of carbon emissions and that there is an urgent need for clean water resources and flood mitigation measures. However, private companies' perception that green sukuk can be utilized exclusively for renewable energy projects has resulted in a relatively low uptake of sukuk issuance. Abdullah and Nayan (2020) sought to clarify the application areas of green sukuk by categorizing the types of contracts used in green sukuk issuance and the categories of development projects eligible for financing through green sukuk. They assert that the benefits of green sukuk extend beyond investors to the general public, ultimately contributing to environmental preservation and benefiting future generations. Rahman et al. (2024) introduced a novel application for green sukuk by proposing forest sukuk as a means to support forest conservation initiatives.

The literature predominantly centers on Malaysia and Indonesia, with a focus largely theoretical in nature. Although a limited number of studies incorporate interviews with issuers, there is a notable absence of financial analyses of green sukuk issuances due to insufficient data. This study addresses this gap by providing a detailed examination of specific bond issuances and aims to raise awareness of green sukuk in Türkiye, a country with a significant Muslim population. It contributes to the discourse by potentially facilitating the involvement of Islamic investors in investments crucial for Türkiye to achieve its 2050 carbon-neutral target.

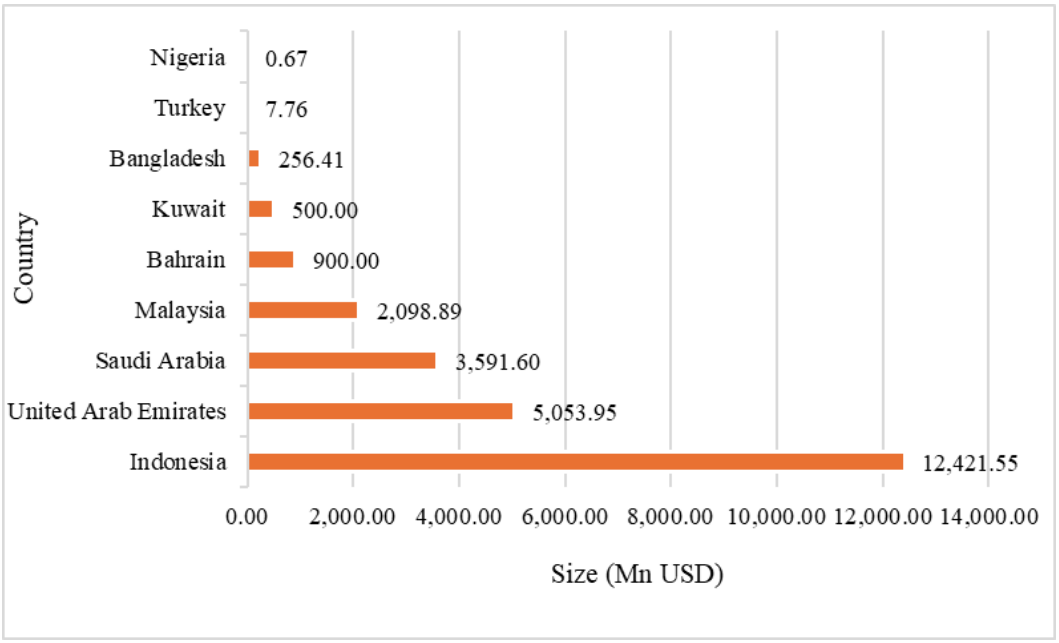
4. An Assessment of Green Sukuk Issuances

Green Sukuk are Islamic financial instruments designed to finance environmental sustainability projects. In this study, data on Green Sukuk issuances, including those from Türkiye, have been sourced from the Datastream platform. Consequently, the dataset encompasses all countries worldwide that issue Green Sukuk. The temporal scope of this study includes data on Green Sukuk issuances from January 1, 2009, to August 1, 2024. These data are presented graphically and discussed sequentially. This analysis provides a comprehensive global assessment of Green Sukuk issuances and highlights Türkiye's position within the global Green Sukuk market.

During the data collection process, the extensive financial and economic indicators provided by DataStream were taken into consideration. However, the data set has certain limitations. Firstly, due to the period limitations defining the scope of the study, the data covers a specific time span (2009-2024). This may render the study's findings context-specific, potentially affecting their validity and generalizability to a particular period. Secondly, as the data set consists of

secondary data, potential updates or verification errors in primary sources may not have been accurately reflected by DataStream. These limitations should be considered when interpreting the study's results.

