FINANCIAL INSTRUMENTS AS THE CATALYST OF SUSTAINABLE FOREST MANAGEMENT: AN ESTIMATE ON GREEN BONDS AND ISLAMIC FINANCING

A Thesis

Submitted to the Master's Study Program of Economics at the Faculty of Economics and Business in partial fulfillment of the requirements for the degree of

Master of Arts (M.A.)

by:

Milhatun Nisa'

03232110019

UNIVERSITAS ISLAM INTERNASIONAL INDONESIA

DEPOK

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Originally titled on this thesis is **'Green Bonds and Islamic Financing as Catalysts for Sustainable Forest Management'**, this work underwent adjustments and revisions following the thesis defense, in response to valuable feedback received. These insights led to the decision to modify the title, resulting in the current version, '**Financial Instrument as the Catalyst of Sustainable Forest Management: An Estimate on Green Bonds and Islamic Financing'**.

This acknowledgment is provided to prevent any potential confusion among readers, particularly considering that various administrative thesis files were signed under the previous title, "Green Bonds and Islamic Financing as Catalysts for Sustainable Forest Management."

FINANCIAL INSTRUMENTS AS THE CATALYST OF SUSTAINABLE FOREST MANAGEMENT: AN ESTIMATE ON GREEN BONDS AND ISLAMIC FINANCING

ABSTRACT

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Deforestation and forest degradation continue to persist, resulting in the loss of millions of hectares of forest annually. This is primarily driven by the exploitation of forests for short-term gains, highlighting the urgent need for sustainable forest management. However, implementing sustainable forest management requires substantial financial resources. Thus, this thesis aims to explore two potential financing streams, namely the impact of green bonds and Islamic financing provided by Islamic banking, in achieving sustainable forest management. It is important to note that achieving sustainable forest management is a complex endeavour influenced by various external factors. In addition to green bonds and Islamic financing, this thesis acknowledges the significance of macroeconomic conditions, financial bank performance, and political factors as potential determinants that can shape the success of sustainable forest management efforts. Therefore, the main objectives of this thesis are to examine the correlation between green bonds and Islamic financing with sustainable forest management (SFM) and to explore the factors that support or hinder the progress of sustainable forest management (SFM). Moreover, the G20 countries are recognized as the largest emitters of carbon emissions globally, and they have issued a significant number of green bonds as a means of mitigating their environmental impact. By focusing on the G20 countries and D-8 countries, the study aims to explore how these countries utilize green bonds to address sustainable forest management. Additionally, the D-8 countries as representatives of Muslim nations as well where Islamic financing is prevalent. Islamic financing, provided by Islamic banking institutions, is recognized for its environmental friendliness compared to other banks. Consequently, the study considered both the G20 and D-8 countries as the subjects of analysis and its cover period around 2010 until 2021. The findings of the study revealed that green bonds have a positive impact on sustainable forest management, whereas Islamic financing has a negative effect on its performance. The certain macroeconomic factors were found to significantly influence forest management outcomes in different ways. Furthermore, financial bank performance and political stability were identified as contributing factors in enhancing sustainable forest management practices. This study stands out from previous literature as it adopts a quantitative approach to explore the relationship between green bonds, Islamic financing, and sustainable forest management. Unlike prior studies that primarily employed qualitative methods, this research provides a unique perspective on the topic. Moreover, the integration of these specific themes within a single study makes it an original contribution to the existing of knowledge. The study recommends that the International Capital Market Association (ICMA) should establish standardized and globally recognized definitions and criteria for the official use of proceeds in green bonds. Additionally, the government of D-8 countries is advised to implement or strengthen regulations that incentivize Islamic banks to prioritize environmentally sustainable projects.

Keywords: ***Green Bonds, Islamic Financing, Sustainable Forest Management***

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LIST OF ABBREVIATIONS

GBP	: Green Bonds Principles
ICMA	: International Capital Market Association
OIC	: Organization of Islamic Cooperation
GHG	: Greenhouse Gas Emissions
ROA	: Return On Assets
SFM	: Sustainable Forest Management
SDGs	: Sustainable Development Goals
DM	: Developed Markets
EM	: Emerging Markets
FSB	: Financial Stability Board
R&D	: Research and Development
UoP	: Use of Proceed
ESG	: Environmental, Social, And Governance
GBDB	: Green Bond Database
GSS+	: Green, Social, Sustainable and Other Labelled
IDB	: Islamic Development Bank
IMF	: International Monetary Fund
IME	: Islamic Moral Economy
PLS	: Profit-Loss Sharing
AAOIFI	: Accounting and Auditing Organization for Islamic Financial Institutions
IFSB	: Islamic Financial Services Board
OIFI	: Other Financial Institutions
KFH	: Kuwait Finance House
IFDI	: Islamic Finance Development Indicator
OLS	: Ordinary Least Squares
PLS	: Pooled Least Squares

FE	: Fixed Effects
RE	: Random Effects
CPI	: Consumer Price Index
LM	: Lagrange Multiplier

CHAPTER 1

INTRODUCTION

1.1 Background

Human life is as dependent on the land as they are on the ocean for livelihoods and sustenance. Plant life takes essential role for providing 80 percent of the human diet. A 30 percent of the Earth's surface is covered by forests (see Figure1.1), which are key for preventing climate change as well as being habitat to millions of species and important sources of clean air and water (UNDP, 2015). The great mitigation potential of forest ecosystems creates carbon management a crucial part of the suggested natural climate solution (Griscom et al., 2017). However, the benefits of the forest are still abused to reap short-term advantage, which leads to deforestation. Based on Ritchie and Roser (2021) almost 10 million hectares of forest are deforested around the world per year. The most prevalent insistence rendering to deforestation and severe forest degradation are agriculture (Austin et al., 2019; Leblois et al., 2017) and human related-economic activity (WWF, 2020), for instance when a forest is clear-cut to create new settlement or the way for a palm oil plantation. It may also eventually occur as a consequence of the ongoing forest degradation as temperature goes up due to climate change (FAO & UNEP, 2020) as an outcome of human activity. Figure 1.2 provides a detailed image about the shift in forest land areas due to agricultural and economic activities. Nowadays, it only leaves a little over one-third (38%) of the area of the habitable land covered in forests. This represents nearly one-quarter (26%) of the entire landmass, including both habitable and uninhabitable land areas.

By 2020, emissions had climbed by nearly 2.1 gigatonnes (Gt) (IEA, 2022). This set 2021 over 2010 as the higher ever the year-on-year growth in energy-related CO2 emissions in absolute terms. The 1.9 Gt drop in emissions due to the pandemic that occurred in 2020 was more than reversed by the rebound in emissions in 2021. CO2 emissions increased for around 180 megatonnes (Mt) over pre-pandemic level of 2019 (IEA, 2022). In fact, higher emissions can be easily overcome by forests if and only if the world's forests are maintained and avoided from deforestation. The research from Harris et al. (2021) and GFW (2022) published startling information that the world's forests absorbed roughly twice as much

carbon dioxide as they released between 2001 and 2019. Or to put it another way, forest act as a "carbon sink," absorbing a net 7.6 billion metric tonnes of CO_2 annually. Figure 1.3 depicts that different from other sectors, where carbon flows in a one-way trip to the atmosphere, forests function as a two-way highway, the forest absorbs CO_2 when they are standing or regrowing and releasing it when they are cut down or deteriorated.

Therefore, the role of forest management here is prominent in order to maintain and preserve the standing trees, without need not to cut off the flow of forest goods. Since good forest management could balance and support stakeholders' interests while preserving the long-term viability of forests, the goods and the service that they provide (Guariguata, 2020). However, the definition of good management has varied over time and differs by area. The principles of excellent management have been formally formalized under the idea of sustainable forest management (SFM) over the past 30 years (Goushehgir et al., 2022). A reference framework for sustainable forest management is adopted by the United Nations Forum on Forests (UNFF). Moreover, UNFF along with FAO are actively implementing several SFM-related programs that address various features into of SFM (Food and Agriculture of Organization, 2020a; UNFF, 2015). Debates on funding sustainable forest management (SFM) at the intergovernmental level have lasted decades, but all parties have come to the same conclusion: SFM is both expensive and severely underfunded (Singer, 2016).

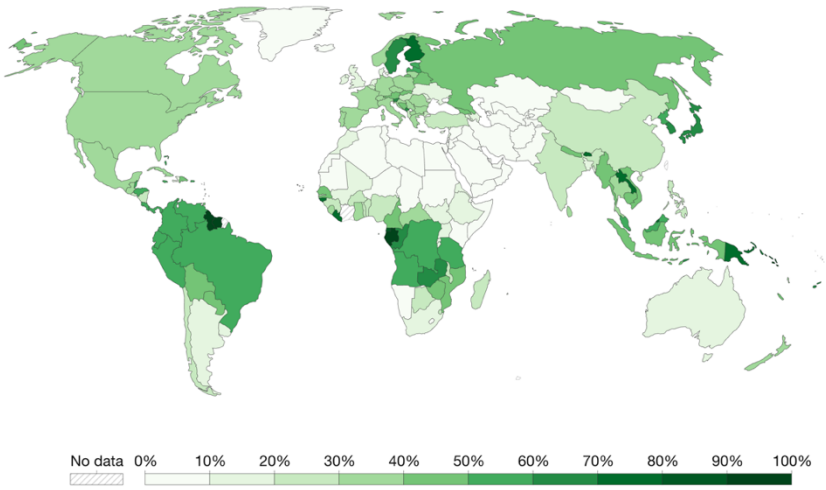

Figure 1. 1 Share of land covered by forest, 2020
Source: OurWorldInData.org

Other than that, forests and the forest sector are particularly prone during these difficult times: increased strain on forests for energy and subsistence farming, as well as a rise in illegal activities, pose severe dangers to progress toward sustainable forest management (SFM). The consequences of this crisis will expand and deepen the poverty divide, escalating the cost of the crisis to the climate change and environment. The crisis has a wide-ranging impact on the world's forests. There has been a rise in unemployed individuals returned from cities to rural areas as impact of increasing in urban unemployment and in forest encroachment. Due to decreased domestic and export demand, there has also been a loss of employment and income in the forestry sector, which includes the manufacturing of wood and non-wood forest products, as well as pulp and paper. There has also been a movement toward shifting cultivation as a result of a lack of other food sources and overexploitation for fuel for the rural poor. All of these factors contribute to additional deforestation and forest degradation. Furthermore, forest law enforcement capacity has been harmed as a result of reductions in government spending (United Nation, 2021).

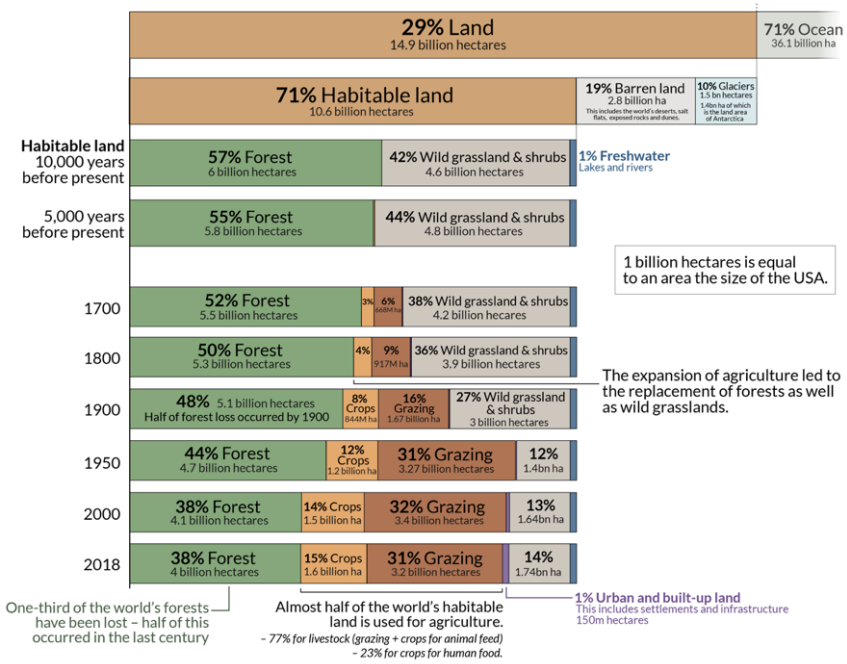

Figure 1. 2 The world has lost one-third of its forest since the last ice age

Source: OurWorldInData.org

Moreover, this issue has become a source of concern for many nations, which has led to the establishment of laws and financial investments in sustainable forestry. Especially for the G20 countries, since they contribute for 75 percent of greenhouse gas emissions, there is a higher responsibility to be more ambitious in inventing solutions for climate and forest management. Hence, at the G20 summit, which was held in Bali 2022, they emphasized to focus on land use management and restoration (Saraswati, 2022). Brazil is one of the G20 members that is actively involved in combating deforestation and the most well-known country for its success in preventing deforestation with its Action Plan for Prevention and Control of Deforestation in the legal Amazon (PPCDAm) between 2004 and 2012 (GPA, 2018; West & Fearnside, 2021). Indonesia is also preparing the Indonesia's Forestry and Other Land Use (FOLU) Net Sink 2030 program which was inaugurated through the Decree of the Minister of Environment and Forestry Number SK.168/MENLHK/PKTL/PLA.1/2/2022. Other than that, as one of the G20 actions to cut carbon emissions, they gradually have issued green bonds since 2014. United states and China recorded as the highest issuer green bonds (Climate Bonds Initiative, 2022).

Moreover, green bond is vital to integrate environmental projects with capital markets and investors and link funds against sustainable development (World Bank, 2021b). The growth of the financial sector has made it straightforward for investing and funding, it aids country's transition to a greener economy by unlock finance for climate-smart projects. One of the green bond success stories because their financial institution is from Sweden. It has been standard practice among Swedish financial institutions to place a strong emphasis on sustainability, active communication of sustainability and high visibility efforts. They primarily concentrate on planning bond issuances for pension funds and real estate firms (Torvanger et al., 2021). Not only does financial development in conventional industry show contribution for environment but also the Islamic sector exhibit environmental care from their principle. Islamic principle state that Islamic banks' increased attention to upholding higher standards of social, environmental, and ethical values.

It is proven by the study of Bae et al. (2022) record that the number of investments in environmental project is greater in Islamic bank than conventional bank due to the proposition of ethical value. From this it can be concluded that the trend of trust in society is changing tend to Islamic bank instead of conventional. Many studies revealed the link between Islamic bank and environmental quality (especially is some forest issues), most of them are from D-8

countries and Bangladesh becomes the most frequent research object (Julia and Kassim, 2019; Sharmeen et al., 2018; Solarin, 2019; Uddin, 2016) besides Malaysia (Obaidullah, 2018; Solarin, 2019). The provision of financing by Islamic banks to enterprises or business owners enables them to obtain additional capital to support their operational needs. This includes purchasing goods and services, acquiring machinery, and fulfilling other production requirements necessary for their business operations. As a result, this financial support can contribute to the growth and development of their businesses, potentially leading to an improvement in their overall performance. As their businesses expand, they have the potential to impact the performance of sustainable forest management through their production processes as well, which can either support or hinder sustainable forest management. For example, when enterprises experience increased profits after receiving financial support from Islamic banking, they may choose to allocate a portion of their earnings towards forest projects or there is also a possibility that these businesses engage in illegal logging practices, bringing to deforestation. Other than that, from Islamic banks sides, who provides Islamic financing, may actively participate in activities such as tree planting or invest in sustainable forest conservation efforts. Resulting to the achievement on sustainable forest management.

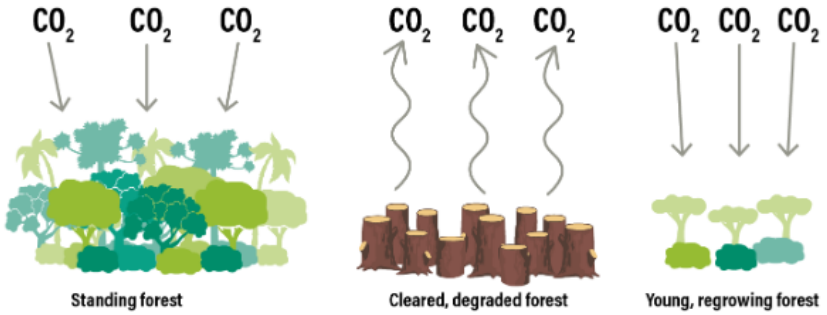

Figure 1. 3 Forest act as both a source and sink for carbon
Source: Global Forest Watch and World Resources Institute

Moreover, the study focuses on analyzing the impact of two types of financing, namely green bonds and Islamic financing, on forest management in G20 and D-8 countries. The term "Islamic financing" used here refers to financing offered by Islamic banks, like mentioned literatures above, that Islamic financing provided by Islamic banks is found to support environment, such as forestry, low-carbon technologies, water conservation and

mass transit (Solarin, 2019). The purpose of the study is not to compare the specific characteristics of these two financing methods or to determine which one is superior. Instead, the study aims to assess the effectiveness of green bonds and Islamic financing in relation to forest management separately. It acknowledges that green bonds and Islamic financing have their own unique features and objectives, such as green bonds is debt-based and Islamic financing given by bank is profit-loss sharing based, which make them are not apple-to-apple for the object of comparison. Furthermore, Green bonds are a type of financing that is specifically designed to fund environmental projects and initiatives. In contrast, Islamic financing encompasses a broader range of financial activities that adhere to Islamic principles and guidelines. While Islamic financing can also support environmental initiatives, its scope extends beyond environmental concerns. The priority in Islamic financing is often given to supporting micro, small, and medium enterprises (MSMEs), promoting economic development. Hence, the discussion between green bonds and Islamic financing is conducted independently, with no intention of comparison. The regression analyses conducted for each financing type were also performed separately.

