BLOCKCHAIN BASED SUKUK AND ITS POTENTIALS FOR GREEN FINANCES AND SOCIALLY RESPONSIBLE INVESTMENTS IN TURKEY

BY

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INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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A dissertation submitted in fulfilment of the requirement for the degree of Master of Science (Islamic Banking and Finance)

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ABSTRACT

Turkey is developing rapidly with notable growing population in the past decades. However, for this reason, Turkish economy is still battling to meet its own growing energy needs. The country imports the average of 70% of its energy. This situation causes problems such as energy supply security, external commitment to energy and current account deficit for Turkey. Within the framework of Turkey's New Economic Plan (YEP). In this context, renewable energy investment is commonly known as green finance and social responsibility investments which have been recently the agenda of many countries including turkey. This study discusses the alternative ways of financing renewable energy in Turkey. However, Investments in renewable energy are not currently favored by many investors due to high transaction costs and multiple market failures such as narrow investor base and insufficient public budget. Therefore, private financing needs to be accelerated to resolve the situation. In this case, there is a need for sukuk and innovative financial instruments that can increase fund raising opportunities with efficiency by injecting resources directly to the real sector. This exploratory study aimed to assess the potentiality and feasibility of blockchain-based sukuk in Turkey and applied an inductive approach based on qualitative evidence derived from expert feedback and open-ended questions and interviews with experts. The target audience interviewed is policy makers, bank employees and professors. Interview questions categorized under the headings of Fintech, Islamic capital market and green economy, and interviews with experts in these three main subjects were conducted face-to-face and online. The findings of this study indicates that, Blockchain technology has emerged as an innovative financing mechanism that provides easy access to funds for small and medium-sized entrepreneurs, reduces transaction costs, increases transparency and provides a broad investor base via tokenized sukuk tokens with full traceability, and has significant potential in green finance. However, blockchain technology is still a new area of study and special regulatory framework is needed to attract more investment in the sector. The study also indicates that a capacity building is needed for the Sukuk stakeholders such as Regulators, Sukuk issuers as well as investors in other to understand how the blockchain technology works and the opportunities it has as alternative way to diversifying financial instruments using the new technology, the study indicates areas of further academic research.

خلاصة البحث

تطورت تركيا بسرعة مع النمو السكاني الملحوظ في العقود الماضية، مع ذلك، لا يزال الاقتصاد يكافح الترك من أجل تلبية احتياجات الطاقة المتزايدة للسكان .في المتوسط ، تستورد البلاد ٪٧٠ من طاقتها .يتسبب هذا الوضع في مشاكل مثل أمن إمدادات الطاقة والالتزام الخارجي بالطاقة وعجز الحساب الجاري لتركيا . بموجب الخطة الاقتصادية الجديدة لتركيا ، يُعرف الاستثمار في الطاقة المتجددة عمومًا باسم التمويل الأخضر واستثمارات المسؤولية الاجتماعية التي كانت مؤخرًا على جدول أعمال العديد من البلدان بما في ذلك تركيا .تناقش هذه الدراسة الطرق البديلة لتمويل الطاقة المتجددة في تركيا .ومع ذلك ، لا يفضل العديد من المستثمرين حاليًا الاستثمار في الطاقة المتجددة نظرًا لارتفاع تكاليف المعاملات وإخفاقات السوق المتعددة مثل قاعدة المستثمرين الضيقة والميزانية العمومية غير الكافية .لذلك ، يجب التعجيل بالتمويل الخاص لحل هذا الوضع .في هذه الحالة ، هناك حاجة إلى صكوك وأدوات مالية مبتكرة يمكن أن تزيد من فرص جمع الأموال بكفاءة عن طريق ضخ الموارد مباشرة في القطاع الحقيقي .هدفت هذه الدراسة الاستكشافية إلى تقييم إمكانية وجدوى الصكوك القائمة على بلوكتشينفي تركيا وطبقت نهجًا استقرائيًا قائمًا على الأدلة النوعية المستمدة من تعليقات الخبراء والأسئلة المفتوحة والمقابلات مع الخبراء . الموظفين والأساتذة .أسئلة المقابلة المصنفة تحت عناوين التكنولوجيا المالية، وسوق رأس المال الإسلامي والاقتصاد الأخضر ، وأجريت مقابلات مع خبراء في هذه الموضوعات الرئيسية الثلاثة وجهاً لوجه وعبر الإنترنت .تشير نتائج هذه الدراسة إلى أن تقنية بلوكتشينقد ظهرت كآلية تمويل مبتكرة توفر وصولاً سهلاً إلى الأموال لأصحاب المشاريع الصغيرة والمتوسطة الحجم ، وتقلل من تكاليف المعاملات ، وتزيد من الشفافية وتوفر قاعدة عريضة من المستثمرين عبر الرموز المميزة للصكوك مع إمكانية التتبع الكامل .ولديها إمكانات كبيرة في التمويل الأخضر .ومع ذلك ، لا تزال تقنية بلوكتشينمجالًا جديدًا للدراسة وهناك حاجة إلى إطار تنظيمي خاص لجذب المزيد من الاستثمار في هذا القطاع .تشير الدراسة أيضًا إلى أن بناء القدرات ضروري لأصحاب المصلحة في الصكوك مثل المنظمين ومصدري الصكوك وكذلك المستثمرين في البلدان الأخرى لفهم كيفية عمل تقنية بلوكتشينوالفرص المتاحة لها كبديل.لة لتنويع الأدوات المالية باستخدام التكنولوجيا الجديدة، تشير الدراسة إلى مجالات البحث الأكاديمي الإضافي

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Master of Science (Islamic Banking and Finance).

……..
Auwal Adam Sa'ad
Supervisor

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Master of Science (Islamic Banking and Finance).

……..
Azman Bin Mohd. Noor
Examiner

This dissertation was submitted to the IIUM Institute of Islamic Banking and Finance is accepted as a fulfilment of the requirement for the degree of Master of Science (Islamic Banking and Finance).

……..
Rusni Hassan
Dean, IIUM Institute of Islamic Banking and Finance

DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Recently, blockchain technology, which has formed a creative destruction effect in the field of Finance, has been used for the Sukuk and bond issuance (Mounira, 2020). Blockchain can be defined as advanced technological engineering, based on completing transactions without any mediation (peer-to-peer) using distributed ledger technology and cryptography, which increases confidence and transparency of transactions (Mounira, 2020). According to (Malamas e. , 2020), the stock issuance has become easier and more systematic with Blockchain technology. The global bond market and sukuk in the Islamic capital market are faced with several pain points when it comes to bond or sukuk issuance, like disparate regulatory framework, limited traceability and auditability, settlement failures and inefficient issuance processes (Malamas e. , 2020). As sukuk and bond issuance will become easier, countries will contribute more to the field of renewable energy, which they are starting to invest in and support. Australia became the first country in the world to issue bonds with blockchain technology in 2019 (HSBC and Sustainable Digital Finance Alliance, 2020). Because of the potential of Blockchain technology to meet financing needs in the renewable energy sector, countries have begun to explore this technology.

Blockchain will enable the development of Islamic finance and Islamic banking. One of the obstacles to the development of Islamic Finance is that its transactions are more expensive than other conventional finance. Since the blockchain system is less costly, it has provided an advantage to Islamic Finance institutions and banks, providing an environment to compete. The Islamic banking system will work more efficiently without worrying about interest and similar issues (Elasrag, 2019).

Green environmental policies have continued to focus on renewable energy and recently grabbed the attention of many countries. From this point of view, a number of countries are accelerating investments in environmentally sensitive renewable energy

sources (Ela, 2019). In the post-pandemic period, the countries' social investments and energy policies have changed within the framework of this self-sufficient understanding. Because of the growing population in the world, the energy needs of countries are increasing. Today, with the increasing population, natural resources are being used extensively and consumption is rising (Alagöz & Yılmaz, 2015). According to (Kandır & Yakar, 2017), many countries are turning to renewable energy sources to meet their growing energy needs and reduce the adverse effects caused by fossil fuels. Despite the positive aspects of renewable energy, its share in world energy production is quite low. One of the main reasons this level is low is that the financing opportunities required for renewable energy investments are insufficient. In this context, green bond and green sukuk are used to meet the need for financing. Green sukuk is defined as covering a wide range of investors, as it is compatible with Green bond, a traditional renewable energy investment vehicle, and Shariah, which serves environmental purposes (Ela, 2019). According to (Climate Bonds, 2017), green sukuk are Sharia-compliant investments aimed at renewable energy and other environmental assets.

Turkey is a country rich in diversity and the potential of renewable energy sources. Turkey is a 70% foreign-dependent country in terms of energy resources. Thanks to Blockchain-based green sukuk, Turkey has reached out to a broad investor base to assess the potential of renewable energy sources (Gençoğlu, 2019). The geothermal and solar energy potential from renewable energy sources of Turkey is among the top 10 countries in the world. However, the assessment of this potential is based on the lack of investment from private institutions. Blockchain-based sukuk will be a good tool to eliminate the lack of this issue (Kandır & Yakar, 2017). The first Blockchain-based sukuk was issued by the Indonesian Islamic microfinance cooperative BMT Bina Ummah has raised 710 million rupiahs ($50,000) through the world's first primary sukuk issuance on a public blockchain and the world's first micro sukuk (International Investment , 2019).

1.2 PROBLEM STATEMENT

As a result of the combination of technology and the financial sector, fintech emerged. In the Oxford Dictionary, fintech is defined as the provision of banking financial services using computer programs or other technologies. Fintech has services such as Big Data, blockchain, biometrics, and cloud mobile data. Blockchain-based bonds can be considered a fintech initiative again (Alam, Gupta, & Zameni, 2020). With Blockchain technology, Blockchain-based bonds/sukuks have now received more investment by reaching a wider investor base. He noted that entrepreneurs, large and small, would benefit from this technology (Mounira, 2020). Blockchain is modern technology, and it helps in gaining momentum in an investment by eliminating the confidence and slow processes encountered in sukuk issuance. In this connection, blockchain technology and Blockchain-based bond / sukuk began to be invested (Juden & Pisa, 2020). Blossom Finance blockchain technology, based in Indonesia, gathers investors from all over the world to provide fund support to small and medium entrepreneurs and the profits from entrepreneurs are sent to the participants. In this way, a wide range of investors is reached, and there is no need to pay extra fees during all transactions (Blossom Finance, 2020). Now, Turkey is experiencing major problems in developing renewable energy sources. In 2011, Turkey's primary energy production amounted to 32228.9 Btep (thousand tons of equivalent oil). In the same year, the distribution of primary energy production based on resources is; lignite (50%), hydraulic (14%), Wood (8%), Oil (8%), geothermal-heat (5%) and coal (4%), respectively. However, the potential of Turkey is far higher than this, it cannot use it very actively, and only 30% of its potential is utilized. Turkey is 7th in the world in terms of geothermal energy potential which is equal to 0.23% of the world's capacity. Other energy sources have a potential of 977000 (kWh) in solar energy, 430 (kWh) in hydroelectric potential, and 31500 (kWh) in geothermal energy potential (Koç & Şenel, 2013). Turkey is not very good at using potential renewable energy sources. The reason for this is the state and private institutions' lack of support for renewable energy sources, and small-medium entrepreneurs need to invest in this area (Kandır & Yakar, 2017). Hence, Turkey is trying to invest in green sukuk in this field.

Split the application of blockchain on green sukuk issuance in three broad areas structuring issuance and distribution, transfer of ownership, payment and settlement,

benchmarking, and reporting. Security issuance practices require many records of information, which trusted third parties currently manage in a rather centralized manner. According to (Seretakis, 2019) block chain's benefits on green sukuk are that blockchain usage in security issuance includes greater transparency and faster clearing and settlement, enhanced recording and tracking of ownership of the securities, and fewer intermediaries and easier collection and sharing of data for supervisory purposes. Hence, the government chooses this technology to increase investment in the green sector easily and without any intermediaries. Investments in renewable energy will reduce Turkey's external commitment to energy and eliminate the problem of energy security. Green sukuk via blockchain will help Turkey attract investments by creating a wider investor base, and it is very important for Turkey. Some problems are raised in using Blockchain technology as a Blockchain-based sukuk. These problems are that states have not yet introduced legal regulation in this area, and a sufficient number of studies have not been conducted (Rabbani, Khan, Eleftherios, & Thalassinos, 2020).

This study aims to explore the potential of Blockchain Sukuk as a new opportunity for renewable energy for green finances in Turkey. The necessary framework for this is to prepare and examine all the processes of green sukuk with blockchain technology and prove how this increases investments in renewable energy sources in Turkey. It examines the challenges and problems of Blockchain technology, offers solutions and helps it develop. Green sukuk will be the right choice to attract investors, especially in the Gulf countries of Turkey.

1.3 RESEARCH OBJECTIVES

This research aims to achieve the following points:

1. Knowing the theoretical aspect related to blockchain technology
2. Knowing the advantages of applying blockchain technology
3. Realizing how blockchain technology is used to increase the investment in the green sector and social responsibility investment
4. Learning about green finance and social responsibility investment is important for Turkey.

5. Learning about the concept of Blockchain-based sukuk, the advantages of dealing in Blockchain-based sukuk for Turkey

1.4 RESEARCH QUESTIONS

There are several research questions which are as follows:

1. What are the basics of blockchain technology?
2. What are the advantages of applying blockchain technology in the green sector and social responsibility investment?
3. What is Blockchain-based sukuk?
4. Why green finance and social responsibility investment in green projects is important for Turkey?
5. What is the potential of renewable energy in Turkey?
6. How can we increase to invest in the green sector in Turkey?
7. What are the Sharī'ah and Regulatory Issues in adopting Blockchain-based Sukuk in Turkey?

1.5 SIGNIFICANCE OF THE STUDY

Turkey imports 70% of its energy needs from foreign countries, and only 30% of the potential of Turkey is renewable energy sources can be evaluated. Importing energy causes Turkey to have currency problems and energy security problems. Research shows that Turkey has a lack of adequate investment in renewable energy sources. This study emphasizes the importance of renewable energy sources for Turkey. It demonstrates their potential for green finance and social responsibility investments with blockchain-based sukuk.. It is important to examine the function of Blockchain technology and products used in finance, especially in Islamic finance, and explain the process of implementing blockchain technology in the green sector area. This study examines the financing process of blockchain technology and renewable energy sources and is an example of studies in new areas.

CHAPTER TWO

LITERATURE REVIEW

2.1 SOCIAL RESPONSIBLE INVESTMENT

Due to the fact that the neoliberal understanding of economics prevails in the globalizing world, the level of development between countries has now deteriorated beyond serious limits. As a result of the interest rate-inflation relationship in this economic understanding, the rich become richer, and the poor become poorer. As a result of the emergence of income injustice, the understanding of Social Investment has developed. The concept of Social Responsibility Investments has emerged to eliminate this income injustice and make investments that are beneficial to society. It is stated that the understanding of Islam is in the same direction. In the theory and understanding of Islam, community benefit is always a priority. The paucity of Islamic Finance products in the field of Socially Responsible Investment has been the subject of criticism from time to time (Syed & R, 2016). Social Responsibility Investments are described in three categories.

- Environmental Investment
- Social Investment
- Governance Investment

It has been included in this system in the financial sector to alleviate poverty and provide social-economic security to people and for environmental investments. In this context, the financial sector has created a Social Impact Bond (SIB) to find and manage funds for three categories. In Social Responsibility Investments, Social Impact Bonds and Islamic Social Impact Sukuk financial instruments have emerged. It is decisively the same between the Social Impact Bond and the Social Impact Sukuk. SIB is not a conventional bond, it is a long-term bonus, and it provides profit according to the success status of the project. Since the same framework is involved in sukuk, an Islamic bond is Shariah compatible and is a financial instrument available in Islamic Finance.

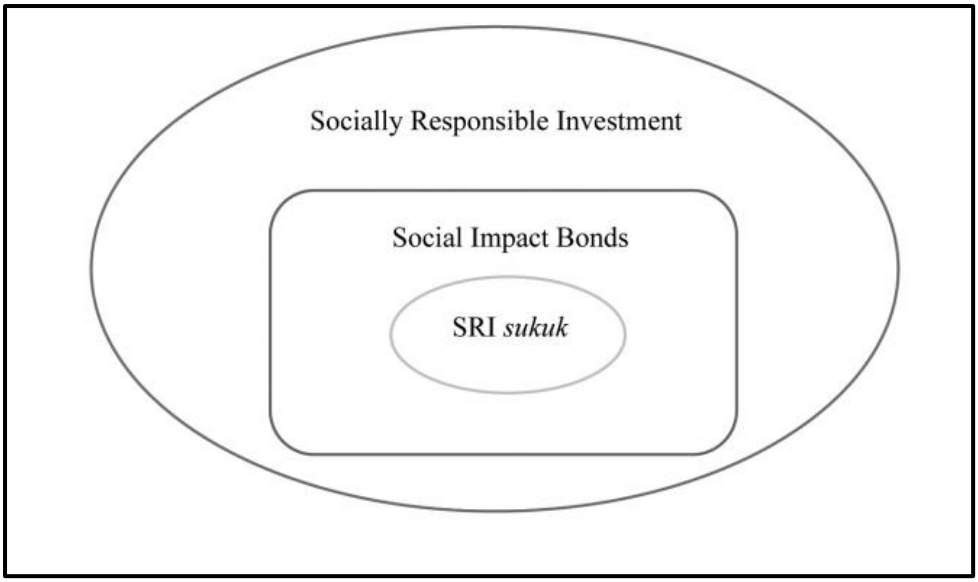

Figure 2.1 General SRI Ecosystem
Source: (Rabiah & Syed, 2016)

Under Social Responsibility Investments, we can write as Social Impact Bonds and Social Impact sukuk, which cover a wider area as financial instruments.

2.1.1 Social Impact Bond (SIB)

A Social Impact Bond is a contract in which the government determines and pays for projects that support poverty reduction, social assistance, and low carbon use based on the project's performance. Funds are collected from investors, who want to invest in social areas, and investments are made through brokerage firms in this area, and a return is made according to the project's success. If the project is successful it is repaid to the investor together with both the parent capital and the return on profit at the end. Social Impact Bonds are used in different countries with different meanings. For example, Canada used the " Human Capital Performance Bond" and US " Pay for Success Bond."

The Social Impact Bond is part of a wide-ranging partnership structure and includes the Public, Private and Social sectors. SIB organizers monitor the project process and submit reports on the project to the government. Funds collected from investors are allocated to those who need social investment through SIB organizers. The

success status of the project is reported to the government by third party institutions, and a profit return is obtained in return.

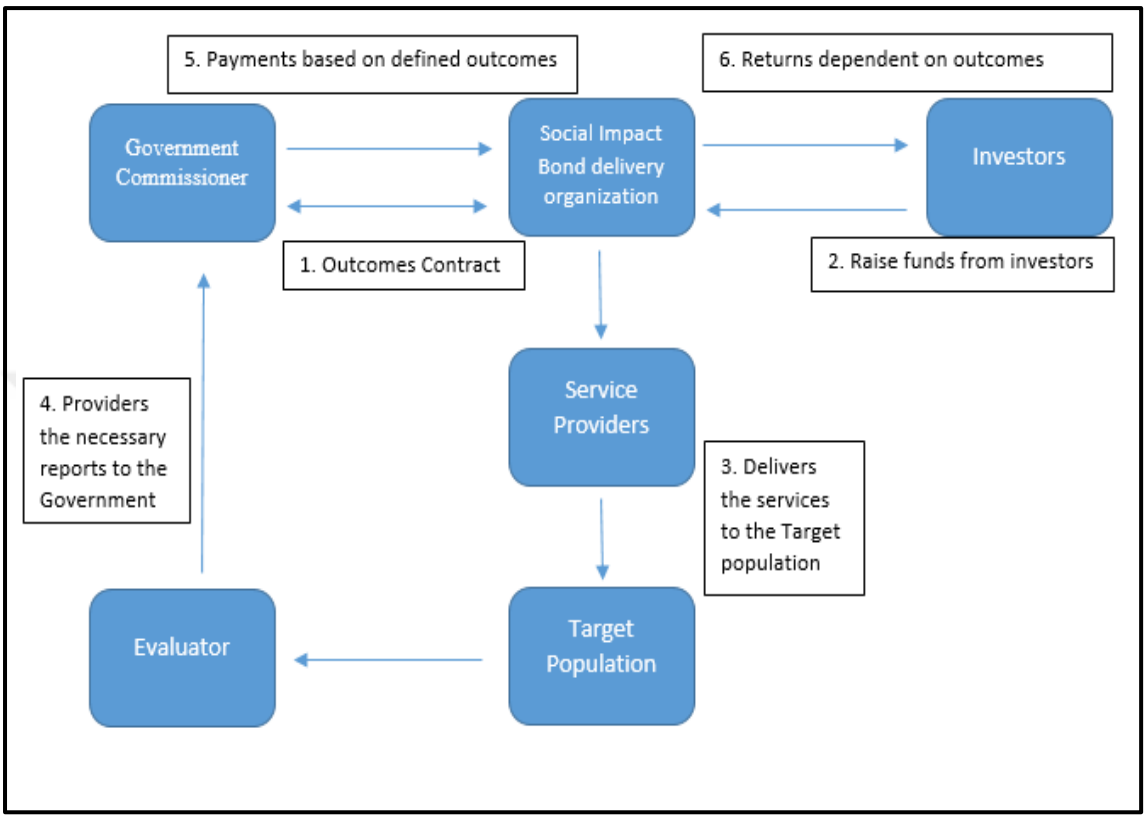

Figure 2.2 General Structure of SIB
Source: (Rabiah & Syed, 2016)

Projects that are environmentally friendly and support low carbon emissions are evaluated within the scope of Social Responsibility Investments. Governments have started to use Social Impact Bonds, one of the Social Responsibility Investment instruments, to finance these projects. Green sukuk and green bond are socially responsible investments (SRI) in such investment instruments that you should evaluate in this area. Governments can support environmental and low carbon emissions by supporting projects that will increase investment in renewable energy sources from investors through SIB.

2.2 FINANCIAL TECHNOLOGY (FINTECH)

Financial technologies have started to make their name in the developing world system. In recent years, many applications that not everyone has noticed but uses can be counted as fintech products. Fintech companies develop financial innovation using a new generation of technological developments. The financial sector is transforming from general services to individual products. Fintech initiatives have been the pioneer of this change by offering products other than the services offered by the conventional industry. The future financial market will consist of companies that cater to all income groups, regardless of the time and place that produces personal solutions on a micro-scale (Demırdogen, 2020).

Fintech has no new definition, but it is defined as the provision of banking or financial services using computer programs or other technologies. In general, fintech is in the form of institutions that offer their products and services on a technology basis, have devastating consequences, and provide their leading services. In fact, fintech companies are shifting the financial sector's activities from physical campuses to cloud-based services to reach everyone. Many financial institutions and banks are increasing their interest in these areas to increase their competitive share in the sector, invest in fintech, and have more customers to become more reliable (Alam, Gupta, & Zameni, 2020).

Fintech has been developing for about 65 years based on the credit cards period, which came out to ease the cash flow burden. Because of the lack of trust in banks after the mortgage crisis of 2008, the search for a new system was conducted worldwide, and the potential of fintech to fill these gaps in the best way was taken into account. With the deterioration of confidence in banks after the 2008 financial crisis, fintech companies has started to increase. Investments in the fintech sector increased from USD 980 million to USD 57 billion from 2008 to 2018 (Alam, Gupta, & Zameni, 2020).

Some of the business models in the fintech sector are as follows.

- **International money transfer**: There would be some difficulties and commission fees for transferring money between local banks or banks

abroad, but some fintech companies such as TransferWise make money transfers at a marginal cost.

- **Equity Financing**: As a result of the global financial crises, some entrepreneurs are having difficulty finding loans. Fintech companies such as FundedByMe meet these lending needs.
- **Trading Platform:** These platforms perform stock trading transactions from another country at low fees.
- **Personal finance method**: Intelligent financial technology companies measure risk based on statistical data that personal finance services can receive.

While Islamic finance cannot put its arguments at the forefront (such as Musharaka, Mudaraba), it is trying to open up space in the market with varieties of conventional banking products adapted to it (such as Ijarah, salam, murabaha). Islamic finance, which is developed first by the hands of banks, has not yet achieved sufficient diversity and progress. Despite its rapid growth, it is having difficulty creating its customer portfolio, and even having the biggest (perhaps the only) trump card, "Islamic", is having trouble explaining to its customers. Considering that almost all products/services originated from conventional 65 banking, it does not seem possible to break this perception in customers anytime soon. On the other hand, fintech have the potential to move finance to different channels by getting rid of the restrictions imposed by conventional banking with the advantages and opportunities it offers. By taking fintech with it, Islamic finance can change the rates, commissions, risk analysis, and collateral requirements imposed by traditional banking and open the way to adopt a more "Islamic" structure of its own. The biggest step that can be taken is to first see and get to know the new medium, then take action from an Islamic point of view and explore a way to design suitable products. Since the new generation of technologies will also attract the attention of Generation Z, who have not yet met the bank, Islamic fintech may be one of the crucial factors in the field of finance of the near future by targeting this group of customers (Demırdogen, 2020).

Islamic fintech companies are responsible for designing products and services with an Islamic approach by breaking off from the continents on which the global finance concept is based. In fact, Islamic finance through fintech means, compared to

conventional finance products, it has more opportunities to offer Shariah compatible products (Alam, Gupta, & Zameni, 2020). With the increase and growth of Islamic fintech, it will be possible to upgrade an alternative Finance, highlighting the more transparent and ethical values of Islamic finance (Setyaw, 2017).