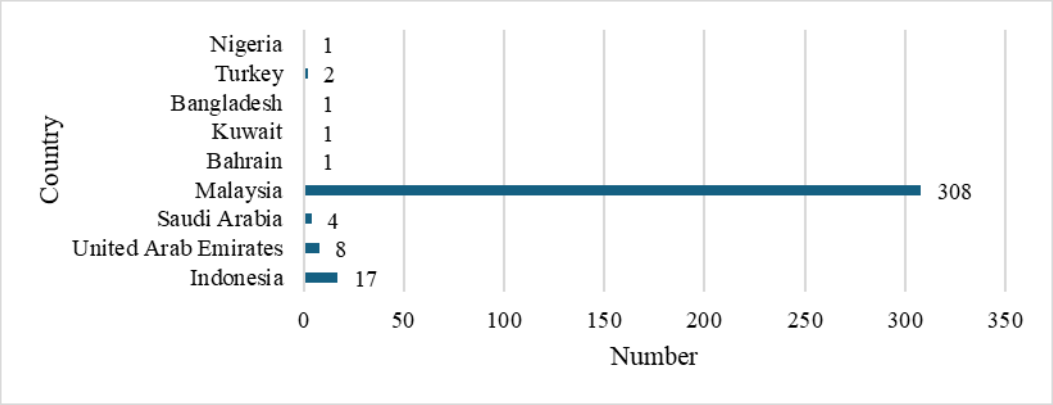
Graph 1: Green Sukuk Issuance Amounts by Country



Source: Own elaboration based on DataStream

Graph 1 illustrates the distribution of Green Sukuk issuance amounts across various countries, expressed in US dollars. The data indicates that Indonesia is the leading issuer, with a substantial total issuance of $12,421.55 million. Following Indonesia, the United Arab Emirates and Saudi Arabia have issued $5,053.95 million and $3,591.60 million, respectively. Malaysia ranks fourth with an issuance amount of $2,098.89 million, while Bahrain and Kuwait have issued $900.00 million and $500.00 million, respectively. Bangladesh is positioned lower with an issuance amount of $256.41 million, whereas Türkiye and Nigeria have the smallest issuance amounts, at $7.76 million and $0.67 million, respectively. These data underscore the considerable variation in Green Sukuk issuance among countries, with Indonesia emerging as a leading player in this sector. Although Türkiye is not at the lowest position, it is evident that the country is still in the early stages of Green Sukuk issuance compared to Indonesia. This graph clearly highlights Indonesia's dominant role in the Green Sukuk market and its leading position in this area. Indonesia's high issuance volume reflects the country's significant commitment to green finance and its advanced development in this sector.

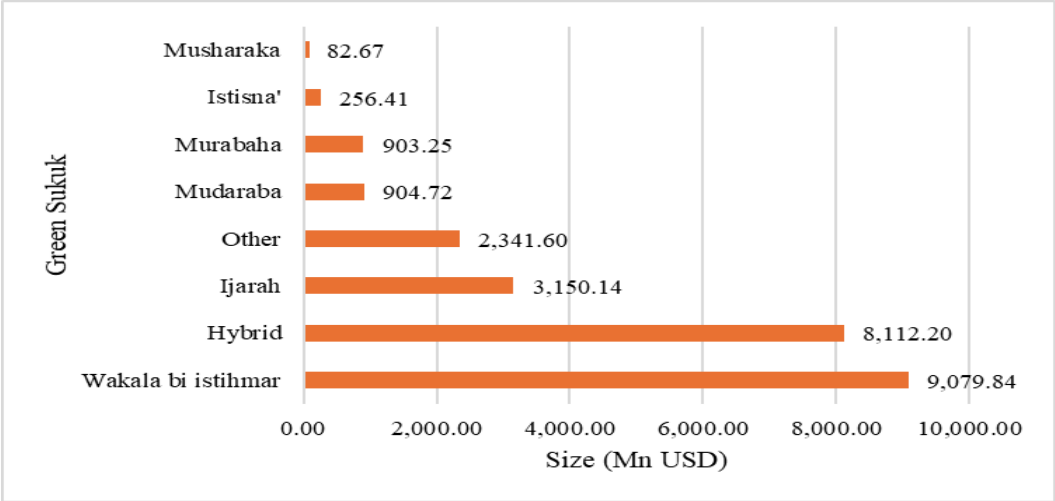
Graph 2. Number of Green Sukuk Issuances by Country



Source: Own elaboration based on DataStream

Graph 2 illustrates the number of Green Sukuk issuances by country. According to the data, Malaysia is the leading country with a substantial margin, having conducted 308 issuances. Following Malaysia, Indonesia has carried out 17 issuances. However, as depicted in Graph 1, Indonesia surpasses Malaysia in terms of issuance value by a significant margin, indicating that while Indonesia has fewer issuances, these are of higher value. The United Arab Emirates ranks third with 8 issuances, and Saudi Arabia holds the fourth position with 4 issuances. Other countries have conducted significantly fewer Green Sukuk issuances: Türkiye has issued 2, while Nigeria, Bangladesh, Kuwait, and Bahrain have each issued only 1. This suggests that the number of Green Sukuk issuances is relatively low in these countries, with Nigeria and Türkiye, in particular, being in the early stages or engaged in more limited activities in this domain.