Since the primary purpose of the study is not to establish a comparison between green bonds and Islamic financing. Consequently, there is no need to align the research objects, such as including green sukuk to achieve an apples-to-apples comparison with green bonds, or comparing Islamic financing from Islamic banks with conventional banks. The main focus of the study is to prove the contribution of green bonds over sustainable forest management and to challenge the notion that Islamic financing provided by Islamic banks can contribute to sustainable forest management. Therefore, the study emphasizes exploring the potential impact of green bonds and Islamic financing on sustainable forest management rather than making direct comparisons with those financing instruments.

The background of choosing G20 and D-8 countries is because green bonds are more pertinent to be issued in the G20, since they mainly focus on decision-making to support global financial stability and sustainable economic growth. While D-8 countries normally concentrate on Islamic banking and financing, hence Islamic finance is hard to be found in G20, and vice versa. Although many G20 countries may share a similar focus on environmental conservation, it is crucial to recognize that this alone does not fully embody the same vision and mission pursued by Islamic financing. Islamic financing is rooted not only in environmental concerns but also draws from Islamic beliefs and Quranic references,

making it distinct in its approach. So, the study want to focus on Islamic financing provided by Islamic bank in the majority Muslim society, and the study believe that D-8 countries are enough to represent the behaviour of Muslim society in maintaining conservation through their Islamic financing activities. Apart from that G20 and D-8 countries also have wide forest area, like the Amazon forests in Brazil and Indonesia's forests, hence it is most suitable area to investigate the performance on sustainable forest management that may be influenced with various potential determinants.

There was only minority of research that quantitatively examines the connection between the green bonds and forest management, Islamic financing and forest management; instead, the most of previous studies used scenario and comparison models (Julia and Kassim, 2019; Kastner et al., 2021; Sartzetakis, 2021). The study differs from the previous literature in a number of ways. To be more specific, the scope of the nation is larger than that of prior research, which typically only looked at one country (Austin et al., 2019; Julia and Kassim, 2019; Sharmeen et al., 2018; Uddin, 2016), resulting in a richer source of study material. The study would also estimate quantitively using approximation forest land that influenced by green bond and Islamic finance that other study does not, which the pervious study do not directly stated forest as measurement, instead of it only cover by environmental quality (Abduh, 2019; Tolliver et al., 2019). In other words, this is the early study, according to author's observation, that examines the prospect of green bonds on sustainable forest management (SFM) and investigates the impact of financing given by Islamic banking on sustainable forest management (SFM), revealing with econometrics model.

1.2 Research Questions

Based on the aforementioned background regarding forest management and both of the potential financing, green bonds and Islamic financing. The research question to be addressed in the study below:

1. Do green bonds and Islamic Financing determine the growth of sustainable forest management (SFM) in reducing carbon emissions?
2. What are other potential determinants that influence sustainable forest management (SFM)?
3. To what extent green bonds and Islamic financing impact the significance of sustainable forest management (SFM)?

1.3 Research Purposes

From the research question posed, it is expected to be able to respond the following:

1. To verify the relationship green bonds and Islamic financing over sustainable forest management (SFM)
2. To investigate the determinants that facilitate or obstruct sustainable forest management (SFM)
3. To ascertain to what extent the significance of green bonds and Islamic financing on sustainable forest management (SFM) and to probe whether or not Islamic financing significantly benefit to sustainable forest management (SFM)

1.4 Implication

This thesis is expected to enrich and fulfilled the literature gap on sustainable forest management (SFM) study from the G20 and D-8 perspective and for future research. The thesis provides these benefits:

1. It enriches the literature review on sustainable forest management (SFM) from the G20 and D-8 context. It also enhances to deepen knowledge about the link between green bonds and Islamic financing over sustainable forest management (SFM) using economic approaches and perspectives. The study plan to submit on journal "Management of Environmental Quality" that it focuses on green bonds in the G20 and "International Journal of Islamic and Middle Eastern Finance and Management" that it focuses on Islamic financing in the D-8 Countries as the firs realization of providing the global literature.
2. It helps to broaden the knowledge on what other factors, such as agriculture and manufacturing industry, may contribute to the sustainable forest management (SFM). This thesis also relates to several political matters that happen within countries or private sector that involve in any forest activities.
3. It expands teaching materials on the sustainable forest management (SFM), especially on the G20 and D-8 countries' efforts to achieve sustainable forest management (SFM) and reduce carbon emission around the world. This thesis could also be used as supplementary materials for other economic subjects, such as agricultural economics, manufactural economics, macroeconomics, political subject, and public policy analysis.

This thesis can help the G20 government and D-8 government in its efforts to sustainable forest management. It could be used as policy guidance for policy makers in those area, in both local and national levels. For instance, In Indonesia there is Ministry of Environment and Forestry. And other forestry councils like the international forest stewardship council and others to help their campaign on sustainable forests. Last but not least, the party providing forest finance, in this case, green bonds or climate agents and banking, both conventional and Islamic banks, could rearrange and review the use of proceed/allocated-fund to improve sustainable forest management. For the government, policy makers or stakeholders, this thesis has the following advantages:

1. It helps the government of G20 and D-8 countries in formulating a strategic decision on policies focusing on sustainable forest management, or for the globe it might as a lesson learned as well. This thesis provides a brief illustration of G20 and D-8 forest management conditions along the chosen years, 2010-2021 period. This information enables the government to develop appropriate strategic plans to ensure the achievement of sustainable forest management (SFM).
2. It provides information about several strategic policies to the party providing forest finance, in this case, green bonds or climate agents and banking, both conventional and Islamic banks, around G20 and D-8 area in achieving sustainable forest management (SFM). The financial party could make a review of the business or project that given finance Whether or if they actually use green energy or are environmentally conscious, especially with regard to the forest. Hence, the financial party could rearrange and filter the right use of proceed or allocated-fund to improve sustainable forest management.

1.5 Thesis Outline

This thesis is designed to has six chapters. The first two chapters contain the introduction and literature review on several prior studies that investigate the determinant might influence in achieving sustainable forest management, it covers the definition and measurement all of chosen variables. Chapter 3 provides the context of the thesis, through the explanation of the trend of green bonds and Islamic financing. Chapter 4 discourses on research methods, which unbalanced panel regression is employed within this thesis. In the following chapters, this thesis analyses the green bonds over sustainable forest management on G20 countries (European Union, United States, China, France, Germany, United

Kingdom, Canada, Japan, Italy, South Korea, Australia, India, Brazil, Indonesia, Mexico, Russia, Saudi Arabia, South Africa, Turkey, Argentina) and Developing-eight or D-8t (Iran, Bangladesh, Indonesia, Malaysia, Turkey, Egypt, Pakistan, and Nigeria) countries, complied by macroeconomics variables, bank's financial performance, and political matters. In addition, the effect of Islamic financing given by Islamic banks on forest management realization in D-8 countries only, which is representation of Muslim countries, also to be analysed in the next session to identify the major implication of forest management issues that could hamper the world's effort to decrease carbon emissions. The final chapter provides a summary, conclusion, and policy recommendations. The final chapter additionally reviews the study's limitations along with offering some recommendations for future research. In a nutshell this thesis is organized as follows:

Chapter 1. Introduction

Chapter 1 gives an overview of the study, including a statement of the problem, the objective of the study, the relevance of the study, and the scope of the study. The context and a summary of the problem are presented to provide an overview of the study aims. In Chapter 1, a brief literature review is provided to establish the groundwork for the research. Finally, this chapter discusses why the study is important. Finally, this chapter discusses the significance of the study.

Chapter 2. Literature Review

The literature review chapter reviews theories and previous studies related to the research. This chapter consists of six sections. The first section explains the concept of sustainable forest management (SFM), followed in the second and third sections by both financing that might influence forestry, green bonds and Financing given by Islamic banking toward sustainable forest management (SFM). The fourth section reviews other determinants to achieve sustainable forest management (SFM) as well as previous studies, this divided into three sub section; macroeconomics which includes some sectors, trade, agriculture, manufacturing and inflation, public expenditure. The fifth section addresses the theories and earlier studies on the role of the bank's financial performance in achieving food security. The sixth section discusses theories and prior studies on how politic could affect in sustainable forest management progress. All section would be breaking it down into

definition and measurement. The research hypotheses are provided to test the validity of the original findings discovered by other scholars with the same research topic.

Chapter 3. Trend of Green Bonds and Islamic Financing

Chapter 3 provide a glance of information about the development, the opportunity and challenges faced by green bonds and Islamic financing, as well as the current trend of green bonds and Islamic financing. Providing context for the reader is critical to ensuring the explanation flows smoothly. By establishing the context, readers are able to understand the relevance and significance of the argument being explored. This comprehension allows them to follow the logical sequence of ideas and arguments offered in the explanation. It also assists readers in grasping the broader ramifications and significance of the topic at hand. As a result, offering context beforehand allows the reader to engage more effectively with the forthcoming explanation and improves their comprehension of the argument being presented.

Chapter 4. Research Methodology

Chapter 4 explains the research methods utilized. This thesis conducts quantitative analysis to obtain empirical research-based, which reflects the actual situation, especially in 2010-2021, on progress of sustainable forest management (SFM) the spread of green bonds and its development, the financing growth of Islamic banking, macroeconomics condition, bank's financial performance in general, politic as well. Furthermore, this thesis would classify the estimates based on the general regression for green bonds, which means covering all countries, and the specific regression for Islamic financing in Islamic countries only. The method that used is unbalance panel regression to analyze the impact of mentioned source of financing over sustainable forest management. In order to select the best model for analysis, estimate begins with the Chow test and the Hausman test. This chapter contains information regarding the data used, its sources, and operational definition of variables. This thesis utilizes unbalanced panel data estimation with the applications using statistical software, Stata. Panel data, as opposed to cross-sectional data, allow for more complex models and estimating approaches. When compared to cross-sectional data, the occurrence of many observations on the same entity throughout time allows for the detection of causal effects under weaker assumptions. Furthermore, some panel data estimators allow for the control of variables that cannot be directly observed or measured

but do not vary over time (time-fixed unobserved heterogeneity) (Cameron & Trivedi, 1995). An unbalanced panel itself is a dataset with unequal numbers of observations of each entity. However, the inclusion of cross-sectional entities observed over various time periods causes certain problems when estimating standard errors using Ordinary Least Squares (OLS) regression models. This is because each additional year of data is not independent of preceding years. As a result, certain specific estimating methods have been created to deal with the unique characteristics of panel data, Fixed Effects (FE) and Random Effects (RE) models.

Chapter 5. Research Finding of Green Bonds over SFM

Chapter 5 reveals the result of estimation models on green bonds towards sustainable forest management (SFM) within G20 countries and D-8 countries. The analysis also include the other potential factors that may influence sustainable forest management. In addition, the focus of analysis is on green bonds role, in this chapter it may reveal not only the impact of green bonds on sustainable forest management (SFM) but also it impacts on carbon emissions. Since the study want to probe that forest is able to absorb emissions efficiently.

Chapter 6. Research Finding of Islamic Financing over SFM

Chapter 6 shows the role of Islamic financing given by Islamic banking in influencing sustainable forest management (SFM) in D-8 countries. The analysis also include the other potential factors that may influence sustainable forest management. In addition, the focus of analysis is on Islamic financing role, in this chapter it may reveal not only the impact of Islamic financing on sustainable forest management (SFM) but also it impacts on carbon emissions. Since the study want to probe that forest is able to absorb emissions efficiently.

Chapter 7. Summary and Conclusion

Chapter 7 concludes the thesis with a summary, research findings and policy recommendations. It also mentions the limitations of this study and provides suggestions for future research.

CHAPTER 2

LITERATURE REVIEW

The chapter presents literature review that contains existing theories and previous studies and research related to the research question and objectives. This chapter has six sub section. The first, the second, and the third sub section explain the concept of forest management, green bond, and Islamic financing, respectively. Then the followed sub sections are basic foundation of the determinant that will be divided at the fourth, the fifth, and the sixth. The fourth sub section reviews several studies related to macroeconomic that influencing forest management cycle. The fifth sub section reviews some previous studies on the performance of financial development in achieving forest management. The sixth sub section recapitulates earlier literatures regarding political matters in affecting the forest management.

2.1 Forest Management

Forests are prominent to life on earth. They protect from erosion, clean the water drink, and serve as a critical buffer against climate change. Particularly in the tropics and subtropics, many of the world's forests and woodlands are not being managed sustainably. Numerous countries do not have adequate forest legislation, regulations, and incentives to support Sustainable Forest Management (SFM). Furthermore, they lack the procedures to guarantee the participation and involvement of all stakeholders in forest governance, planning, and development, as well as the financial and human resources required for the formulation, implementation, and monitoring of forest management plans.

However, it might not be appropriate to adopt any internal or external strategies to the problem of forest management without understanding the main concept of forest management. One of the issues that arises when a nation attempts to address forestry problem is a lack of understanding in defining forest management and its measurement. Moreover, a global knowledge of forest management is essential for informing policies and decisions-making regarding issues such as forest conservation, the potential supply assessment of forest biomass, carbon accounting, renewable energy, sustainable forest management and forest restoration techniques.

The United Nations General Assembly recognized SFM as a dynamic and developing concept in 2007 as a guide to maintain and improve the economic, social, and environmental values of all types of forests for the benefit of the present and future generations and used the following seven thematic elements as a reference framework: (1) extent of forest resources; (2) forest biodiversity; (3) forest health and vitality; (4) productive functions of forest resources; (5) protective functions of forest resources; (6) socio-economic functions of forests; and (7) legal, policy and institutional framework.

A globally concur definition of SFM is impractical beyond a very general level due to the enormous variation of forest types, climates, and socioeconomic situations around the world. SFM, however, can be broadly defined as the human interventions on sustainable use and protection of forests with the goal of preserving and enhancing a variety of forest resources. Humans are at the center of SFM since it aims to continuously contribute to the diverse needs of society (Food and Agriculture of Organization, 2020b). To be more detailed, the aim of SFM is to ensure that forests provide commodities and services to meet both present-day and future needs, as well as to contribute to the sustainable development of communities.

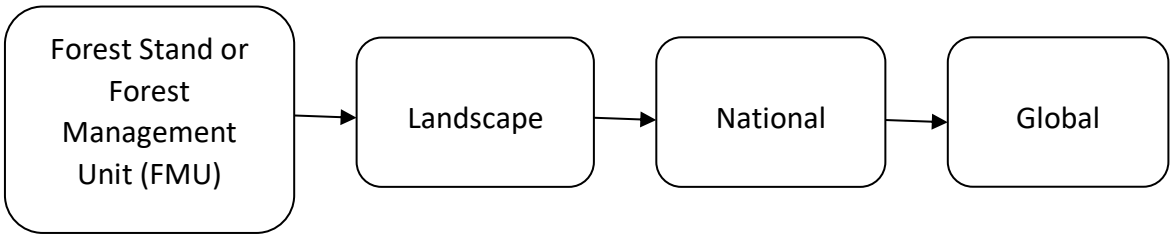

Figure 2. 161 The targeted achievement scale in forest management

Source: Food and Agricultural Organization

Figure 2.1 show the scale at which SFM is applied—global, national, subnational, landscape, forest management unit (FMU), or forest stand—is a crucial aspect. All of these levels should handle SFM. At the global and national scales, the target of SFM is to support the management, protection, and sustainable development of all types of forests, as well as to ensure their multiple complementary functions. While on the international level, all the global environmental services that forests provide, such as biodiversity preservation and climate

change mitigation, should be handled since each countries have a desire in maintenance (Food and Agriculture of Organization, 2020b).

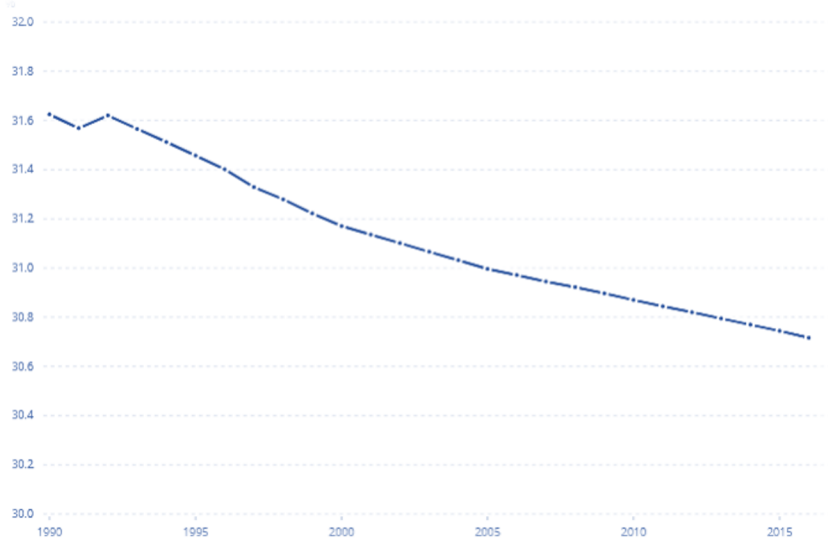

Figure 2. 273 The number of total forest land in the world

Source: World Bank

Therefore, the highlighted word based on SFM definition is sustainable use and conservation forest or in other words still can use the beneficial of forest but accompanied by maintaining forest without degrade the number of forest stand. So, it stands to reason that determining a correlation between SFM and forest land. Whether successful or not SFM can be measured by the number of forests. This measurement is supported as well by Lesiv et al. (2022) that stated forest management itself is connected to natural regeneration, planted forests, and plantation forests. As a result, forest management is closely related to the total number of forest land areas. Data from Forest land also allow for the tracking of changes in land cover throughout countries (American & Woodcock, 2021). Figure 2.2 exhibits the number of forest land from world bank continuously decreasing over the year in 1990-2021. Schall and Ammer (2013) in their paper on the title "How to quantify forest management intensity in Central European forests" also agreed that the measure for the assessment of forest management intensity is the total number of single stands of tree, or in other words; forest stands. The same measurement, according to Tong et al. (2020), demonstrates that the rise of forest land is an

outcome of forest management. They document several land use conversions to agricultural usage, which lessens the intensity of the forest cover.