2.2.1 Fintech Ecosystem in Turkey

Turkey has a strong position in terms of banking, technology use, and digitalization. Turkey ranks 7th in the world with 82.8 million credit card owners. Turkey ranks 9th in the world in terms of the number of credit card transactions. In addition to these statistics, 1.7 million POS devices, 48% in-store contactless payment rate, 52.100 ATMs, and 70.3 million active retail digital banking customers make Turkey one of the leading countries in the field of banking. Thanks to innovation-friendly regulations, the fintech ecosystem in Turkey has grown every year, increasing the number of fintech to 520 and the number of licensed payment institutions and e-money companies to 56. Fintech startups in Turkey are one of the favorite sectors of both banks and venture capital funds. While the funds established by the banks invest in fintechs, more fintech startups are supported with acceleration programs. Regulatory changes such as share-based crowdfunding, open banking, service model banking, digital banking, and remote authentication are the most important indicators that the fintech ecosystem will become more active in the coming period (Presidential Finance Office of Turkey, 2021).

Table 2.1 Turkish Fintech Ecosystem in Numbers

Number of Fintech	E-money and Payment Institution	Share-based crowdfunding platform	Number of Credit Card	Number of Digital Banking active users
520	56	5	82,8 Billion	70,3 Billion

Source: (Presidential Finance Office of Turkey, 2021)

2.3 BLOCKCHAIN

Blockchain is a recording technology that can be kept and protected on a distributed network without the need for any central authority or user parties (Guven, 2020). Blockchain, which is a structure consisting of technological application, consists of foundation, network, progress, distributed ledgers, approach, and cryptography base service (Durbilmez & Turkmen, 2020). The planning of these systems is in blocks. In this system, the transactions are kept in blocks, verified, added to each other in a chain, and cannot be changed by others (Tanriverdi, Uysal , & Ustundag, 2019).

The possibilities offered by blockchain technology are wide. One of the most important things in the world is information and personal data. Blockchain technology is now a mechanism that ensures the security of personal data and decentralized transmission without intermediaries. Especially, getting to know banks' customers and personal information is very important. As a result of the increase in internet usage, blockchain is preferred in many areas because it is transparent, reliable, resistant to failures, and less costly.

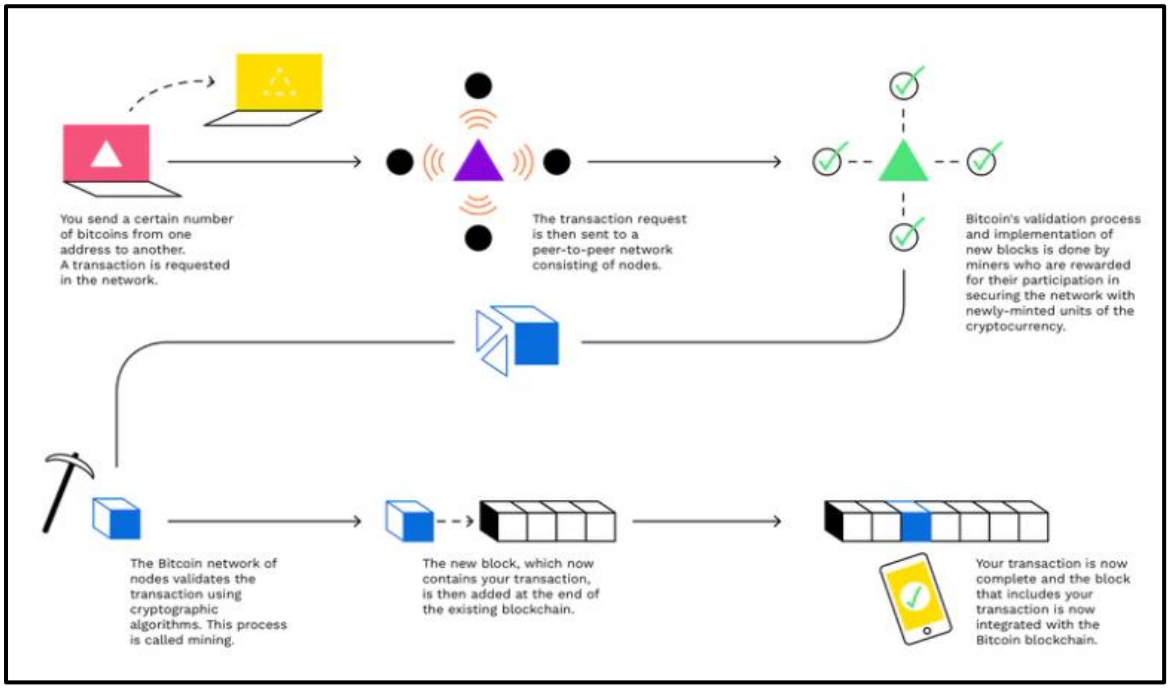

Figure 2.3 How Does Blockchain Work
Source: (Bitpanda, 2020)

As seen in the figure, the money or other information transfer transaction of the parties is presented in blocks, the participants in the network confirm the validity of the transaction, and the block is permanently added to the chain, and the transfer takes place. The definition and operation of blockchain technology are briefly like this, and the advantages and risks that this technology can provide are listed below.

Advantages of blockchain technology:

- It has a distributed structure and can operate without a central authority.
- Establishing trust between participants without the need for intermediaries with verifications and digital signatures.
- Users can also monitor the status of other transactions in the chain from their own transactions, thus ensuring transparency.
- Participants save the data, and everyone can access the data and monitor the transactions, thus preventing the loss or corruption of data.
- With blockchain technology, smart contracts have become possible, and transactions with these contracts can be automated (Tanriverdi, Uysal , & Ustundag, 2019).
- Since the information in the system is recorded unanimously each time, the accuracy and quality of the data are high (Bakan & Sekkeli, 2019).

Disadvantages of blockchain technology:

- Users can lose all their assets if they forget their passwords or private keys.
- The states do not recognize transactions made with this technology, and there is no serious legal infrastructure yet,
- It is possible for users to seek their rights in a possible issue or to have problems such as not passing their assets to their heirs.
- In the public blockchain model, the fact that the data in the network is accessible to everyone can cause problems in terms of the privacy of the participants.
- After the creation of smart contracts, they cannot be changed, which brings problems to users in terms of the right of withdrawal (Tanrıverdi, Uysal , & Üstündağ, 2019).

Blockchain comes in different types depending on its access status, namely public, private and consortium blockchain, and its details are mentioned below.

A public blockchain is a type of blockchain where anyone can view transactions, and only the required software is downloaded to participate. This system, in which everyone can participate in the consensus mechanism (mining), is considered a completely independent and central authority-free blockchain system. Bitcoin and Ethereum are examples of such chains (https://academy.binance.com/, 2021).

In the private blockchain model, it is acceptable only when allowed. It will be open to anyone to participate in the network agreement. This is the system that settles in the system with permission, and if you are the usual ones, it is called the system that makes purchases with these tools. In these networks, a central authority's authorization to change any process occurs as needed. It is likely to prefer this type for users who want data access, permission access, and knowledge about it. It works with the Corda platform of R3, the large private blockchain type of enterprises (Unal & Celebi, 2020).

The consortium blockchain model, on the other hand, includes elements of the other two types. The most obvious difference from the others can be seen at the level of consensus. In this system, there are few equal-powered parties working as validators. Chain visibility can be limited to validators; only authorized persons or anyone can view the chain. This type can be used when different institutions operate in the same industry and need common space to carry out transactions or share information. IBM's Hyper ledger project is an example of this type (https://academy.binance.com/, 2021).

Although Blockchain technology entered our lives with Bitcoin in 2008, it is used in many areas other than cryptocurrencies. The application areas of blockchain technology are as follows (Tanrıverdi, Uysal , & Üstündağ, 2019).

Global Payments: Global payments today are time-consuming as well as costly. With this technology, payments can be made in real-time, with fewer participants, and at a low cost.

Supply Chain Management: When we look at traditional supply chain management, there are complex integration and information processes, and problems can be experienced in terms of cost, time, and company efficiency. With Blockchain recording technology, the process from the production to the sale of the product can be made more efficient in terms of time and cost, and the process can be made more transparent.

Know Your Customer Process: As it is known, many businesses legally collect information about their customers within the scope of customer acquisition and customer records. Even if the customer information is in another institution, each institution has to collect the information independently. As such, the customer identification process creates a problem in terms of efficiency and cost. The customer's information can be transferred to the requesting institution, with the customer's approval, on the Blockchain network, when necessary.

Micro Finance: In cases where access to bank services is a problem or in microfinance transactions that classical financial institutions will not be involved in, services can be provided with blockchain technology.

Public Records: Land and property titles, vehicle records, business licenses can be moved to the blockchain. The use of blockchain technology for the storage and consistency of public data can provide a more secure and regular service than the traditional method.

In addition, it may be used in capital markets, tax collection and management, tenders, royalty records, and collection and monitoring of donations.

Many governments and international organizations worldwide follow Blockchain technology, and project and prototype developments are made. Significant developments are taking place in terms of using this technology other than cryptocurrencies, and there is fierce competition. According to the World Economic Forum, the market value of blockchain, which was 1 billion dollars in 2013, will exceed 3.1 trillion dollars in 2030 (Tufekci & Karahan, 2019).

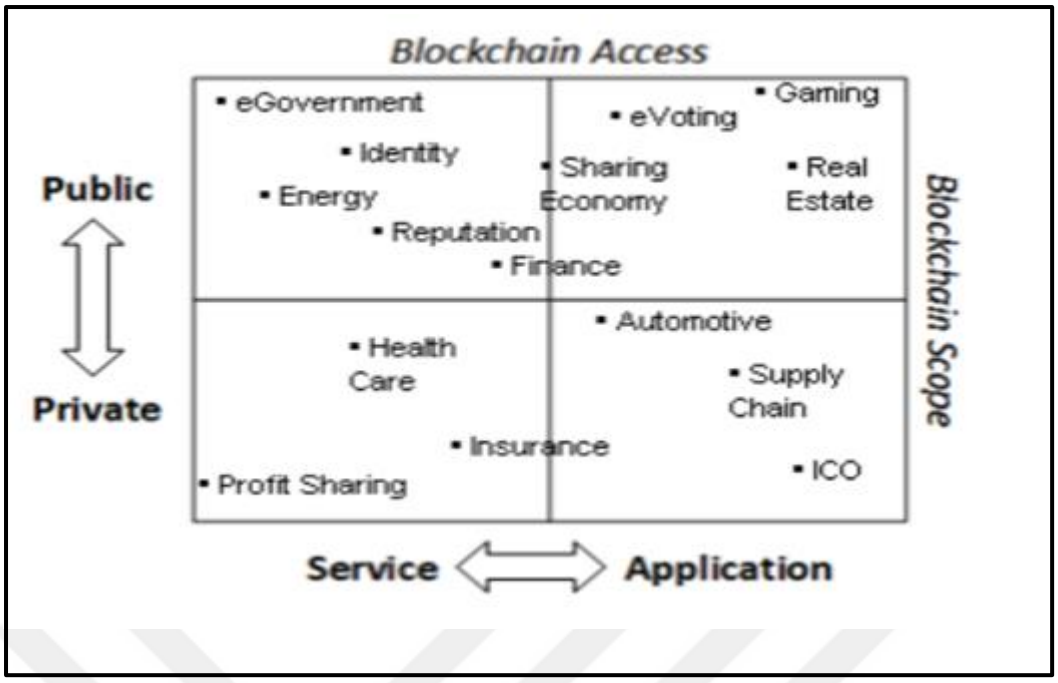

Figure 2.4 Application of Blockchain in area
Source: (Mounira, 2020)

In this table, these sectors need to store some information and access it easily. Blockchain technology makes all transactions of information keep a safe guard on the network as distributed ledger—for example, health care and real estate sectors information important to keep safe and Blockchain technology gives benefits to keep information and access easy in this area.

In addition, blockchain technology has many advantages used in Islamic Finance. There are many Islamic Finance products that are can be used on blockchain especially through the use of Blockchain-based sukuk, cloud data storage, Zakat collection, Waqf management, Takaful, and Blockchain-based sukuk, which leads to increased transparency and effectiveness of Islamic finance. (Mounira, 2020).

2.4 ISLAMIC CAPITAL MARKET

Capital markets are one of the most important elements of the modern financial system. Investors with surplus funds and entrepreneurs in need of funds benefit from capital markets by using various tools and intermediaries. In this sense, well regulated, effective, and healthy functioning capital markets play an important role in economic development.

The Islamic capital market can be defined as securities markets in which all types of purchases and sale transactions and other operations are carried out in accordance with Islamic principles and requirements. Therefore, in an Islamic capital market, transactions, practices, and behaviors that are prohibited according to Islam, such as Riba, Gharar, maysir, , manipulation (e.g. hoarding), are not included (Rahman, Shahrim, & Ramli , 2014).

Capital markets are very important for financial systems. It provides all kinds of opportunities for the economic development of countries and their monetary flows. In addition, it is very important in the financing of long-term projects. It is the place where players having much liquidity and want to invest, find it. Islamic Capital Market based on Shariah is the place where transactions are made with compatible principles and rules.

There are primary and secondary market Capital Markets. The primary market is the market directly faced by those who issue securities such as stocks, bonds, etc., those who need funds and those who have savings. "IPO" is an example of a primary market. The company, which is an IPO, issues shares for financing, and savers also evaluate their savings by investing in these shares. The secondary market is where the conversion of securities into cash is provided. Securities on the secondary market have previously been the subject of purchase and sale. Securities (stocks, shares, futures contracts, warrants, options, etc.) are bought and sold through brokerage firms in the secondary market through brokerage firms. Direct investors and issuers cannot trade. In short, the secondary market is the market where securities change hands between investors through brokerage firms. The most organized example of a secondary market is the stock exchange (investaz, 2018).

The tasks and objectives of capital markets are the same as Islamic capital markets. Islamic capital markets differ only on the appropriateness of Shariah and some issues. If we list the objectives;

- Comparing institutions that have a liquidity surplus and need liquidity. These can be in the private sector and the public sector.
- Plays a complementary role to the Islamic banking and Takaful sectors.
- Provides opportunity for diversification of risks.
- Makes available various financial services
- Contributed economic growth, in the search for financing of infrastructure sectors. Thanks to stocks of new projects and fundraising events not only domestic but foreign investors as well invest in Islamic stocks which increase employment and help ensure economic growth (ISRA, 2015).

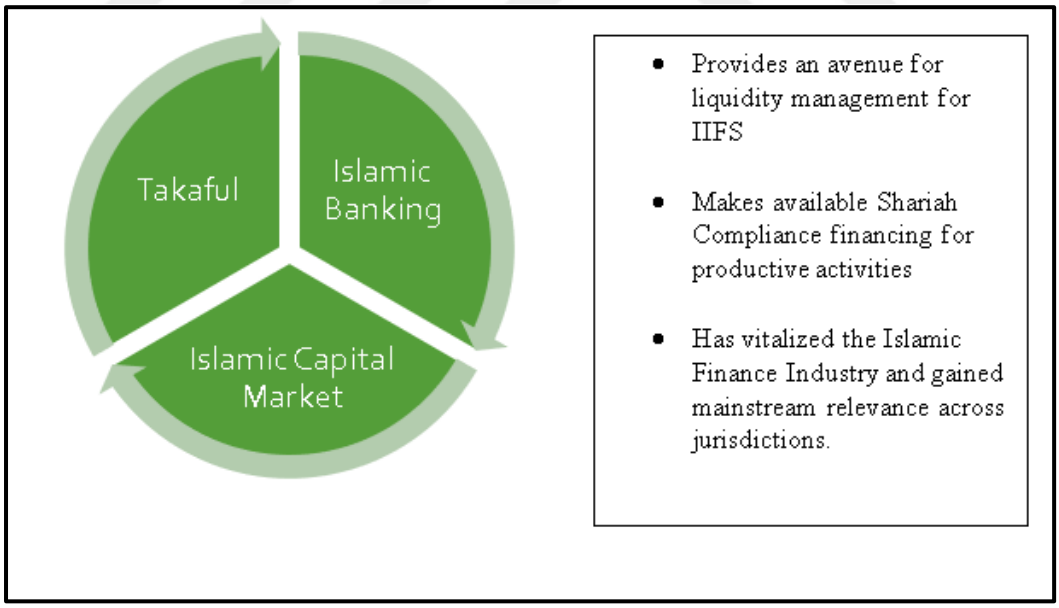

Figure 2.5 Islamic Capital Markets
Source: (ISRA, 2015)

Islamic capital markets are divided into equity and debt. Islamic capital market products have developed over time. These are Islamic unit trust, Islamic real estate investment (Islamic REITs), commodity funds, Islamic exchange-traded funds, Islamic private equity, and sukuk (Islamic bond), which is one of the most important products. Malaysia, which has a large Islamic Capital Markets volume, is recognized as the most developed country in the world for issuing Sukuk. It has a 45% market share of the global Sukuk issuance. Saudi Arabia follows Malaysia with 24.6% (IIFM, 2021)

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2.4.1 Sukuk

The Accounting and Auditing Organization for Islamic Finance has defined sukuk as follows: “After issuing, the sukuk represents equal values; the amounts from the issuance are invested as planned; These are certificates that represent the rights and shares on fixed assets and the like, or give partnership rights in a project or a special investment activity, depending on the type of investment made (Ozeroglu, 2014).

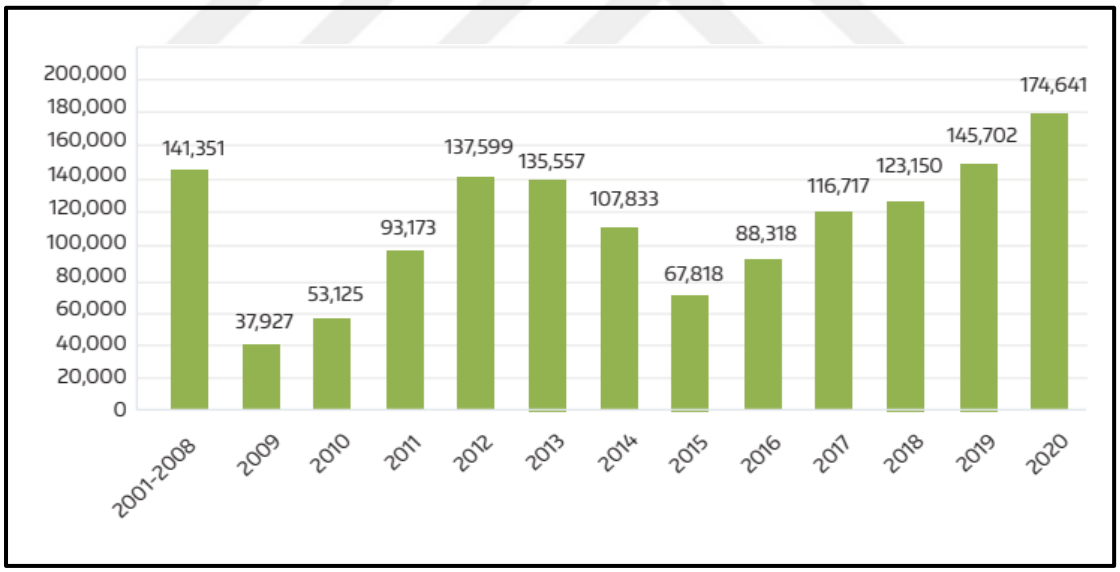
The concept of Sukuk is considered a financial instrument, which has been growing in popularity in recent years. It emerged because of rapidly growing Islamic finance activities. It is a tool that provides financial resources to all financial institutions and organizations, especially participation banks and all enterprises in need of capital in accordance with the Islamic legal structure (Serpam, 2013). Sukuk, also called and known as Islamic bond (Sherif & Erkol, 2017)is also expressed in Islamic Investment Certificates. It is an interest-free capital market product that provides fixed or variable income in the long or medium term. Today, it has become the focus of attention of many investors (Dinçer & Yüksel, 2017) is a liquid financial instrument that is also traded in secondary markets (Aydın, 2015).

Interest-free banking initiatives were first tried in Pakistan among the world's States but failed. Later, the pilgrimage fund was established in Malaysia in 1963, and successful results were achieved. Because of this success, the International Islamic University of Malaysia was established in 1983 (Aker & Karavardar, 2018). This issue of sukuk made in 983 through the Central Bank of Malaysia is the first in the modern period. Globally recognized sukuk issuance occurred again in Malaysia, and the sukuk

issue in question was made on behalf of an international Shell company. The second sukuk issue after this date was held in Bahrain in 2001. After 2002, Sukuk exports began to be made in Malaysia and many different countries. (Aker & Karavardar, 2018). After the 2008 financial crisis, there were developments in the sukuk market, and sukuk issuance began to increase.

The high volatility in Sukuk issues globally from one year to the next reflects the concentrated nature of the market. More than 90% of the outstanding Sukuk amounting to US$648 billion, belongs to only a handful of key countries (Malaysia, Indonesia, Gulf States, and Turkey). However, this trend is gradually changing; high-potential jurisdictions such as Pakistan, Bangladesh, Egypt are becoming more active in the field of Nigerian Sukuk (IIFM, 2021).

Table 2.2 Total Global Sukuk Issuances (Jan 2001 - Dec 2020) - All Tenors, All Currencies, In Usd Millions



Source: (IIFM, 2021)

Global sukuk issuance increased by about 19.84% compared to the previous year, or increased from US$145.702 billion in 2019 to US$174.641 billion in 2020. Although the stable export volume in 2020 is mainly due to government Sukuk exports from Asia, the Gulf Cooperation Council, Africa, and some other jurisdictions,

Malaysia nevertheless continues to dominate the Sukuk Sunday. Share from countries such as Indonesia, he UAE, Saudi Arabia, and Turkey rose with good volume.

Because sukuk exports are profitable and have a large return, they have attracted the attention of many countries and have made efforts to enter this market. Many countries have begun to pay more attention to this profitable market. As an example, non-Muslim countries such as the UK, America, and France have attempted to have a say in the high-income sukuk markets in recent years. Recently, developments in sukuk markets worldwide have occurred, especially in countries with participation banking infrastructure. The first participation bank was established in 1979 in Bahrain. The established bank emerged with the property of being the first interest-free Bank (Keskin & Kantarcı, 2015).,

Internationally, sukuk markets have reached an export volume of about $400 billion, especially over the last two decades. The export volume in question is still developing. In terms of sukuk issuance, Malaysia and Gulf countries are among the biggest actors in the sukuk market (Duqi & Al-Tamimi, 2019).

2.4.2 Sukuk in Turkey

Sukuk, Turkey also started trading on the Islamic capital market in accordance with article 61/1 by the SPK (Capital Markets Board) on December 23, 2012. In this declaration, the SPK has defined the procedures, principles, and bases related to the issuance and sale of sukuk in a general sense. Declaration is a law consisting of five articles covering the duties and responsibilities of Asset Leasing Company (VKŞ) in Turkey. Sukuk, which is exported under the name “Lease Certificate in Turkey”, is exported under the name sukuk in different countries (Yazıcıoğlu & Kazak, 2019). There are some sukuk regulation problems in Turkey. The first sukuk arrangement was made in Ijara sukuk in 2010. Subsequently, new regulations were introduced in Turkey in 2012, and the field of sukuk has expanded further. These new regulations, introduced in accordance with the Law and the new law in 2013, have expanded the scope of underlying assets to include all kinds of rights and assets and have implemented five internationally recognized sukuk structures (Wakalah, Murabaha, Mudaraba,

Musharaka, and Exception). It provides a greater variety of products. Also, in 2016, it reduced registration fees by five percent to encourage companies to access financing, reduce their financing costs, and improve the sukuk market. Turkey ensures the development of the Islamic Capital Market with the support provided by the state. One of these perspectives can be evaluated within the framework of the efforts to turn Istanbul Financial Center project into an Islamic Financial center. After some regulations, both the private sector and the state can issue sukuk in Turkey. Sukuk exports have increased recently in Turkey and continue to increase. The countries that export the most sukuk in the world value this situation in Turkey as a potential investment and attract the attention of Muslim countries, especially Gulf countries. In this area, the Turkish state provides facilities such as tax breaks for sukuk issuance and tries to make it a center for Muslim and non-Muslim investors.

Recently, the Republic of Turkey has taken some steps to improve the Islamic Finance environment. Turkey drew attention to the importance of the Istanbul Finance Center to develop the Islamic Finance environment through the New Economic Plan (YEP). In the New Economic Plan, the Istanbul Finance Center is targeted to be an Islamic Finance base. The Presidential Finance Office was established to increase the diversity of institutional infrastructure and interest-free finance.

Table 2.3 2013-2021 Public and Private Sector Sukuk Issuance Total Amounts in Turkey

Between 2010-2021	**USD (Million USD)**	**MYR (Million MYR)**	**TL (Million)**	**Sum of TL equivalent**
Private Sector	4.495	1.960	119.155	168.701
Public Sector			85.561	85.561
Total	4.495	1.960	204.676	254.262

Source: (TKBB, 2021)

The private sector has a significant share in the export of sukuk. Again, sukuk exports are made in Turkey on its own money. Sukuk issuance in foreign currency is not much, as can be seen in the table.