Graph 3. Types of Issued Green Sukuk



Source: Own elaboration based on DataStream

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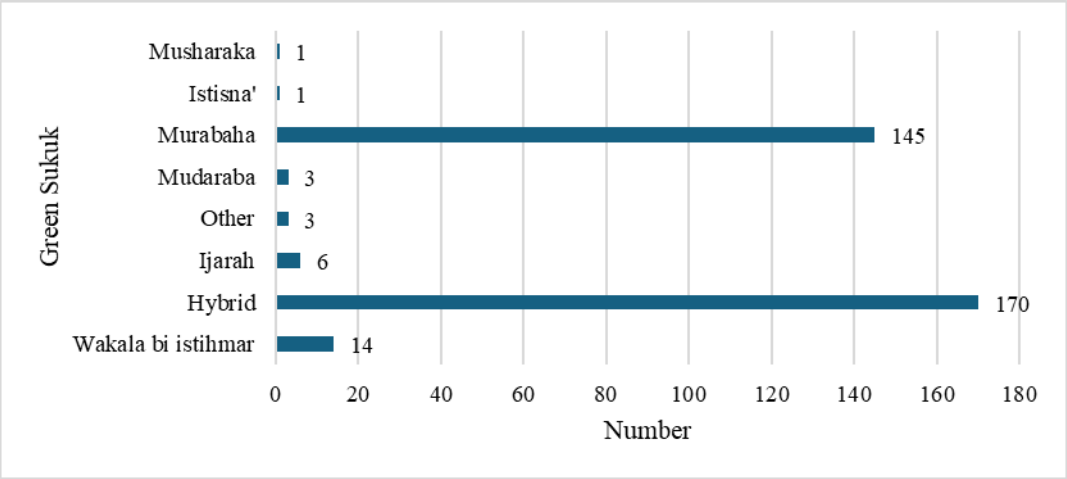
Graph 3 presents the issuance amounts of various Green Sukuk types in U.S. dollars. According to the data, the largest issuance amount is associated with the Wakala bi Istithmar type, totaling $9,079.84 million. The Hybrid type follows, with an issuance amount of $8,112.20 million, securing the second position. Ijarah sukuk are ranked third, with a total issuance of $3,150.14 million. Among the lesser issuance amounts, the other category amounts to $2,341.60 million, Mudaraba $904.72 million, Murabaha $903.25 million, Istisna' $256.41 million, and Musharaka $82.67 million. This data indicates that Wakala bi Istithmar and Hybrid types are the most prevalent structuring methods in the Green Sukuk market. The substantial issuance amounts of these sukuk types reflect investor preference and confidence in these structures. Conversely, other sukuk types are comparatively less favored or utilized for more limited projects.

Graph 4. Number of Issued Green Sukuk



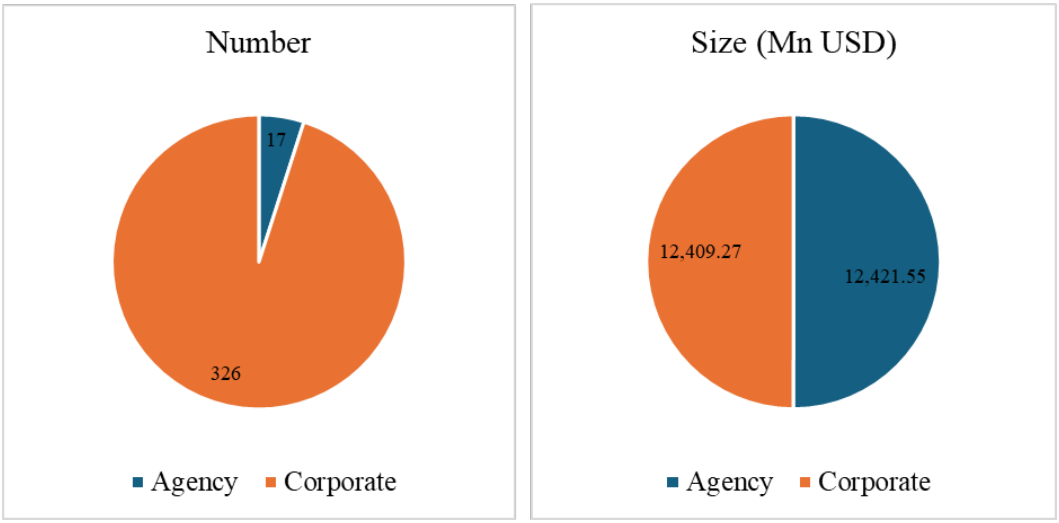
Source: Own elaboration based on DataStream