2.2 Green Bonds over Sustainable Forest Management

Two foremost international initiatives for resolving the problem between economic growth and environmental stewardship are The Sustainable Development Goals (SDGs) within the 2030 Agenda for Sustainable Development of the United Nations Development Program (UNDP) and the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). The latter urges funding low-carbon, climate-resilient global development and limiting global temperature increases in the 21st century to no more than 2° C (over pre-industrial levels) (UNFCCC, 2016). According to the International Energy Agency maintaining by 2035, the 2° C temperature threshold of Paris Agreement would necessitate $53 trillion in energy-related investments (International Energy Agency, 2014). In order to address the need of funding, the society of world start to initiate financing. There are a number of ground-breaking environmental finance products that are beneficial for advancing environmental goals related to the SDGs and NDCs, such a green bond.

The World Bank introduced green bonds for the first time in 2007, and the European Investment Bank (EIB) introduced Climate Awareness Bonds in 2008. This instrument was designed to make green bonds would be similar to conventional bonds in side of the risk-reward formula and structure. Less than a year after following the introduction, the World Bank issued its first green bond in November 2008. According to the definition of green bonds itself, green bonds are defined as "any sort of bond instrument where the proceeds will be exclusively utilized to finance or re-finance, in part or in full, new and/or existing eligible green projects" (International Capital Market Association, 2022).

Since its launch, the green bond market has expanded dramatically. A group of investment banks originally launched the GBP (Green Bonds Program) in 2014. This was a crucial component because it established a consistent process for issuing green bonds, which ensured the instrument would have enough transparency and trust. In order to provide administrative direction for the issuing of green bonds, the ICMA operated as the GBP secretariat.

Previous studies reveal that there is link between green bonds and forest management. It is plausible since green bonds include land use as their use of proceed (Climate Bonds Iniative,

2022). Funding related to green project successfully attracts society, nowadays public awareness of environmental sustainability is increasing (Agliardi and Agliardi, 2019), and the largest allocation is in the forests. The existing literature, although scarce, has focused on green bonds performance influence sustainable forest management. Furthermore, it is integrated with the SDGs point 15 "life of land" that calls for the preservation of biodiversity, terrestrial ecosystems, and land productivity. As Nationally Determined Contribution (NDC) environment from the study Tolliver et al. (2019) revealed that Belarus, Georgia, Burkina Faso, Chile, Lebanon, Vietnam, Bhutan, and Honduras each perpetrate them to preserving or restoring forests and otherwise developing land in a sustainable manner. Sartzetakis, (2021) and Locatelli et al. (2016) highlighted the most crucial element of green bonds is the subject of project that would be funded by the proceed, one of the main categories includes sustainable land use and biodiversity conservation. Through the use of bonds in financing forestry area would have to relieve most of the burden in climate change. Additionally, this is supported by Löfqvist and Ghazoul (2019), they addressed that private finance in debt instrument (green bond) is best suited for leveraging forest and landscaping restoration to combat carbon emissions. Not only does forest management cover one scope but it covers two scopes, like the study of DuPont et al. (2015) deployed that land conservation can be linked to green bond issuances related watershed management.

In short, the aforementioned studies confirm the green bonds boost the performance of forest management, with the requirement that it allocates in the right project. Concerning the effect of green bond on sustainable forest management, the above survey-based studies suggest that portfolio allocation for the demand of green bonds attract the willingness of investor to invest in green project. Using the amount issued of green bond as an indicator for green bonds, the study derives hypothesis:

H1. An increase in green bonds significantly raises the achievement of sustainable forest management.

2.3 Financing given by Islamic Banking towards Sustainable Forest Management

The Islamic banking system is one of the elements of financial institutions that has not been completely taken into account in the literature to yet. Over the years Islamic banking has

been growing. According to predictions by 2020, the Islamic banking system would control more than 50% of the market share of the whole financial industry at least in six nations, including Saudi Arabia, Kuwait, Qatar, Malaysia, and the United Arab Emirates (Global Islamic Finance Report, 2015). The idea of Islamic banking was originally created in the 1950s and established in the invention of the first generation of Islamic investment banks in Egypt and Malaysia in the early 1960s. In 1974, Dubai Islamic Bank was produced as the first private interest-free bank (Karbhari et al., 2004). The Organization of Islamic Cooperation (OIC) defined Islamic banks as "financial institutions whose statutes, regulations and procedures openly indicate their dedication to the principles of Islamic Sharia and to the prohibition of the receiving and payment of interest on any of their operations".

The fact that Islamic law forbids paying and earning interest does not imply that they disfavor on making money or advocate returning to an all cash or barter economy. They encourage individuals involved in a financial transaction to share the risk and the venture's profit or loss. In Islamic banking, depositors are comparable to investors or shareholders who gain rewards from the bank's profits or lose some of their funds if the bank suffers a loss. The goal is to provide a more equitable distribution of wealth by connecting the return in an Islamic contract to project production and quality (Qorchi, 2005).

There are several Islamic modes of financing, such as *Mudarabah* (profit-sharing and loss-bearing), *Wadiah* (safe-keeping), *Musharaka* (joint venture), *Murabahah* (cost-plus), and *Ijara* (leasing). Financing (loan) given by Islamic banking, or on the next discussion called as Islamic financing, is one of the financial instruments that highly expected by MSMEs because Islamic financing seems more friendly for MSMEs to be achieved than other financial institutions (Santoso, 2020). Through a profit and loss sharing mechanism, its effect on economic development could become more significant. Islamic banking provides capital loans for the production process as well as tools designed aimed at improving a company's capital (Zarrouk et al., 2017). Besides, Islamic financing is well-known more eco-friendly compare to conventional counterparts. *Muzara'ah* and *musaqah* (forms of financing provided to agriculture projects) is the demonstration that Islamic financing is committed to conserving the environment, specifically in terms of revitalizing land resources (Ali et al., 2021). This may appear to contradict the prior discussion, because land is used for agriculture which results in deforestation. But, at first, the *muzara'ah* and *musaqah* did not use the forest as their object; instead, their object was a barren land, treeless area that was utterly vacant and untouched.

Therefore, with the two projects, it turned greened land. Another relationship between Islamic financing and forestry can be explained through the production scheme carried out by the recipient of the financing. When financing is used as business capital that requires large amounts of fuel, mining or expansion of agricultural land which can cause deforestation or even these businesses can contribute positively to forests when accompanied by forest conservation efforts, either through steps by companies into forests or through investment. Given that several industries must comply with the Kyoto protocol and usually to deal with excessive carbon production they carry out emission trading systems or invest in projects that can absorb emissions, which it is noticeable leading to the function of forest.

There are several studies proved the correlation of Islamic financing towards sustainable forest management. Islamic financing is renowned more promoting ethical, sustainable, and environmentally and socially responsible than conventional counterpart (ADB, 2022; Obaidullah, 2018). In the study of Abdullahi (2019), he presented the fact that one of the main barriers to afforestation activities in the majority of OIC nations is the lack of funding. He argued as well that in rich countries, the accelerating afforestation activities is successful since their economic system is matured, which it is linked with the presence of developed financial system that could address those problem. Nevertheless, this is not the case in majority of OIC member countries where the financial system is underdeveloped. Consequently, credit is so difficult to obtain, and the majority of individuals focus primarily on how to acquire their basic needs. Here, Islamic financing has the prospect to supply finance for the establishment of forestry resources, then financing by Islamic banks can reduces emission in the country gradually, and it is proven by Solarin (2019) and Julia and Kassim (2019). This is due to the reason that Islamic banks serve as a part of a larger value-based social system that is governed by the principle of public interest, rather than only as a component of the financial system. The goal of this approach is to work toward enhancing peoples' overall wellbeing. In contrast, Abduh et al. (2022) exhibited that Islamic financing redounds notably to the raise in the degradation of environmental quality and energy consumption. He commented that the current of the development and the application of Islamic finance might not be in its ideal form.

In short, the aforementioned studies confirm the Islamic banking that high financing distribution influence sustainable forest management. Even though, the different findings are found, some research reveal negative impact on forest and the rest exhibit positive link over forest management. However, returning to the basic nature of Islamic banking that avoids of

harming environment include forest. Using total shariah-compliant financing of Islamic bank as an indicator for Islamic financing, the study derives hypotheses:

H2. Islamic Financing given by Islamic bank is positively contribute to forest management

2.4 Other Determinant that Influence Sustainable Forest Management

When collecting studies related to forest sustainability, macroeconomics is typically used as one of the measures in research on the sustainability of forests, taking into account that investments in green projects are inextricably linked to the global economic cycle. Which is plausible that it involves the government in macroeconomics. As a result, it is also prominent to gauge how capable a government is at running its affairs, through political stability and corruption are two factors that can be used to evaluate government influence in achieving sustainable forest management. In addition, the role of banks, which in general are involved in financial transaction traffic, has a role in allocating their investment whether in green projects or not, which will affect the bank's image in society. Bank profitability and capital are used as parameters in the study. The next section is for further explanation on the potential existence of other determinants.

2.4.1 Macroeconomic on Sustainable Forest Management

The involvement of the business cycle, market performance and government cannot be separated from economic activities. Since it holds all its control over what happens in a country. This phenomenon is called as macroeconomics, according to its definition, macroeconomics is the area of economics that examines how the overall, or aggregate, economy is structured, performing, behaving, and making decisions. In addition, rapid changes in demography, wealth, technology, and environment have ushered in a new period of world transformation. Yet, economic growth has been uneven, has harmed the environment, and has already slowed as a result of climate changes. Global obstacles, such as conflicts, resource depletion due to environmental deterioration, and fiscal pressures on countries brought on by the COVID-19 epidemic, pose a threat to recent progress. Intensifying systemic vulnerabilities, such as trade disputes, rising debt levels, decreased efficiency of monetary policy as a crisis instrument, and rising inequality - both between and within countries —exacerbate these difficulties (World Bank, 2021a).

Moreover, macroeconomic policies have extensive effects on how forest resources are used and conserved in developing nations, and these effects can be visualized in term of concentric rings. At the center are policies have an immediate impact on timber and forest management. They include the organizations in charge of property rights (including traditional ones) related to forest land and produce, as well as the revenue-generating mechanisms for the forest. Macroeconomic policies affecting the demand for forest products include those governing trade and investment that are based on the cost of wood and energy. Furthermore, despite first appearances of macroeconomic may initially appear not have a role but actually it has powerful impacts on forestry (Repetto, 2000).

The study considers trade openness, agriculture, manufacturing, inflation, and public expenditure as a parameter of macroeconomics. Given that it highly closes to the definition of macroeconomics activities (markets, businesses, consumers, and governments). Precisely, the market represented by trade openness, business taken by agriculture and manufacturing, consumer side by consumer price index (inflation) and government is reflected in public expenditure/government spending. There are several previous studies linked macro variables with deforestation. Such as Nathaniel and Bekun (2020) proved that in Nigeria trade openness improves environmental quality by reducing deforestation and has had not harmed the environment in any ways. In contrast, Kastner et al. (2021) showed that trade openness largely brings about deforestation in Latin America and it is linked with agriculture matter, the rise demand of agriculture product would cause the expansion of agricultural land, and this activity would result in forest loss. Dudley and Alexander (2017) emphasized that almost a third of the earth's surface is taken up by agriculture, which is the single largest land use. Hence it is obvious that it would drive to environmental degradation. Filho and Hanusch (2022) showed that manufacturing can address earlier agricultural issues. There is no need to expand the land because the agricultural production process may be manufactured, which makes it more efficient. The costs will be high if agricultural production is conducted without the aid of technology. In sum, manufacturing reduces deforestation. Comparatively, Fang et al. (2020) asserted that cities with large manufacturing exports tend to have higher levels of pollution than cities with large manufacturing imports, even if the total of trade is considered to be the same. Taheripour et al. (2019) found that Inflation in Malaysia and Indonesia caused by restricting consumption of palm oil has contributed to reducing deforestation. Whereas Mujahid and Minhaj (2020) revealed that inflation in Pakistan positively augment to

deforestation. Due to declining purchasing power, individuals are becoming more dependent on forest-derived natural resources for survival. Abid (2017) and Combes et al. (2018) agreed that public expenditure induce deforestation, since it can foster deforestation when it is a complement to natural capital. In this case, higher public expenditure is more likely to be allocated to deforestation-related activities, which creates a case for an environment-development trade-off.

In short, the aforementioned studies confirm the macroeconomics may significantly influence sustainable forest management. Concerning the impact of macroeconomics on the sustainable management of forests may fluctuate, thus the variable macroeconomic analysis requires careful and deep analyzation because it reflects the state of the global current condition. Using The sum of exports and imports of goods and services, agriculture, forestry and fishing value added, manufacturing value added, consumer price index, and general government final consumption expenditure as an indicator for macroeconomics, the study derives hypotheses:

H3. Sustainable forest management might be significantly influenced by macroeconomics

2.4.2 Financial Performance of Bank on Sustainable Forest Management

The banking sector is crucial to the modern economy. In today's world, all financial transactions—from small to big project done through banks. The outcomes of financial development allow to perceive this. Additionally, the development of financial sector contributes the creation and expansion of the institutions, tools, and markets that support massive investments and growth that contribute to the eradication of poverty and the enhancement of the environment (Guru & Yadav, 2019). Furthermore, Bank quality can be gauged by its financial performance, or in other words, the value of the banks will increase if their performance improves. It reflects the bank's capability to allocate and manage resources (Sintha, 2018).

Based on the definition its self, performance term has been originated from term 'performed' which means 'to do', 'to carry out' or 'to render' (Enad & Gerinda, 2022). Organizational performance is one of the most important aspects in management research, which is also debatably the most important indicator of organizational performance. Based on Liaqat and Sonia (2019), profitability is one of indicator in financial performance that highly utilize by studies as well as capital quality. Earnings is also the aspect of financial statements

that cause great concern, as bank earnings are likely to serve as a benchmark for banks in terms of how well they perform as a whole in accomplishing business objectives. While capital quality serves as a benchmark for the level of financial security that the bank already possessed and will be required to fund all foreseeable transactions and operations.

Currently, it is crucial to integrate environmental risk into bank's business strategy and decision-making processes so that institutions may promote environmentally viable projects and cutting-edge technologies (Nieto, 2017). For example, the study was written by Setiono (2007) with the title "assessing the role of banking and financial policies for promoting sustainable forest management in Indonesia" reveals that the bank performance could expand business interest in forestry sector. In addition, there are abundance of previous literature that investigate the link both of financial performance of bank on forestry. According to Nizam et al.(2019), he highlighted that capital to asset ratio and return on asset are the crucial tools to influence environmental performance. When a bank's profitability increases, the bank focuses on expanding access to funding for environmental practices, which forest conservation is leading in those allocation, since it could combat climate change (Shakil et al., 2019). According to this, banks should increase their financing of environmental impact projects, this will result in improved business performance for the bank. However, it is crucial to exercise caution due to the fact that banks serve as a significant source of financing (Sanfilippo-Azofra et al., 2018), they may unintentionally contribute to deforestation, air and water pollution, greenhouse gas emissions (GHG), and the loss of biodiversity by financing businesses whose operation results negative externalities (Yip and Bocken, 2018). Capital to asset ratio based on Nasreen et al. (2017) is a higher ratio denotes better capitalization. When compared to institutions with lower capital ratios, banks with higher capitalization are perceived as being more safe, prudent, and less risky. Compared to aggressive banks, conservative banks are more inclined to avoid risk, especially in forest management project that might take more risk. Hence, Nasreen et al. (2017) expected that capitalization to have negative link with forest management

In short, the aforementioned studies confirm the financial performance of banks may have link with sustainable forest management. Using the return on assets (ROA) and capital to asset ratio as an indicator for profitability and capital quality in bank's financial performance, the study derives the hypotheses:

H4. Financial bank's performance has connection with the existing of sustainable forest management

2.4.3 Political matters on Sustainable Forest Management

The advent of government as an active force in steering social and economic development has resulted in a significant expansion of governmental duties in all modern states. In nations with command economies, the government is responsible for a wide variety of economic behavior. The government controls or owns business and industry in those nations that favor social democracy. Politic itself based on Oxford languages is the activities associated with the governance of a country or other area, especially the debate or conflict among individuals or parties having or hoping to achieve power.