As the issuer of the sovereign Sukuk in Turkey, the Ministry of Treasury and Finance (MTF) conducts all these Sukuk issuances under the structure of Ijarah Sukuk. In 2016 the MTF issued the first longest term (5 years) maturity Sukuk to enhance liquidity and provide a benchmark yield curve (IIFM, 2021). With the notification published in 2010, sukuk entered the Turkish capital market legislation, and a participation bank made the first lease certificate issuance worth US$ 100 million in the same year in international markets. Following the tax regulations regarding lease certificates in 2011, the first TL-denominated lease certificate issuance of TL 1.6 billion was made in the domestic markets in 2012 by the public treasury. With the regulations made in 2016, the tax problems in front of private sector lease certificate issuances were removed, and the non-banking private sector started to take an active role in the lease certificate market in 2017. With the Automatic Enrollment System (OKS) introduced in 2017, 63% of investors participating in the Private Pension System (BES) preferred participation-based funds, increasing the demand for lease certificates and expanding their market share. In 2018, the volume of lease certificates issued in the domestic market increased by 160.8%. With the regulation made in 2018, a participation-based repo and reverse repo market was established under the "Committed Transactions Market" at Borsa Istanbul A.Ş. and lease certificates started to be traded in this market. Thus, the issuance of lease certificates issued by participation banks accelerated significantly. In parallel with the fact that the participation finance system continues to grow by gaining a place in the Turkish finance sector and the structural arrangements and incentives in the participation capital market are completed to a large extent, the issuance of lease certificates in the domestic markets as of 2019 increased by an annual average of 56.4% and reached 115.54 billion TL in 2021. 83.6% of the lease certificates worth 115.64 billion TL, issued in TL in 2021, were issued by participation banks, 9.9% by the public treasury, 5.4% by the non-banking private sector, and 1.1% by the private sector.. The most important reason for the small share of the public treasury is that since 2018, it has focused on the issuance of gold-backed and foreign currency lease certificates. Turkey's first sustainable lease certificate issuance was made in 2020 by a company operating in the energy sector in the amount of 50 million TL. A participation

bank also carried out sustainable subordinated lease certificate issuance of USD 350 million in September 2021 for the first time in the world. In November 2021, Turkey's first green lease certificate issuance worth TL 52 million was made by a participation bank, again based on partnership. The last green lease certificate of 2021 was issued in December, with a value of 600 million TL and based on the work contract, within the scope of financing the Istanbul Finance Center project.

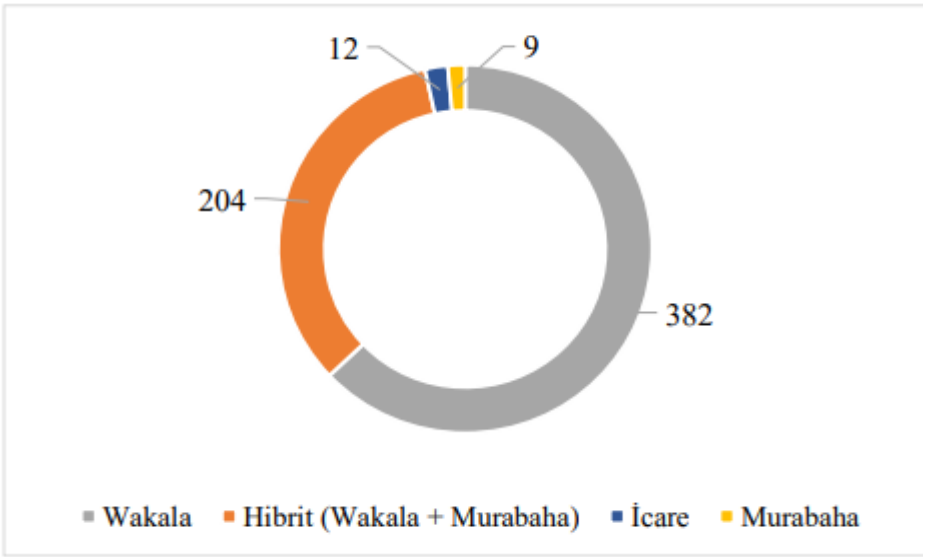
Table 2.4 Sukuk issuances in Turkey (from 2016 to 2021) TRY

Years	Participant Banks	Investment Banks	Companies	Sovereign
2016	3.358.613.800	75.000.000	-	6.262.256.540
2017	7.208.000.000	250.000.000	450.000.000	4.259.964.792
2018	20.603.934.047	1.247.660.000	2.629.650.000	7.253.675.000
2019	40.483.695.953	1.624.360.000	4.063.000.000	7.601.170.000
2020	54.142.398.000	1.900.000.000	4.212.950.000	37.155.160.000
2021	96.537.764.404	1.310.000.000	6.216.090.000	11.477.850.000
Total	226.403.497.204	6.507.020.000	17.571.690.000	85.530.269.018

Source: (Hazine ve Maliye Bakanlığı, 2021) (TKBB, 2022) (KAP, 2022)

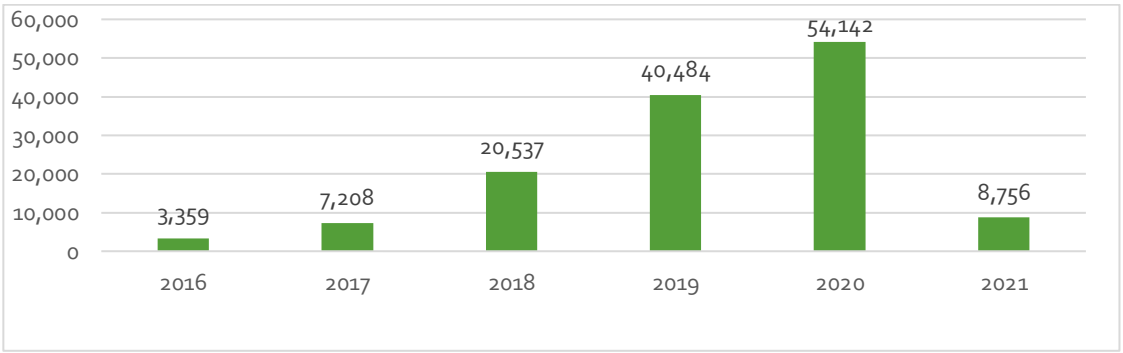
The total figures of TRY issuances issued by participation banks from 2010 to 2020 in Turkey are shown in 2.4-4. After 2017, the export volume increased dramatically, reaching a total of 54,141 Billion TRY in 2020. The average maturity of sukuk issued in Turkish lira by participation banks in Turkey is approximately 110 days (TKBB, 2021). When the distribution of TL sukuk issued domestically by participation banks is examined, it is observed that the most preferred sukuk structure is Wakalah with 63%, Hybrid with 34%, Ijarah with 2% and Murabaha with 1%. Accordingly, we see that most of the TL sukuk issuances of participation banks in Turkey can be bought and sold in 110 days maturity, in the Wakalah structure, and therefore in the secondary market. When we examine the issuance method of sukuk issued in Turkey, we see that sales to qualified investors dominate with a 51.15% share. While sales abroad constitute 29.28% of the sukuk issued, it is followed by public offering with 11.89% and privately owned sales with 7.67% (SPK, 2021).

Table 2.4: Structures of Sukuk Issued by Participation Banks (2010-2020, Number)



Source: SPK 2021

Table 2.5 Development of Sukuk Issue Volumes by Years (Million TL)



Source: (TKBB, 2021)

The regulations regarding sukuk in Turkey are shown in the figure 2.4-1. Especially after 2016, the reason for the increase in the issuance of sukuk is related to the regulations that came in that year. In 2021, important regulations and additions were introduced. It is very important for the development of green sukuk that the draft guideline has been prepared, especially in the field of green sukuk.

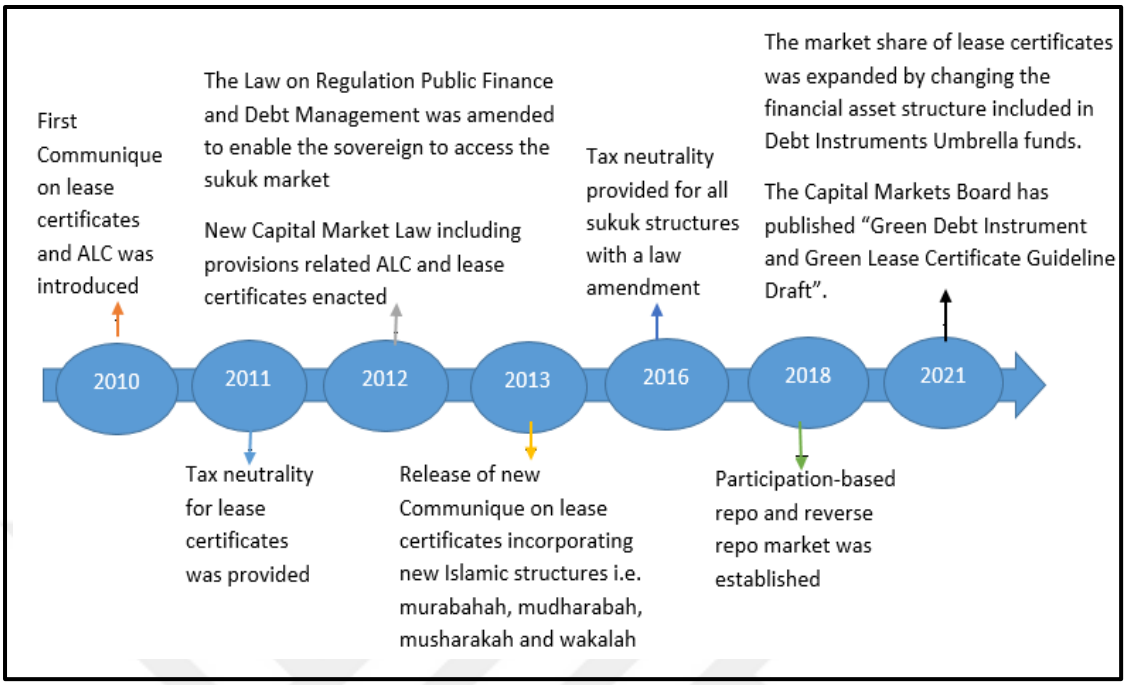


Figure 2.6 Timeline of Turkey's Sukuk Regulation
Source: (Hazine ve Maliye Bakanlığı, 2021)

Sukuk view in Turkey

As stated in the CMB announcement, sukuk issuances have been made in the types of ownership (ijarah), purchase-sale (murabaha), partnership agreement (mudaraba) and hybrid sukuk where management and purchase-sale agreement are used jointly. Ownership-based (ijarah) sukuk has been the sukuk structure with the largest issuances in terms of value. The reason for this is that twice a year issuance by the Treasury to domestic investors exceeds 1 billion dollars. The issuance of sukuk based on the partnership agreement was relatively less. Partnership-based lease certificates, which include labor-capital (mudaraba) and capital partnership (musharakah) structures, do not show sufficient interest from the demand and supply side due to the risk involved. However, the increase in issuance in these structures is important for the development of the Islamic capital market (Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı, 2020).

2.4.3 Type of Sukuk

Although there are many types of sukuk, there are 6 types of sukuk that are generally accepted by experts and academics. Recently, the types of sukuk in question, which have seen an increase in their use in terms of trading volume, usage and export frequency, have been tried to be described below

2.4.3.1 Al-Murabaha

Murabaha, an Arabic term, is defined as a sales process made by adding profit to a product at a rate agreed by the parties (Yakar & Önal , 2013). In Murabaha, the buyer can immediately own this asset but pays the purchase price in predetermined instalments within a specified period (Smaoui & Ghouma, 2019). It can also provide its investor with a fixed return on the purchase and sale activities performed (Kuşat, 2014). Parties who own Murabaha sukuk may have the right to resell the Murabaha they own (Alpaslan, 2014).

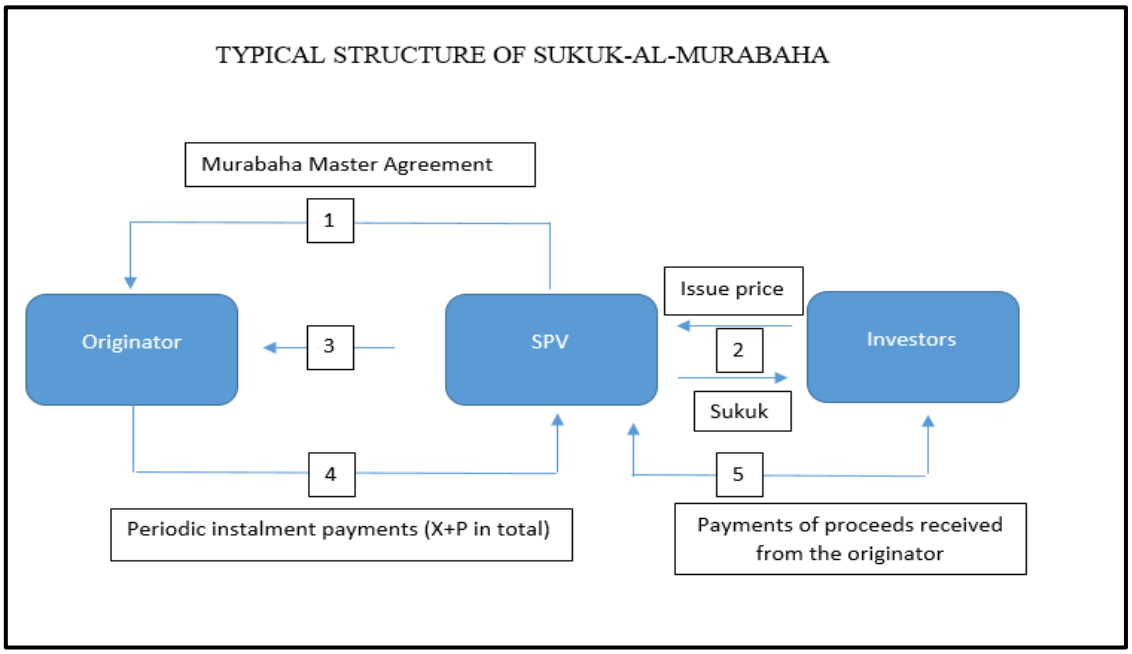


Figure 2.7 Murabaha Process Flow
Source: (Lee, 2009)

2.4.3.2 Al-Mudarabah

Mudarabah sukuk are Partnership-based contracts to meet the financing needs of Special Purpose projects. Mudarabah contract is generally implemented for projects in need of large-scale financing (Yılmaz, 2020). Mudaraba sukuk is recognized as a model in which two mutual parties participate in profit loss sickling by putting forth one capital and the other labor or knowledge. At the same time, parties can also consist of one or more people. In Mudaraba, all project costs are borne by the capitalist, and management-related activities are carried out by the entrepreneur (Yanpar, 2015). In this aspect, it can show a similar situation with venture capital. It is also a type of sukuk in which it is determined how profit-sharing should be done at the start of the business between partners (Kağıtıcı, Yılmaz, & Bademli, 2019). Mudaraba sukuk certificate holders can earn as much income as the amount of profit they agree on from the income generated because of a transaction. In other words, Mudaraba only has a contractual profit partnership. If there is a loss because of any financial transaction, the loss belongs entirely to the owner of the capital. A person or institution that owns the labor and information part of the work under the contract has no responsibility for such damage (Selçuk, 2014).

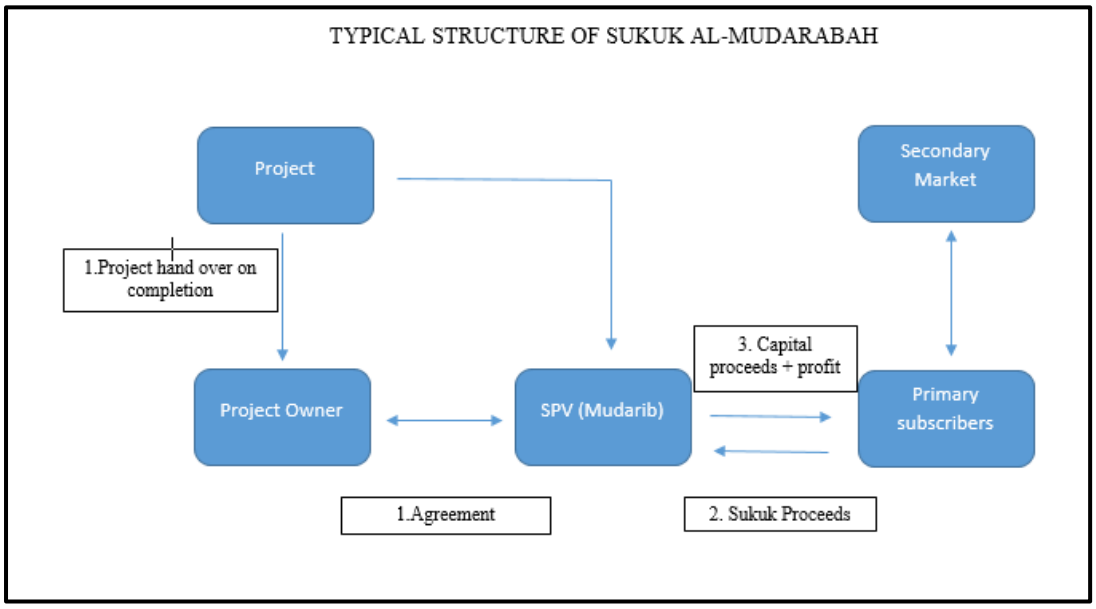
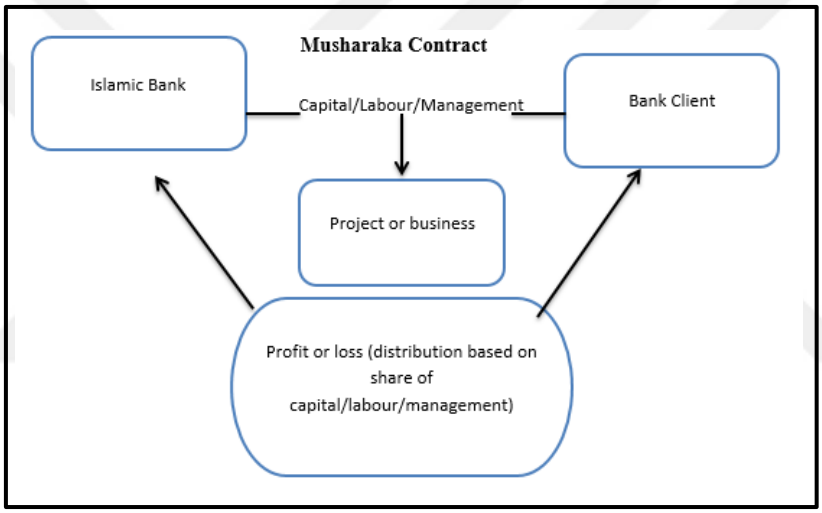


Figure 2.8 Al-Mudarabah Structure
Source: (Arabi, 2015)

2.4.3.3 Musharaka Sukuk

A Musharaka sukuk is a partnership based on a commercial activity performed between two or more people and the sharing of profits obtained in relation to this activity between them. Besides capital, labor is also laid out in Musharaka. Thanks to this situation, Musharaka sukuk is separated from Mudaraba sukuk (Kenton, 2020). Musharaka sukuk are investment sukuk of equal value that indicates ownership of the asset owned by the parties in a partnership. It can be used to finance an existing business or a new project based on a partnership.



2.4.3.4 Ijarah Sukuk

Ijarah is considered a type of contract in which the lessor transfers to the lessee any right of use of the goods or services for a certain period for a certain price and may have interests in the goods or services that the lessee has leased. According to (Kordvani, 2009), Ijara sukuk refers to bonds on structured global scales based on leasing principles. In addition, Ijara sukuk may also grant the owner of the value a partnership or usufruct right on the securities or real estate subject to lease in any rental event. In other words, in this sukuk model, the lessor can transfer or sell the ownership rights of the securities or real estate that he owns to another person in a way that the lessee will not be affected (Alpaslan, 2014)

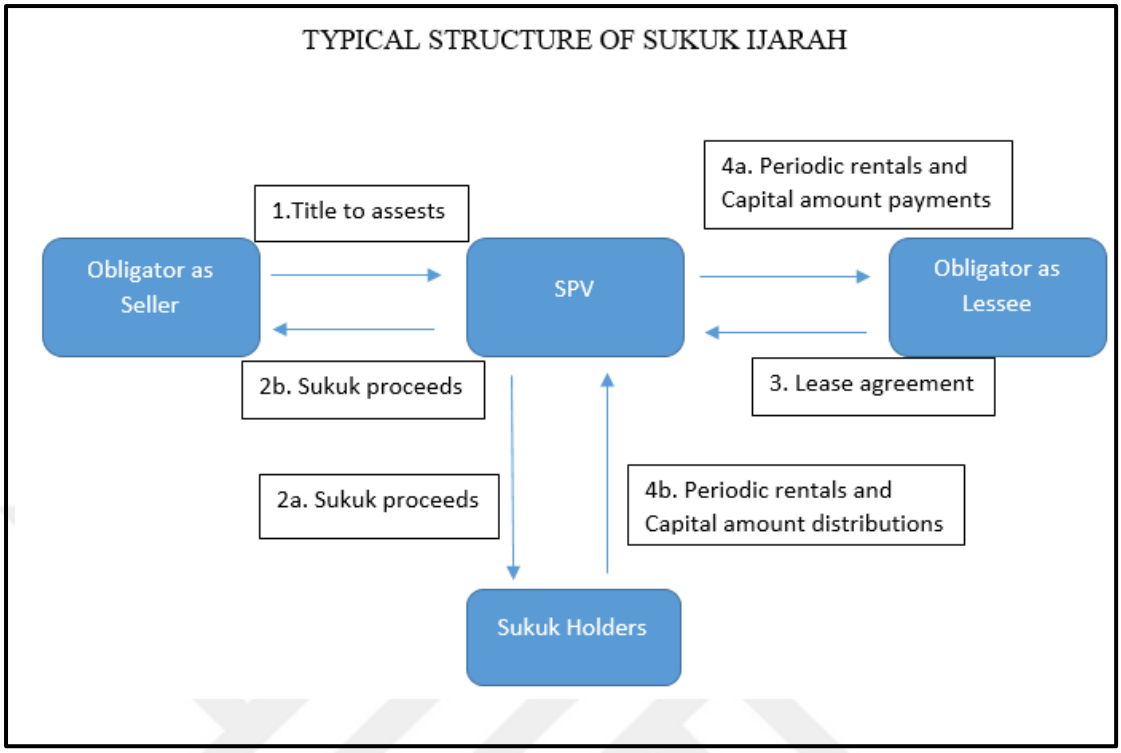


Figure 2.10 Typical Structure of Sukuk Ijarah
Source: (Abubakar, 2020)

2.4.3.6 Green Sukuk

Green sukuk to fund environmental-friendly projects and support projects that find solutions to environmental problems, Shariah is the appropriate type of Islamic bond (Abdullah & Nayan, 2020). It has recently gained significant momentum with the financing method of projects suitable for solving environmental problems. In addition, because there is no difference between a green bond and a green sukuk, the fact that it has more capacity than green bond investment capacity shows the advantage. One of the advantages of green sukuk is that it combines traditional investors with those who want to invest in accordance with Islamic rules in the same project (Kandır & Yakar, 2017). Green sukuk are Shariah-compliant investments in renewable energy and other environmental assets. Sukuk funds will be used to conserve the environment and natural

resources, conserve energy, promote renewable technologies, and reduce greenhouse gas emissions (Abdullah & Nayan, 2020).

At the United Nations Global Warming conference in Paris, the Islamic Development Bank (IDB) announced its interest in Environmental Assistance projects with green sukuk. 56 countries that are members of the IDB announced that they had raised funds for the $ 186 billion green sukuk project. In addition, the IDB announced that it aims to raise these goals from $ 80 billion to $ 150 billion by 2016-2030 (Rahim & Mohamad, 2018). These projects are important for demonstrating the development of green sukuk and reducing carbon emissions in the world.

Proceeds from green sukuk can be used to finance construction or the payment of a government-granted green subsidy. The structure of green sukuk involves securitizing future income cash flows from ring-fenced projects or assets with specific criteria attached as shown in Table 2.7. The funds raised from the sukuk issuances are utilized mainly for green Shariah-compliant projects. Profits from the portfolio after deducting the expenses of the Special Purpose Vehicle (SPV) are passed on to the sukuk holders. The Obligor also commits to purchasing the portfolio at maturity from the SPV. The purchase price is to be determined as the sum of the aggregate nominal amount of the trust certificate and accrued unpaid periodic distribution.