Graph 4 depicts the types of sukuk and their respective quantities, illustrating the prevalence of various structures within the green sukuk market. The graph highlights that Hybrid (170 issuances) and Murabaha (145 issuances) sukuk are the most common types. This indicates that hybrid sukuk structures and Murabaha transactions are the predominant instruments utilized in the green sukuk market. In contrast, sukuk based on the Wakala bi Istithmar structure are less prevalent, with only 14 issuances. Nevertheless, as shown in Graph 3, this sukuk type commands the largest issuance volume.

The sukuk types Ijarah (6 issuances), Mudaraba (3 issuances), and Other (3 issuances) are also represented in the graph, although their usage is comparatively limited. Sukuk based on Musharaka and Istisna' structures are the least frequently issued, with only 1 issuance each, and these types also exhibit lower issuance volumes relative to others.

This distribution indicates a notable preference among green sukuk issuers for the Hybrid and Murabaha structures. The reduced usage of other sukuk types may be attributed to specific constraints or a lower degree of suitability for certain project requirements. Consequently, the graph provides a clear indication of the more prevalent structures in the green sukuk market and reflects the preferences of investors and issuers regarding different sukuk types.

Graph 5. Issuer Type



Source: Own elaboration based on DataStream

Graph 5 provides an analysis of the distribution of green sukuk in terms of both quantity and size. The graph on the left illustrates the numerical distribution of green sukuk, revealing a predominance of corporate issuances. Out of a total of 343 green sukuk issued, 326 are attributed to corporate entities, while agencies account for only 17 issuances. This distribution indicates that corporations are substantially more active in the green sukuk market compared to agencies.

In contrast, the graph on the right shows the distribution of green sukuk by size. It demonstrates that the issuance volumes for both corporate and agency categories are nearly equivalent, each approximately USD 12.4 billion. This suggests that despite the fewer number of sukuk issued by agencies, these issuances are of considerable value. In other words, while agencies issue fewer green sukuk, the total value of these issuances is comparable to that of corporate issuances. Therefore, while corporations dominate in terms of the number of green sukuk issued, agencies balance this by issuing fewer sukuk of larger value.