More democracy often contributes to better governance. It is the conventional wisdom, and it is frequently accurate: if a nation has a corrupt government, it needs more transparency, which entails better media, more open disclosure of budgets and spending data, etc. Also, it emphasizes the value of accountability, which refers to political processes that allow the country to genuinely penalize the dishonest and inept. Democracy does not, however, automatically lead to improved governance. Opening up politics to democratic contestation frequently results in clientelism, which is not the same as "pure" corruption when the politician receives direct rewards, especially in developing nations. In a clientelistic system, a leader rewards his political base with jobs, cash, and contracts in order to maintain their support, which later it leads to political stability (Gourevitch, 2008).

It is popular that politic are commonly happen in the resource-rich countries, covering higher rates of conflict and authoritarianism compared to their non-resource-rich nations. And it is called as "the resource curse", it refers to the inability of many resource-rich nations to completely capitalize on their natural resource wealth and for their governments to adequately address demands related to public welfare (Roberts and Robinson, 2015). The survey collected by Winbourne (2002) as evidence of political matters in forests sector, one of them are around $5 billion in annual revenue is lost to governments as a result of illegal logging, with an additional $10 billion lost to the economy of the producing nations and the Ministry of Forestry was ranked eleventh out of 35 government agencies in the 2002 Indonesia Corruption Study as the agency with the highest perception of corruption. According to 20 percent of the responding businesses, this ministry is among the top four for corruption. According to a survey, 56 percent

of Ministry of Forestry public employees are thought to routinely accept unauthorized payments.

The are many previous studies as well that examines the role of politic on sustainable forestry. According to Fenetahun et al. (2021) on sustainable rangeland management, the finding denoted that clearly how political instability affects economic, sociocultural, and environmental degradation. The explanation of this matter is political instability causes to human mobility, which leads to rangeland degradation, and it leads to food insecurities, worsening poverty, and environmental degradation. In addition, Galinato and Galinato (2013) measured deforestation which caused by political stability and control of corruption through cropland expansion in forest land and unpaved road development. The study revealed that political stability has a positive and substantial impact on forest cover, whereas control of corruption has a negative and significant impact. Political instability breeds uncertainty, which degrades resource conservation and resource stocks (Sofuoğlu and Ay, 2020). It is supported by (Mao, 2018) that showed democratic transition in Indonesia boosts carbon intensity by approximately 25.34 percent. Then, Masron and Subramaniam (2018) exhibited that corruption has a positive impact on pollution.

In short, the aforementioned studies confirm politic plays a role in achieving sustainable forest management. Concerning the effect of the flow of political exchanges and corruption on sustainable forest management, survey-based studies find that political matters for the sustainable forest management are negative (Mao, 2018; Sofuoğlu & Ay, 2020). Using the political stability and control of corruption as an indicator for politic in sustainable forest management, the study derives the hypotheses:

H5. Political matters play significant in achieving sustainable forest management

2.5 Research Framework

The given charts illustrate the used determinants to approach study objectives (Figure 2. 3 and 2. 4). In the first step, the study examines the link of green bonds over sustainable forest management combine with other determinants in G20 and D-8 countries. Second steps, carbon emissions were employed to confirm the previous result on green bond which was linked with sustainable forest management, to test whether the results are consistent or inconsistent with the existing theory, that the growth of forest management can absorb emissions. In the third and fourth step it follows the first and second steps, respectively. However, the difference is

on the highlighted variable was changed from green bonds to Islamic financing, and this examination only calculate D-8 countries.

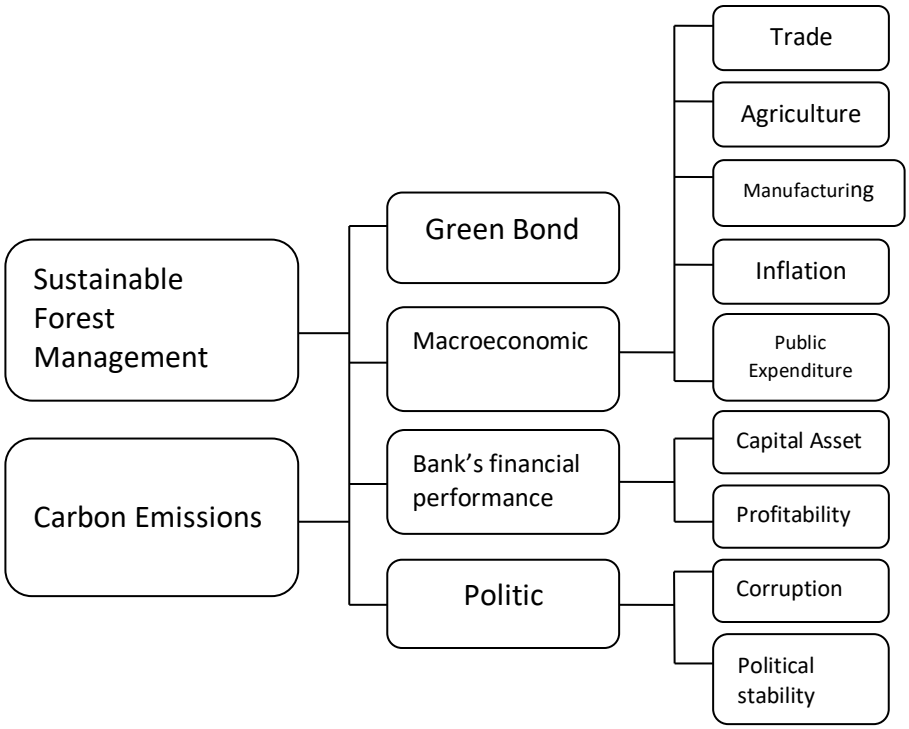

Figure 2. 465 Approach to investigate the link green bond on SFM and Emissions

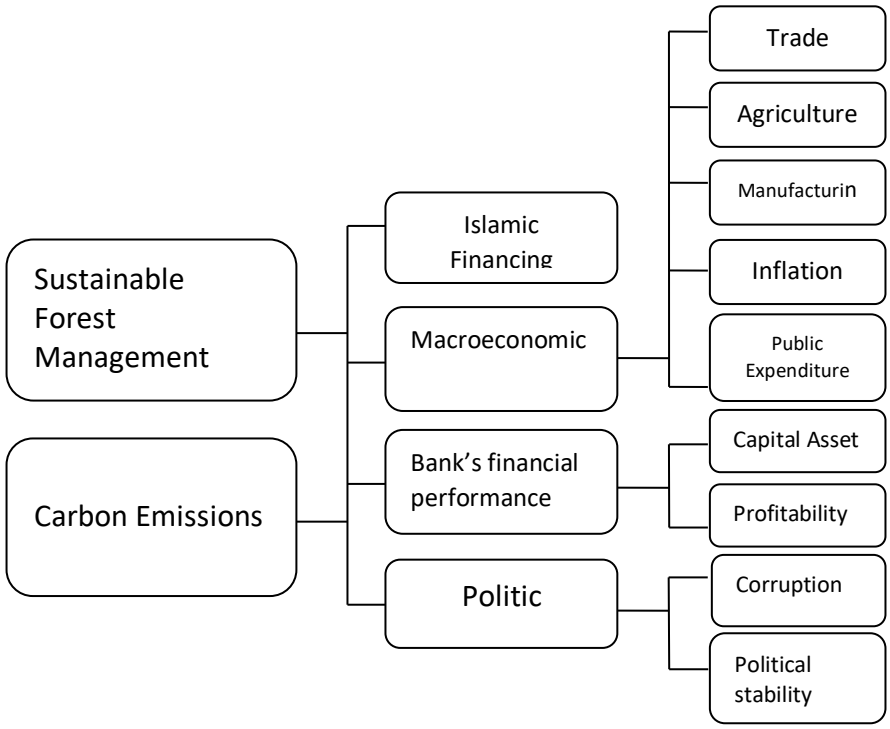

Figure 2. 569 Approach to investigate the link Islamic financing on SFM and Emissions

Figure 2. 570 Approach to investigate the link Islamic financing on SFM and Emissions

CHAPTER 3

THE CURRENT TREND OF GREEN BONDS AND ISLAMIC FINANCING

This chapter provides several information regarding the development and the trend of existing green bond as a global as well as specific within G20 and D-8 countries. Including the opportunity, the challenge in realizing green bond and the use of proceeds. It is also followed with the explanation of the development and the characteristic owned by Islamic financing or financing given by Islamic banking that make it different from other banking sectors, especially with syariah principle they hold. This description is designed to equip the reader with the sufficient context of knowledge. Transferring the knowledge in order to get the link between both of those financing (green bonds and Islamic financing) and sustainable forest management (SFM). Due to the unique and special characteristic of a region or country as well, it is necessary to have better understanding in following the current trend of green bond and Islamic financing globally or regionally to catch up any change of strategy or policy that might influence the achievement of green bond and Islamic financing.

3.1 Green Bonds

In recent years, the urgency to address climate change and promote sustainable development has gained significant global attention. As a result, governments, corporations, and investors are actively seeking innovative solutions to fund projects that contribute to a greener future. Green bonds have emerged as a powerful tool to bridge the gap between sustainable initiatives and the necessary capital to bring them to fruition. Green bonds not only offer financial benefits but also align investments with environmental goals, thereby facilitating the transition to a low-carbon economy. Moreover, Green bonds often attempt to contribute to various SDGs, including SDG 7 - affordable and clean energy - by minimizing the negative environmental impact of carbon emissions and energy usage. The types of green bonds' project are frequently used to fund initiatives involving energy-efficient buildings, clean energy, and clean technologies. Increasingly attracting further investments in clean water (SDG 6), sustainable industries, innovation, and infrastructure (SDG 9), conserving life below water (SDG 14), including climate adaption measures (SDG 13), and maintaining life on land (15). In this session, the study will focus on showing the evolution of green bonds from their

inception to the current trend. The discussion will begin with a review of the increasing popularity of green bonds.

3.1.1 The Development of Green Bonds

The market for bonds with a green label has experienced remarkable growth in recent years. It all began in 2007 when the European Investment Bank issued the first bond with a green label, known as the "climate awareness bond". This pioneering bond paved the way for the development of subsequent green bonds. A significant milestone in the expansion of the green bond market occurred in January 2014 when the International Capital Market Association (ICMA) introduced the Green Bond Principles. These principles served as the foundation for many of the existing green labels, providing a framework for issuers to follow in order to ensure transparency and credibility in their green bond offerings. Since the introduction of the Green Bond Principles, the market for labelled green bonds has witnessed tremendous growth. In 2016, the total issuance of green bonds surpassed the $100 billion mark, signifying a significant milestone for the market. The first half of 2017 alone saw an issuance of approximately $60 billion, indicating the continued momentum and investor interest in sustainable finance (International Capital Market Association, 2022).

However, it is important to note that the market for green bonds still remains relatively small when compared to the broader global bond market. In 2016, green bonds accounted for less than 1.6% of the total global debt issuance (Packer, 2017) and although experts have commented on the good implications of Green Bonds for the environment, society, and economics, the Green Bond still accounts for only around 3% of all bond markets, and this number is much lower in several Asian developing countries (Yamahaki et al., 2022a; H. Zhang, 2020). Despite this small share, the growth and potential of green bonds are undeniable, with increasing momentum and a growing investor appetite for environmentally responsible investments. The expansion of the green bond market signifies a shift towards sustainable finance, where investors are increasingly seeking opportunities to align their investments with environmental objectives. Green bonds play a crucial role in funding projects that address climate change, promote renewable energy, enhance energy efficiency, support sustainable infrastructure, and mitigate environmental risks (Packer, 2017; Reboredo & Ugolini, 2020). In other words, since investors recognized the challenges and uncertainties posed by climate change to long-term economic development and human society, the findings for sustainability,

climate mitigation programs, and environmentally friendly investments such as green bond have expanded.

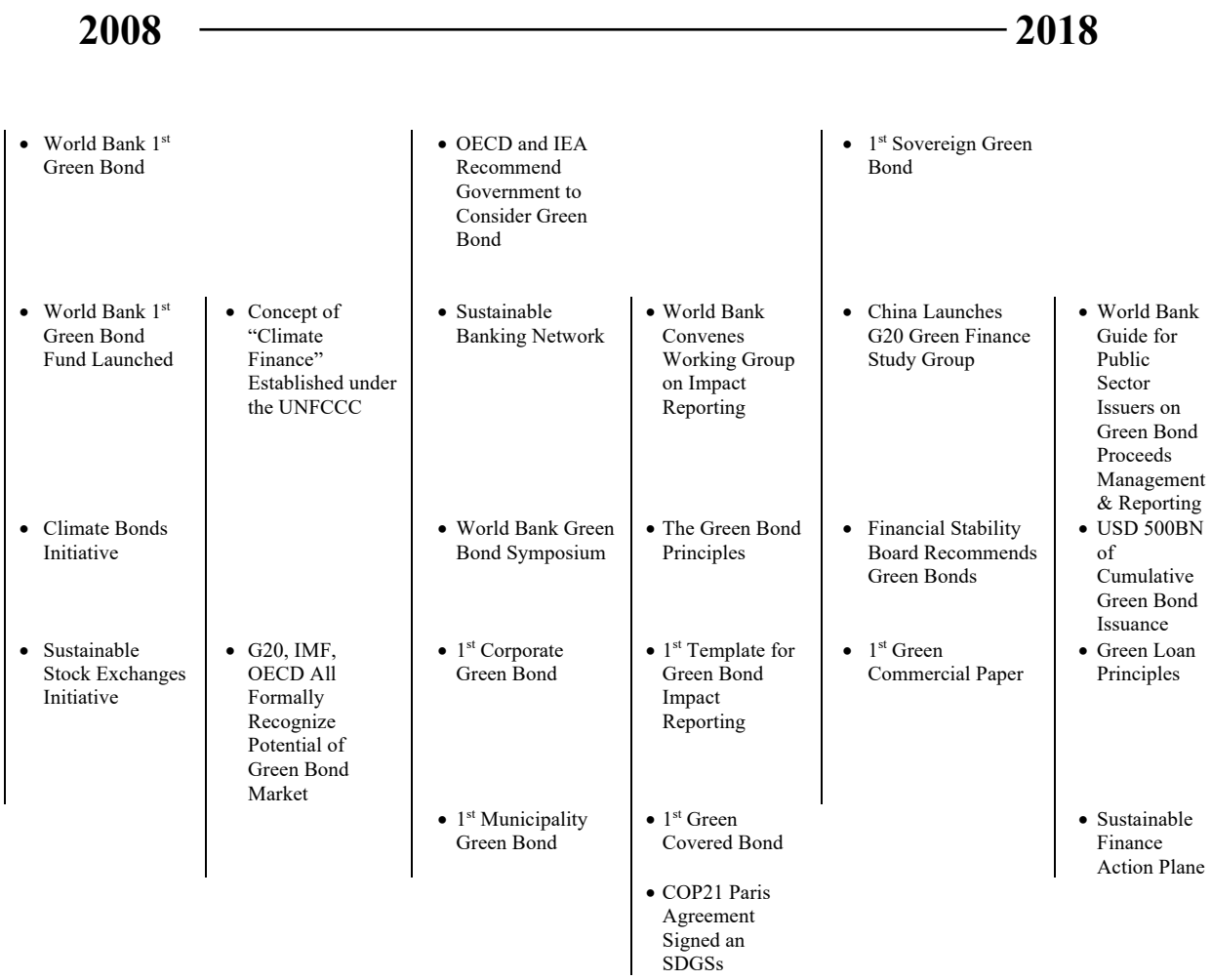

Figure 3. 1 The development of green bond
Source: World Bank (2019)

Figure 3.1 exhibits that the emergence of green bonds demonstrates advancement in a clear direction, its accomplishments every year progressively leads to concept maturity and are prepared to make a genuine contribution to the environment. The G20 is a region or organization that strongly supports green bonds, as evidenced by its involvement in several important processes, as can also be observed from its development. Not only are G20 nations finalizing the concept of green bonds, but they are also actively involved in green bond

investments, such as China and the United States are always competing as the primary source of green bonds, then followed by America and several other European countries (Michetti et al., 2023). To be more detailed, this success is frequently supported by policy support between G20 countries to carry out bilateral collaboration. China is collaborating with the European Union on an integrated taxonomy that would clarify definitions of what comprises green activities recognized bilaterally in order to promote cross-border issuance and investment (S&P Global, 2023b).