As defined by Climate Bond Standards certification, assets that can be utilized for green sukuk include solar parks, biogas plants, windfarms, ambitious plans to promote energy efficiency, renewable transmission, and infrastructure, electric vehicles, and light rail, among others. (Alam, Duygun, & Ariss, 2016)

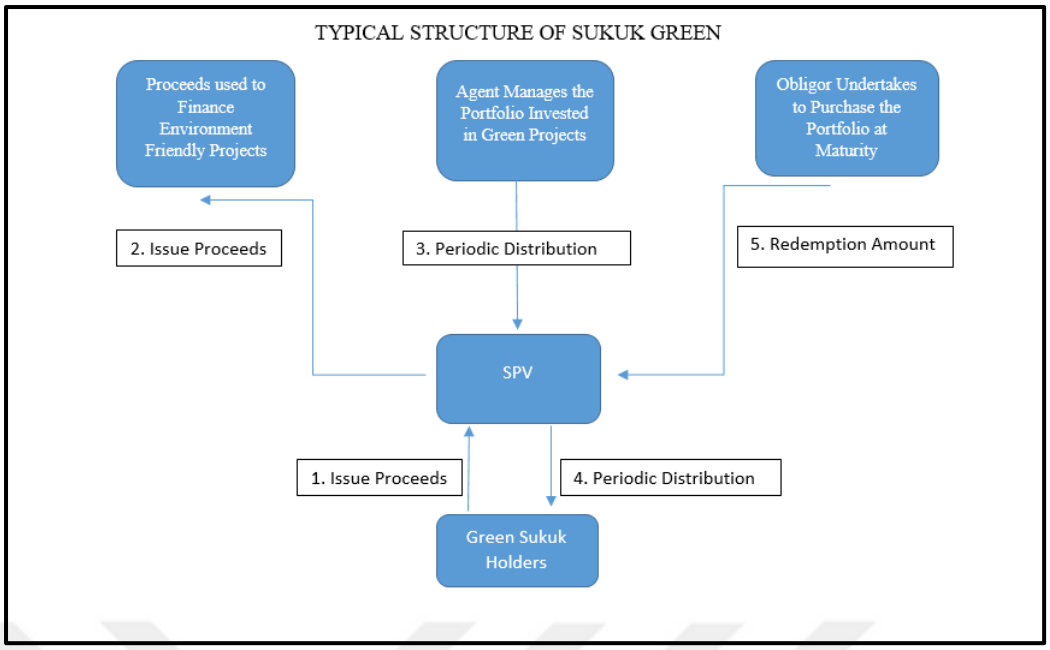


Figure 2.11 Green Sukuk Structure
Source: (Alam, Duygun, & Ariss, 2016)

The first green sukuk is Legendre Patrimione (solar energy and real estimate company) had issued Orasis Green Sukuk with Anouar Hassoune Conseil (an Islamic finance consultancy firm offering financial, brokerage, project management, and training advisory services) in 2012 in French. The sukuk termed "Orasis Green Sukuk" is backed by renewable energy assets and is the first structure in France where Islamic certificates are open for investment to private individuals as well as institutional investors.

Industrial Development Bank of Turkey (TSKB) became the first Turkish bank to issue Green / sustainable bonds in international markets, signing another principle. The 5-year issuance of

TSKB, which provides resources for the transition of the Turkish private sector to a low-carbon economy, amounting to $ 300 million, is the 13th of the planned amount. The fund provided by this issuance, which is implemented under the Coordination of Bank, which TSKB raises will only be used to finance green and sustainable projects (TSKB, 2017). TSKB first issued green bonds in our country in 2016. The issuance with a maturity of 5 years and an amount of 300 million dollars

received a demand of 4 billion dollars from 317 institutional investors. Since that date, the total green and sustainability-themed bonds issued by the banking sector has reached approximately 2.5 billion dollars. Banks and company groups operating in more than one sector mostly carry out the practices carried out in our country for green bonds, which offer new opportunities. As of the first quarter of 2021, a total of more than $3 billion in environmental, social, and sustainable bonds was issued. The acceleration in the world of green finance has also triggered the convergence of the world of Islamic finance and sustainable finance practices. The compatibility of the ethical financing concept in Islamic financing with the sustainability phenomenon has paved the way for establishing sustainability-themed issuances in Islamic financing instruments. Although efforts to adapt it to Islamic finance started in 2012 with the "DanaInfra Exchange Traded Bonds and Sukuk" program, Tadau Energy, a solar energy company in Malaysia, issued the first green sukuk in 2017. TSKB made the first issuance in Turkey in the field of Islamic sustainable finance in 2020 with a 50 million TL issuance on behalf of a private sector energy company operating in the energy field (TSKB, 2021).

Milestones of green sukuk by years are summarized as follows. (Aassouli, Asutay, Mohieldin, & Nwokike, 2018,)

- In 2012, an Australian company (Solar Guys International and Mitabu) obtained a USD 100 Million sukuk to finance a PV 50 Mega project in Indonesia.
- In 2012, the French company Orasis issued sukuk to finance solar projects.
- In 2012, the Green Sukuk Working Group was established in the United Arab Emirates to create standardization and awareness regarding green sukuk and to facilitate the development of the green sukuk market by ensuring that issuances are made in accordance with climate bond standards.
- In 2014, Malaysia launched the framework legislation of a Sustainable and Responsible investment (SRI) sukuk (SRI Sukuk), which covers environmental and social aspects, to facilitate the financing of sustainable and responsible investment initiatives.

- In 2017, Malaysian Tadau Energy issued Malaysia's first green sukuk. The issuance amount of the sukuk is MYR 250 Million and the maturity is 2-16 years.

2.5 BLOCKCHAIN-BASED SUKUK

The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) defines sukuk, which is referred to as lease certificates in our country, as “Sukuk refers to ownership over existing goods (ayn), interests or services, or proprietary shares in the assets of a particular project or private investment activity. They are certificates that are issued in a similar way and of equal value to each other”. In the continuation of the definition, it is stated that “These certificates (sukuk) represent joint ownership of equal value on the assets only after the certificate fees are collected, the issuance is realized, and the supply is completed. They are used for the purpose for which they were issued” (Yazicioglu & Kazak, 2019). Sukuk enables issuers to finance large-scale projects and businesses. It provides its investors with real business transaction income, not interest income. Sukuk with many variants; It can be exported in many types, such as partnership-based, trading-based, contract-based, and agricultural activities. If we roughly consider the mudaraba type sukuk, which is one of them, by establishing a partnership between the investors and the issuer on the basis of risk-sharing, the fund collected from the issued certificates meets the financing needs of the issuer, while the investor gains the chance to profit by adding his idle funds to the economy wheel.

Sukuk, also referred to as Islamic bonds, differs significantly from traditional bonds. Although there are debt relations based on interest in bonds, it has a simpler mechanism than sukuk, while states and companies with a system that has been established for many years issue it. When we look at Sukuk transactions (although there are differences in each type), there are real commercial activities such as partnerships, buying and selling of goods, and investors earn income based on these activities. There are many parties during its implementation, the document work is serious, and the taxation issue differs from region to region. Significant time and cost costs are incurred during its issuance. Due to the briefly mentioned above and other reasons, its market

share is very low compared to conventional bonds, and governments or large companies can generally issue it.

However, when we consider the problems of today's world caused by excessive financialization, it will be beneficial in many ways that the sukuk instrument based on real economic transactions replaces the traditional debt-based bond. In addition, sukuk, with its multiple variants, can offer significant opportunities for financing micro-level institutions, but small businesses cannot take advantage of the opportunities offered by sukuk due to its complexity and cost. It is important for businesses with limited capital to benefit from the opportunities provided by sukuk to ensure sustainable growth in the economy.

In Sukuk and other participation finance instruments, using financial technologies by correctly arranging Shariah and legal issues, there will be a chance to reduce costs, reach wider customer masses and increase the participation finance market share. Issuing sukuk on the blockchain can be one of these options, and with this method, cost and time problems can be overcome, and micro-enterprises can be financed with sukuk. Although blockchain-based sukuk is a new concept, there have been many important events in various countries related to the subject, and it seems likely that we will hear its name frequently in the future. The conventional finance equivalent of sukuk has been issued several times over the blockchain, and serious studies have been carried out to use blockchain technology in the capital markets. In short, with the low cost, speed, and efficiency provided by the technology, it can be expected that such issuances and the use of blockchain technology by different institutions in capital markets will increase.

The issuance of sukuk on the blockchain offers a revolutionary solution that promises to reduce costs and simplify complexity with efficiency and transparency (Mohamed, 2019). This structure includes executing contracts in traditional sukuk, by automating necessary transactions such as payment and property transfer with the smart contracts facility of blockchain technology. Since the transactions are kept in the blockchain records, they can be monitored (Auwal Adam Sa’ad, Kunhibava, Mustapha, Muneeza, & Karim, 2020). This structure is called “Smart Sukuk,” and its primary importance is to standardize and automate most of the accounting, legal, and payment

overheads of traditional sukuk offerings. All of these are supported by fully licensed legal entities in the issuing country (Sa'ad, 2018).

In this format, papers that provide investors with ownership and income rights over the asset are distributed as crypto tokens (Mohamed, 2019). Tokenizing sukuk using blockchain can help create more secure and immutable data while reducing the number of intermediaries involved. Tokenization also expands the issuance of sukuk, making it easier for smaller groups to be involved so that small producers, micro-enterprises, and SMEs that have difficulties accessing finance can be financed with sukuk (Khan, Kchouri, Yatoo, & Kräussl, 2020).

With this method, significant benefits can be obtained in terms of financial participation and bringing idle funds to the economy. That is, while participation in financial markets is not easy for everyone due to the high investment amount required in traditional methods, small investors may also be able to participate in sukuk with the micro sukuk issuance that can be made with this technology. Thus, large returns can be achieved in general by bringing investors with limited savings and young people with technology-related and small investment potential to the economy wheel. At the same time, it can be expected that the customer potential of participation finance will be increased, and the retail sukuk area will expand.

Sukuk structures contain contracts of issuers, investors, and special purpose companies (SPV); this process can be automated and made more transparent with smart contracts. Real-time, efficient procedures can be prepared by automating payments between parties (Khan, Kchouri, Yatoo, & Kräussl, 2020).

A much more efficient process can be achieved with this technology at the point of monitoring and auditing the fulfillment of the contract requirements. In this context, by providing an easier, more transparent, and healthy control, the intentional or unintentional mistakes that the parties may make in the operation of the contract can be detected more quickly.

One of the most important issues in Sukuk and other financial instruments is the clearing and settlement process. Clearing refers to the process of matching orders on

the trading platform to determining net debits and credits, and this service is provided by clearing houses. The clearing house also assumes the market risk and becomes the counterparty to each market participant. Reconciliation or delivery, transfer of net debts and receivables resulting from clearing between the parties on account or physically, means the service of actually ending the life cycle of transactions. The transfer of the instrument to the buyer can be more efficient with blockchain technology, without a central authority, automatic delivery, and payment. With the automation of periodic payments, counterparty risk is reduced as settlement occurs in real-time (Khan, Kchouri, Yatoo, & Kräussl, 2020). Secondary market transactions for sukuk that are suitable for sale in the secondary market will be easier and faster, as well as the opportunity to meet with more buyers so that the liquidity of papers (certificates) can increase significantly.

With the globality of the internet and technology, the visibility and accessibility of the issue will increase so that it will be easier for the issuer to reach foreign investors, and it will be easier for the issuer and investor to meet with 24/7 access. Current credit ratings are made with national credit bureaus, and calculations differ from organization to organization. Credit ratings can become more fair and efficient with a decentralized due diligence platform. Know your customer (know your customer, evaluation) process is also done more efficiently and quickly (Mohamed, 2019).

In general, the opportunities provided by blockchain-based sukuk are speed, efficiency, transparency, low cost, and reaching a large investor base.

With these possibilities, we are in the early stages of blockchain technology, and this technology generally has no legal basis. This situation poses a problem both in terms of Islamic law and the current legal system. The points to be considered will be given below.

Blockchain-based sukuk has no legal basis in many regions, but the transfer of ownership in sukuk must actually exist. Dispute resolution and grievance resolutions can only be achieved with the appropriate legal framework (Khan, Kchouri, Yatoo, & Kräussl, 2020).

Possible faulty coding and any other errors in smart contracts to be issued can cause great harm (Khan, Kchouri, Yatoo, & Kräussl, 2020). Just as the issue of trust is important in economic activities in general, the platform that provides services for blockchain sukuk is essential for the trust of issuers and investors, its accountability, and the health of transactions (Mohamed, 2019).

Public blockchain platforms are likely to pose a data privacy challenge. Therefore, private blockchain platforms may be preferred (Khan, Kchouri, Yatoo, & Kräussl, 2020).

Cyber threats also pose a risk to blockchain sukuk. Those responsible should take the necessary measures to prevent this from happening, and steps should be taken to eliminate the grievances that may occur despite all the precautions (Auwal Adam Sa'ad, Kunhibava, Mustapha, Muneeza, & Karim, 2020).

Blockchain-based Sukuk and Shariah Perspective

As with all Islamic finance products, Shariah compliance must be ensured for blockchain-based sukuk. First of all, the fiqh status of blockchain, smart contracts, and tokens will be evaluated before issuance begins. Although the salient points of these technologies in terms of Shari'ah are briefly mentioned above, some points will be conveyed here as well, and these and additional issues need to be examined by Islamic law experts.

In the contract theory of Islamic law, there are some conditions such as certain age limits and mental status sought by the parties, issues such as the possibility of arranging this on blockchain technology should be examined by scholars. In smart contracts, the discretionary rights of the parties cannot be changed after the contract is activated; the actual existence of the transactions to be made in the contract (partnership, purchase, and sale of goods); In case of problems that may arise, it is necessary to clarify whether the grievances can be eliminated by legal means. In this structure, we have stated that the papers that give entitlement to the investors are distributed as coins: these tokens can be purchased with crypto money. There is no state behind cryptocurrencies,

states do not recognize them, and these coins, which contain speculative and instability, are not permissible by Islamic jurists. Whether or not trading with cryptocurrencies is legally permitted in the country of issue should be evaluated because sukuk investors must have real ownership on the said basis. The possibility of making this sukuk issuance over the national currency-based virtual currency on the blockchain and the use of cryptocurrencies for sukuk investment rather than buying and holding should also be discussed by experts. We have mentioned that in the sukuk structure, investors must have full real ownership of the underlying, and in this and other respects, the representation of the assets of the tokens should also be considered.

If a decision is made to create a smart sukuk, the structure of the sukuk to be issued should be according to Shari'ah, competent people should arrange the steps from the beginning to the end of the maturity, and a tool should be put forward in accordance with the principles of Islamic finance. To deal with this product in detail, it will be healthier for Islamic lawyers, computer programmers, financiers, and legal advisors to come together and provide enlightening information on the points related to their field. It is essential to clarify the question marks for this new model, which offers great opportunities.

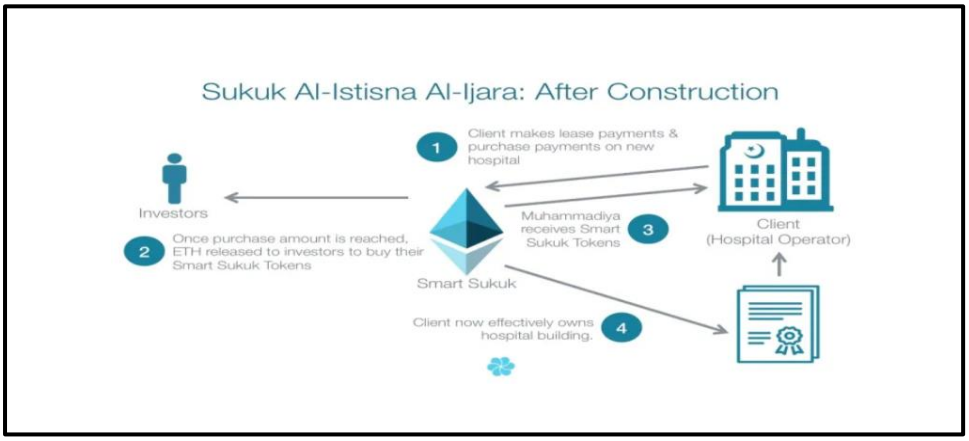


Figure 2.12 How Blockchain-based Sukuk Works
Source: (Blossom Finance, 2018)

This example is a sukuk issuance image of Blossom Finance, a fintech institution in Indonesia, made over the blockchain as sukuk ijarah. First, you need to have all Shariah eligibility to become commodity sukuk. Then, these shariah-compatible sukuks

become coins and are traded on the Ethereum platform, and investors receive these sukuks. Later, the periodic profit income is transferred to the accounts.

Investors are issued a certificate of ownership. Investors can be from overseas and invest in Indonesia. The coins they send can be bitcoins or Ethereum, but these coins are immediately converted into local currency. As a result of these transactions, an Ethereum smart contract is obtained, and these contracts can be traded on the secondary markets. These transactions and refunds are automated using the decentralized blockchain, not through people paying dividends (Tan, 2021).

Blockchain-based bonds/sukuk have brought a lot of innovation and convenience to the financial sector. Traditional contract processes have difficulty keeping up with the pace of the financial world. As can be seen in Figure 2.3 above, participants who did not know each other without any intermediary institution were able to make contracts among themselves (Albaraka, 2020). Blockchain-based bonds/ sukuk are based on blockchain technology, allowing you to reach participants world widened increase investments through Blockchain-based bonds/sukuk (Demirdöğen, 2020).

Table 2.6 Advantages of Blockchain-based bonds over Traditional Contracts

Traditional Contracts	**Blockchain-based bonds**
It is prepared by a lawyer	It is to be coded by the engineering of computer
It consists of legal terms and concepts on paper	It involves digital and algorithm
Necessary the third parties for execution	Can be execution based on terms predefined as automatic
Get a long time to be ready	No need to take a long time to be ready
The process is so slowly	The process is so fast

Source: (Simsek & Samar, 2020)

Due to failures in traditional contracts, investments are slowing down, and long processes are taking place. In addition, in the wake of the 2008 financial crisis, there was a problem of trust in such contracts. Investor confidence is an indicator that describes the risks associated with the instrument being invested. In this sense,

increased economic uncertainty and risk with the global financial crisis were reflected in the capital market (Ulusoy & Ela, 2018). Because Blockchain-based bonds are blockchain-based, this eliminates the problem. (Keleş, 2019) emphasized the importance of blockchain and the necessity of Blockchain-based bonds in terms of creating a stock exchange infrastructure such as stock exchange by acting as Blockchain-based bonds and capital markets and investment banking.

2.6 GREEN FINANCE

After the Second World War in 1929, due to the economic understanding prevailing at that time, countries reached significant numbers in industrialization and industrialization to ensure development and economic growth. While economic growth was achieved, the consumption of fossil fuels increased in parallel with this. Rapid industrialization has put pressure on the limited resources in nature and posed a threat to the ecological system. The increase in the use of fossil fuels during this period has raised the problem of environmental pollution. The concept of "zero economic growth" of increasing fossil fuel consumption in line with the economic growth goals of the countries was introduced as a solution (Sahin U. , 2017). The foundations of an environmentally friendly economic understanding were laid after the Keynesian economic understanding began to disappear in the 1980s. The fact that the Green Economy has become more popular has been after the financial crisis of 2008. Each new economic crisis has brought with it a new order and system. the reason for the 2008 financial crisis was based on three main factors. These factors are ecological, social, and economical. As a solution to these three factors, a Green Economy has been adopted. The United National Environment Program (UNEP) has said that its decision to exit the crisis will only be with a Green Economic understanding (Sahin U. , 2017). After these developments, the understanding of the Green Economy has developed. This understanding is a critical understanding of economics that introduces the prevailing economic theory. Green Finance is defined as an economy that seriously reduces environmental risks and environmental shortages while ensuring human well-being and social equality. Green Finance;

- Aiming to minimize the bad impact of man on nature.

- Aiming to produce-consume-stay in harmony with nature.
- Advocating human well-being and social equality.
- Adopting an environmentalist approach by reducing carbon emissions and energy pollution.

The scope of Green Finance is wide. Each activity that will reduce environmental pollution is the subject of a green economy. Electric cars, projects that provide afforestation and waterproofing, artificial intelligence that provides interrupted electricity flow with renewable energy, investments in renewable energy sources using blockchain technology, and environmental research such as green economy are entering the field of the green economy.

One of the first things that come to mind regarding the green economy is renewable energy sources. All forms of production are environmentally friendly and sustainable resources, providing them from natural sources. As renewable energy sources, solar energy, wind energy, geothermal energy are the most important. In addition, the characteristics of Renewable Energy Sources are as follows;

- Sustainable
- Unlimited resources
- Environmentally friendly and recyclable

Green Finance also supports localization and nationalization. He notes that in the global trade structure, production is shifted to whichever state has a cheaper labor price, leading to an increase in global trade. The growing global trade is causing devastating ecological destruction and the transfer of environmentally polluting industries to cheap labor-owning states. Its understanding of self-sufficiency with green finance argues that there is no longer any need for global trade that causes greenhouse gases. In addition, since localization will provide a more environmentally friendly economization that will eliminate income inequality, it is consistent with the green economic understanding. Green Finance will look in a little more detail at the economic factor, which is one of the three main problems of economic understanding (social, ecological, economic) (Asıcı, 2017).

2.6.1 General Outlook of Green Finance in Turkey

The inclusion of sustainability among the economic policies in Turkey started with the Eleventh Development Plan. On the other hand, the European Green Consensus has been an important breaking point in sustainability and climate change policies. After the transformation in the international economy and trade field because of the European Green Consensus and the comprehensive changes in EU policies, important steps have been taken towards sustainability and financing sustainability in Turkey. One of the most important steps is the Green Reconciliation Action Plan published by the Ministry of Commerce in July 2021. In the Green Reconciliation Action Plan, the main headings of green and circular economy and green finance and the actions to be taken towards the targets under these are determined. In the Medium Term Program, which was published in September 2021 and covers the years 2022-2024, the main objective is to create a growth structure in which green transformation is taken into account. In this context, various policies and measures regarding green transformation are included in the Medium Term Program. The important items included in the Medium Term Program and evaluated within the scope of green finance are listed below:

- Financial survival will improve the green transformation of the industry.
- Environmentally sensitive investments will be financed from ready-made green buildings and sukuk projects in line with international standards.
- It is aimed at environmentally friendly production that uses global air conditioning in a minimized and economical way.
- Guidelines for strategy formulation, institutional structuring, risk management, review, and the project will be prepared for compliance with the European Green Agreement preparations for green practices.
- Invested advance loans will be placed in a new local and green framework.

Turkey signed the Paris Agreement on April 22, 2016, and the said agreement was put into effect on October 7, 2021, by the Presidential Decision. It has also been declared by our Honorable President that Turkey will reach the net-zero emission target by 2053 (Sahin, Taksim, & Yitgin, 2021).

Turkey is a country that has adopted the framework of neo-liberal understanding since 1980. This understanding has faced some economic problems for many years within the framework of this understanding. The current account deficit and high interest rates are at the very beginning of these economic problems. Turkey is an outward-bound country in energy. Because it is a country with a high-energy demand and limited energy resources, Turkey meets its energy needs through imports and is an outward dependent country in energy. A high degree of external dependence on energy puts pressure on the current account deficit, which has become chronic for Turkey. To ensure sustainable and stable growth, the external balance should be under control, and the current account deficit should be reduced within this framework. For this reason, Turkey should reduce its external dependence on energy by meeting the energy it needs through renewable energy sources, which it has not used at an adequate level to date, despite having significant potential. However, in recent years, we have seen that Turkey has been pursuing some policies to close the current account deficit. The most important of these policies can be listed as investments in renewable energy sources, production of domestic electric cars, natural gas research. Renewable energy sources have an important potential in Turkey. However, the amount of energy to be produced from renewable energy sources is far below its potential, and although there are many reasons for this situation, the most important reason is that it cannot find investments. Investment in renewable energy sources will increase in Turkey thanks to private entrepreneurs and small-medium-sized investors and entrepreneurs. In the following sections, this topic will be described in more detail (Pezikeoglu, 2019).

2.6.1.1 Renewable Energy in Turkey

Renewable energy is called energy that can be obtained from carbon-neutral natural sources such as sunlight, wind, rain, tides, waves, and geothermal heat and can be obtained from sources that are naturally renewed on a human timescale. These sources can be listed as solar energy, wind energy, wave energy, geothermal energy, and biomass energy. This energy source is the opposite of fossil fuels, which are being used much faster than they are being replenished (Wikipedia, 2020).

Energy has existed in almost all areas, including transportation, nutrition, production, and even our social life, based on micro and macro of our daily life from different sources. It is possible to classify the sources of energy we use as coal, oil, natural gas under the main heading of fossil fuels, and nuclear energy is also one of the sources. It is possible to say that there is an upward trend in energy consumption due to various factors in a global sense. However, when we examine the energy sources consumed, the largest share of the pie belongs to fossil fuels with 81%. Fossil fuels are relatively cheaper, easily transported, easier to extract with new technological advances, and attractive as a primary energy source because energy efficiency is more concentrated.