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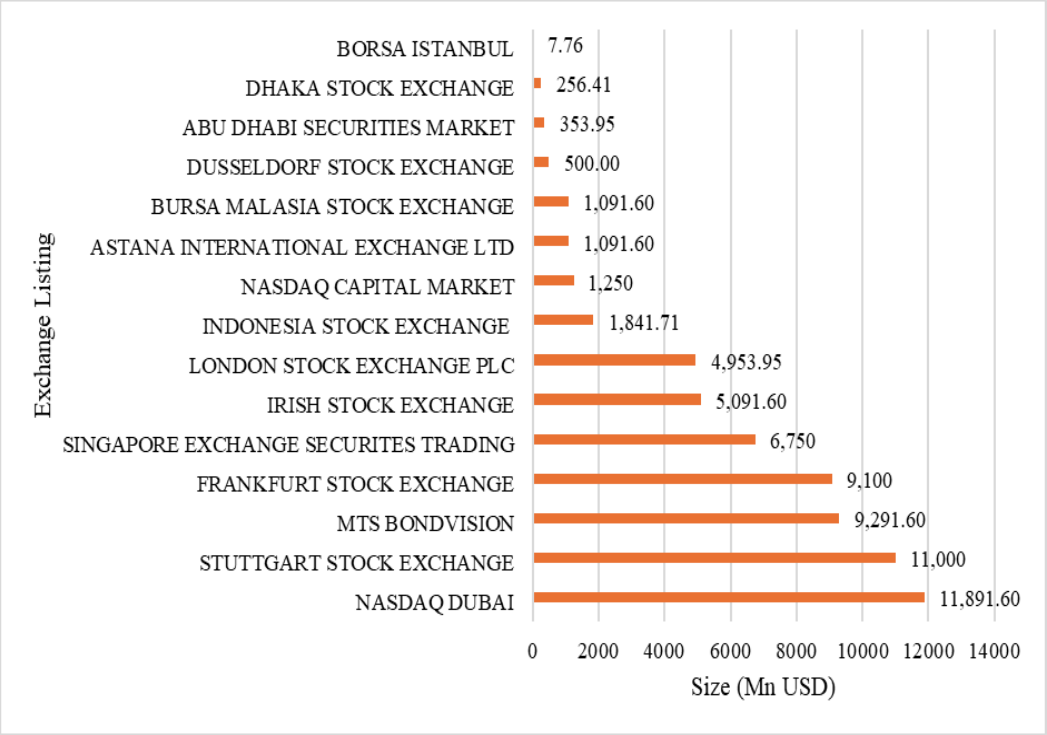
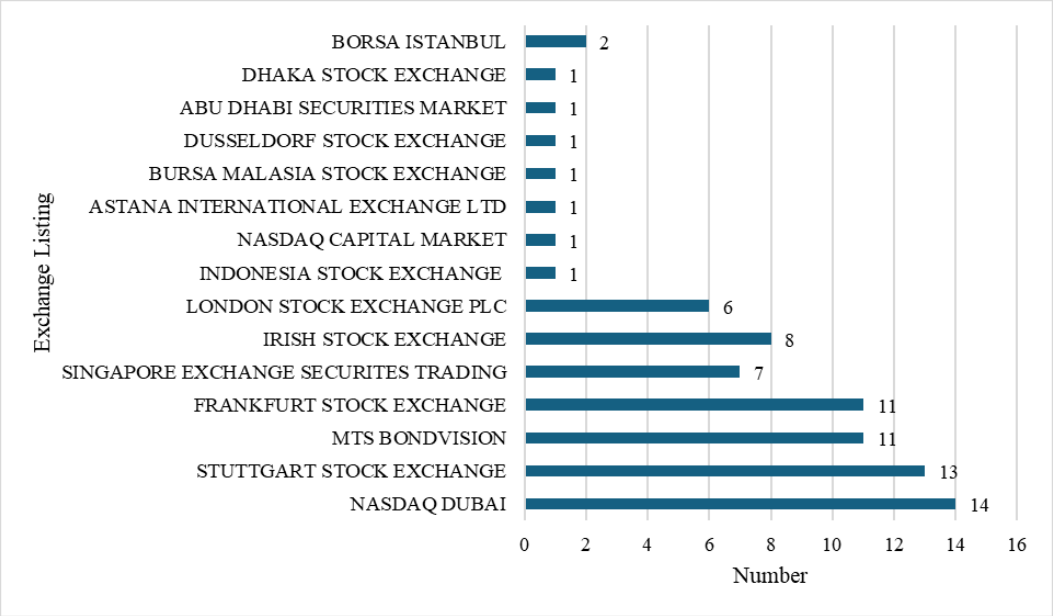
Graph 6. Exchange Listing Size



Source: Own elaboration based on DataStream.

Graph 6 presents a comparison of the trading volumes of green sukuk across various exchanges, expressed in million USD. The vertical axis enumerates the names of the exchanges where these sukuk are traded, while the horizontal axis depicts the trading volumes for each exchange. Key observations from the graph include: The exchanges with the highest trading volumes are NASDAQ Dubai, the Stuttgart Stock Exchange, and MTS Bondvision, with volumes amounting to USD 11,891.60 million, USD 11,000 million, and USD 9,291.60 million, respectively. These figures indicate a substantial interest in green finance on these exchanges. Exchanges of medium size, such as the Frankfurt Stock Exchange (USD 9,100 million), the Singapore Exchange Securities Trading (USD 6,750 million), the Irish Stock Exchange (USD 5,091.60 million), and the London Stock Exchange PLC (USD 4,953.95 million), also exhibit significant trading volumes. This suggests that these exchanges play a notable role in the green sukuk market. Exchanges with comparatively lower trading volumes include Borsa Istanbul, the Dhaka Stock Exchange, and the Abu Dhabi Securities Market, with volumes of USD 7.76 million, USD 256.41 million, and USD 353.95 million, respectively. These figures imply that these exchanges have a relatively minor presence in the green sukuk market.

Graph 7. Exchange Listing Number



Source: Own elaboration based on DataStream.