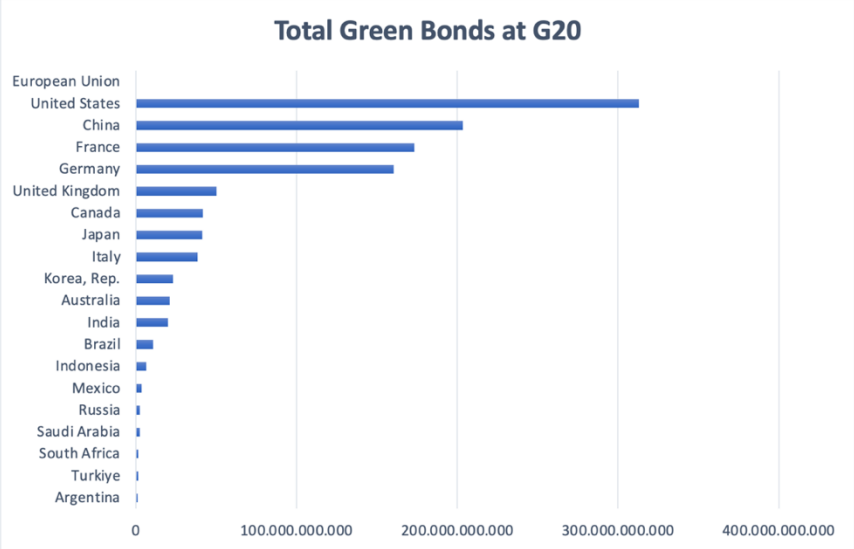

Figure 3. 2 Total record of G20 investment in green bond, 2010-2021

Source: Climate Bond Initiative

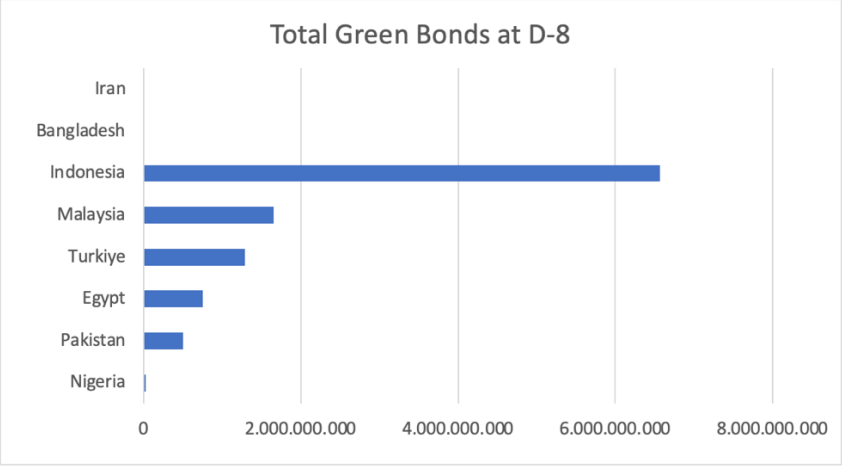

Figure 3. 3 Total record of D-8 investment in green bonds, 2010-2021

Source: Climate Bond Initiative

Another legislation that will assist green bonds is China's Green Bond Principles, released in July 2022 and will standardize the criteria inside the country and set standards that are more in line with international practices. President Joe Biden's Inflation Reduction Act in the United States will encourage the issue and investment of green bonds. The measure, which will be signed into law in August 2022, will offer $386 billion in energy and climate spending over ten years, with associated tax breaks totaling around $265 billion above the former trend rate (S&P Global, 2023a). Furthermore, Figure 3.2 depicts the details of several G20 members' contributions to the growth of green bonds through the total amount green bond issued. Apart from China and the United States, Asia-Pacific (Japan, South Korea and Indonesia) and the European Union (Such as France, Germany, and Italy) are in the top 15 out of G20 members that highly to pour issued green bond. Additionally, this enthusiasm subsequently expanded to emerging countries such as D-8 countries, who are now concerned about green bonds as well. Despite the fact that the numbers are lower than in developed nations such as the G20. In this region, Indonesia and Malaysia have the highest rate of green bond issuance (see Figure 3.3). Malaysia and Indonesia have made rapid progress, given that they issued green bonds for the first time in 2017-2018. As mentioned in Climate Bonds Initiative (2023), the Developed Markets (DM) accounted for two-thirds (67 percent) of 2022 green bond volume, while Emerging Markets (EM) accounted for 23 percent.

Besides that, several factors that contributed to the invention, issuance, and acceptance of green bond can be linked to institutional pressure exerted by a diverse set of parties. Some parties, for example, such as standard setters, investors, or important business partners, have direct influences on the choice to issue or develop green bond. Other actors, such as government agencies that advocate sustainability regulations or international groups that favor green bond, can be considered as having an indirect influence on the decision to spend more in green bond. Other investors, on the other hand, may be hesitant to keep green bond because they fear it will limit their economic rewards (Tolliver et al., 2021). According to Gupta et al. (2010), institutions are sluggish to react and adapt to change, which is cited as a major obstacle for tackling climate change and sustainability threats. Additionally, if the disruption brought on by the Covid-19 epidemic had not surfaced, interest in green bond had been growing dramatically and was anticipated to increase significantly in 2020 and 2021 (Nguyen et al., 2023).

3.1.2 The Use of Proceed

The ability to recognize the bonds that actually provide environmental or climate-related benefits is crucial for asset managers and their principals if investment in green bonds is to become widely popular. The resources to make a well-informed decision may be available to asset managers alone. The Financial Stability Board's (FSB) Task Force on Climate-Related Financial Disclosures is only one example of a global movement that aims to increase public access to improved environmental information. The ICMA Green Bond Principles (GBP) are so-called "voluntary process guidelines" that specify the standard requirements that the majority of certification programs adhere to. They were assembled under the direction of the ICMA by significant private financial institutions. The principles offer prospective issuers advice on the essential elements of green bond issuance, including: (i) the use of proceeds for environmentally sustainable activities; (ii) a procedure for determining project eligibility; (iii) management of the proceeds in a transparent manner that can be tracked and verified; and (iv) annual reporting on the use of proceeds.

The fundamental element of a green bond is the use of bond proceeds for approved green projects, which must be adequately explained in the security's legal documentation. The issuer shall evaluate and quantify the environmental advantages of all selected qualified green projects by issuer, these benefits must be apparent and unmistakable. In the event that all or a portion of the proceeds are or may be used for refinancing, it is advised that the issuers provide an estimate of the share of financing or re-financing, and where appropriate, also specify which investments or project portfolios may be refinanced, as well as to the extent relevant, the expected look-back period for refinanced eligible green projects.

Table 3. 1 The listed eligible Green Projects Categories

Category	**Examples**
Renewable Energy	Production, transmission, appliances and products
Energy Efficiency	New and refurbished buildings, energy buildings, energy storages, district heating, smart grids, appliances and products

Pollution Prevention and Control	Reduction of air emissions, greenhouse gas control, soil remediation, waste prevention, waste reduction, waste recycling and energy/emission-efficient waste to energy
Environmentally Sustainable Management of Living Natural Resources and Land Use	Environmentally sustainable agriculture, environmentally sustainable animal husbandry, climate smart farm inputs such as biological crop protection or drip-irrigation; environmentally sustainable fishery and aquaculture; environmentally sustainable forestry, including afforestation or reforestation, and preservation or restoration of natural landscapes
Terrestrial and Aquatic Biodiversity Conservation	the protection of coastal, marine and watershed environments
Clean Transportation	electric, hybrid, public, rail, non-motorised, multi-modal transportation, infrastructure for clean energy vehicles and reduction of harmful emissions
Sustainable Water and Wastewater Management	sustainable infrastructure for clean and/or drinking water, wastewater treatment, sustainable urban drainage systems and river training and other forms of flooding mitigation
Climate Change Adaptation	efforts to make infrastructure more resilient to impacts of climate change, as well as information support systems, such as climate observation and early warning systems
Certified Eco-efficient Products	the design and introduction of reusable, recyclable and refurbished materials, components and products; circular tools and services
Green Buildings	Infrastructure that meets regional, national or internationally recognized standards or certifications for environmental performance

Source: ICMA, Green Bond Principles, June 2021

The Green Bond Principles (GBP) specifically recognizes a number of broad areas of eligibility for green projects that support environmental goals such biodiversity preservation, natural resource conservation, climate change adaptation, and mitigation. Even though it is merely indicative, the list of project categories on Table 3.1 includes the most typical types of

initiatives that the green bond market has funded or is anticipated to support. Green Projects comprise assets, investments, and other associated and supporting expenditures, such as R&D, that may be tied to more than one category and/or environmental goal. The list's three environmental aims (pollution prevention and control, biodiversity protection, and climate change adaptation) also function as project categories. As such, they relate to projects that are explicitly designed to achieve certain environmental goals.

While the Green Bond Principles (GBP) does not take a position on which green technologies, standards, claims, and declarations are best for achieving environmentally sustainable benefits, it is worth noting that there are several current international and national initiatives producing taxonomies and nomenclatures, as well as providing mapping between them to ensure comparability. These may provide additional direction to Green Bond issuers as to what investors may consider green and eligible. These taxonomies are in various phases of development at the moment.

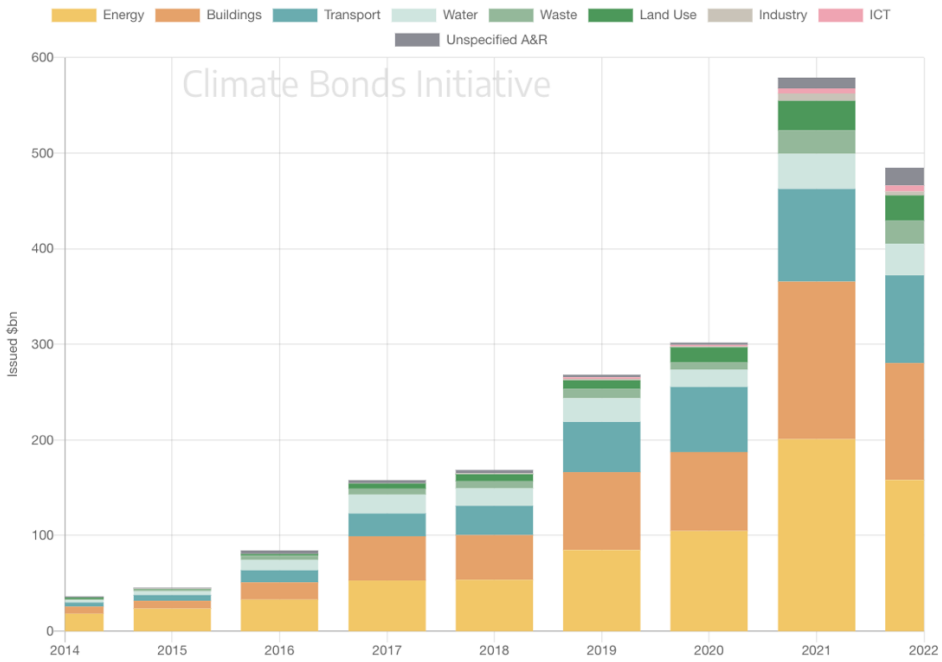

Figure 3. 4 The Use of Proceed (UoP) green bond
Source: Climate Bond Initiative

Furthermore, from the Use of Proceed (UoP) energy, buildings, and transport remained the three largest Use of Proceed (UoP) categories, collectively contributing 77 percent of the total green debt volume, it can be seen from Figure 3.4 However, this is a decrease from 81 percent in 2021 and 85 percent in 2020. Smaller categories are growing in popularity as more issuers (including major sovereigns) fund a larger range of projects. Adaptation-related investments increased the highest, but they still account for a very low fraction of the market (Climate Bonds Initiative, 2023).

3.1.3 Opportunity and Challenge in Realizing Green Bond

Green bonds are becoming increasingly popular because they provide financing for clean energy, mass transit, and other low-carbon projects that can help countries adapt to and mitigate climate change, while also providing investors with high-quality-credit, fixed-income investment opportunities that have a positive impact (World Bank, 2014). According to Jun et al. (2016), from the material that made to support of the G20 Green Finance Study Group, there are numerous significant advantages to green bond:

1. Supplying An Extra Green Financial Source

   Bonds are an effective funding tool for such projects given the significant need for green investment. There is a need to introduce new financing methods that can leverage a wider investor base, including institutional investors (such as pension funds, insurance companies, and sovereign wealth funds) that manage over USD 100 trillion in assets globally. Traditional sources of debt financing will not be adequate in light of the immense needs for green investments. Green lending by banks and green equity financing by investors may have access to additional funding sources since the growth of the green bond market.

2. Reducing the Maturity Mismatch and Enabling more Long-Term Green Finance

   Due to the short maturity of their liabilities and a lack of mechanisms for hedging duration risks, banks' capacity to offer long-term green loans is restricted in many countries. Refinancing concerns for long-term green initiatives are also faced by corporations that can only access short-term bank funding. These limitations on long-term green funding can be lessened if banks and corporations issue medium- and long-term green bonds for green projects.

3. Clarifying Environmental Approach and Enhancing Issuers' Credibility

Issuing a green bond is a great method to build and implement a credible sustainability strategy for investors and the wider public by demonstrating how funds will contribute to a pipeline of concrete environmental projects. Green bonds can thus benefit an issuer's reputation, as well as internal sustainable development plans, because they are an effective means for the issuer to demonstrate its commitment to increasing environmental sustainability. These enhancements may result in product marketing benefits as well as potential government policy incentives for corporate operations. Because of their dedication to "green" transparency, issuers may benefit from establishing a green bond structure.

Despite many reasons to be optimistic about the future of the green bond market, several problems remain. Clear guidelines are required, particularly in taxonomy, certification, and regulation. Yamahaki et al. (2022b) and Deschryver and de Mariz (2020) research has shown various obstacles.

1. Uncertain Benefit

The uncertainty around the benefits of issuing a green bond underlines the value of intermediaries to issuing corporations. Major financial institutions have established qualified origination teams. These teams serve as advisors and must devote more resources to the development of a green bond issuance (e.g., identification of strategic proceeds, development and assessment of a green bond framework, liaison with second-party opinions). Banks may find it difficult to charge an additional cost to issuers because it may ruin the public perception of a greenium and make green issuing less competitive than standard bonds. The expansion of dedicated coverage teams will make sense only as the market matures and reaches a critical scale.

G20 members expressly emphasized the lack of clarity of green activities and products as an impediment to investment in their summary report on Green Finance issued in 2016. This barrier, combined with financial obstacles (e.g., continuing high levels of subsidies for the production and consumption of fossil fuels, a green bond market that is still maturing, and the absence of a single carbon price, which discourages companies from offering low carbon solutions to the market), structural barriers (e.g., transaction costs), and a lack of standardized frameworks, would result in mispriced green bonds. As a result, green bonds will continue to be less appealing than so-called brown projects.

2. The Infancy of The Market and the Lack of Supply

The nascent green bond market is plagued by a lack of reputation, credentials, and supply. There is a "chicken and egg" problem (Bowman, 2019)—the market's infancy does not provide investors with adequate data to make an informed investment decision. Investors are hesitant to move further in this situation. They may seek the ideal transaction, i.e., large transactions with direct allocation of revenues to relatively easy green assets, in order to quantify an unequivocal impact. As a result, the crucial requirement for project quality, size, and recurrence looks to be unfulfilled, exacerbating a scaling difficulty. On the other hand, and perhaps more importantly, the unique qualities and procedures of green bonds preclude many issuers from entering this market, maintaining a lack of competition.

3. Higher Up-front Cost and the Cost of Meeting Green Bond Requirement

The awareness and prejudice factors lead to the late issuance. For 74% and 41% of participants in a survey conducted by the G20 Green Finance Study Group, respectively, there is either a lack of awareness about the benefits of green bonds or a perception of an additional cost connected with a green issuance (Jun et al., 2016). The perception of a costly process was likewise the top challenge mentioned by issuers in the study. Prior to issuing a green bond, issuers must prepare by training and hiring knowledgeable staff on environmental, social, and governance (ESG) issues; developing environmental accounting; and developing environmental, social, and governance communication (e.g., sustainability reports for investors, shareholders, and customers). Furthermore, the pre-issuance process necessitates the creation of a framework that is compatible with the GBP; obtaining a second-party opinion to examine the issuer's ESG risks and mitigation strategies; reviewing the project selection, fund allocation, and reporting process; and obtaining opinions on the social and environmental impacts of projects.

Moreover, investors expect issuers to meet certain criteria. While green bonds are linked to specific projects in the Green Bond Principle (GBP), our interviews reveal that investors look at issuers' ESG profile holistically. Even if a project is aligned with the Green Bond Principle (GBP), the issuance might not succeed if the issuer has a good sustainability profile or strategy across the business. Therefore, taking a broader perspective is accompanied by higher standards.

4. The lack of standardization for the stakeholders

The absence of a universally agreed-upon definition and a distinct reference framework are significant impediments to the growth of the green bond market. Several organizations have established various criteria and best practices for green bonds. Furthermore, numerous green bond issuers have designed and published their own green bond frameworks. Development banks, such as the Asian Development Bank and the International Finance Corporation, as well as other actors, such as the Nordic Investment Bank, have done so. Nonetheless, given the broad categories of qualifying projects under the latter, compliance with green bonds with the Green Bond Principle (GBP) is quite small.

In addition, investors with a tighter view of green investing, often referred to as "dark green investors," feel that rather than expanding the market, a flexible approach would erode its credibility, posing a severe risk of greenwashing. Investors with a milder screening process and a preference for the lighter green end of the spectrum, on the other hand, are eager to capitalize on the green bond market opportunity while tackling climate change problems. Meanwhile, underwriting banks are also facing this issue.

5. Perception of Higher Risk

It also imposes limits and potential disadvantages on issuers. Some issuers may desire to avoid drawing attention to their operations and sustainability performance. At the board level, the danger of greenwashing can be significant enough to cause a green bond offering to be rejected. Environmentalist Jay Westerveld invented the phrase "greenwashing" within 1986 in a critical essay about the absurdity of the "save the towel" movement in hotels. Greenwashing occurs when an organization spends more time and money branding itself or its projects as green than actually implementing sustainable business practices. Not to mention the lack of transparency about the use of proceeds, given that no existing structure demands a direct and controlled allocation. The proceeds of green bonds are fungible. As a result, there is a risk of misallocation.