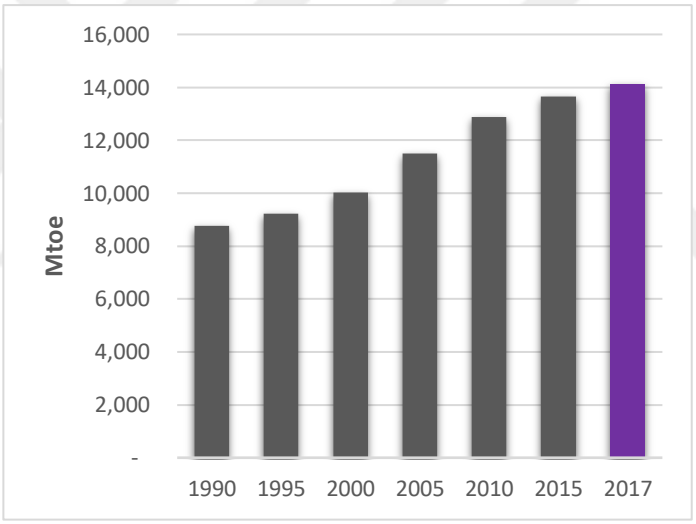


Figure 2.13 Global Energy Consumption

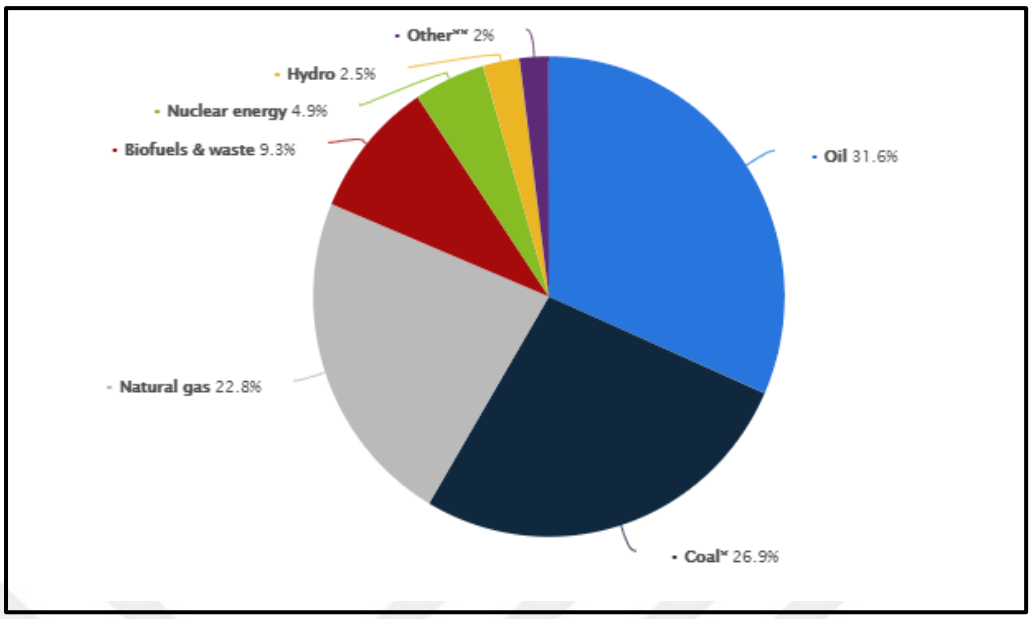


Figure 2.14 Distribution of Energy Consumption
Source: (National Geographic, 2017)

Many countries are turning to renewable energy sources to meet their growing energy needs and reduce the negative effects caused by fossil fuels (Kandır & Yakar, 2017). The industrial revolution is an important development because it makes mechanical innovation possible and involves fossil fuels in the production process. Industrialization and modernization create the light side of this revolution, while the long-forgotten dark side has recently come to the fore. Pressures on Natural Resources and consequences such as global warming are increasingly concerning (Mathews, 2011). Moreover, the world's energy needs are expected to nearly double in 2000-2040 (Energy Information Administration, 2020). In addition to meeting the rapidly growing energy needs, other important problems facing the energy sector arise in the form of reduced fossil fuel reserves, rapid population growth, and energy security (Abdmouleh, Alammari, & Gastli, 2015). The above-mentioned problems, concerns about climate change, fossil fuel prices, and energy supply from renewable energy sources require inclusion in the political confusion in countries benefit more.

Recently, countries have been turning to renewable energy sources due to the scarcity of fossil fuels and the increase in population. Turkey continues to work on this issue. Turkey imports more than 70% of its energy needs (Gençoğlu, 2019). This

situation leads to Turkey's energy security problem and foreign trade deficit due to external commitment. Nevertheless, Turkey has a great point in terms of using renewable energy sources. Due to its geopolitical position, a bridge country provides this energy flow between the energy sources located around it and the Western states. Turkey's geopolitical importance is expected to give it a competitive power in producing and marketing energy resources. In this context, the state supports Turkey's renewable energy production. However, it is very difficult to say that Turkey is still in a good position (Bekar, 2020). In 2018, we can see Turkey's energy consumption according to resources as follows.

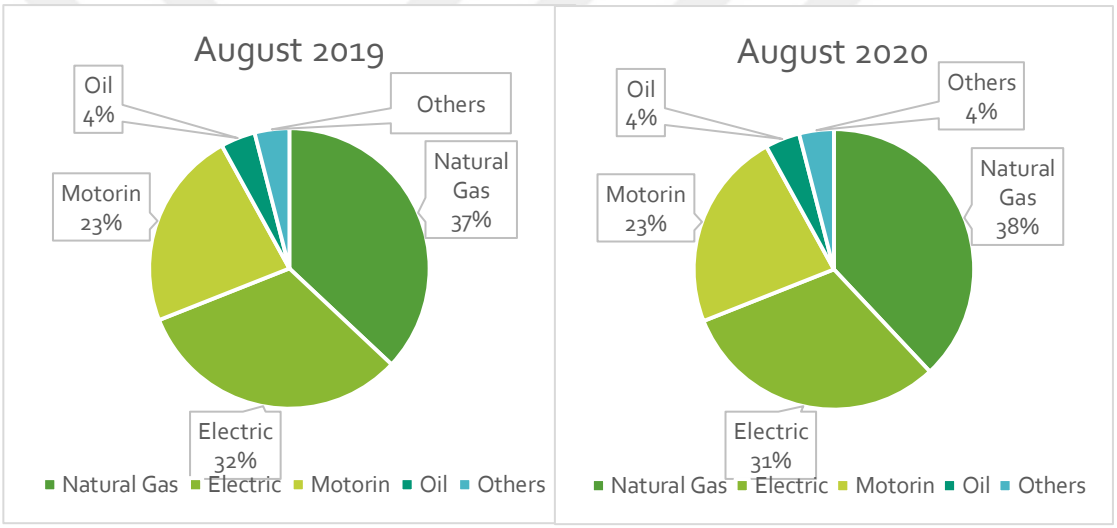


Figure 2.15 Turkey Energy Consumption Figures
Source: (T.C Enerji Bakanlığı, 2021)

According to data published by the Ministry of Energy and Natural Resources at the beginning of February 2021, the share of renewable energy sources in electricity generation is rising, but it is still far from competing with fossil fuels

Table 2.7 Share of Renewable Energy Sources in Installed Power

	Hydroelectric	Wind Energy	Solar Energy	Geothermal Energy
January 2020	17,3%	7,21%	0,99%	2,48%
January 2021	30%	8,40%	1,52%	2,96%

Source: (KPMG, 2021)

Renewable energy production has experienced an increase in all energy sources in 2020. However, it remains well below potential energy production. However, their share in production remains at 32.4 percent, below its share in capacity, as opposed to natural gas, for example. In addition to climate and weather conditions, there is a factor in this, such as the fact that plants are not economically rational (efficient) to operate at the current level of electricity prices. Based on this, it can be said that some of the renewable energy sources remain dormant (KPMG, 2021).

2.6.1.2 Potential of Renewable Energy Sources in Turkey

Turkey is an energy importing country; more than half of its energy needs are imported. Oil has the largest share in primary energy consumption. Based on efforts to diversify energy sources, the use of natural gas has just been introduced to the Turkish economy and is developing rapidly. Turkey has extensive reserves of coal, especially lignite. The declared lignite Reserve is 8 billion tons. The estimated total reserves are 30 billion tons. On the other hand, Turkey has been one of the fastest-growing energy markets in the past two decades with its young population, increasing energy needs per capita, fast-growing urbanization, and economic development. It is estimated that Turkey's electric energy needs will be 300 billion kWh in 2010 and 580 billion kWh in 2020. Turkey's electric energy needs are growing by about 6-8%, depending on the economic growth rate. In 2005, primary energy production and consumption reached 34 and 130 million tep (tons of equivalent oil). The most important developments in production have been observed in hydropower, geothermal, solar energy, and coal production. Turkey's hydropower, geothermal and solar energy has increased since 1990. Nevertheless, the share of renewables in total primary energy sources has declined due to increased use of natural gas and reduced non-commercial biomass. To respond to the growing energy needs, Turkey has put nuclear energy on the agenda to prevent the increase in

dependence on energy imports. On the other hand, at the end of 2005, the installed capacity and production capacity of power generation plants reached 41,457 MW and 176,234 GWh (Bilgen, Keleş, Sarı, & Kaygusuz, 2008).

Turkey's potential for renewable energy sources is rich and diverse, and it is the second-largest energy source group in the country after coal. Turkey's main renewable energy sources include hydraulic energy, biomass, wind, biogas, geothermal, and solar energy. As of 2008, the share of renewable energy in total electricity production was 16.75%, while the share of natural gas was 48.19%. In planning for the period 2006-2020, the annual growth in total electricity production is projected to be 8%. The additional production capacity needed by 2020 requires a large investment. Table 2.8 shows Turkey's renewable energy potential (Ayas, Demirayak, İş, Kumbaroğlu, & Yenigün , 2019).

Table 2.8 Turkey's Annual Renewable Energy Potential
(MTEP: Mega Ton equivalent oil)

Renewable Energy Type	Use Energy Type	Natural Potential	Technical Potential	Economics Potential
Solar Energy	Electric (billion kWh)	977000	6105	305
Hydroelectric	Electric (billion kWh)	430	215	124,4
Wind Energy	Electric (billion kWh)	400	280	50
Geothermal Energy	Heat (MTEP)	31500	7500	284,3
Biomass Energy	Fuel	120	50	33

Source: (Gençoğlu, 2019)

2.6.1.3 Solar Energy

Turkey is a very rich country in terms of solar potential. The average annual solar energy across the country is 1315 kWh/m2. Accordingly, the amount of energy coming to the entire surface of Turkey is 1025 101 1012 kWh. This amount is approximately 11000

times the total electricity produced by Turkey in 1996. (Ayas, Demirayak, İş, Kumbaroğlu, & Yenigün , 2019)

2.6.1.4 Hydroelectric

Considering the reasons such as hydraulic potential being a national and renewable resource, the benefits of HPP to the economy, and the fact that the domestic construction rate is higher than other power plants, it will be in our country's interest to bring the hydroelectric potential assessment rate to a minimum level of 90% over the next 20 years. To achieve this goal, the construction of large-capacity Hess, whose installed power ranges from 100 MW to 1000 MW and their number is not too large, should begin as soon as possible. (Bekar, 2020)

2.6.1.5 Wind Energy

Although Turkey's s wind potential has not been entirely determined, its gross potential is believed to be 400 billion kWh per year, and its technical potential is 120 billion kWh. The technical potential in question is 1.2 times the annual electricity production. (Drahor, Kumlutaş, & Göktürkler, 2019)

2.6.1.6 Geothermal Energy

Due to its geological location and its developing features, our country is greatly important in terms of geothermal activity. According to MTA studies, more than 600 thermal sources have been identified in Turkey, with temperatures reaching 100 0 C. The Reserve calculated based on these resources is 2420 MW. Again, according to the calculations of the MTA, the possible potential in our country is 31500 MW. Turkey is 7 out of 41 countries in the direct use of geothermal energy. We are in line. Given all these facts, it seems that Turkey, which has a high geothermal potential, cannot use this energy adequately and does not have a policy based on the use of this energy (Drahor, Kumlutaş, & Göktürkler, 2019).

2.6.1.7 Biomass Energy

Biomass is defined as all organic matter that can be regenerated in less than 100 years, including plants grown on land and water, animal residues, food industry and forest products, and urban waste. The total energy equivalent of biomass, which is a renewable energy source, is 65376 MTEP, which is equal to approximately 8 times the world energy consumption of 1997. Currently, only 7% can be used (Acaroğlu & Ültanır, 2020)

2.7 BLOCKCHAIN TECHNOLOGY ON GREEN SUKUK

Many countries have begun to increase their investment in renewable energy sources, which have become one of the dynamics of a sustainable economy. In this context, the Paris Agreement and 17 sustainable development goals clauses oblige countries to invest in renewable energy sources, subject to the International Convention. The Paris Agreement is an international legal agreement on climate change. November December 12, 2015, was adopted by 196 parties at COP 21 in Paris and entered into force on November 4, 2016 (Unfccc, 2020). This agreement aims to bring warming below 2c. To comply with this agreement, countries are seeking to cut gas emissions below 2c. In addition, the Paris Agreement provides financial support to countries in this regard (Wikipedia, 2019). Another situation in this area is Development Goals. The drivable Development Goals (SDGs), or Global Goals, is a collection of 17 interconnected global goals designed to be a "better and more drivable plan for all." In 2015, the United Nations targeted 17 targets by 2030.

These 17 targets of Sustainable Developments Goals are as follows.

- No Poverty
- Quality Education
- Gender Equality
- Clean water and sanitation
- Affordable and clean energy

- Good job and economic growth
- Industry, Innovation and Infrastructure
- Reduce inequality
- Sustainable Cities and Society
- Responsible Consumption and production
- Climate action being
- Zero Hunger
- Good health
- Under the lake water for life on land
- Life
- Peace, justice, and strong institutions
- Partnerships.

The efforts of countries in this area have also increased the interest in green bonds and green sukuk. However, today, green bond and green sukuk have many problems, and this affects investments in renewable energy sources. By addressing these issues, we will see how blockchain technology provides an advantage over these problems.

Sukuk exists as a financial instrument that has been decelerating among Islamic financial products lately. It differs from conventional financial instruments in many ways, the most important of which is an asset-based financial instrument with risk-sharing instead of bringing an interest gain. Sukuk has a low level of development and volume compared to other financial instruments, and there are many reasons for this. Sukuk contracts are spread over a wider area, especially sales, leasing, agency combinations. In the face of such situations, scholars are concerned about the areas in which sukuk finance provides funds, and sukuk stickers are prevented if they cannot be tracked. For such reasons, the expansion of the volume of sukuk has slowed down. Blockchain technology, one of the modern technologies, will be important for developing the sukuk market to provide a solution to this problem and ensure the traceability of blockchain-based sukuk. Among other advantages of blockchain technology, bonds and sukuk ease of access, and other tools are distributed, and robust

security features for authentication sukuk ranked among the developer. The important problems in the export of sukuk and the development of sukuk are listed as follows;

- Solving data inconsistencies in sukuk structures involving more than one type of contract.
- Extended time of money transfers due to intermediaries.
- Multi-step processes that cause larger errors.
- Traceability based on the underlying asset.
- Length of time from decision-making to market release.

2.7.1 Green sukuk Challenges

a. Lack of Standardization in Sukuk Practices

The time spent designing the structures and frameworks for Sukuk and Shariah boards for Green sukuk can be long and costly (Kandır & Yakar, 2017).

The Blockchain technology, Shariah rules, and government rules are written into Blockchain-based bonds using a mathematical algorithm (Malamas e. , 2020). Using blockchain technology, these algorithms that write Green sukuk rules are distributed and approved to different computers. In this way, green sukuk frames become standard and provide convenience. Furthermore, blockchain helps in monitoring the various issue relationship between the agent (Islamic Banks Managers) and the stakeholders (Shariah Supervisory Boards and governmental regulators) (Mounira, 2020).

b. Project Performance Measurement Problem

The problem with implementation and documentation is also evident for performance. Indeed, there is not yet a standard approval system required for green sukuk performance measurement (Kandır & Yakar, 2017).

All transactions for Blockchain-based bond/sukuk are all recorded. If the details specified in contract terms are incomplete for one party, this contract will not apply. Islamic banks, a brokerage firm, and an SPV blockchain monitor are monitored, and

these organizations approve each transaction. In this way, the performance of the energy investment can be monitored and measured (Mounira, 2020).

c. Risks

In green bonds and green sukuk, there is much risk. Some of these risks are liquid risk, operational risk, information quality risk, credit risk (Malamas e. , 2020). Such risks have always negatively affected investments and demand for green sukuk.

However, blockchain technology removed all risks in the green sukuk. Blockchain eliminates such risks by digitizing the existing renewable energy source project according to different types of sukuk. Digital assets that have become digital assets and all their information is registered are trusted, and the risks disappear. In addition, all detailed information about projects related to renewable energy sources is approved and announced by SPV and Islamic Banks. In this way, the risk of information is eliminated. Blockchain use helps to reduce risks related to transaction security or identify theft, and the blockchain network provides the provenance.

d. Secondary Market Problem

The secondary market for Green sukuk is quite small. The main reason for this is that a small number of investors hold sukuk, and other institutional investors have sufficient secondary market expectations that can meet investors' liquidity expectations (Kandır & Yakar, 2017).

2.7.2 Advantages of Blockchain in Green Sukuk

a. Ease and Speed of Transactions

Green sukuk transactions progress slowly as there is a need for some applications and approval by some institutions. However, blockchain technology increases the speed of institutions and speeds up transactions digitally (Mounira, 2020).

b. Large Investor Audience

Green sukuk is a common point of both a traditional investor and an investor with Islamic sensitivity, and this is why it differs from other types of sukuk and bond types. Thanks to Blockchain, all investors can be reached without a financial institution and banks to invest in renewable energy sources. As an example, Blossom Finance Blockchain-based bond sukuk in Indonesia reaches investors from all over the world. Without having to deal with the local country's currency. Sukuk has been a popular approach for governments seeking to finance infrastructure projects, but the legal complexity and overall cost to issue sukuk has kept it out of reach for smaller corporations and MSMEs. It has been an excellent way to raise much-needed capital, but investors have also been always restricted to the much larger institutional investors due to the high barrier of entry, which usually starts in the millions. However, the inability to lower these barriers of entry at the retail level to thousands or hundreds of dollars to enable Blockchain-Based Islamic Capital Market, wider participation (and access to more funds) for sukuk participation, and hence wider risk and profit-sharing in the Islamic capital market, is still present and remains an impediment to truly shared prosperity (Mohammed & Ali, 2019).

c. Cheap Transaction Cost

Many brokerage firms are involved in this process when trading green sukuk. Banks will approve project managers in the secondary market institutions with the agreement to trade on the stock exchange. Because of these, green sukuk costs are increasing, and Blockchain technology eliminates these intermediaries, ensuring a more cost-free transaction. This means that green sukuk issuance is easy to invest in from stakeholders (Smaoui & Ghouma, 2019).

Sukuk are likely to have higher initial structuring and issuance expenses than traditional securities. Sukuks are complex instruments to form because they necessitate significant and costly legal and ethical counsel, as well as a wide range of talents and

resources. The entire costs of the arrangement and issuance range from 5% to 8% of the Sukuk value. The nature of Sukuk investment and its novel features necessitate comprehensive screening and supervision from the standpoint of financial intermediation. Sukuk contracts are sophisticated and broad due to their asset-based/asset-backed nature (SAKKEX, 2020).

The contracts include; master agreement, master and supplemental declaration of trust, agency agreement program, agreement purchase undertaking, deed sale undertaking, deed redemption undertaking, deed change of control undertaking essentially, the complexities inherent in a given process can be reduced by standardizing certain of the process's well-identified aspects (SAKKEX, 2020).

In this regard, blockchain based sukuk offers a decentralized processing platform pulsed by augmented smart contracts that leverage the issuance costs by standardization and automation. Blockchain proposes the templating of contracts, the tokenization of Sukuk certificates and the modeling of Sukuk in a standard data format. Through the tokenization of Sukuk certificates, Blockchain setup a new frontier for the issuance and management of financial assets. The tokenization of Sukuk by a blockchain platform significantly reduce the tasks of an SPV (special purpose vehicle) in the issuance, distribution and redemption of Sukuk certificates. The cost for transactions and settlement are also reduced with the use of smart contracts.

In one of Khan's studies (2019), made a blockchain-based sukuk cost calculation. Proved the cost difference between sukuk issued by traditional methods and blockchain-based sukuk in his study. The following data are available in the study;

- Amount: 500,000,000 $
- SPV/Issuer: Aldar Sukuk
- Obligor: Aldar Sukuk Investment Properties
- Minimum settlement amount: $200,000
- Par amount: $100,000
- Issue date: 10/01/2018
- Maturity date: 09/29/2025
- Issue price: : 99.718%

- Profit per annum: 4.75%
- Sukuk type: Hybrid involving Wakalah and Murabaha

Transaction (Tx)	Gas Used	Tx fee (ETH)	Costs ($)
Deploy Smart Contract on Ethereum	2737722	0.0027377	0.35043
registerObligor	63336	0.0000633	0.0081
newInvestor	278484	0.0002785	0.03565
buyCoins	406430	0.0004064	0.05202
investInSukuk	389826	0.0003898	0.04989
enterProceeds	77130	0.0000771	0.00987
automaticPayment (1 investor)	371594	0.0003716	0.04756
automaticPayment (5 investors)	1650610	0.0016506	0.21128

Source: (Khan,2019)

In this example, the Aldar sukuk model shows the cost table that will occur if the blockchain-based sukuk is issued from the ethereum platform.

Sukuk Issuance Type	Total Cost= Fees and Expenses paid upfront + Issue price
Conventional Issuance	$7,165,532
Tokenization on Public Ethereum	$3,676,316
Tokenization on Consortium Blockchain	$3,443,734

As a result of the study, the cost of the sukuk issued in the traditional way and the sukuk issued on the ethereum platform has been compared in this table. The Ethereum platform has made the issuance of sukuk cheaper as there is no documentation cost and no brokerage costs.

d. Transparency, Security

Blockchain-based bond/sukuk, is almost impossible to change because all information about the contract and project is added to blocks and stored on many networks. In this way, the operations are protected in a highly reliable way. In addition, transactions that either party does not approve cannot be written in the contract, so it is transparent and accurate. Because it is not in a physical state compared to other contracts, there is no trust problem in brokerage firms. Since the structure of green assets in the contract is

written in the Shariah compliance contract, sukuk holders will have no problem analyzing and obtaining any information (Mounira, 2020).

2.8 LITERATURE OF PREVIOUS STUDIES

1. Research (Alam, Gupta and Zameni, Fintech and Islamic Finance Digitization, Development and Disruption, 2020). This study explores the basics of blockchain, its structure, and the application of blockchain applications in Islamic finance. In the view of Alam et al., "due to the digitization of banks by blockchain technology, payment services, investment services and financing advisory services have created a creative disruptive effect in financing and insurance services". . "In particular, the convenience it provides in investment services and financial financing explains the potential impact of blockchain-based bond sukuk.
2. Research (İrfan & Ahmed, 2020) Titled "Fintech the Opportunities for Islam Finance", this exploratory article examines the benefits and innovations fintech brings to Islamic banking. Islamic finance can develop within itself by allowing the traditional economy to adopt new financial technologies rather than developing in the shadow of the traditional financial system and by adapting Sharia law to develop some of its products. Likewise, according to Irfan & Ahmed, Islamic financial products can leverage this blockchain technology for more development and reach a wider audience. Examples include Zakat and waqf.
3. According to Alam, Gupta&Zameni, Blockchain-based bonds are self-executing contracts based on predefined scenarios that automate the trust element, eliminating the need for an intermediary. Sukuk trust is one of the most important studies in Islamic finance and the most problematic area. According to Alam, trust issues with blockchain-based bonds will be eliminated, and it will be able to easily meet those with excess and needy funds through blockchain-based bonds. This will improve the sukuk market, one of the most important studies in Islamic finance. He also believes that blockchain and blockchain-based bond protocols can improve the global sukuk industry. According to S&P Global Ratings, blockchain and blockchain-based bonds emphasize that they can increase transparency of

cash flows and underlying assets, eliminate inefficiencies in the financial system, and reduce costs. Blossom Finance is also the first blockchain-based bond sukuk exporter in the region, exporting Mudarabah-based sukuk.

4. Some studies have listed their potential in Blockchain-based bond usage areas. Most notably, Oseni & Safina provided information on capital markets and investment banking and Blockchain-based bond sukuk, including corporate finance (IPOs, private equity), (syndicated loans and leveraged loans), and Exchange infrastructure (Oseni & Safina, 2020).
5. It has been emphasized in some studies that Islamic finance products can develop with blockchain technology, especially in the field of sukuk, which can gain good momentum. However, to achieve all these developments, fintech and blockchain technology need to ensure Shariah compliance in Islamic finance applications. A study of (Azam, 2021) tried to explain this situation by giving Islamic fatwa a place in the study, which evaluated Blockchain-based bonds from the Sharia perspective vaccine. According to Azam, Shariah is suitable and can be used in Islamic finance products because all details are recorded in Blockchain-based bond contacts.
6. According to (Alam, Gupta and Zameni, Fintech and Islamic Finance Digitization, Development and Disruption, 2020), Shariah is compatible as long as blockchain-based bonds avoid elements such as gambling, Gharar and cheating. This does not happen as the prerequisites for blockchain-based bonds are approved and processed into blocks, indicating that blockchain-based bonds are Shariah-compliant, which has nothing in terms of Shariah compliance problem.
7. According to Kandır and Yakar, renewable energy is important for Sustainable Development and environmentally friendly projects and is an area where countries should invest. In addition, according to Onal and Yarbay, one of the obstacles to the development of renewable energy sources is the need for financing, and this need for financing can be met with the participation of the private sector not only with government policies. Green bonds and Green sukuks have stated that the inclusion of investment in renewable energy sources in the private sector will lead to development in renewable energy sources. In this context, according to Ela's study, although Turkey has significant potential in renewable energy sources, it is

unsuccessful in using this potential. Turkey needs to invest in these renewable energy sources due to the energy security problem and the high-energy consumption problem in the face of the growing population. According to Gencoglu's study, turkey can finance renewable energy sources by finding wider investors in green sukuk. In the study of Alam, "Blockchain-based bond sukuks are becoming global with blockchain technology" and will increase investments due to the inclusion of more investors in the system. Renewable energy sources in Turkey with Blockchain-based sukuk

2.9 LACK OF THIS STUDY

Blockchain technology has recently become popular thanks to bitcoin cryptocurrency, which emerged after the 2008 financial crisis, and has started to be applied in many areas (Juden & Pisa, 2020). Since it is a newer technology, the work done in this area has remained at the theoretical level, and no good work has yet been put forward in the application process. Because it is difficult to determine the impact of Blockchain technology on economic indicators, only forecasts are discussed. Blockchain-based bonds are the same. There is still a legal gap for contracts on Blockchain-based bonds and regulatory shortcomings that countries expect to be sufficient for this area. Since a global investor pool is now reached without brokerage firms, the lack of institutions and laws that can get an interlocutor in exchange for any problems in contracts is one of the biggest problems. The unstable state of the states in this regard also affects blockchain technology badly. In Islamic finance, differences in Shariah standards and changes in the views of Shariah scholars, and lack of work in this field are among the most important gaps (Alam, Gupta, & Zameni, Fintech and Islamic Finance Digitalization, Development, and Disruption, 2020).