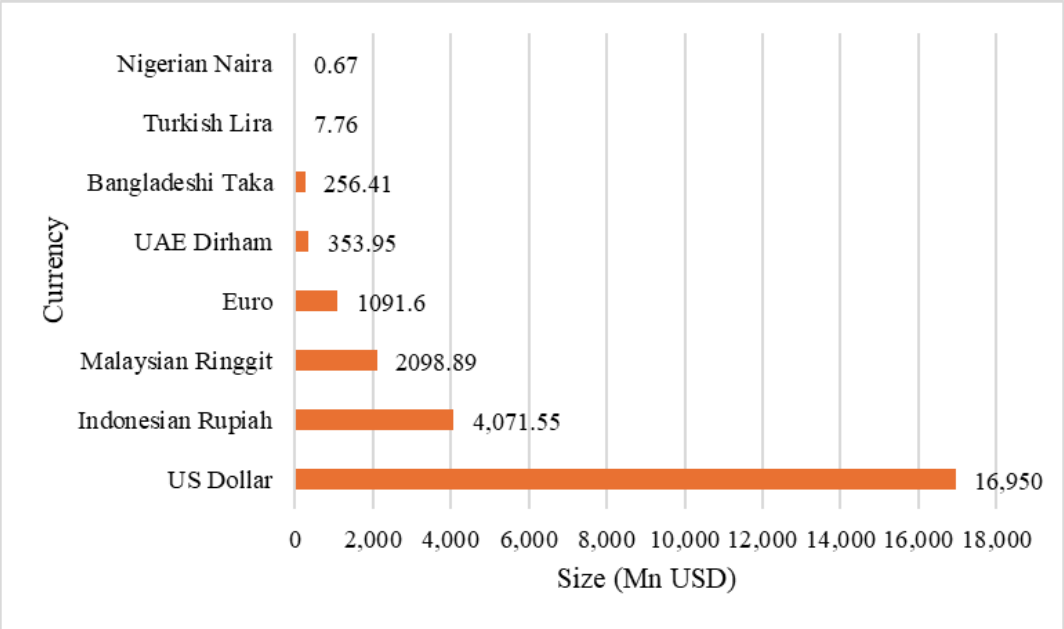
The above graph presents a comparison of the number of green sukuk listed on various exchanges. The vertical axis enumerates the exchanges on which the sukuk are traded, while the horizontal axis indicates the quantity of green sukuk listed on each exchange. Key observations from the graph are as follows: The exchanges with the highest number of green sukuk listings are NASDAQ Dubai, the Stuttgart Stock Exchange, MTS Bondvision, and the Frankfurt Stock Exchange. NASDAQ Dubai leads with 14 sukuk listings. It is closely followed by the Stuttgart Stock Exchange (13 sukuk), MTS Bondvision (11 sukuk), and the Frankfurt Stock Exchange (11 sukuk). This indicates that these exchanges play a significant role in the green sukuk market and are instrumental in meeting the demand for financial instruments that promote environmental sustainability.

Exchanges with a moderate number of sukuk listed include the Singapore Exchange Securities Trading (7 sukuk), the Irish Stock Exchange (8 sukuk), and the London Stock Exchange PLC (6 sukuk). These exchanges also maintain a notable presence in the green sukuk market. Exchanges with fewer sukuk listed include Borsa Istanbul, the Dhaka Stock Exchange, and the Abu Dhabi Securities Market, which each list only 1 or 2 sukuk. This suggests that these exchanges have a relatively limited impact on the green sukuk market.

Graphs 6 and 7 elucidate the extent of diversification within the green sukuk market across various global exchanges and highlight which exchanges are hosting a larger volume of these financial instruments. Exchanges with substantial trading volumes demonstrate the growing prominence of green sukuk as a financing tool and reflect a robust interest in financial products that support environmental

sustainability. Furthermore, the presence of sukuk on these exchanges indicates their strong infrastructure for green finance and their capacity to support and promote such sustainable financial instruments.