3.1.4 The Trend of Green Bond

Green bond volumes registered in the Climate Bonds GBDB (the Green Bond Database) in 2022 decreased a bit by 7 percent compared to 2021, but remained consistent at roughly 3 percent of total market volumes. Green issuance in H2 totaled USD293.6 billion, down from USD355.4 billion in H1, with September being the most active month of the year, at USD75.9 billion. November finished in second with USD72.8 billion in volume, an increase of 8.6

percent year on year. None of the bonds contributing to the USD26.9 billion were priced in December (Harrison, 2023). Following Russia's invasion of Ukraine, which prompted oil price increases, inflation, and rising interest rates, global capital markets activity was affected in 2022. This includes bonds with thematic labels (-24% year on year), which accounted for 5 percent of total debt volumes, the same as in 2021 (Climate Bonds Initiative, 2023).

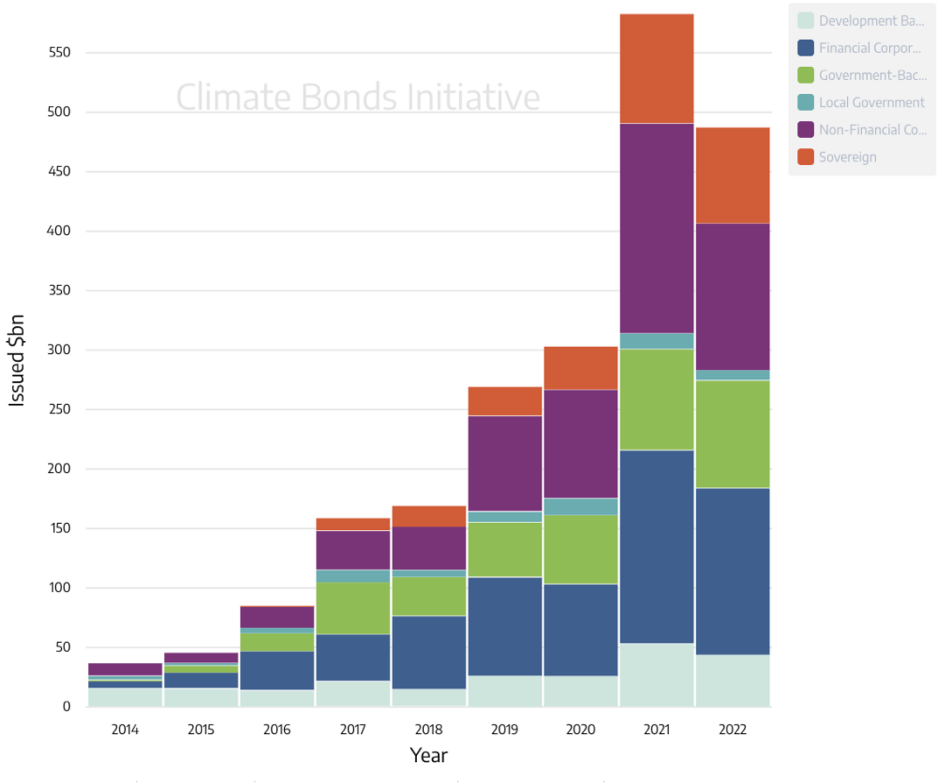

Figure 3. 5 The composition of issuer type's green bond

Source: Climate Bond Initiative

The green label continues to dominate global thematic debt issuance, accounting for 56 percent of GSS+ (The Green, Social, Sustainable and Other Labelled) volumes at the end of the year and bringing the segment's cumulative total to USD2.2 trillion. Moreover, to date, demand for green bonds has significantly outstripped supply. This trend continued in 2022, with green bond issuers stating that investors who identified as green or socially responsible aided in getting projects approved (Michetti et al., 2023). Additionally, the composition of green bond issuer has evolved significantly over time. There are several types of issuers that

consist of development bank, financial corporate, government-backed entity, local government, non-financial corporate, and sovereign. In accordance with 2021 that the development can be seen on Figure 3.5, the private sector fuelled 2022 green volume, with corporations accounting for 54 percent of issuance. Financial corporations contributed the most volume (29 percent), while non-financial corporations contributed 25 percent. European corporations accounted for nearly half of private sector green issuance, with the two largest issuers being German commercial bank Helaba (USD5.2 billion and 45 transactions) and Danish multinational power provider Orsted (USD 4 billion and 6 transactions). Just under 20 percent of 2022 green issuance came from government-backed companies, which were the only issuer category to grow over 2021 (up 6 percent), owing to the EU reopening its 2037 deal three times for a total of EUR6.5 billion (USD6.9 billion) (Climate Bonds Initiative, 2023). Furthermore, according to market development in H2 2022, issuers remained active in the bond market, albeit with caution, as evidenced by multi-day intervals with no new issuing and rumours of last-minute deals being pulled. Many green bond issuers emphasized that the green label aided in deal placement in volatile markets (Harrison, 2023).

3.2 Islamic Financing

In this study, Islamic financing refers to financing given by Islamic banks to customers, enterprises, and other stakeholders. Hence, when focusing on financing, it is critical to remember that it is not distinct from Islamic baking. Islamic financing is known for its support of the general financial sector and capital market development for microfinance, small and medium-sized businesses, and regulatory reforms in developing member nations. Based on these characteristics, Islamic banking finance is typically more accessible to micro, small, and medium-sized businesses than conventional banking. Furthermore, the use of Islamic Banking to ensure every transaction is under the law of Islamic economics. The Islamic economic system is founded on norms that apply to both individuals and societies. Adherence to these norms of conduct ensures economic growth and development in an Islamic community. Islamic law (Shariah) prescribes the norms, which are founded on laws in the Quran, operationalized by Sunnah, and extended to new situations by Ijtihad. The Islamic economic system differs from conventional systems in that the ultimate source of regulations is not society but "the Law Giver" or Allah SWT (Alafianta et al., 2021). In addition, the discussion will begin with the development of Islamic banking and the initiation of providing financing to entrepreneurs so that the current concept of Islamic baking is formed.

3.2.1 The Development of Islamic Banking

From a very early stage in the history of the Islam. Muslims were able to create an interest-free system for raising funds to finance profitable projects and consumer needs. During the height of Islamic culture and for many centuries after, the system operated fairly efficiently. According to Professor S. D. Goitein, in the twelfth and thirteenth centuries throughout the Mediterranean region, partnership and profit-sharing rather than interest-based borrowing and lending became the basis of trade and industry (Goitein, 2009). The Islamic legacy, however, remained dormant as the economic center of gravity shifted throughout the ages to the Western world, where Western financial institutions, including banks, took over. However, in recent years, there has been a strong revival of interest in building a modern version of the typical Islamic banking system, owing to Muslims' wish to avoid interest.

When commercial banking formed after the industrial revolution, a large majority of Muslim scholars conveyed serious reservations about it due to its reliance on the interest rate mechanism, and they called for the development of alternative mechanisms to perform the financial intermediation function in Muslim societies. The Muslim people avoided dealing with commercial banks to a large extent. However, in increasingly monetized economies, the growing demands of traders, industrialists, and other entrepreneurs were pressing. Muslim economists and banks rose to the challenge of inventing alternative financial intermediation models. In the early nineteenth century, important theoretical work was completed. The majority of the Muslim world was colonized at the time. When Muslim countries won independence after world war II, real trials with interest-free financing began on a small scale and progressively extended in breadth.

While credit groups and cooperatives (which worked on an interest-free basis) existed in various Muslim countries even during the colonial period, the first banking institutions appeared in the early 1960s. From 1963 to 1967, Mit Ghamar, Egypt, launched a pioneering experiment in putting Islamic precepts controlling funds dealings into practice. The Mit Ghamar program, which was inspired by the concept of German saving banks, gathered small savings from the rural sector primarily through savings accounts. The account holders received no interest. Nevertheless, as an incentive they were eligible for small, short-term, interest-free loans for productive uses. They were permitted to make withdrawals from their deposits on demand. Furthermore, profit-sharing investment accounts were developed. The funds raised were invested on the basis of profit sharing with entrepreneurs.

Nasser Social Bank, Egypt's first interest-free institution with the word 'bank' in its name, was also created in 1971. This was the first time a Muslim government expressed enthusiasm for establishing an interest-free organization. Despite the fact that the Nasser Social Bank's primary goals were social in nature, such as providing interest-free loans to the poor and needy, scholarships to students, and profit-sharing microcredits to small projects, the involvement of a public authority in interest-free banking sent crucial signals to Muslim businessmen with surplus funds. In 1975, a group of such entrepreneurs founded the Dubai Islamic Bank in Dubai, United Arab Emirates (UAE). This was the first Islamic bank founded on private initiative. However, official assistance was critical, with the governments of the UAE and Kuwait each contributing 20 percent and 10 percent of the capital, respectively.

The establishment of the Islamic Development Bank (IDB) in 1975 was the most significant step in the history of Islamic finance. The IDB was founded as an international financial institution in response to a declaration of intent published by a conference of Islamic finance ministers in Jeddah, Saudi Arabia, in December 1973. The declaration was signed by representatives from 23 member countries of the OIC. The Articles of Agreement creating the Islamic Development Bank were accepted during the second conference of finance ministers, held in Jeddah in August 1974. The IDB's initial meeting of the Board of Governors took place in Riyadh, Saudi Arabia, in July 1975 and it began operations on 20 October 1975.

The period between 1975 and 1990 was the most vital in the history of the Islamic financial industry's development. During this time, it grew into a viable alternative financial intermediation model. It gained esteem and legitimacy through theoretical breakthroughs as well as actual experiences. On the one hand, various Shariah-compliant financial products were produced, and on the other, Islamic banks demonstrated good outcomes when implementing these products. Not only was the period marked by the emergence of an abundance of Islamic financial institutions in the private corporate sector under various socioeconomic conditions, but it also saw the expression of intent from three countries - Pakistan, Iran, and Sudan - to gradually eliminate interest from their entire economies and replace it with a fully Islamic banking system. Several practical efforts have also been done in these countries to achieve that goal. Even more significant, numerous major global banks began offering Islamic financial products. That was a clear acknowledgement of the new model's viability and its acceptance by international participants. The International Monetary Fund (IMF) and the World Bank both recognized Islamic financial products as legitimate forms of financial intermediation and

issued papers to that effect. While the banking industry continued to grow (albeit at a slower pace) throughout the 1990s, attention was also paid to non-bank financial firms. Other than banks, Islamic financial entities began to emerge in greater numbers. These included insurance companies and investment funds. While the Islamic insurance business has not grown sufficiently, Islamic investment funds have made great development.

Initiatives to build various infrastructural organizations to support the Islamic finance industry also began in the 1990s. Initially, Islamic financial firms had to operate inside the institutional framework that underpins conventional banking. They were at a disadvantage because the framework was not tailored to their specific requirements. A foundation has been laid for the establishment of an Islamic finance industry support network.

3.2.2 The Ethical Framework of Islamic Financing given by Islamic Banking

The ideal goal of Islamic banking and its performance is related to the theoretical framework of Islamic Moral Economy (IME), which justifies the existence of Islamic Banking. The conceptual foundations of Islamic Moral Economy (IME), its axioms, value system, operational dimensions, and the behavioral norms of individual Muslims ('homoislamicus') have been developed as a result of the knowledge creation process led by Muslim economists (Asutay, 2007) and are based on Islam's ontology and epistemology, namely the Quran and Sunnah. Asutay, (2012) and Mergaliyev et al. (2019) states the following Islamic Moral Economy (IME), foundational axioms:

a. Tawhid

Tawhid, this is the most important thing that Islam teaches, and it is at the heart of everything that Muslims think and do. The vertical part is how much a person believes in Allah and depends on Him. The horizontal parts of it show up in how each person interacts with the rest of creation and in a number of the other axioms. This represents the nature of knowledge and its articulation, suggesting that no stakeholder can have control over the others. It shows that this principle recommends an enhanced stakeholder governance framework for IBs based on *ihsan* or equilibrium. The prohibition of *riba*, for example, means capital de-centring and bringing capital to the same level as other stakeholders via the *ihsani* (good) process.

b. ‘Adalah

'Adalah, Justice in Islam means granting all Shariah-entitled individuals their due rights. Thus, it includes the rights of citizens as well as the rights of workers and employers. Additionally, it covers more esoteric concepts like environmental protection and animal rights. This axiom stands in opposition to oppression or *dzulm*. For the industry's goal purpose, which is to achieve equilibrium among stakeholders.

c. Rububiyyah

Rububiyyah, a developmentalist method that recognizes the operational purposes of Islamic banking in the shape of divine preparations for food, sustenance, and direction toward perfection. It means that all stakeholders have a predetermined route for development, which must be maintained through the opportunity spaces. it implies the application of intentional enlightenment to realize constructive norms and exemplary behavior. This idea is intimately associated with the notion of *ihsan*. In industry case, such as conformity of contracts and execution by suppliers to stakeholders.

d. Tazkiyah

Tazkiyah entails expansion in harmony within the complementarity of tawhid so that the interests of all stakeholders can be fulfilled without injuring anybody else, implying a constraint on the operation of Islamic Banking. It also linked with *ukhuwwah* that it symbolizes the brotherhood of man as Adam's acknowledged offspring. Consequently, a feeling of closeness, kinship, and cooperation that is attained in an ideal Islamic community; a conceptual expansion of *'adalah*. To build positive relationships between the Islamic banks and stakeholders throughout the project, in terms of creating effectiveness.

e. Khilafah

Khilafah, reflect that human are Allah's representatives on earth, meaning that man is ultimately accountable to Allah. As a representative of Allah on earth, one carries a duty for which he or she will ultimately be held accountable in the afterlife; hence, Islam provides a two-dimensional utility or welfare role. It should be stressed that this principle applies to everyone, not only rulers and leaders. It represents the Islamic banking and their stakeholders' responsibility, how they interact with environment and how they use natural resources wisely.

f. Ihsan

Ihsan is the key to the above elements, to keep them in harmony for sustainability. If tauhid is the basis and center of Islam, then *ihsan* is the finishing touch or crowning glory. It is the end goal of the dynamic process of economic, social, and spiritual development, and getting there means getting to *falah* (success). So, it can be seen as putting all other values and axioms into practice and making them real. In order for it to be shown that tawhid is a vertical relationship with God, *ihsan* is a horizontal relationship between Islamic banking and stakeholders.

Based on some of the Islamic moral economy above, there are several points that have concern about the environment and natural resources, indicating that since the beginning, the nature of Islamic baking is indeed environmental-friendly without added environmental value, which is now being intensively campaigned for. Furthermore, since protecting the environment is mandated by Islam, it stands to reason that Shariah compliance should include good environmental practices. Hence, an Islamic bank should include environmental preservation as part of its objective, making the creation of green banking methods critical. In other words, since Islamic banks must be Shariah compliant, such systems must be developed, employed, and practiced. Therefore, it is proposed that this compliance incorporate sustainable measures that protect the environment. In addition to that, sustainable financing given by Islamic baking focuses on managing a corporation's influence on the economy, environment, and society while also ensuring its own future. This includes addressing concerns like as resource scarcity, aging populations, and economic inequality, all of which have an influence not only on society but also on business (Kunhibava et al., 2018).

3.2.3 The Opportunity and Challenge Faced by Islamic financing given by Islamic Banking

When it comes to Islamic banking discussion, it is simultaneously talking about Islamic finance as a whole, since the biggest contribution in Islamic finance is Islamic baking, with a total of 70 percent share from other Islamic finance sectors. Following these recent advancements, Islamic finance has evolved into one of the fastest growing sections of the global financial system, becoming systemically significant in many economies and too large to ignore in others. With its theoretical foundation emphasizing risk sharing, equity-based contracts, entrepreneurship, prudence, economic progress, and prosperity, Islamic finance has been favorably embraced by both Muslim investors and the wider financial system. Furthermore, Islamic banking has increased its penetration in many countries, crossing the 15

percent as a share of banking system assets in ten countries (Iran and Sudan, which have a fully-fledged Islamic financial sector, Bangladesh, Brunei, Kuwait, Malaysia, Qatar, Saudi Arabia, the United Arab Emirates, and Yemen). Based on Bove (2015), there are several advantages in implementing Islamic banking as listed below.

1. Achieving social justice. One of the primary overarching Islamic aims is to pursue and attain social justice. According to Islamic principles, a financing system promotes justice when: (1) not only the entrepreneur (borrower), but also the financier bears the risk of losses in an equitable manner; and (2) a fair portion of society's credit resources are accessible to the poor under affordable conditions in order for them to pursue their social and economic objectives. The "no risk, no gain" idea gives substance to the first criterion of social fairness (equal profit and risk sharing). This is implemented through the ban of guaranteed return rates (which implies the prohibition of interest). Furthermore, the "profit-loss share (PLS)" issue is important since Islamic banking requires equity-based financing rather than debt-based financing. The risk is simply transferred from one party to another in debt financing, however with equity-based financing, the risk is shared by both parties, which improves the equality of all parties involved.
2. Equitable distribution of credit. One of the five pillars of Islam is to help those in need (*zakah*). It prescribes the redistribution of income and benefits from the wealthiest to the poor. The foundation of the notion of providing credit to the needy may be found directly in the Qur'an, which states that "wealth should not only circulate among the rich." This notion of serving in each sector ('microfinancing') will not only lead to investment and leverage diversification, but it also has an ethical worth of its own. In fact, *zakah* cultivates the small business sector, which leads to job creation. This will gradually re-energize the bottom layers of the economy, encouraging microfinance. Furthermore, since *zakah* is a deeply entrenched fundamental value (rather than a short-term leveraging diversification tactic), it creates a stable climate that actually promotes equitable growth and development. In this light, Islamic banking microfinance can be viewed as an effective and legitimate development tool.
3. No excessive leverage. Debt and leverage are the primary sources of insecurity in conventional banking. Individuals and (investment-) businesses were encouraged by comparatively low interest rates to borrow beyond their liquidity level, resulting in the

2007 major financial crisis. In this regard, Islamic banking (which includes equity financing) may be the panacea. In fact, Islamic banking promotes risk sharing while opposing debt financing. In actuality, Islamic investment banks that maintain a 100% repayment reserve (i.e., are equity-based investment banks) invest their deposits directly in tangible assets and legitimate industrial ventures throughout the economy. Only after making a profit (or a loss) do investment funds receive reimbursement. Returns (or the lack thereof in the case of losses) are inextricably related to the actual activities that were invested in. This is in stark contrast to mere financial investments (which Islamic banks are not permitted to make). Essentially, Islamic finance involves a direct interaction between the industrial and financial sectors. This, clearly shows that credit (and consequently debt) cannot expand independently of real industrial assets or growth. Uncontrolled credit and leverage generation is consequently out of the question. The phenomena eliminate the incentive to participate in excessive leverage risks in any scenario, making Islamic banking significantly more secure than conventional financing.