Sukuk, one of the Islamic financial instruments in Turkey, has just been recognized by the state and accepted by the markets. The presence of six Islamic banks in Turkey shows that the sukuk market is not yet in good development. The first type of sukuk accepted in the sukuk area is the Ijarah sukuk (Ela, 2019). Although there are studies on the potential use of Green sukuk in Turkey, there are some question marks

about financing renewable energy sources. Having legal and legal problems in the field of Green sukuk will affect the development of green sukuk in Turkey. There is an academic research gap in this area. In addition, there are very few examples of sukuk being exported using Blockchain-based bond sukuk with blockchain technology, and there are usually studies on the theory.

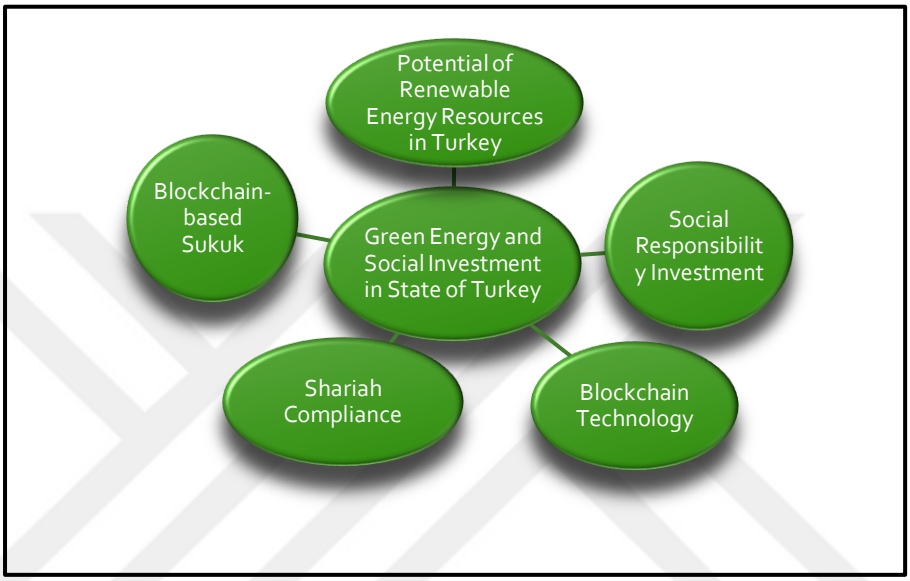


Figure 2.16 Conceptual Framework

A conceptual framework is a structure that the researcher believes can best explain the study topic (Camb, 2001). It is the section where the researcher's ideas about the research problem are presented. The conceptual framework provides a holistic view of the studied problem (Liehr & Smith, 1999). Financing green energy sources and supporting social investments with Blockchain-based bond sukuk, a new field based on the literature discussed earlier, is based on 5 independent variables in Green energy investment in Turkey. In order to develop Blockchain-based bond sukuk, a product of Blockchain technology, states need to regulate in this area. Especially in Turkey, there are no comprehensive regulations regarding Green sukuk and other sukuk. Turkey is realizing the new potential of renewable energy sources every day. The abundance of potential energy sources has led to developing new emerging technologies (Blockchain-based bond sukuk) investment vehicles in this area. Noting Turkey's potential energy sources, it was emphasized that investments in this area should accelerate. One solution

to this situation is the financing of sukuk and renewable energy sources. Turkey, an Islamic country, manages Green sukuk; a type of financing that will meet a wider base of investors from Gulf countries and European countries where traditional investors are located. The development of Blockchain-based bond sukuk will increase investment in renewable energy sources in Turkey. Blockchain-based bond sukuk and new blockchain technology have raised Shariah compliance issues. Shariah compliance with sukuk blockchain technology, one of the Islamic Financial Instruments, is important for its development. Islamic scholars ' views on investing with Blockchain-based sukuk influence Green energy investments in Turkey, which is a dependent variable. It was concluded that there is a link between these 5 variables regarding Green energy investments in Turkey. This conceptual framework, factors affecting Turkey's financing of renewable energy sources.

CHAPTER THREE

METHODOLOGY

3.1 RESEARCH DESIGN

As the research responds to a problem that has not been clearly defined yet, it adopts an exploratory research design. Exploratory research is the process of researching a new problem that has not been fully explored before. The exploratory type of research is often done to better understand the problem (Saunders, 2014). Exploratory research is used to learn more about a particular field. In exploratory research, qualitative research was used in the research process. Qualitative research is a type of research created with data collection methods such as observation and document analysis. It represents the process of holistic examination of events and phenomena in a realistic environment. It examines human and social behavior (https://www.iienstitu.com/, 2021). Qualitative data were obtained using the interview method. The interview technique was used in order to prepare the ground for new studies on the subject that was not researched and to make it reliable and understandable by interviewing experts in the field in Turkey. In this study, the potential of blockchain-based sukuk is investigated in Turkey. The potential of blockchain-based sukuk on green finance and social responsibility investments in Turkey is being investigated. Research has been conducted on the financing of renewable energy resources, which is the common point of Green Finance and social responsibility investments, with blockchain-based sukuk. In this document, two-pronged approaches are taken in understanding the purpose and challenges of blockchain-based sukuk. First, the phenomena were described, and then face-to-face open-ended interviews were held with key people in the fields of blockchain, sukuk, sharia, green finance, social finance in Turkey. The interviews are presented in the appendices and the results are analyzed in Chapter 4.

Exploratory research is the process of investigating a problem that has not been studied or thoroughly investigated in the past. Exploratory type of research is usually conducted to have a better understanding of the existing problem, but usually does not lead to a conclusive result. Researchers use exploratory research when trying to gain

familiarity with an existing phenomenon and acquire new insight into it to form a more precise problem (Moody, Peter, & Sinha, 2010). This study uses an exploratory research method. The results of the data were tried to be determined by this analysis method.

3.2 DATA COLLECTION METHOD

The interview method used in the study is considered as primary data. Therefore, primary data provides safe information for studies. In short, if the collected data is original and first collected by a researcher, it is called primary data. In the interview, specific questions are asked to experts in the field. Interviews are analyzed according to these answers. In this study, face-to-face interviews were conducted with six people. According to the results obtained, the potential of Blockchain-based sukuk on green finance and social responsibility investments in Turkey has been examined.

3.2.1 Interview Method

In its historical development, the interview technique is the oldest among the observation techniques. Interview technique, among other research techniques, is an observation technique that provides flexibility and depth to the researcher and the interviewee. The interview technique is to get information about a subject within the framework of questions to be asked from the relevant people (https://cdn-acikogretim.istanbul.edu.tr/, 2021). Interview technique, among other research techniques, is an observation technique that provides flexibility and depth to the researcher and the interviewee. Collecting data face-to-face with the interviewees is a factor that increases the depth of the research.

This study collected and used data by interview method to answer questions and achieve its objectives. The study is a case study for Turkey on a specific topic, so information on blockchain-based sukuk is collected and analyzed by interviewing experts in the field in Turkey. As blockchain-based sukuk is a new topic for Turkey, discussions were held to assess its potential. A semi-structured interview was chosen as it provides flexibility in the depth of the information collected. Measuring Turkey's

economic targets and the potential of blockchain-based sukuk in these targets provides a reliable and better understanding of information by interviewing experts in their field in Turkey.

Interviews were held with experts in the fields of fintech, sukuk and shariah in Turkey. Meetings were held with the head of the fintech department of the Finance Office of Presidency of the Republic of Turkey and the head of the Islamic finance department of the Finance Office of Presidency of the Republic of Turkey. Meeting with the economist and project manager in the field of Green Finance and Social Responsibility Investments. Interviewed academics who have published academic articles in the blockchain field. The reason for the selection is to obtain information and opinions about blockchain-based sukuk directly, as there are authorized persons in the fields of fintech and sukuk legislation, regulation, supervision, policy proposal, project design and implementation.

3.2.1.1 The Respondents

All of the targeted people were interviewed.

1. **Prof. Dr. Tariqullah Khan**
    - Undergraduate: Karachi University
    - Master: Karachi University
    - PhD: Loughborough University
    - Co-Lead Global Islamic Financial Services Development Program in IsDB
    - Visiting Scholar Stanford University
    - Visiting Scholar Harvard University
    - Prof. Dr. Sabahattin Zaim University
2. **Prof. Dr. Servet Bayındır.**
    - Undergraduate: Marmara University Faculty of Theology
    - Master: Islamic Finance and Banking at Inceif, Malaysia
    - Prof. Dr.: Istanbul University
    - He works in the field of Sharia and fiqh.

- Presidential Economic Policy Board Member
- Vakıf Katılım Bank Board Member

3. **Dr. Tarık Akın**
   - Undergraduate: Bilkent University
   - Master: Harvard University
   - PhD: Islamic Finance and Banking at Inceif, Malaysia
   - Head of Islamic Finance Department of Finance Office of the Presidency of the Republic of Turkey.
4. **Melih Turan**
   - Undergraduate: Bilkent University
   - Master: Islamic Finance İnstitutions of Marmara University
   - PhD: Marmara University
   - Director of Fintech Strategy Finance Office of the Presidency of Turkey
5. **Bilal Bağış**
   - Undergraduate: Yıldız Teknik University
   - Master: University of California
   - PhD: University of California
   - Project Manager of Political Economy and Social Research Foundation
6. **Murat Aydın**
   - Undergraduate: International Islamic University of Malaysia
   - Master: Istanbul University
   - Staff of KuveytTurk Bank treasury department
7. **Esma Karabulut**
   - Undergraduate: Istanbul Bilgi University
   - Head of Investment Banking & Investor Relations in Emlak Participation Bank
   - First green sukuk issuance in Turkey by Esma Karabulut
8. **Madaa Munjid**
   - Undergraduate: International Islamic University of Malaysia
   - Master: International Islamic University of Malaysia
   - Master: INCEIF

- Member of the Secretariat, Technical and Research (Shariah)
- Project Manager of Finance Office of the Presidency of Republic of Turkey

3.2.1.2 Interview with the Relevant Parties

Interviews were conducted to gauge the opinions and the perspectives of the relevant people that either exclusively involve or has information of or aware of. A list of semi-structured questions was prepared in advance to facilitate the interviews. Initially the lists of questions were email to the respective respondents. The respondents reply with proposed answer. Upon receiving the reply, face-to-face interviews were planned and conducted.

Interview times and dates are designed for the following;

a) Fintech Strategy Department of Finance Office of the Presidency of the Republic of Turkey- **(Melih Turan) – (35 minutes / 17.01.2022)**
b) Islamic Finance Department of Finance Office of the Presidency of the Republic of Turkey (**Tarık Akın) – (50 minutes/ 14.01.2022)**
c) Staff of Treasury and Capital Market Department, KuveytTurk Participation Bank **(Murat Aydın) – (65 minutes/ 21.12.2021)**
d) Member of the Presidential Economic Policy Board of Turkey **(Servet Bayındır) – (30 minutes/ 30.12.2021)**
e) Political Economy and Social Research Foundation **(Bilal Bagis) – (45 minutes/ 16.12.2021)**
f) Professor Sabahattin Zaim University **(Tariqullah Khan) – (Online)**
g) Head of Investment Banking & Investor Relations in Emlak Participation Bank first Green sukuk issuance by Emlak participation Bank **(Esma Karabulut) – (45 minutes/ 20.01.2022)**
h) Project Manager of the Presidential Finance Office of the Republic of Turkey (**Madaa Munjid**) – **(35 minutes/ 14.04.2022)**

The relevance and justifications of the selected sample are explained as below;

a) Fintech Strategy Department of Finance Office of the Presidency of the Republic of Turkey

This department monitors the fintech ecosystem in Turkey, conducts project research, reports to Turkish President Recep Tayyip Erdogan and makes policy recommendations. Unique information and experiences about Fintech and blockchain in Turkey. This department provide strong source for research.

b) Islamic Finance Department of Finance Office of the Presidency of the Republic of Turkey

This department monitors the development of Islamic banking in Turkey. It examines Islamic Finance products in the world and tries to adapt it to Turkey. It works in the field of Islamic Fintech and presents a report to the President of Turkey, Recep Tayyip Erdogan. Develops new Islamic Finance products and enacts legislation. This research provides information about sukuk, one of the Islamic Finance products in Turkey, and about blockchain-based sukuk.

c) Staff of Treasury and Capital Market Department, KuveytTurk Participation Bank

This department of the Islamic Finance bank handles all the processes of issuing sukuk from Turkey to abroad. Employees in this department are knowledgeable about the sukuk issuance processes and the difficulties encountered. In this research, it provides information about the problems and challenges and new solutions to be brought, and provides a framework.

d) Member of the Presidential Economic Policy Board of Turkey

It produces policies about the economy in Turkey and audits fiqh about Islamic Finance products. In this study, the sharia dimension of the study is discussed. Shared information is shared; experiences are shared from studies such as sharia compliance and sharia law or legislation draft.

e) Political Economy and Social Research Foundation

This foundation makes policy recommendations to the important ministries of the state. In line with sustainable development goals, studies are carried out in the fields of green finance and social finance. In this research, experiences and information about green finance and social responsibility investments were obtained from this foundation.

f) Investment Bank in Turkey

The Bank carries out a sustainable economy project, a green finance project, and a social responsibility investment project. The bank receives funds from the Turkish government. In my article, there are renewable energy and green finance phonemes in Turkey. The staff of this bank will give an insight into green finance and SRI from Turkey.

3.2.1.3 Description of Data Analysis Method

Direct Interview

The analysis of the data includes as follows;

a) A list of questions has been emailed/handed earlier to the potential respondents prior to the interview to give the respondents some time to prepare for the expected answer.
b) Some respondents only reply the email with the answer while some are agreed for face-to-face interview.
c) If they agreed for face-to-face interview, the interviews were conducted in their respective selected locations.
d) It took roughly 20 to 60 minutes of interview depend on the respondents depth involvement in the sukuk.
e) The questions were open-ended and the respondents were encouraged to answer or express their opinion freely. Different respondents received different set of questions or / and maybe repeating questions.

3.2.1.4 Data Integration Analysis

The data collected were transcribed, examined and arranged accordingly. As the identity of the respondents remains confidential, the respondents were coded as follows;

a) **R1**- Fintech Strategy Department of Finance Office of the Presidency of the Republic of Turkey- (Melih Turan)
b) **R2**- Islamic Finance Department of Finance Office of the Presidency of the Republic of Turkey (Tarık Akın)
c) **R3**- Staff of Treasury and Capital Market Department, KuveytTurk Participation Bank (Murat Aydın)
d) **R4**- Member of the Presidential Economic Policy Board of Turkey (Servet Bayındır)
e) **R5**- Political Economy and Social Research Foundation (Bilal Bagis)
f) **R6**- Prof. from Sabahattin Zaim University. (Tariqullah Khan)
g) **R**8- Head of Investment Banking & Investor Relations in Emlak Participation Bank (Esma Karabulut)
h) **R9**- Project Manager of the Presidential Finance Office of the Republic of Turkey (Madaa Munjid)

3.3 INFORMANTS OF THE STUDY

The study was carried out by making an appointment as a result of long interviews with experts in the targeted field. Meetings were held in their offices for at least 30 minutes. Since there is a study on Turkey, more meetings were held with policy makers. The answers given by the policy makers of Turkey reflect a more binding and real state. The information obtained from participants with academic background has been useful about blockchain-based sukuk, which is still a new field. The number of participants is not at the desired level. The answers given by the participants will be a source for future studies.

3.4 LIMITATIONS

There were limitations in terms of data and sample size. However, due to the unique nature of the research, the focus was on the example of Turkey. The sample size mainly consists of policy makers working in the field of blockchain-based sukuk and thesis phenomena. Head of Turkish fintech department in Fintech, Head of Turkish Islamic Finance Department in Sukuk, Turkish economic policy maker in Shariah, participant working in Sukuk operation and private bank treasury department, Turkish policy maker foundation researcher and valuable professor Tariqullah Khan who can give academic direction. The fact that they are important names in their fields and especially authorized persons in Turkey constitutes my sample base.

CHAPTER FOUR

RESULTS

4.1 INTRODUCTION

This chapter presents the results of the study. It discusses the outcome of using the planned methodology in answering the research questions. Data are primarily collected from the interview the rest are collected from the other sources stipulated in Chapter 3 (Methodology). Two aspects are laid out in that chapter: objectives and challenges.

4.2 INTERVIEW RESULTS

The results of the interviews have been structured in two parts: objectives and challenges. The results are arranged accordingly to best suit the answering of the research questions.

4.2.1 Motivates and Objectives

4.2.1.1 Significance of Green Finance and Social Responsibility Investment in Turkey

Green finance and social responsibility projects, which have gained more importance in the post-pandemic period all over the world, have entered the agenda of many countries. Sustainable economy has become an area that countries are beginning to attach more importance to. Participant R7 and R5 emphasized the importance of green finance in Turkey from an economic perspective within the scope of sustainability. Respondent (R7) stated:

> *"Turkey has been obtaining a large part of its energy needs from fossil fuels since its existence. Since fossil fuel resources are scarce in our country, energy imports constitute our biggest source of current account deficit. There is a parallelism with the substance 'The current account deficit will be reduced and investments in renewable energy resources will be increased' in the Turkish New Economic Model (YEP)."*

Respondent (R5) stated:

> *"We supply the majority of our energy deficit from fossil fuel oil. For developing countries, energy means everything. You cannot produce without energy. As a result, your relations with the countries from which you import energy have to be good. This situation creates a situation of supply security and dependency"*

In the meetings with R5 and R7, renewable energy sources were identified as a common area of green finance and social responsibility investments. They drew attention to the advantages of renewable energy sources in terms of both their importance in Turkey's new economic model and to its geopolitical position.

The analysis of the interviews about the significance of green finance and social responsibility investment for Turkey revealed that the following issues were emphasized:

- the current account deficit
- energy supply security
- independence from external factors
- Turkish New Economic Model (YEP)
- currency and interest threat
- the geopolitical advantage of renewable energy sources.

All these show how important green finance is for Turkey. Respondent (R5) stated:

> *"...in line with the Paris Agreement and the European Green Deal, Turkey is starting to invest in renewable energy."*

As a result of these two agreements, the importance of green finance has increased.

Due to Turkey's new economic model, the above-mentioned conditions have been analyzed to be important to the country's economy and security. Policy makers R5 and R7 have identified renewable energy sources as representing a common area of green finance and social responsibility investments, and they presented the reasons why

Turkey remains below its potential in this field and suggested solutions. In this context, R5 stated:

> *"...another issue is that investments in this field are long-term investments. It is experiencing financial deepening problems as a result of long-term investment. It is not easy for small and medium-sized entrepreneurs to attain financing that will enable them to invest in renewable energy resources."*

According to interviews of policy makers in the field of green finance and renewable energy resources, we can list the reasons why renewable energy resources, which are one of the common areas of green finance and social responsibility investments in Turkey, remain below their potential.

- Insufficient investments
- Renewable energy investment source is long term
- Difficulty in private sector access to funds
- Lack of financial depth
- Insufficient tax incentives

According to the analysis obtained from the joint interviews of all the participants in this field, the difficulty faced by small and medium-sized entrepreneurs in accessing finance and financial depth were determined as the most important problem. In order to solve this situation, R7 stated:

> *"...Yes, providing financial depth can be a solution to this problem. At this point, green sukuk and green bonds will provide financial depth. However, especially as an Islamic finance tool and a tool that directly transfers resources to the real sector, sukuk will be the most important financial diversification tool in the financing of renewable energy resources. In this context, as the Investment Bank of Turkey, we are happy to issue the first social and sustainable sukuk in Turkey. As policy makers, financial diversity in this area will definitely be ensured by sukuk..."*

However, there are some difficulties in issuing sukuk. Small and medium-sized entrepreneurs who were interviewed found it difficult to access financing due to the unnecessary cost of issuing sukuk and the fact that the sukuk investors are the holders of at least a small amount of capital, not fast and prolonging the legal processes.

Blockchain-based sukuk provide a technological solution that could eliminate such problems. R5 stated about this issue that:

> *"Blockchain is the most conspicuous technology of the new era. It makes serious contributions to diversification, security, greater accessibility and less costly financing. Blockchain technology, which is also used in different sectors such as health, retail and travel, creates a new field that we call 'decentralized finance' based on the free will of people. It will provide serious benefits in basic points such as cheapness, speed, efficiency and cost."*

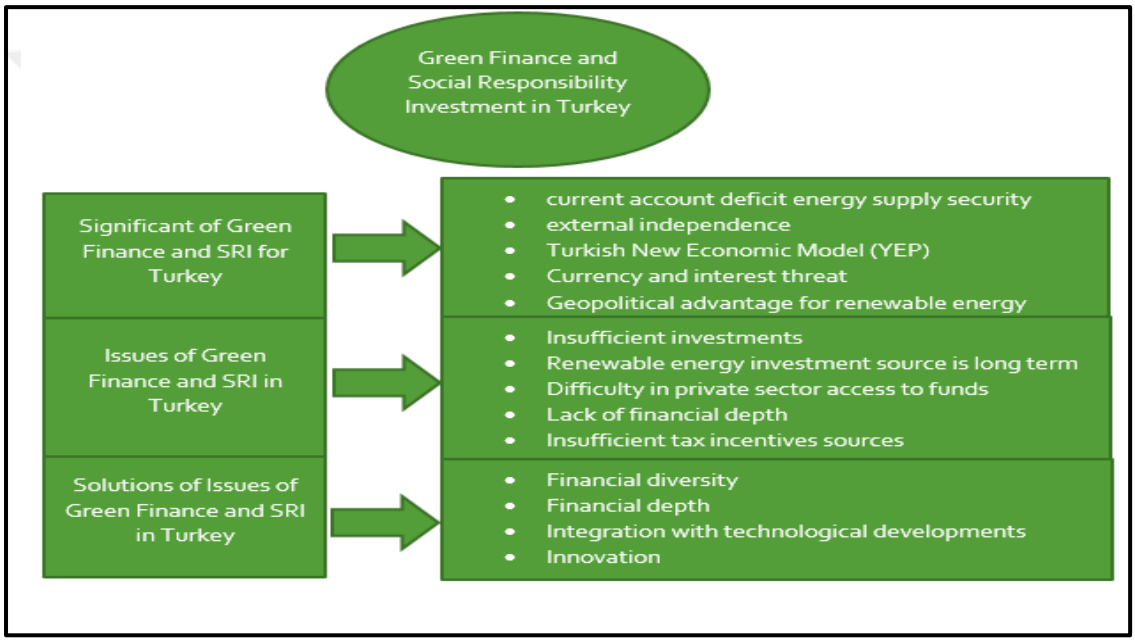


Figure 4. 1 Significance of Green Finance and Social Responsibility Investment in Turkey

4.2.1.2 Attractiveness of Sukuk for Green Finance and Social Responsibility Investment in Turkey

We asked all the interviewees about the importance of sukuk, an Islamic finance product, for Turkey and its advantages for green finance SRI. We also asked what the potential of sukuk is for Turkey. According to our analysis, they agreed on a common point. A sukuk can be structured on the basis of either a good or a service. Turkey's new economic model emphasizes the importance of transferring finance directly to the real

sector. Direct transfer of the sukuk source to the real sector will ensure more efficient use of the funds. Sukuk can provide an important advantage for green finance and SRI in Turkey as they will provide financial diversity and depth. The government of Turkey is giving special support to sukuk by reducing taxes upon them as part of its efforts to become a center of Islamic finance, and investors want to benefit from these advantages.

Respondent (R2) indicated

"…Istanbul Finance Center is one of our most important projects. The goal of this project is to become the center of Islamic finance in the world. Turkey has a very important potential in the field of Islamic finance. Due to both our advanced banking infrastructure and our strategic location, there are many investors who want to invest in Turkey…There is a significant potential in renewable energy resources, and the state supports sukuk issuance and investments. Funds collected through sukuk are transferred directly to the real sector according to their types. This means that entrepreneurs increase fund efficiency in green finance and social responsibility investment…"

Respondent (R3) stated,

"Emlak Participation Bank issued the first green sukuk in Turkey this year. Renewable energy resources are a common area of green finance and social responsibility investments. Since renewable energy sources are both environmentally friendly and sustainable, they are very compatible with Islamic finance principles and objectives. Therefore, sukuk will be a good tool to attract both Islamic finance investors and conventional investors to invest in green finance in Turkey."

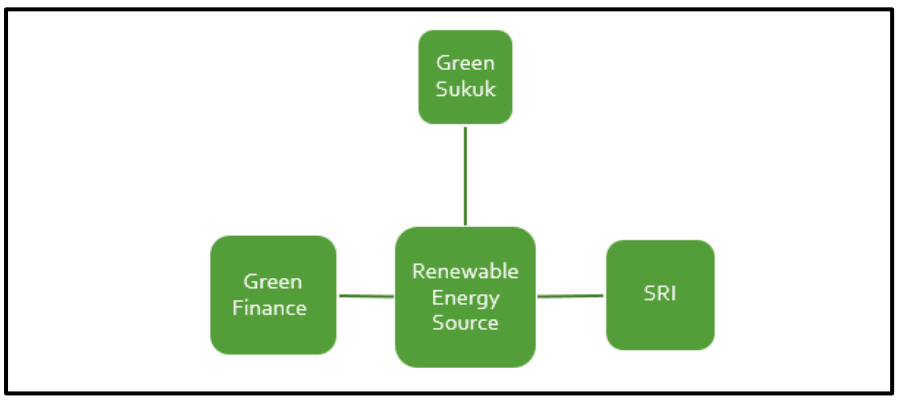


Figure 4.2 Components of Green Finance and SRI

a) Green sukuk provides direct transfer of funds to the real sector.
b) Green sukuk provides large investors (Muslim and non-Muslim) for green finance and social responsibility investment in Turkey.
c) Asset-backed sukuk contracts make them reliable for the Turkish economy.
d) Sukuk is a financial instrument suitable for green finance and social responsibility investments. Sukuk can be the means of equitable wealth distribution.
e) Sukuk provides financial diversification for the Turkish economy.
f) Green sukuk could be a driving force of sustainable development for the New Turkish Economy plan.