Graph 8. Currency Size



Source: Own elaboration based on DataStream

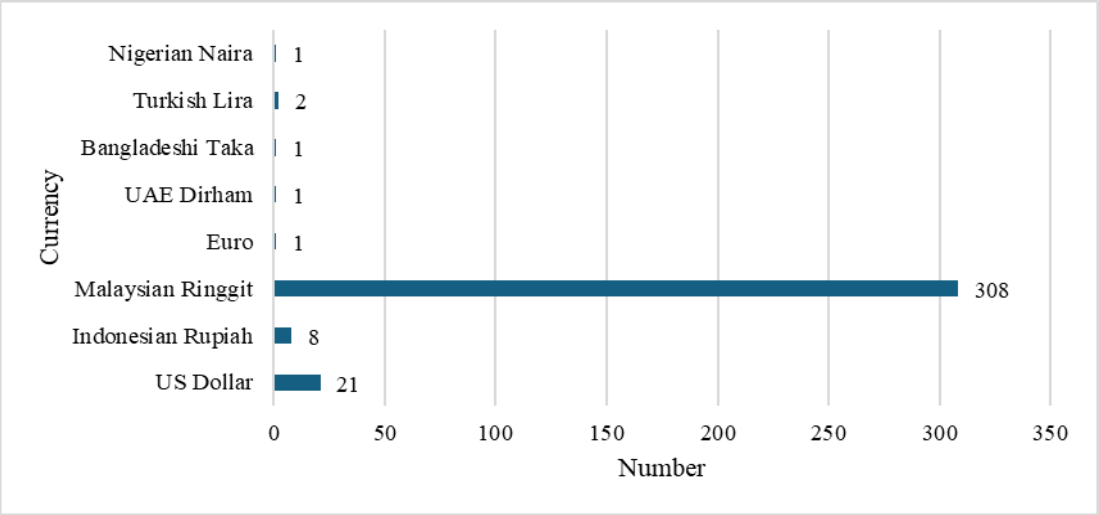
This graph illustrates the total trading volumes of green sukuk across various currencies, expressed in million USD. The US Dollar (USD) emerges as the dominant currency with a trading volume of 16,950 million USD, underscoring its prevalent role in global financial markets and its status as the preferred currency for numerous financial instruments, including green sukuk. Significant trading volumes are also observed in the Indonesian Rupiah (4,071.55 million USD) and the Malaysian Ringgit (2,098.89 million USD). These currencies reflect the prominent positions of Indonesia and Malaysia within the Islamic finance and green sukuk sectors, corresponding to their substantial financial activities in these markets.

In contrast, currencies such as the Euro (1,091.6 million USD), the United Arab Emirates Dirham (353.95 million USD), and the Bangladeshi Taka (256.41 million USD) exhibit lower trading volumes. These currencies are utilized in smaller markets or to address specific regional financial requirements.

Currencies with minimal trading volumes include the Turkish Lira (7.76 million USD) and the Nigerian Naira (0.67 million USD), indicating their limited involvement in the green sukuk market. Overall, this graph provides insight into the currencies used for issuing green sukuk and highlights the predominance of certain

currencies in this financial arena. The preeminence of the US Dollar reflects its role as the preferred currency for international investors and underscores that the green sukuk market is predominantly conducted in USD.

Graph 9. Currency Size



Source: Own elaboration based on DataStream.

Finally, Graph 9 illustrates the distribution of green sukuk issuance by currency. It reveals that a total of 308 green sukuk have been issued in Malaysian Ringgit (MYR). Given that the total number of sukuk issued is 343, this figure substantially surpasses the number of sukuk issued in other currencies. In second place, there are 21 sukuk issued in US Dollars (USD). Additionally, 8 sukuk have been issued in Indonesian Rupiah (IDR).

Sukuk issued in other currencies, such as the Nigerian Naira, Turkish Lira, Bangladeshi Taka, UAE Dirham, and Euro, are relatively sparse, with each currency representing only 1 or 2 issuances. Consequently, the graph underscores the dominance of sukuk issued in Malaysian Ringgit. This illustrates Malaysia's significant role in the green sukuk market and its leading position in the issuance of sukuk denominated in its own currency.

Türkiye's integration into the green sukuk market, while still at an initial stage, is assessed to possess considerable growth potential. Türkiye benefits from its strategic location and emerging financial infrastructure, positioning itself as a promising player in the Islamic green finance sector. The nation's rapidly increasing environmental sustainability awareness and the rising demand for green projects provide a robust foundation for the expansion of green sukuk. Furthermore, Türkiye's commitment to enhancing its economic and regulatory frameworks will facilitate the broader adoption of green sukuk, enabling access to a wider investor base and contributing positively to the national economy. Consequently, Türkiye's

growth potential within the green sukuk market offers significant opportunities for both domestic and international financial markets.

5. Conclusion

The Sustainable Development Goals (SDGs) were adopted and introduced during the United Nations General Assembly held in the United States on September 25, 2015. These goals emphasize the adoption of circular economic principles in the developmental strategies of countries worldwide. They encompass 17 fundamental objectives aimed at addressing critical global challenges, including reducing inequality, curbing excessive production and consumption, enhancing health and education, protecting marine and forest ecosystems, improving sanitation and access to clean water, and alleviating poverty. The SDGs are crucial for combating environmental issues and ensuring a sustainable and habitable planet for future generations. Consequently, there has been an increased focus on climate change adaptation and mitigation. Both governments and corporate entities are now competing to achieve environmentally responsible certifications, which enhances their visibility and attracts a broader investor base.