4. No excessive uncertainty. Depositors in conventional banks typically hedge themselves through either convenient hedging or deposit insurance. This undeniably reduces the visibility of the danger of personal losses, removing the primary incentive for deliberate investment. Islamic banking, on the other hand, not only forbids such speculative trading (*gharar* ban), but also encourages investment in genuine assets. Because depositors are ethically prohibited from taking excessive risks, the Islamic financial industry as a whole is less vulnerable to financial disasters. Speculation is also less prevalent in the products themselves, as physical assets, partnerships, and services are important in Islamic banking.

Moreover, during the recent global financial crisis, Islamic banks were more immune to the toxic assets that tainted the conventional banking world, but they were subject to second-round impacts, most notably the real estate downturn. Furthermore, there are complexities or challenges within the Islamic Banking system that resulting in inefficiency, as seen below:

1. Islamic banking entails providing financial services in obedience with the *Shari'ah* prohibition on interest (*riba*). It also demands that the financing be asset-based, which frequently results in the purchase, ownership, transfer, and exchanges of real things between counterparties. However, there is a tendency to structure transactions and

financing in such a way that Islamic banking contracts resemble conventional (debt) financial contracts, resulting in a complicated layering of transactions and the involvement of third parties to be *Shari'ah* compliant. This can lead to risks (credit, market, operational, and legal) and complexity at various phases of the Islamic finance contract's implementation. For example, some home mortgages based on *Murabahah* (sell at cost plus profit) can include many transactions (even with more than one commodity) and multiple transfers of ownership and layered to maintain *Shari'ah* compliance (Aksak & Asutay, 2015; Kammer et al., 2015).

2. The adoption of Islamic banking standards differs across countries. The Islamic Banking has two key standard setters: the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), formed in 1990, sets for *Shari'ah* accounting and auditing standards, and the IFSB, created in 2002, sets for regulatory and supervisory standards. These organizations have established a wide range of technical standards and guidance notes, collaborating closely with the Basel Committee and other traditional standard-setting organizations to guarantee coherence and consistency with their standards. Nonetheless, the lack of consistent application of AAOIFI and IFSB standards, particularly in countries where Islamic banks are active, risks eroding transparency and creating opportunities for regulatory arbitrage. Increased regulatory clarity, as reflected in banking laws and regulations and informed by improved dialogue between Islamic standard setters and national regulators, is required, as is strengthened collaboration between Islamic and global standard setters in developing appropriate industry standards (Kammer et al., 2015).
3. Poor risk of management practice. Islamic finance is severely lacking in product range, depth, and sophistication. Despite its rapid growth, Islamic finance has limited risk-hedging products and strategies. A lot of risk management approaches are not available due to *shari'ah* compliance constraints. Credit derivatives, swaps, derivatives for market risk management, and money market instruments are examples. Hence, the creation of prudential laws and procedures for risk management, capital adequacy, and corporate governance in Islamic banking is all the more important. Islamic banks may face greater operational risk due to a greater number of contracts, newer supporting systems, developing skill sets, and a lack of consistency in best practices. Islamic banking is thought to be more vulnerable to operational risks caused by the failure of controls, procedures, information technology systems, and analytical models.

Operational risk extends beyond mathematical models and capital adequacy; a culture shift in the business is required to achieve strong operational risk management methods (Malim, 2015).

3.2.4 The Trend of Islamic Banking

Following a horrific 2020, economies began to recover in 2021. Regardless, the Islamic financial industry faced another hard year, with several markets cautiously resuming operations and governments reopening their economies. The onslaught of new waves of the Covid-19 virus, particularly the Delta and later the Omicron versions, slowed the forward momentum. The new Covid-19 waves prompted further lockout or safety precautions, disrupting global supply lines and increasing transportation costs. 2021 concluded on a positive note, as high vaccination rates prompted most governments to relax pandemic-related restrictions. However, The Islamic finance business grew by 17 percent to about US$4 trillion in 2021, up from 14 percent in 2020. The overall global net income reported by Islamic financial institutions in 2021 tripled from US$10.5 billion in 2020 to US$32 billion in 2021, indicating improved outcomes, particularly for Islamic banks (Refinitiv, 2022).

Islamic banking is the most powerful of the five sub-indicators (Islamic banking, takaful, Other Financial Institutions (OIFIs), sukuk, Islamic Funds), with a score that is above average due to the sheer number of Islamic banks or Islamic banking windows in many nations. Furthermore, Islamic banking accounted for 70% of overall Islamic finance assets in 2021, or US$2.8 trillion, and delivered superior results, as seen by increased net income (a 290% increase globally) and higher average return on assets for some nations. This is due to smaller credit loss provisions in 2021 compared to 2020. Islamic banks also made prudential financing decisions aimed at higher-end customers, and they profited from extended government assistance to pandemic-affected sectors. Finally, many banks obtained operational efficiencies as a result of initiatives like branchless banking and collaboration with FinTechs. According to some emerging trends, there is still a strong market for Islamic banking, which will put it on track to reach US$4.0 trillion by 2026.

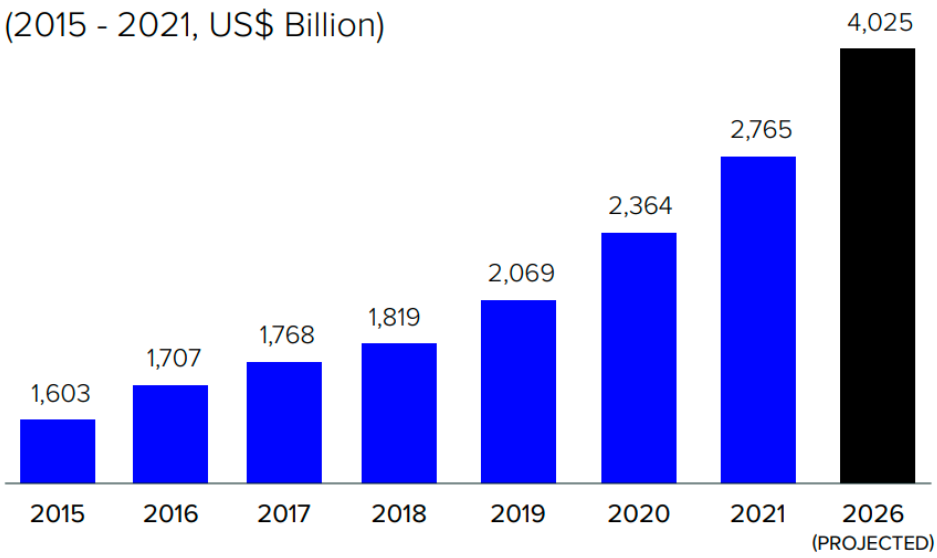

Figure 3. 6 Islamic banking assets growth
Source: Islamic Finance development Report 2022

The conversion of conventional banks is evidence of the ongoing need for Islamic banking (Luthfi Hamidi & Worthington, 2020). By the end of 2022, Pakistan's Faysal Bank intends to renounce its conventional banking license and begin operating as a full-fledged Islamic bank in January 2023. Consolidation will benefit the Islamic finance sector as well. As at the time this report was written, Kuwait Finance House (KFH) was in the final stages of purchasing Bahrain's traditional Ahli United Bank. As a result of its merger with KFH's Bahraini affiliate, the combined bank will grow to become one of the largest Islamic banks in the world and the biggest bank in Bahrain. In addition, the MoU that both sides signed in August 2022 may allow Kuwait's Gulf Bank to convert to Islam as it progresses toward merging with Al Ahli Bank. This indicates that there will continue to be a need for Islamic banking in Kuwait, which, based on Islamic Finance Development Indicator (IFDI) estimations, has an Islamic banking sector that is worth US$134 billion and is the sixth largest in the world. Conversion is not restricted to a single institution, but could affect an entire banking system. Following the installation of a new government by the Taliban after regaining power in August 2021, Afghanistan's central bank declared in May 2022 that it intends to create an Islamic banking system. In the same region, the Federal Sharia Court of Pakistan's directive to the government to prohibit *riba* by the end of 2027 is a step toward greater expansion for Islamic finance in the country (Refinitiv, 2022).

Besides, Islamic banks outperformed conventional banks in terms of Return on Assets (ROA) (Refinitiv, 2022). The highest Islamic capital market is currently owned by Malaysia and is the center of Islamic finance in the world. In addition, Malaysia and Indonesia are the top 5 countries that are concerned about the Environmental, Social and Governance (ESG) project through their Islamic finance performance. As it can be seen from the Figure 3.6, the Islamic banking asset has been heading upward, showing positive growth since its establishment. This has not been spared numerous countries that have supported and contributed greatly to fostering the establishment of Islamic banking, particularly in Muslim countries or with a mostly Muslim population through several capacity building, knowledge sharing and policy implementation, like what happened in the Developing Eight (D-8) countries. The D-8 conducted a meeting of the Working Group on the Development of the Islamic Financial Services Industry in Kuala Lumpur, Malaysia, on 28 October 2010. The gathering's goal was to inspire discussion regarding the importance of Islamic finance and the D-8 member countries' interlinkage policy. This meeting also acted as a follow-up to the resolution made at the D-8 Central Bank Governors' Meeting in July 2010. In 2011, the Developing Eight (D-8) organized another session of the Islamic Microfinance Workspace in Indonesia. The workshop was organized in anticipation of the huge rise of Islamic finance in recent centuries, as well as to further explore and enhance Islamic economic potential among the countries' participants (Hamadou, 2022).

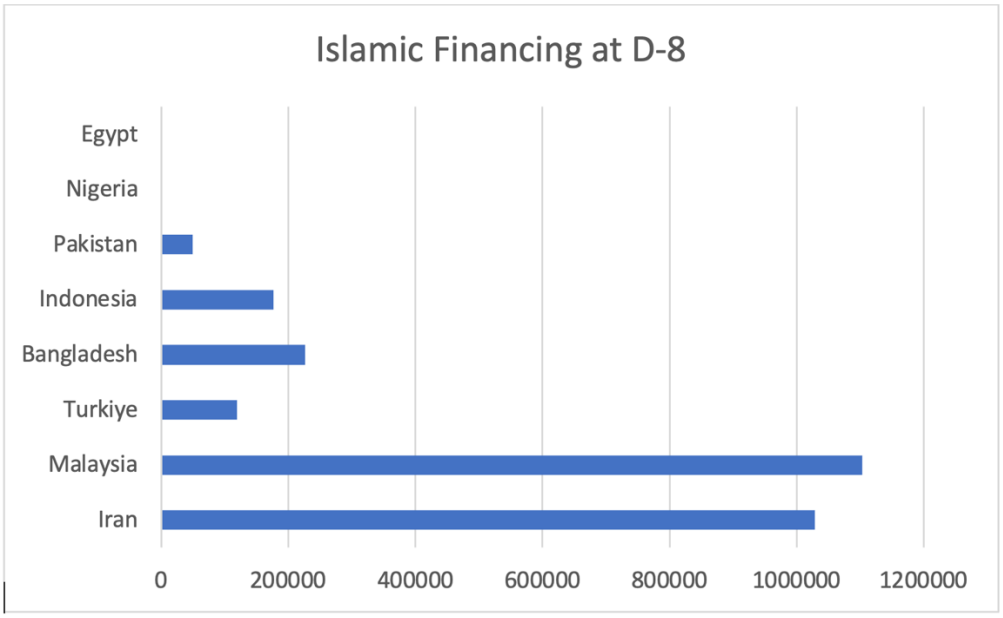

Figure 3. 7 Total Islamic financing given by Islamic banking at D-8 countries
Source: Author's calculation, OICstat

Moreover, Islamic financing has gained traction in the developing eight (D-8) countries, a group of emerging economies that includes Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey. These countries are increasingly interested in Islamic finance as a means of promoting economic development and financial inclusion while adhering to Islamic values. The Figure 3.7 shows the total distribution of Islamic financing given by Islamic bank from 2013 until 2021, revealing that Malaysia is leading in this sector as well apart from their achievement in other Islamic finance sectors. For Egypt, there is no financing data that published for public. Therefore, the Islamic financing remains blank. While Nigeria become the smallest share of Islamic financing, it is around US$ 1 billion. In sum, this demonstrates that Muslim countries, or the majority of Muslims, are devoted to growing the Islamic financial industry by incorporating Islamic banking into their economic cycle, especially for gaining the capital for running a business.

CHAPTER 4
METHODOLOGY

This study utilizes quantitative analysis to acquire a thorough understanding of the impact of green bonds, Islamic financing, and other determinants in attaining sustainable forest management (SFM). Furthermore, using the quantitative analysis, this research employs econometric and statistical techniques or approaches to validate earlier economic theories and discoveries. Econometric techniques and approaches can play a significant role in social sciences, particularly in the construction and estimation of models to examine the correlations between multiple sets of variables utilizing the mathematical concept of a function (Gujarati & Porter, 2009). This study presents a novel technique to investigating the relationship between forest and economic activity by developing a new econometric model by modifying existing models. This research applies panel data (or time series cross section) analysis. Panel data model is used to analyze the relationship between growth of green bond and several explanatory variables that directly and indirectly have an impact on sustainable forest management (SFM). This panel data model is also used to investigate the role of Islamic financing given by Islamic banking in influencing the sustainable forest management (SFM).

Additionally, the estimation between green bonds and Islamic financing will be separated, the focus of the estimation of the green bond model will be on the G20 couple with D-8 countries. Moreover, the study tend to focus in all sample, as these countries are members of the United Nations as well and are obligated to comply with the Paris climate agreement. One of their efforts to mitigate their emissions and address activities that could potentially harm forests is through green bond issuance. Therefore, the study believes that not only G20 countries are active in tackling environmental issues through issuing green bonds, but D-8 countries also have same responsibility and they may accomplish with green bonds instrument as well. In addition, the focus of the estimation for Islamic financing will be on developing eight (D-8) countries. Because the study specifically focuses on D-8 countries to investigate the behaviour of Muslim societies concerning Islamic financing activities and their potential unintended impact on the performance of sustainable forest management. By limiting the scope to D-8 countries, which represent a significant portion of the Muslim population, the study

aims to gain insights into how Islamic financing practices may influence sustainable forest management outcomes in these particular contexts.

Although there are many various approaches to model creation, a logical and valid strategy would be to follow the stages outlined in figure 4.1. As a mentioned by Brooks (2008) in his book "Introductory Econometrics for Finance", it is vital to highlight that the process of developing a solid empirical model is iterative, and it is not a precise science. The final preferred model may be substantially different from the one originally proposed, and it does not have to be unique in the sense that another researcher using the same data and the same beginning theory may arrive at a different final specification. Measurement errors and data revisions are common problems encountered when undertaking applied econometric work in the field of economics. These challenges stem from the fact that the data may be estimated or measured in error, and will frequently be subject to several vintages of subsequent changes. This data challenge will be explained further in the methodology subsection.

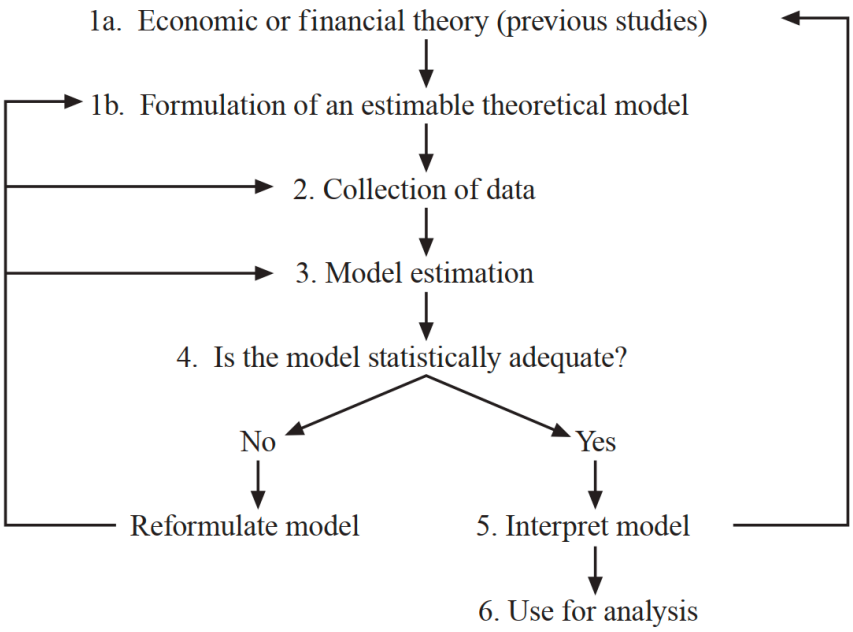

Figure 4. 1 Steps in developing an econometrics model

Source: Chris Brooks (2008)

The first step of the quantitative analysis is examining the sustainable forest management (SFM) in G20 and D-8 countries by estimating the relationship between forest management and several explanatory variables in a panel data model, with emphasizing the role of green bond and Islamic financing given by Islamic banking. Panel data analysis is used to investigate the impact of green bonds, Islamic financing, macroeconomic activities, financial bank performance and political matters in achieving sustainable forest management (SFM). The first step in panel data estimation is choosing the model to be examined. The data panel itself contains three regression models: ordinary least squares (OLS) or pooled least squares (PLS), fixed effects (FE), and random effects (RE).