As a result of the interviews with the participants, the importance of green finance and social responsibility investments for Turkey was evaluated in relation to the research questions and objectives. The interviewees stated that blockchain-based sukuk have great potential for increasing investments in renewable resources, which is the common area of green finance and social responsibility investments in Turkey.

In this context, specifically, the potentials of blockchain-based sukuk for green finance and social responsibility investments were analyzed in four areas.

a) Investment in renewable energy sources in Turkey
   - Financial depth
   - Provision of easy access to funds for SMEs
   - Large investor base
   - Efficient use of funds
b) Increasing Turkey's green sukuk volume
   - High secondary market
   - Without intermediaries
   - Fast, reliable and traceable
c) Increasing Market Share
   - Easy access for investment
   - Good prestige for green finance
   - Wide investor base with Generation Z

d) Compliance with the Turkish New Economic Model
   - Provide sustainable economy for Turkey
   - The impetus for the Istanbul Finance Center (IFM) project

4.2.1.3 Investment in Renewable Energy Sources in Turkey

Green finance and social responsibility investments have the potential to increase investments in renewable energy resources, which are their common areas. In the analysis of our interviews, most of the participants focused on the same points. These points are follows:

Financial Depth and Easy Access to the SME fund

Blockchain-based sukuk create financial diversification to increase investments in renewable energy sources. Due to the Paris Agreement and the European Green Deal, the importance of renewable energy sources is increasing, but the means to provide funding are not available. Blockchain-based sukuk will provide financial deepening. This conclusion was reached from the answers of the participants.

Respondent (R5) stated:

> *"Green transformation and combating climate change will be one of the top priorities of the new era. It will also be decisive in international economic relations. Blockchain is the most conspicuous technology of the new era. It makes serious contributions to diversification, security, and more accessible and less costly financing. We can say that the reason for the low investment in renewable energy sources is the lack of financial depth. Blockchain-based sukuk have great potential to provide financial depth."*

In order to increase energy production from renewable energy sources, it is necessary to ensure that small and medium-sized entrepreneurs and investors can easily access funds and invest. In the analysis made, blockchain-based sukuk and small and medium investors will provide easy access to funds and will provide financial efficiency by transferring the funds directly to the real sector together with the sukuk.

Accordingly, respondent (R6) stated,

"DLT-based sukuk can be beneficial, and they can offer small investors an opportunity to invest. The idea of using technology for green finance is admirable....You need to be a qualified investor in Turkey to invest in sukuk. A qualified investor has a capital of 1 million TL. This means that it is only available to institutional investors and that individual investors do not have access to it. DLT sukuk will be suitable for micro sizes and hence for small and micro investors. Since sukuk is absorbed in this way, it will spread the risk to unlimited investors and therefore be more efficient."

4.2.1.4 Increasing Turkey's Green Sukuk volume

Green sukuk are important in financing renewable energy resources, which is a common area of green finance and social responsibility investment. Green sukuk are used to finance renewable energy sources. A green sukuk was issued for the first time in Turkey this year. The problems that hinder Turkey's green sukuk development could be solved with blockchain, which would increase Turkey's sukuk volume.

Participant (R8) mentioned,

"Since sukuk structures are mixed in Turkey, more than one legislative rule is applied in some sukuk transactions. This causes the sukuk transactions to be slow. Transaction costs and issuance procedures, especially for issuing green sukuk, have a negative impact. With blockchain technology, transaction costs and long transaction processes will be reduced."

One of the most important advantages of blockchain is that it provides a large investor base. Thanks to blockchain-based sukuk, green finance and social responsibility investments have the potential to reach wider audiences and attract investors.

According to Respondent (R3),

"Green sukuk can bring both Muslim and non-Muslim investors together in the same area. However, because of some barriers, the development of green sukuk in Turkey is not at the desired level. Blockchain technology

removes these barriers and provides a faster and more accessible investor base. Not only investors in Turkey, but also people in the relevant platforms around the world will be able to invest."

Participant (R4) evaluated blockchain-based green sukuk from the perspective of Shariah and stated that blockchain-based sukuk will serve the principles of Shariah and will increase the volume of sukuk because it is secure:

"It will increase the demand for more investors because it is traceable, transparent, reliable and convenient. Maqasid al-Shariah are realizable with blockchain technology."

Analyzing from the feedback, blockchain-based sukuk will increase the attractiveness of sukuk investments in Turkey as blockchain conforms to Shariah principles and provides fast and low cost transactions. Blockchain-based green sukuk have the potential to attract idle investors not only from Turkey but also from all over the world. This will increase investment in renewable energy sources by developing the sukuk market.

4.2.1.5 Market Share

One of Turkey's strategic plans is to increase the market share of sukuk in Turkey. In this context, Istanbul Finance Center has determined it as one of its targets. In particular, green blockchain-based sukuk have the potential to increase significant market share.

Respondent (R8) stated:

"…even housewives in Japan will be able to invest in green sukuk traded in the secondary market thanks to blockchain technology. In addition, incentives such as green sukuk tax deductions are provided all over the world. Thus, green sukuk will be less costly than other sukuk and will increase its market share. In this case, blockchain technology has the potential to increase market share by reaching both broader social responsibility investors and sophisticated investors."

Respondent (R8) suggested other reasons for an increased market share:

"The generations between the ages of 15-30, which we call Generation Z, are more concerned with the next generation technology. Almost every Turkish youth plays the stock market and follows the stocks. With blockchain-based sukuk, we can attract the attention of Generation Z and increase its market share both in the domestic and foreign markets. The fact that the number of people in Generation Z is higher than other generations in Turkey and the fact that blockchain technology appeals to Generation Z reveals its potential in this field."

In addition, respondent (R2) stated:

"The fact that blockchain technology is made by everyone without the need for any capital to invest on the Ethereum platform will increase its market share. As Turkish government policy makers, we achieve good prestige abroad with financial innovations by combining green sukuk with blockchain technology, and it will increase our market share compared to other countries."

According to R9

"Determining the principles of sukuk and using them in sukuk issuance over a network is important in terms of establishing a standard. Setting standards on the rules of Sharia on platforms that can be seen by everyone will ensure shorter sukuk issuance times and improve market share. The inclusion of the standards in Malaysia into the system will pave the way for the creation of a common standard with the inclusion of the standards in Turkey into the system."

4.2.1.6 Compliance with the Turkish New Economic Model

Interviewees said that blockchain-based sukuk offer a good potential for the Turkish economic model. They said that in Turkey's new economic model, current account deficits are high due to energy imports, and they will support investments in renewable energy resources. At this point, the idea of using blockchain-based sukuk in the financing of renewable energy sources has attracted attention from government policy makers and they said that they would be supported in this area. One of the goals of the Istanbul Financial Center project is to make Turkey the best country in the field of fintech. The implementation of blockchain-based sukuk on green finance would provide good financial diversity and would be a good advertisement for initiative in that field. In this case, economic policy makers emphasized that blockchain-based sukuk are

potentially important for green finance and social responsibility investments in the context of sustainable economic development.

Respondent (R2) stated,

> "*The Istanbul Financial Center project is important for Turkey to become the world's sukuk market. Especially green finance projects are attracting the attention of investors all over the world. Blockchain-based sukuk will both gain good prestige and become an IFM advertisement for these projects, and will also stimulate investments in Turkey."*

According to Respondent (R1) *"In the new economic model, blockchain technology will increase the investments of renewable energy sources and create a significant import-reducing effect. At the same time, it has the potential to create good diversity within this model, on the way to making Istanbul a fintech hub."*

4.2.2 Challenges

Blockchain technology has many uses in the financial field. Nevertheless, blockchain technology is still considered very new. Three points came to the fore after our interviewees' evaluations of blockchain-based sukuk. The evaluations of Turkish economic policy makers and participants from the banking sector highlighted problems in the field of regulation and legislation. Afterwards, the advisory board of Turkish *fiqh* issues evaluated from the perspective of Shariah and brought some problems to the agenda. Based on the evaluations of social scientists, They said that the society did not have sufficient knowledge on this subject.

4.2.2.1 Regulation

Blockchain technology is a new technology in the world. As its usage areas expand, it appeals to more people. This situation has produced some unfortunate results: fraud, cheating, unfair advantage, and misuse of technology. In the interviews I conducted, the

participants talked about the potential of blockchain-based sukuk on green finance and social responsibility, but they said that a major regulation should be instituted.

Related to this, participant R2 gave many important points:

"Blockchain is a new technology for Turkey, and the government needs to regulate it for better implementation. Especially in the field of sukuk, Turkey still does not have a lot of legal infrastructure, and the fact that it is blockchain-based makes this situation even more complicated. Technically, which platform will be used for blockchain-based sukuk and how will the reliability of that platform be ensured? Which institution will be complained to in case of any dispute? If these problems are solved by legal regulations, blockchain-based sukuk will be more beneficial and efficient."

According to R8

"Blockchain-based sukuk do not have a legal basis in the banking sector. The banking industry thinks that the government should regulate blockchain-based sukuk because blockchain is very open to speculation. Which project is real? Which project should be invested in? Fraud and dishonest people can use this technology to raise funds for projects that actually never existed.

According to R9

"In Blockchain technology, for example, using the Ethereum platform, we may face a legal weakness. There are problems in getting legal response in case of any malfunction. Who will protect investor rights? Who will protect customer rights? Since it is a legal vacuum, it poses a problem in terms of Sharia."

4.2.2.2 Shariah Compliance

According to the analysis, the regulations are valid in accordance with the Shariah. In decentralized technology, any dispute will have a resolution problem. In addition, there is no right to withdraw from the contract, since the sukuk contract is made reserved by an algorithm. Being vague and open to speculation poses a problem in terms of Shariah.

Respondent (R4) indicate that,

"Yes, of course, we still cannot say that it is completely appropriate. Some areas in particular are very gray areas. There is a lack of regulation and legislation in these areas – especially regarding sukuk, which is an Islamic finance product – in Turkey. In some transactions, it is even considered to be covered by the same legislation that covers stocks. First of all, there is a need for a blockchain-based sukuk arrangement. Another issue is: what happens after the default sukuk blockchain base is processed? In addition, how will the return on project investments be? From the point of view of Shariah, some uncertainties need to be removed. And with blockchain-based sukuk, all information is shared and seen by everyone, which creates a problem. In addition, if it is decentralized, who can be contacted to return the blockchain-based sukuk from the contract? These are problematic and gray areas in terms of Shariah."

4.2.2.3 Asymmetric Information

According to the analysis, most people in Turkey have only superficial and incomplete information about crypto assets. According to some survey results and analysis, they are usually defrauded or do not want to invest in this field at all because they do not know about blockchain technology.

According to participant R8,

"... many employees in the banking industry are not familiar with blockchain technology."

Likewise, participant R5 adds,

"... the majority of the public do not want to invest in blockchain-based sukuk because they do not know about the subject."

4.2.3 SWOT Analysis

In this section, a SWOT table was created by analyzing the feedback from the participants. The SWOT analysis shows the advantages and disadvantages of blockchain-based sukuk for green finance and social responsibility investments in Turkey.

Table 4.1 SWOT Analysis

Strengths	**Weakness**
➢ Transparency, traceability, immutability and auditability ➢ Efficiency through blockchain-based sukuk and reduced transaction costs ➢ Programmability and regulatory compliance ➢ Large investor base, Disintermediation, High secondary market	➢ Emerging technology, insufficient public understanding and awareness ➢ User experience ➢ Regulatory uncertainty regarding blockchain and green sukuk ➢ Shariah non-compliance
Opportunities	**Threats**
➢ Increasing renewable energy source investment flow through new investors ➢ Integration of other emerging technologies ➢ Liquidity through a global investor base and fractional ownership ➢ Alternative financial infrastructure for the green sector ➢ Greater flexibility for small to medium-sized projects to raise funds ➢ Compliance with Turkey's New Economy Plan ➢ Financial diversity ➢ Increase in Turkish sukuk issuance volume ➢ Big market share for Turkey ➢ Establishing common sharia standards.	➢ Slowing progress due to the process of eliminating weaknesses ➢ Regulatory uncertainty and potential prohibition ➢ Fraud due to asymmetric information ➢ Blockchain-based sukuk is not suitable for all types of sukuk.

4.3 SUGGESTED IMPLEMENTATION FOR GREEN FINANCE AND SRI: BLOCKCHAIN-BASED SUKUK FOR THE FINANCING OF RENEWABLE ENERGY RESOURCES

4.3.1 Blockchain-based Sukuk Stakeholders

The projected scenario would be as follows: a blockchain-based sukuk is formed; the legislation required for green sukuk is standardized and written on a platform that can be accessed by everyone. When issuing blockchain-based sukuk, there is no need for independent supervisory firms to have a central advisory board in Turkey. Legislation that is accessible to everyone and that does not require differences will be written into the system, thus facilitating the issuance of sukuk. Our model was created by assuming that these operations have been done.

A. Standardizers: The design of this model has taken into account that it be in accordance with the International Capital Market Association (ICMA) green bond principles. These are requirements an entrepreneur's green project must fulfil in order for a green sukuk to be issued. The model has also taken into account compliance with the sustainable development guideline prepared by the Islamic Development Bank (IsDB). In addition, the project was evaluated and approved by an international audit company. Among the blockchain-based sukuk stakeholders, the Islamic Development Bank and ICMA provide the necessary framework for the approval process of the green project.

B. Independent audit firm: A private independent organization examines the green project to ensure that it complies with standards such as those of the ICMA and IsDB.

C. **Special Purpose Vehicle (SPV):** For green projects that have complied with the required standards, the SPV announces the necessary registrations and issuance of the sukuk on a blockchain platform (Ethereum).

D. Central Advisory Board: The organization oversees the Shariah compliance of green projects.

E. Banks: A bank makes a *mudarabah* contract (labor-capital partnership) with the entrepreneur (*mudarib*). It audits compliance with ICMA and IsDB standards for green projects. Then, it presents the green finance compliance

of the projects to the international evaluation firm and the documents showing where the collected funds come from and for which projects they will be used.

Participant R8, head of the investment department of Emlak Participation Bank, which issued the first green sukuk in Turkey, stated about the selection of the contract, *"Sukuk issued in Turkey are generally short-term. If a long-term green project is being exported, you need to provide periodic payments. The first green sukuk we issued was made with the mudarabah contract. Blockchain-based green sukuk will also be more suitable for the mudarabah contract."*

In addition, respondent R6 indicated that, *"...in my opinion, mudarabah is appropriate. It spreads the risk because it is a labor-capital partnership and will bring many investors together. Mudarabah sukuk is suitable for long-term projects due to periodic returns."*

F. Turkish Ministry of Energy and Natural Resources: In the green project issuance process, the Ministry provides tax-withholding support and facilitates the sukuk issuance process. The Ministry provides support to support the investment in energy resources.

G. Investors: These will be social impact investors or social capital suppliers, i.e., institutional investors, corporate investors, and private investors (sophisticated and retail), both local and foreign alike who will invest their money in the environmental, social, and governance (ESG) investment portfolio.

In addition, investors from all over the world will be able to invest in green sukuk without the need to be a qualified investor specified in Turkey.

Participant R6 expressed it as follows.

> *"The most serious challenge about sukuk is that the shares are in large denominations: $100k and above. That means it is available only for institutional investors while individual investors don't have access to it. DLT Sukuk will be available at micro sizes and hence will be suitable for small and micro investors. As such, such sukuk will spread the risk to an unlimited pool of investors and hence will be more efficient."*

H. Issuer: Small and medium-sized entrepreneurs (SME), companies etc.

4.3.2 Structure of Blockchain-based Green Sukuk

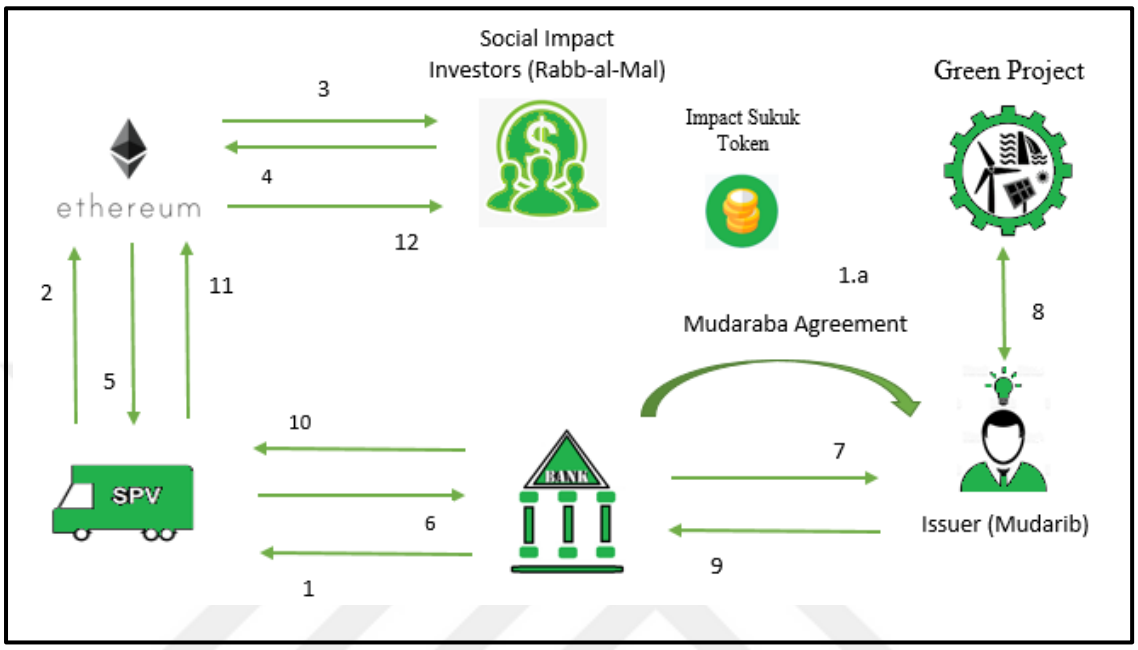


Figure 4.3 Structure of Blockchain-based Green Sukuk

1. The bank makes a *mudarabah* agreement with the entrepreneur for the green project as well as an agreement with the SPV.
2. The SPV announces green sukuk issuance to all investors via the Ethereum platform.
3. All investors receive sukuk via their digital wallets on the Ethereum platform, and they can sell impact sukuk tokens in the secondary market.
4. Sukuk investments are written to the Ethereum platform according to the current TL value.
5. The SPV receives funds from the Ethereum platform.
6. The funds are transferred to the bank.
7. Pursuant to the *mudarabah* contract, the bank provides capital to the entrepreneur.
8. The *mudarib* uses the funds and earns profit or loss.

9. According to the *mudarabah* contract, profit or loss is transferred to the bank.
10. For periodic payments, the bank pays the SPV.
11. The SPV transfers periodic payments to the Ethereum platform.
12. Periodic payments are transferred to investors via the Ethereum platform.

Participants R8 and R6 created this model as an example. According to the analysis of feedback from respondents, green sukuk will be issued more easily with blockchain-based sukuk without the need for intermediary institutions. It will also be easier for SMEs to access funds. Transferring the investments made to the real sector will also increase fund efficiency. Thanks to tax incentives and discounts, green sukuk will reach a wider investor base through the Ethereum platform, which will become more advantageous. This will increase investment in renewable energy sources.

CHAPTER FIVE

CONCLUSION

5.1 INTRODUCTION

In this section, first of all, a general summary of the study will be made. Then, according to the results of interviews with experts and policy makers in Turkey, information will be given about the potential of blockchain-based sukuk for green finance and social responsibility investments. Finally, various recommendations and suggestions will be offered about the potential of blockchain-based sukuk in Turkey.

5.2 SUMMARY OF THE STUDY

This study has investigated blockchain-based sukuk and their potential for green finance and social responsibility investments in Turkey. The study has focused on renewable energy resources in Turkey, which is an area of overlap between green finance and social responsibility investments. Investment potentials in renewable energy sources in Turkey have been examined, and it was stated that energy production from renewable energy sources has remained well below the potential. Turkey is in the position of a country dependent on foreign countries in the use of energy. Turkey imports 70% of its energy needs from foreign countries. Only 30% of Turkey's can be considered as renewable energy sources. Importing energy causes Turkey to experience foreign exchange problems and energy security problems. Research shows that this is due to Turkey's insufficient investment in renewable energy sources. The particular importance of this study lies in its examination of the function of blockchain technology (as well as other financial products, especially those used in Islamic finance) in the financing process for developing Turkey’s green sector. It paves the way for further studies in new related areas.

The study has provided extensive information about sukuk; the world sukuk market has been examined, and information has been given about sukuk in Turkey. Sukuk comprise an important tool to increase investments in Turkey. Green sukuk are

especially important for green finance and social responsibility investments. Fund efficiency is very high as the funds collected through green sukuk are transferred directly to the real sector. In Turkey, a green sukuk was issued by Emlak Participation Bank for the first time and used to finance investments in renewable energy resources. This marks a milestone for the development of green sukuk in Turkey. This study has adopted an exploratory research methodology as it answers a problem that has not yet been clearly defined. This study explores the potential of blockchain-based sukuk for green finance and social responsibility investments. In the study, interviews were conducted with the heads of the Turkish Presidency Finance Office, the heads of the investment departments of some Islamic banks and the Turkish Economy Policy makers.

Blockchain technology offers different usage possibilities in many areas of life. One of them is the issuance of financial instruments. The smart contracts brought by this technology and the tokenization of assets on the blockchain have significant potential in reducing the costs of instrument issuance, ensuring transparency, facilitating the process and reaching foreign investors.

The idea of issuing sukuk on the blockchain also offers a serious alternative to the problems encountered in traditional issuance. The analysis of interviews with bankers from the industry and heads of finance department of the Presidency has revealed that many participants expressed the potential of blockchain-based sukuk under the following headings: the issuance of micro enterprises, reaching more investors and providing transparency, high sukuk volume, financial diversity, increase in Turkish sukuk issuance volume, big market share for Turkey and increasing investments in renewable energy resources. Recently, two issuances were made abroad, one in the primary market and the other in the secondary market. At the same time, it was stated that the fields of participation finance and financial technologies will have an important place in the Istanbul Finance Center project in our country. This issuance, which is the integration of the participation finance instrument sukuk and the financial technology product blockchain, has the potential to make a good impression for Turkey and the Finance Center internationally. The announcements regarding the issuances are positive, and it can be expected that the sector's interest in this matter will increase. As a result of the interviews, the potential of blockchain-based sukuk for green finance and

social responsibility investments was demonstrated by SWOT analysis. In addition, a blockchain-based green sukuk issuance model was created for better understanding based on the feedback obtained from the participants.

Nevertheless, since blockchain technology is so new, there are some problems in this area. According to the analysis, one of the most important problems is the absence of specific legislation to regulate it. Moreover, while the legal problems of sukuk continue in Turkey, the need for regulations for blockchain technology is one of the factors hindering the development of this technology in Turkey. Problems arise in terms of Shariah, as there is no adequate regulation and it is suitable for speculation and fraudulent activities.

5.3 RECOMMENDATIONS

Blockchain-based sukuk is a new concept that requires awareness and education, especially for decision makers and policy makers. Appropriate regulatory frameworks are needed for blockchain-based sukuk to mobilize green finance in Turkey. Regulatory uncertainties are the biggest barriers to technological development. Many people have already been defrauded in Turkey through a cryptocurrency exchange. This situation has caused a cautious approach to blockchain technology in Turkey. Turkey's New Economic Plan mentions the goal of becoming a technology base. To achieve this goal, the development of the fintech sector and the diversification of technological financial instruments are required. In this context, the introduction of regulations for blockchain-based sukuk will both ensure the development of the sukuk market and support the growth of the fintech sector.

Sustainable development and blockchain technology represent a change in the financial field. Banks play an important role in the financial system. If banks participate in the process of financial change, they will be an important force for realizing Turkey's plan to be a technology base and for achieving the targets of the New Turkish Economy. targets to be a technology base and for the New Turkish Economy. As a result of our meeting with the experts of the banking sector, the importance of the banking sector in the financial change process was emphasized. However, it is understood that many

people working in the banking sector do not have enough knowledge about technological developments such as blockchain and sustainable development. In order for the banking industry to make a positive contribution to financial change, it must first train its employees in the field of blockchain technology and green finance. Work that is more efficient can be achieved with training and certificate programs for bank employees.

With blockchain-based sukuk, supportive policies should be provided to reduce investment costs in the field of renewable energy, to encourage investors, to attach importance to R&D activities, to eliminate legal and physical infrastructure deficiencies, to develop integrated facility alternatives, and to ensure sustainability. Incentives such as reduced taxes for renewable energy investments would be a positive step.

Discussion of the idea of blockchain-based sukuk issuance by Islamic lawyers, computer programmers, legal advisers and financiers will help answer the question marks on the product. Compliance with Islamic finance principles and giving confidence to investors are important and need to be resolved.