When analyzing financing instruments for environmentally friendly investments, green bonds are recognized as the predominant tool. These instruments have garnered significant demand, particularly in China, the United States, and various European countries. However, due to their non-compliance with Islamic principles, green bonds are not utilized by Muslim-majority countries, both in terms of issuance and demand. Despite this, these countries, which represent approximately 21% of the global population, hold substantial potential. Moreover, compared to European nations, these countries are at earlier stages of economic development and urbanization. The increased energy demand and industrialization, coupled with high dependency on fossil fuels, have led to a significant rise in carbon emissions. Therefore, it is crucial for these economies to secure financing for investments that transition to a circular economy without impeding their economic growth. For example, Türkiye has recently placed considerable emphasis on solar and renewable energy investments. Türkiye also has the potential to undertake these investments at a reduced cost, supported by loans from the European Union. In this context, Türkiye should focus on attracting investments from the Islamic world, which has considerable potential. Furthermore, the principles of Islamic finance align closely with the concept of environmentally sustainable development. Sustainable development not only prioritizes economic progress but also emphasizes the responsible and efficient use of natural resources, aiming for optimal outcomes. Green sukuk, in this regard, becomes increasingly significant, as it provides Islamic financial instruments with the opportunity to contribute to sustainable development.

Analysis of the distribution of green sukuk issuances indicates that Middle Eastern investors exhibit the highest level of engagement, representing 32% of total investments. This is followed by Asian regional investors at 25% and American

investors at 15%. Indonesian investors, with a 10% share, have matched the investment levels of European regional investors (Abdullah and Keshminder, 2022: 235). In comparison, Türkiye lags significantly behind countries such as Indonesia, Malaysia, the UAE, and Saudi Arabia. The substantial demand and prominence of green sukuk issuances in Indonesia and Malaysia can be attributed to considerable government support. These governments have actively led green sukuk issuances, implemented regulations to encourage green sukuk and environmental investments, and spurred private sector involvement in response to increased demand. Consequently, Türkiye, which remains notably behind in green sukuk issuance within the Islamic finance community, should focus on developing appropriate regulations, enhancing promotional efforts, and adopting policies that incentivize green sukuk issuance. By doing so, Türkiye could leverage its position as a bridge between Europe and Asia to attract both environmentally conscious and Islamic investors.

The limited adoption of green sukuk in Türkiye can be attributed to a range of economic, legal, and cultural factors. Firstly, the concept of green sukuk is still relatively novel in Türkiye, and there is a notable deficiency in awareness and knowledge regarding this financial instrument. The limited understanding of its potential benefits and advantages among both investors and issuers is likely impeding its broader acceptance and use. Secondly, the Turkish financial markets generally exhibit a greater emphasis on traditional financing instruments, which may result in alternative financing methods, such as green sukuk, remaining underdeveloped. The strong commitment to conventional financial instruments can retard the advancement of innovative and sustainability-oriented instruments like green sukuk. A third factor contributing to the limited use of green sukuk is the relatively underdeveloped investor interest in environmental sustainability and green projects within Türkiye. The lack of substantial interest in environmental initiatives among investors results in fewer green sukuk issuances. Enhancing environmental awareness and a more comprehensive understanding of the economic returns from green projects could potentially attract a greater number of investors to this domain. Moreover, the prevalent use of green bonds in financing green projects in Türkiye may also contribute to the secondary status of green sukuk issuance. Finally, economic uncertainties and market volatility can further constrain the utilization of relatively new and complex financial instruments such as green sukuk. Both investors and issuers may exhibit a preference for established and perceived lower-risk financial options.

In conclusion, the limited utilization of green sukuk in Türkiye can be attributed to a confluence of factors, including insufficient information, deficiencies in the legal framework, a preference for alternative financing instruments, a lack of awareness regarding environmental sustainability, and economic uncertainties. Overcoming these barriers is essential for facilitating the broader adoption and effectiveness of green sukuk as a financing tool in Türkiye.

It would be appropriate to draw on successful models from countries such as Malaysia and Indonesia to develop more specific and applicable policy

recommendations for Türkiye. For instance, examining Malaysia's regulatory framework in Islamic finance infrastructure or Indonesia's innovative financing models could provide insights into how these practices might be adapted to Türkiye's own economic and social dynamics. This could contribute to the development of Islamic green finance in Türkiye. Additionally, a more detailed roadmap containing action plans and strategic steps tailored to local conditions could be developed. This approach aims to enhance the effectiveness and feasibility of the recommendations.

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