BIBLIOGRAPHY

Abdmouleh, Z., Alammari, R., & Gastli, A. (2015). Review of Policies Encouraging Renewable Energy Integration & Best Practices. *Renewable and Sustainable Energy Reviews*, 249-262.

Abdullah, N., & Nayan, M. (2020). GREEN SUKUK: FINANCING THE FUTURE TO SUSTAINABLE ENVIRONMENT. *INTERNATIONAL JOURNAL OF ZAKAT AND ISLAMIC PHILANTHROPY*, 14-23.

Abubakar, A. M. (2020). SUKUK AND NATION BUILDING IN NIGERIA. *JURNAL EKONOMI DAN BISNIS ISLAM*, 71-84.

Acaroğlu, M., & Ültanır, M. (2020). Enerji Potansiyeli ve Değerlendirilmesi İçin Öneriler., (pp. 161-171). Ankara.

Aker, Y., & Karavardar, A. (2018). Kira Sertifikası Ve Türkiye'deki Kobi'ler İçin Yeni Bir Finansman Modeli Önerisi. *In Internatıonal Congress Of Islamıc Economy, Fınance And Ethıcs*, 50-64.

Alagöz, S., & Yılmaz, A. (2015). DOĞAL KAYNAKLARIN TÜKENME ENDİŞESİ İLE TÜKETİCİLERİN OLUMLU DAVRANIŞ DEĞİŞİKLİKLERİ EDİNMESİNDE TOPLULUK TABANLI SOSYAL PAZARLAMANIN ROLÜ: KONYA İLİ ÜZERİNE BİR ARAŞTIRMA. *Necmettin Erbakan Üniversitesi, Uygulamalı Bilimler Fakültesi*, 240-255.

Alam, Gupta, L., & Zameni, A. (2020). Emergence of Shariah-Tech and Its Landscape. In Fintech and Islamic Finance. In *Palgrave Macmillan, Cham* (pp. 63-79).

Alam, N., Duygun, M., & Ariss, R. (2016). Green Sukuk: An Innovation in Islamic Capital Markets. *Springer International Publishing Switzerland*, 167-185.

Alam, N., Gupta, L., & Zameni, A. (2020). *Fintech and Islamic Finance Digitalization, Development, and Disruption.* Kuala Lumpur: Palgrave Macmillan .

Albaraka. (2020). *Fintech ve İslami Finans: Dijitalleşme, Kalkınma ve Yenilikçi Yıkım.* İstanbul: Albaraka.

Alpaslan. (2014). Yeni bir finansman aracı olarak sukuk (kira sözleşmesi) ve muhasebeleştirilmesi. *Finansal Araştırmalar ve Çalışmalar Dergisi*, 15-31.

Arabi, M. (2015, May 15). *Mudarabah Sukuk*. Retrieved from http://www.icm.seo.ir/.

Asıcı, A. (2017). Iktisadi Dusuncede Yesil Ekonominin Yeri. In A. A. Asıcı, *Yesil Ekonomi* (pp. 35-57). Istanbul: Yeni Insan Yayinevi.

Auwal Adam Sa'ad, Kunhibava, S., Mustapha, Z., Muneeza, A., & Karim, M. (2020). Sukuk on blockchain: a legal,regulatory and Sharī'ah review. *ISRA International Journal of Islamic Finance*.

Ayas, C., Demirayak, F., İş, G., Kumbaroğlu, G., & Yenigün , O. (2019). *İklim Çözümleri: 2050 Türkiye Vizyonu.* İstanbul: X-PressBaskı.

Aydın, E. (2015). Evaluatıng Lease Certıfıcates And Asset Lease Companıes Accordıng To Income Tax And Corporate Tax. *Erciyes Üniversitesi Iktisadi Ve Idari Bilimler Faküeltesi Dergisi*, 43.

Azam, A. (2021). Digital Smart Contracts: Legal and Shari'ah Issues. In M. M. Billah, *Islamic FinTech Insights and Solutions* (p. 165). Kuala Lumpur: Palgrave Macmillan.

Bakan, I., & Sekkeli, Z. (2019). Blok Zincir Teknolojisi ve Tedarik Zinciri Yönetimindeki Uygulamaları. *International Journal of Society Researches*.

Bekar, N. (2020). YENİLENEBİLİR ENERJİ KAYNAKLARI AÇISINDAN TÜRKİYE'NİN ENERJİ JEOPOLİTİĞİ. *Türkiye Siyaset Bilimi Dergisi*, 37-54.

Bilgen, S., Keleş, S., Sarı, A., & Kaygusuz, K. (2008). Global Warming and Renewable Energy Sources For Sustainable Development: A Case Study in Turkey. *Renewable and Sustainable Energy Reviews*, 372-396.

Bitpanda. (2020, March 20). *How does a blockchain work?* Retrieved from https://www.bitpanda.com/academy/en/lessons/how-does-a-blockchain-work/.

Blossom Finance. (2018).

Blossom Finance. (2020, Aguost 21). *Blossom Finance*. Retrieved from https://blossomfinance.com/#:~:text=Blossom%20Finance%20uses%20%5Bblockchain%5D%20to,to%20microfinance%20institutions%20for%20investments%E2%80%A6%E2%80%9D.

Camb, W. G. (2001). Formulating and Evaluating Theoretical Frameworks for Career and Technical Education Research. *Journal of Vocational Education Research*, 4-25.

Climate Bonds. (2017, March 21). *Green Sukuk*. Retrieved April 12, 2021, from https://www.climatebonds.net/projects/facilitation/green-sukuk.

Demırdogen, Y. (2020). İSLAMİ FİNTEK EKOSİSTEMİ ÜZERİNE BİR DEĞERLENDİRME. *Gaziantep University Iktisadi ve Idari Bilimler Fakultesi*, 64-95.

Demirdöğen, Y. (2020). ANALYSIS OF THE ISLAMIC FINTECH ECOSYSTEM IN EUROPE. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 469-481.

Deren, & Dikmen, B. (2019). Sukuk Ve Ortaklığa Dayalı Kira Sertifikalarının Muhasebeleştirilmesi. *Muhasebe ve Vergi Uygulamaları Dergisi*, 907-927.

Dinçer, H., & Yüksel, S. (2017). *Finansal İktisat.* Ankara: Orion.

Drahor, M., Kumlutaş, D., & Göktürkler, G. (2019). Dünya 'da ve Türkiye 'de Jeotermal Enerji ve Kullanımı. Yenilenebilir Enerji Kaynakları Sempozyumu., (pp. 61-68). İzmir.

Duqi, A., & Al-Tamimi, H. (2019). Factors affecting investors' decision regarding investment in Islamic Sukuk. *Qualitative Research in Financial Markets*, 60-72.

Durbilmez, S., & Turkmen, S. (2020). BLOCKCHAIN TECHNOLOGY AND ITS STATE IN THE FINANCIAL SERVICES SECTOR IN TURKEY. *Research of Financial Economic and Social Studies (RFES)*.

Ela, M. (2019). Yeşil Sukuk ve Türkiye Uygulanabilirliği. *Yönetim ve Ekonomi Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakultesi Dergisi*, 221-237.

Elasrag, H. (2019). *Blockchains for Islamic finance: Obstacles Challenges.* Munich Personal RePEc Archive.

Energy Information Administration. (2020, October 14). *International Energy Outlook*. Retrieved from https://www.eia.gov/outlooks/ieo/.

Gençoğlu, M. (2019). Yenilenebilir Enerji Kaynaklarının Türkiye Açısından Önemi. *Fırat Üniversitesi Mühendislik Fakültesi Bölümü Dergisi*, 50-74.

Guven, E. (2020, July 7). *https://tr.cointelegraph.com/*.

Hazine ve Maliye Bakanlığı. (2021, February 8). *Merkezi Yönetim İç Borç İstatistikleri, Senet Çeşitleri*. Retrieved from www.hmb.gov.tr: https://www.hmb.gov.tr/kamu-finansmani-istatistikleri

HSBC and Sustainable Digital Finance Alliance. (2020). Blockchain Gateway for Sustainable Linked Bonds. *HSBC*.

https://academy.binance.com/. (2021, Jun 21). Retrieved from Özel, Herkese Açık ve Konsorsiyum Blockchainlerin Farkları.

https://cdn-acikogretim.istanbul.edu.tr/. (2021, Jun 5). Retrieved from Görüşme.

https://www.iienstitu.com/. (2021, Jun 4). *Nitel Araştırma*. Retrieved from https://www.iienstitu.com/.

IIFM. (2019). *Sukuk Report.* International Islamic Financial Market (IIFM).

IIFM. (2021). *Sukuk Report.*

International Investment . (2019 , October 21). *Indonesia issues world's first blockchain sukuk*. Retrieved from https://www.internationalinvestment.net/news/4006149/indonesia-issues-world-blockchain-sukuk.

investaz. (2018). *Yatirim sermaye piyasasi*. Retrieved from https://www.investaz.com.tr/yatirim/sermaye-piyasasi-nedir.

İrfan, H., & Ahmed, D. (2020). Fintech the opportunities for Islamic Finance. In A. Umar, Oseni, & S. Nazim Ali, *Islamic Finance Theory and Practice* (p. 21). Kuala Lumpur: Taylor&Francis Group.

ISRA. (2015). *Islamic Capital Market Practices and Principles* . Kuala Lumpur: ISRA.

Juden, M., & Pisa, M. (2020). Blockchain and Economic Development: Hype vs. Reality. *Center for Global Development*, 1-42.

Kağıtıcı, A., Yılmaz, B., & Bademli, Y. (2019). Lease Certificates (Sukuk) As A New Finacial Instrument In Bond Market: A Case Study Of Turkish Capital Market. *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi*, 999-1006.

Kandır, S., & Yakar, S. (2017). Yenilenebilir Enerji Yatırımları İçin Yeni Bir Finansal Araç : Yeşil Tahviller. *Maliye Dergisi*, 85-110.

KAP. (2022, February 8). *Pay Dışında Sermaye Piyasası Aracı İşlemlerine İlişkin Bildirimler (Faizsiz)*. Retrieved from https://www.kap.org.tr/en/: https://www.kap.org.tr/tr/

Keleş, H. İ. (2019). *NEW METHOD IN ISLAMIC FINANCE: GREEN SUKUK*. İstanbul: Sage Yayınları.

Kenton, W. (2020, November 27). *Musharakah*. Retrieved from https://www.investopedia.com/terms/m/musharakah.asp.

Keskin, İ., & Kantarcı, H. (2015). The Importance and Role of Sukuk Marketing as an Islamic Bond in the Economy. World Academy of Science, Engineering and Technology,. *International Journal of Social*, 1897-1902.

Khan, N., Kchouri, Yatoo, N., & Kräussl, Z. (2020). Tokenization of sukuk: Ethereum case study. *Global Finance Journal*.

Koç, E., & Şenel, M. (2013). The State of Energy in World and Turkey - General Evaluation. *Mühendis ve Makina,*, 32-44.

Kordvani. (2009). A legal analysis of the Islamic bonds (sukuk) in Iran. *International Journal of Islamic and Middle Eastern Finance and Management,*, 323-337.

KPMG. (2021). *Enerji Sektörel Bakış*. Retrieved from https://assets.kpmg/content/dam/kpmg/tr/pdf/2019/03/sektorel-bakis-2019-.

Kuşat. (2014). Modern İslami Finans Sektörünün İnovatif Gücü: Sukuk. *Akademik Bakış Uluslararası Hakemli Sosyal Bilimler Dergisi*, 41.

Lee, M.-H. (2009, June 5). *Structured Islamic finance*. Retrieved from https://ca.practicallaw.thomsonreuters.com/0-500-8755?transitionType=Default&contextData=(sc.Default)&__lrTS=20180908132124103&firstPage=true.

Liehr, P., & Smith, M. J. (1999). Middle Range Theory: Spinning Research and Practice to Create Knowledge for the New Millennium. *Advances in Nursing Science*, 81-91.

Malamas, e. (2020). A blockchain framework for increased trust in green bonds issuance. *Ecomic Science of University of Piraeus*, 1-21.

Malamas, V., Thomas, K., Arakelian, V., & Gregory, C. (2020). A blockchain framework for increased trust in green bonds issuance. *Ecomic Science of University of Piraeus*, 1-21.

Mathews, J. (2011). Naturalizing Capitalism: The Next Great. *Futures*, 868-879.

Mohamed, H. (2019). Blockchain-based impact sukuk. *Fiscal Policy Agency*, 106.

Mohammed, H., & Ali, H. (2019). *Blockchain, Fintech, and Islamic Finance.* Berlin: Degpress.

Moody, W., Peter, K., & Sinha, P. (2010). An exploratory study: Relationships between trying on clothing, mood, emotion, personality and clothing preference. *Journal of Fashion Marketing and Management*, 161-179.

Mounira, B. (2020). Blockchain Technology Applications in the Islamic Financial Industry. *Economic Sciences, Management and Commercial Sciences Review*, 309-325.

National Geographic. (2017). *Renewable energy, explained*. Retrieved from https://www.nationalgeographic.com/environment/article/renewable-energy.

Oseni, U., & Safina, L. (2020). The Potentials of Smart Contracts in Islamic Trade Finance. In U. Oseni, & S. Nazim Ali, *Fintech in Islamic Finance Theory and Practice* (p. 220). Kuala Lumpur.

Ozeroglu, A. I. (2014). SUKUK VE TÜRKİYE'DE SUKUKUN UYGULANABİLİRLİĞİNİN DEĞERLENDİRİLMESİ. *Journal of History School (JOHS)*, 751-772.

Patton, M. Q. (1990). *Qualitative Research & Evaluation Methods.* London: Sage Publications.

Pezikeoglu, F. (2019). YEŞİL EKONOMİ GÖSTERGELERİ VE YEŞİL ETİKETLER. *Suleyman Demirel Üniversitesi Ziraat Fakültesi Tarım Ekonomisi Bölümü* , 1390-1398.

PlutusX. (2018, February 28). *Smart Contracts for Dummies*. Retrieved from https://medium.com/@PlutusX/smart-contracts-for-dummies-3bf381caf0c9.

Presidential Finance Office of Turkey. (2021). *TURKISH FINTECH ECOSYSTEM STATUS REPORT*. Istanbul: CBFO.

Rabbani, M., Khan, S., Eleftherios, & Thalassinos. (2020). Fintech, Blockchain and Islamic Finance: An Extensive Literature Review. *International Journal of Economics and Business Administration*, 65-86.

Rabiah, E., & Syed, M. (2016). Potential Role of Social Impact Bond and Socially Responsible Investment Sukuk as Financial Tools that Can Help Address Issues of Poverty and Socio-Economic Insecurity. *Intellectual Discourse*, 343-364.

Rahim, S. R., & Mohamad, Z. Z. (2018). Green Sukuk for Financing Renewable Energy Projects. *Turkish Journalof Islamic Economics*, 130-144.

Rahman, A., Shahrim, Z., & Ramli , R. (2014). Understanding Islamic Capital Market. *IBFIM*.

Sa'ad, A. (2018). Smart Sukuk Structure From Shari'ah Perspective: The Application Of Mudarabah Smart Contract.

Sahin, M., Taksim, M., & Yitgin, B. (2021). EFFECTS OF THE EUROPEAN GREEN DEAL ON TURKEY'S ELECTRICITY MARKET. *The Journal of Business, Economic and Management Research*.

Sahin, U. (2017). Yesil Dusunceden Yesil Ekonomiye. In A. A. Asıcı, *Yesil Ekonomi* (pp. 22-35). Istanbul: Yeni Insan Yayinevi.

Saunders, M. (2014). Research Methods for Business Students. *6th edn*.

Selçuk. (2014). Revaçta Olan Bir İslami Finansman Aracı: Sukuk. Bildiriler Kitabı.

Seretakis, S. (2019). Blockchain, Securities Markets and Central Banking. *Oxford University Press*.

Serpam. (2013). İslami Finans: İslami Finans Kavramı, Ürünler, Dünyada ve Gelişimi. *Sermaye Piyasaları Araştırma ve Uygulama Merkezi*, 67.

Setyaw, V. (2017). Does financial performance of Islamic banking is better? *Panel Data Estimation*.

Sherif, M., & Erkol, T. (2017). Sukuk and conventional bonds: shareholder wealth perspective. *Journal of Islamic Accounting and Business Research,*, 347-374.

Simsek, M., & Samar, M. (2020). *İslami Finans ve Finansal Teknolojiler (Fintech) Blokzincir-Akıllı Sözleşmeler-Kripto Paralar*. Konya: Neuyayin.

Singh, A., & Masuku, M. (2010). SAMPLING TECHNIQUES & DETERMINATION OF SAMPLE SIZE IN APPLIED STATISTICS RESEARCH: AN OVERVIEW. *International Journal of Economics, Commerce and Management,*.

Slidetodoc. (2014, March 4). *What is Sukuk*. Retrieved from https://slidetodoc.com/sukuk-jasim-alajmi-what-is-sukuk-sukuk-is/.

Smaoui, H., & Ghouma, H. (2019). Sukuk market development and Islamic banks' capital ratios. *Research in International Business and Finance*, 101064.

SPK. (2021). *SPK 2021 Rapor*. Istanbul: SPK.

Syed, M., & R, E. (2016). Potential Role of Social Impact Bond and Socially Responsible Investment Sukuk as Financial Tools that Can Help Address Issues of Poverty and Socio-Economic Insecurity. *Intellectual Discourse*, 343-364.

T.C Enerji Bakanlığı. (2021). *Aylık Enerji İstatistikleri Raporu–08*. Ankara: T.C EnerjiBanaklığı.

Tan, V. (2021, December 12). *Blockchain Sukuk: The Smart way of doing it*. Retrieved from https://ifnfintech.com/.

Tanriverdi, M., Uysal , & Ustundag, M. (2019). Blokzinciri Teknolojisi Nedir ? Ne Değildir ?: Alanyazın İncelemesi. *BİLİŞİM TEKNOLOJİLERİ DERGİSİ,* 203-213.

Tanrıverdi, M., Uysal , M., & Üstündağ, M. (2019). Blokzinciri Teknolojisi Nedir ? Ne Değildir ?: Alanyazın İncelemesi. *BİLİŞİM TEKNOLOJİLERİ DERGİSİ,*, 203-2015.

TKBB. (2021). *Sukuk Raporu.* İstanbul: TKBB.

TKBB. (2022, February 8). *Sukuk İhraç Hacimleri Raporu*. Retrieved from https://tkbb.org.tr/: https://tkbb.org.tr/veri/sukukihraclari

TSKB. (2017). *First Green Bond in Turkey*. Retrieved from http://www.iklimekonomisi.org/haberler/17-turkiyenin-ilk-yesil-tahvili-tskbden.html.

TSKB. (2021). *Türkiye'de Enerji Görünümü.* Ankara: TSKB.

Tufekci, A., & Karahan, C. (2019). BLOKZINCIR TEKNOLOJISI VE KAMU KURUMLARINCA VERILEN HIZMETLERDE BLOKZINCIRIN KULLANIM DURUMU1. *Verimlilik Dergisi*.

Ulusoy, A., & Ela, M. (2018). KÜRESEL FİNANSAL KRİZİN SUKUK PİYASASINA ETKİSİ. *Osmaniye Korkut Ata University Journal of Economics and Administrative Sciences*, 99-114.

Unal, G., & Celebi, H. (2020). Bitcoin alanında herşey. *Bilişim Dergisi*.

Unfccc. (2020). *Paris Agreement*. Retrieved from https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

Usmani. (1998). An introduction to Islamic finance. *Arham Shamsi*.

Usta, A., & Doğankeskin, S. (2020). BLOCKCHAIN 101. *Bankalar Arası Kart Merkezi*.

Ustaoglu, M. (2014). Alternative Interest-Free Insurance and Investigating Public Awareness by Income Level: Empirical Analysis. *Siyaset, Ekonomi ve Yönetim Araştırmaları Dergisi*, 109-130.

Vishwanath, S., & Azmi, S. (2009). An Overview of Islamic Sukuk Bonds. *The Journal of Structured Finance*.

Wikipedia. (2019 , April 3). *Smart contract*. Retrieved from https://en.wikipedia.org/wiki/Smart_contract.

Wikipedia. (2019). *Paris Agreement*. Retrieved from www.wikipedia.com.

Wikipedia. (2020, June 7). *Renewable Energy*. Retrieved from www.wikipedia.com.

Yakar, S., & Önal , Y. (2013). Yeni Bir Finansman Aracı Olarak "Sukuk-Kira Sertifikası" ve Vergisel Boyutunun İncelenmesi. *Bankacılar Dergisi*, 72-94.

Yanpar. (2015). *İslâmi Finans İlkeler, Araçlar ve Kurumlar.* İstanbul: Scala Yayıncılık.

Yazicioglu, I., & Kazak, H. (2019). SUKUK AS ONE THE ISLAMIC FINANCIAL INSTRUMENTES: INVESTIGATION OF THE MURABAHAH CONTRACTS IN THE HYBRID SUKUK IN TERMS OF COMPLIANCE WİTH THE ISLAMIC PROVISION. *Journel life of Economics*, 93-110.

Yazıcıoğlu, İ., & Kazak, H. (2019). İslami Finansal Enstrümanlardan Birisi Olarak Sukuk: Hibrid Sukuk İçerisinde Yer Alan Murabaha Sözleşmelerinin İslami Hükümlere Uygunluk Yönünden İncelenmesi. *Journal Of Life Economics*, 91-118.

Yılmaz, M. (2020). Sukuk pazarlanasında karşılaşılan sorunlar . *BATMAN ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ İŞLETME ANA BİLİM DALI*.

APPENDIX A

INTERVIEW QUESTIONS

Head of Fintech Strategy Department of Finance Office of the Presidency of the Republic of Turkey (Melih TURAN)

1. What is your view on Islamic fintech development in Turkey?
2. What would be the role of blockchain-based sukuk in development of Sukuk market in Turkey?
3. How do you see the potentials of blockchain based sukuk for Turkish economy?
4. What are the possible challenges of establishing a blockchain-based sukuk platform?
5. How do you think blockchain-based sukuk will have impact on green finance and social responsibility investments?
6. Are there any new studies in the field of Fintech in Turkey?
7. What are the barriers preventing the development of fintech in Turkey? How will Turkey adapt to fintech**?**

Head of Islamic Finance Department of Finance Office of the Presidency of the Republic of Turkey (Tarık AKIN)

1. Do blockchain-based sukuk affect the development of sukuk in Turkey? Does it increase the volume of sukuk in Turkey?
2. What is the contribution potential of Turkey's green sukuk issues to the Turkish New Economic Model?
3. What do you think about the development and future of green sukuk in Turkey, what are the difficulties in development?
4. What impact do you think blockchain-based sukuk will have on sustainable, green finance and social responsibility investments?
5. Do you think that blockchain-based sukuk will support the IFM project by increasing the diversity of Islamic Finance products in Turkey?

Staff of Treasury and Capital Market Department, KuveytTurk Participation Bank (Murat AYDIN)

1. What is the sukuk issuance process in Turkey?
2. What are the challenges in the sukuk issuance process and will blockchain solve these challenges?
3. Would blockchain-based sukuk expand crypto investment?
4. What are your views on the future of green finance and socially responsible investments with blockchain-based sukuk?

Member of the Presidential Economic Policy Board of Turkey (Servet BAYINDIR)

1. What is the Shari'ah perspective on blockchain-based sukuk?
2. Is it appropriate to invest and trade in blockchain-based sukuk?
3. Could there be a Shari'ah compliant framework for blockchain-based sukuk in Turkey?

4. Does blockchain-based sukuk facilitate the principles and purposes of sharia?
5. Are there sharia problems in blockchain-based sukuk?

Political Economy and Social Research Foundation (Bilal BAGIS)

1. Why green finance and social responsibility investments are important for Turkey's new economic plan (YEP)
2. Turkey is below its potential in terms of energy production from renewable energy sources. What do you think is the reason?
3. What advantages do blockchain-based sukuk provide in Turkey's green transformation and development?
4. Does blockchain-based sukuk provide an alternative financing option for the Turkish economy?
5. Can blockchain-based sukuk be used and be an important tool in financing renewable energy resources?
6. What need to do for the development of blockchain-based sukuk in Turkey?

Professor in Sabahattin Zaim University (Tariqullah KHAN)

1. How do you think blockchain-based sukuk will have impact on green finance and social responsibility investments?
2. Does blockchain-based sukuk provide financial deepening?
3. What are the challenges in the sukuk issuance process and will blockchain solve these challenges?
4. What are the Sukuk structures that could be designed on Blockchain technology to achieve sustainability in the Islamic Economy?
5. What do you think about blockchain-based green sukuk in social responsibility and green finance?

Head of Investment Banking & Investor Relations in Emlak Participation Bank first Green sukuk issuance by Emlak participation Bank (Esma KARABULUT)

1. As Turkey's first bank to issue green sukuk, what are the handicaps you encounter in issuing green sukuk?
2. Do you think blockchain-based sukuk can solve these handicaps?
3. Do blockchain-based sukuk increase investment in renewable energy sources?
4. What structure of blockchain-based sukuk do you recommend for green finance?
5. Does blockchain technology increase the volume of sukuk in Turkey?

Project Manager of the Presidential Finance Office of the Republic of Turkey (Madaa MUNJID)

1. Are there any Shariah issues in using blockchain technology in sukuk issuance?
2. Are there any Shariah advantages in using blockchain technology in sukuk issuance?
3. What do you think needs to be done to make Blockchain-based Sukuk more functional?