4.1 The Data

This part discusses the data to be studied, before delving into the data section, it is essential to reemphasize the variables used in the study. The study utilizes the total amount of forest area for the measurement of sustainable forest management as dependent variable. This data set measures the percentage of forest land area. Since there is no specific data for sustainable forest management records, the study follows Schall and Ammer (2013) that quantifying forest management with land area. In addition, the explanatory variables consist of green bonds, Islamic financing, macroeconomics activities, financial bank performance, and political matters. Where green bond is represented by total amount of green bonds issued. Total sharia-compliant financing stands for Islamic financing given by Islamic banking. Then, macroeconomic activities are reflected by; first, trade openness which express the total of goods and services exported and imported, measured as share of the gross domestic output. Second, inflation, this dataset exhibits how the Consumer Price Index (CPI) accurately measures the annual percentage change in the average consumer's cost to purchase a basket of goods and services.

Third, manufacturing, it represented by the added value of manufacturing, measured as share of the gross domestic output. Fourth, agriculture, which taken from the added value of agriculture, forestry, and fishing, measured as share of the gross domestic output. Lastly, general government final consumption expenditure stands for public expenditure. For financial bank performance, there are capital to asset ratio and return on asset, which measured with ratio of bank capital and reserve to total assets and bank profitability, respectively. Moreover, control of corruption and political stability represent political matters. Control of corruption capture perceptions of the extent to which public power is exercised for private gain, including

both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Political stability allows to express the possibility of political instability and/or violence driven by politics, especially terrorism. For the detail, it can be seen on Table 4.1 on summary of variable.

The main data source in the study is from the World bank with its various databases (such as world development indicators, governance financial development, and world governance indicators), the remaining sources are obtained from SESRIC, Climate Bond Initiative, and Our World in Data. The base year was chosen from 2010 until 2021, considering that a record of Islamic financing data first appeared in 2013 and the first green bond was initiated in 2014. Thus, choosing the aforementioned timeframe in order to make long and reliable data. Due to data structure of several variables and incomplete data in some countries, unbalanced panel data was employed (Gujarati and Porter, 2009), with the coverage of G20 and D-8 countries. Table 4.2 and Table 4.3 displays descriptive statistics of variable between G20 and D-8 countries model.

Table 4. 1 Variable Summary

Variable	**Definition of Operational Variable**	**Unit**	**Source**	**Previous Studies**
Dependent variable				
Forest management	The total of forest land area	% of land area	WDI	Schall and Ammer (2013)
Carbon emissions	The total amount of Carbon dioxide (CO2)	Billion tonnes	Our World in Data	(Mao, 2018); Fang et al. (2020)
Independent variable				
Green bond	The total amount of green bonds issued	USD	Climate Bonds Initiative	Bae et al. (2022); Löfqvist and Ghazoul (2019);
Islamic financing	The total asset of total shariah-compliant financing given by Islamic banking in D-8 countries	USD	SESRIC (OICStat)	Bae et al. (2022); Solarin (2019)

Trade openness	The sum of exports and import of goods and services	% of GDP	WDI	Fang et al. (2020)
Inflation	The percentage change in consumer cost to acquire goods and services	%	WDI	Mujahid and Minhaj (2020); Taheripour et al. (2019)
Manufacturing	The added value of manufacturing	% of GDP	WDI	Fang et al. (2020); Filho and Hanusch (2022)
Agriculture	The added value of agriculture, forestry, and fishing	% of GDP	WDI	Dudley and Alexander (2017); Kastner et al. (2021)
Public expenditure	The total of general government final consumption expenditure	USD	WDI	Combes et al. (2018); Zhang et al. (2021)
Capital to asset ratio	The ratio of bank capital and reserve to total assets	%	Global Financial Development	Nasreen et al. (2017); Nizam et al.(2019)
Return on asset	The total of net income over the average total assets	%	Global Financial Development	Nasreen et al. (2017); Shakil et al. (2019)
Control of corruption	It captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	Percentile Rank	World Governance Indicators	Mao (2018)
Political stability	It measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.	Percentile Rank	World Governance Indicators	Galinato and Galinato (2013); Mao (201Ga

Source: author's collection

4.2 The Methodology

This subsection explains the econometric models that apply in panel data estimation. Several panel tests are conducted to determine the best modal for examining the relationship between sustainable forest management (SFM) and green bonds as well as Islamic financing. All data are transformed to logarithms prior to analysis, standardizing the data distribution to make it shock-resistant, except the data that already in the form of percentage. The study assumes that the relationship between sustainable forest management and other independent variables takes the logarithmic form. The transformation into the logarithmic form is intended to linearizing those variables as well. Another benefit is that the form allows us to estimate elasticities. Thus, it gives us parameters that are useful for policy purposes. Finally, analyzing the regression findings is relatively straightforward (Hirawan, 2017).

These panel models, with their own assumptions and implications, offer alternative approaches to addressing the issues of panel data analysis. The choice of ordinary least square (OLS) or called as pooled least square, fixed effect, or random effect is determined by the nature of the data and the underlying assumptions of models. The ordinary least square (OLS) has been studied for about 200 years. The noteworthy idea underpinning OLS is the recognition that there may be error in the relationship between dependent and explanatory factors (Chumney and Simpson, 2006). It is assumed that the explanatory variables are not stochastic. If they are stochastic, they are unrelated to the error term (u_{it}). It is also expected that the error term has a zero mean and a constant variance. For the sake of hypothesis testing, it is seemingly perceived that the error term (u_{it}) is normally distributed as well (Gujarati and Porter, 2009). The following model represent the model of this study in the form of ordinary least square coupled with the error term as well.

$$FOM_{it} = \alpha + \beta_1 GB_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + u_{it} \quad (4.1)$$

$$FOM_{it} = \alpha + \beta_1 ISF_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + \beta_9 D_{1it} + u_{it} \quad (4.2)$$

The *i* and *t* deputize country and time variables, respectively. FOM is forest management, while GB, TRADE, CPI, AGR, and MNF, PE, CA, ROA, COC, PS represent green bond, trade openness, inflation, added value of agriculture, forestry and fishing, and added value of manufacturing, public expenditure, capital to total assets, return on assets, control of corruption, political stability respectively. In addition, ISF stands for Islamic financing and D_1 is dummy variable of D-8 countries. Furthermore, when the results of the pooled regression or ordinary least square (OLS) are examined using traditional criteria, all regression coefficients are not only highly statistically significant, but also match prior predictions, and the R-square value is quite high. The sole "fly in the ointment" is that the computed Durbin-Watson value is rather low, implying that the data may contain autocorrelation and/or spatial correlation. The main issue with this model is that it does not differentiate between the various groups, nor does it reveal if the response of the dependent to the explanatory factors over time is the same for all groups. In other words, clustering distinct groups together at different times it disguises any heterogeneity (individuality or uniqueness) that may exist among the variables or it is also possible that OLS detect that there are no significant differences between groups. Hence, it is feasible that sometimes the error term is related to some of the regressors included in the model. Resulting in biased coefficient estimates in Ordinary Least Squares (OLS). However, the Ordinary Least Squares (OLS) is widely used for estimating the parameters of a linear regression model. It is assumed that there is no correlation between the unobserved individual or entity-specific effects and the variables that are observed. The coefficients are estimated using OLS by minimizing the sum of squared discrepancies between the observed and predicted values. Under certain conditions, such as no endogeneity or omitted variable bias, it yields unbiased estimates of the regression coefficients. When the assumptions are met, OLS provides accurate estimates (De Souza & Junqueira, 2005).

Other than that, Fixed effects estimation is intended to address time-invariant heterogeneity that has not been observed in the data. It is assumed that the observable variables are connected with the individual or entity-specific effects. Individual or entity-specific dummy variables are included in the regression model for fixed effects estimation. These dummy variables capture time-invariant effects and allow for within-group variation estimation.

In a situation in which observed variables are correlated with unobservable, OLS estimate may bias the parameter. Instead, Fixed effects estimation could address this issue as it accounts for unobserved heterogeneity by distinguishing individual or entity-specific effects

(Bai, 2009). Individual-specific or entity-specific features that do not change over time and are unique to each individual or object in the panel are captured by fixed effects. However, it is vital to recognize that when there is significant collinearity between the dummy variable of fixed effects and the individual-specific effects, fixed effects estimates may be sensitive to the issue of omitted variable bias. When there is a large degree of collinearity between the fixed effects dummy variables and the individual-specific effects, it becomes difficult to distinguish their independent influences on the dependent variable. The existence of omitted variables which are linked with both the individual-specific effects and the dependent variable violates the rigorous exogeneity rule and may induce bias into the estimations (Collot and Hemauer, 2021). The following is the study model of fixed effect.

$$FOM_{it} = \alpha + \beta_1 GB_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + v_i + u_{it} \quad (4.3)$$

$$FOM_{it} = \alpha + \beta_1 ISF_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + \beta_9 D_{1it} + v_i + u_{it} \quad (4.4)$$

Where v_i is unobserved heterogeneity that can bias the estimated coefficient from the OLS model. Furthermore, other than fixed effects estimation, random effects estimation can treat unobserved heterogeneity as a random variable and assume that it is uncorrelated with the observed variables. Random effects estimation calculates the average effect of unobserved heterogeneity on the dependent variable. It enables the correlation of individual-specific or entity-specific effects with observed variables in the regression model. The estimation of random effects requires that the unobserved heterogeneity follows a given distribution, usually the normal distribution. If this assumption is violated, the random effects estimation estimates may be inefficient. Inefficient estimates have bigger standard errors, which leads to less precise and reliable parameter estimates. since of its capacity to adjust for time-invariant unobserved heterogeneity and give consistent and efficient results, fixed effects estimation is frequently favoured over random effects estimation (Bell & Jones, 2015). Nevertheless, it depends on the result of Lagrange Multiplier (LM) and Hausman or Chow test in determining the suitable model in panel data regression for analysis the study.

Table 4. 2 Descriptive Statistic Variables of G20 and D-8 Countries

Variable	Mean	SD	Min.	Max.	Obs.
Forest management	29.792	19.487	0.451	68.493	312
Carbon emission	19.978	1.605	14.063	23.163	312
Green bonds	21.281	1.843	17.207	25.223	127
Trade	54.729	24.944	20.722	157.944	307
Inflation	4.915	5.543	-2.093	39.907	299
Manufacturing output	15.377	5.491	5.565	32.064	306
Agriculture output	6.653	6.523	0.566	25.129	306
Public expenditure	2.706	0.382	1.482	3.401	308
Capital asset ratio	101.96	79.665	1	246	300
Return on asset	138.366	85.390	1	287	300
Control of corruption	54.747	28.155	7.692	96.208	300
Political stability	39.534	26.066	0.473	95.238	300

Source: Author' calculation

Table 4. 3 Descriptive Statistic Variables of D-8 Countries

Variable	Mean	SD	Min.	Max.	Obs.
Forest management	23.511	20.250	0.451	59.242	96
Carbon emission	19.305	0.710	17.804	20.434	96
Islamic financing	9.522	2.253	4.101	12.650	60
Trade	53.101	33.858	20.722	157.944	93
Inflation	9.429	7.368	-1.138	39.907	95
Manufacturing output	16.607	4.262	6.552	23.491	95
Agriculture output	13.694	5.735	4.642	25.129	95
Public expenditure	2.290	0.347	1.482	2.776	95

Capital asset ratio	39.177	26.837	1	86	96
Return on asset	24.510	22.260	1	67	96
Control of corruption	31.573	17.219	7.692	67.298	96
Political stability	16.340	15.357	0.473	57.619	96
D-8 Countries	0.75	0.435	0	1	96

Source: Author' calculation

Furthermore, the effect of Islamic financing on the sustainable forest management (SFM) will be evaluated by replacing the coefficient $\beta_1 GB_{it}$ (green bond) with Islamic financing variables ($\beta_1 ISF_{it}$) using the same model flow as mentioned above (see the model 2 and 4). This method provides for a thorough examination of the impact of Islamic financing given by Islamic banking on the outcome variable. Besides, the dependent variable will be changed from sustainable forest management (FOM_{it}) to carbon emission (CO_2it) to further validate the estimation results. As stated by Harris and Gibbs (2021), this adjustment takes into consideration the role of forests in absorbing existing emissions. We can acquire insights into Islamic financing and green bond's potential contribution to lowering greenhouse gas emissions by studying its effect on carbon emissions. It would be able to determine whether the findings are consistent across different measurements by repeating this comparative analysis with two different dependent variables. This method improves the robustness and reliability of the estimation results, allowing for a more complete knowledge (Lu & White, 2014) of the impact of Islamic financing and green bond on sustainable forest management (SFM) and carbon emission (CO_2). The following model of carbon emission, as general written in the OLS model.

$$CO_{2it} = \alpha + \beta_1 GB_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + u_{it} \quad (4.5)$$

$$CO_{2it} = \alpha + \beta_1 ISF_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + \beta_9 D_{1it} + u_{it} \quad (4.6)$$

To ensure the consistency of the findings of the green bond and Islamic financing variables, the author will use a gradual variable addition strategy. This entails gradually adding additional variables into certain groups, allowing for a step-by-step analysis of the estimated impacts. Using this incremental variable addition approach, the author may systematically test the robustness and consistency of the results. This method provides insights into how the estimated impacts of the green bond and Islamic finance variables may be altered by the inclusion of additional factors, ensuring a full assessment of the link between these financing mechanisms and the dependent variable. In addition, it also addresses the multicollinearity within the models.

CHAPTER 5

RESEARCH FINDINGS ON GREEN BONDS

This part discusses the study findings from the regression process, highlighting the significance of green bonds in attaining sustainable forest management in G20 and D-8 countries. Additionally, this part would concentrate on the impact of green bonds on the spread of carbon emissions within G20 and D-8 countries as well. The analysis of the statistic relationships is structured and estimated by using the unbalanced panel regression. In addition, this section will also disclose the panel data regression model that was utilized in each subsection. As support and enrichment for the discussion, additional variables that could have an impact on the study, such as macroeconomic activity, financial bank performance, and politics, will also be explored.

5. 1 Green Bonds over Sustainable Forest Management in G20 and D-8 Countries

After performing some tests on a panel data model. The model which focuses on examining the impact of green bonds on sustainable forest management in G20 and D-8 countries reveals that the preferred option is the fixed effect. The Lagrange Multiplier (LM) test, for determining whether OLS or random effect, yields a number greater than alpha (0.05) as a sign for an acceptable random effect. However, when the Hausman test (to determine in utilizing random effect or fixed effect) is run, it rejected, as the model fails to meet the asymptotic assumption. Hence, the fixed effect is the suitable model for this part. The final model, in the form of a fixed effect, is depicted below.

$$FOM_{it} = \alpha + \beta_1 GB_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + v_i + u_{it} \quad (5.1)$$

Furthermore, the models were tested in classical assumption in order to provide a reliable outcome. The model has multicollinearity, meaning that there are independent variables have correlations of greater than 0.80 with other variables within the model. However, it has been

solved through assessing the model's consistency by gradually adding various variables. Multicollinearity tends to increase standard error meanwhile keeping the coefficients remain the same, assuming that the model is unbiased. Thus, the model remains consistent.

The results show that the model is consistent, confirming the consistency of green bonds result. Overall it can be seen on the Table 5.2. Additionally, the Wooldridge test for autocorrelation shows that the probability value is less than alpha (0.05), indicating that autocorrelation occurs in the model. Furthermore, the modified Wald test yields less than 0.05 as well, indicating that there is a problem with heteroskedasticity. The two issues are treated with Driscoll-Kraay standard errors. Given that, the Driscoll-Kraay standard errors allow for the adjustment of heteroskedasticity and autocorrelation in regression coefficient estimation. They account for the presence of these problems and provide more robust standard errors, making hypothesis testing and inference more reliable (Hoechle, 2007). After successfully passing various tests to confirm its dependability, the model is to proceed the next stage, which is analysis. Following the completion of these thorough analyses, it is possible to confidently conclude that the model is reliable and acceptable for further investigation. The conclusive outcome of the impact of green bonds on sustainable forest management (SFM) is presented in Table 5.1.

Table 5. 1 The adjusted fixed effect of Driscoll-Kraay standard errors on green bonds over SFM

	Fixed Effect		
	(1)	(2)	(3)
Green Bonds	0.0494***	0.0574***	0.5716***
	(0.0182)	(0.0190)	(0.2081)
Control of corruption			0.0175
			(0.0121)
Political stability			0.0051**
			(0.0019)
Trade	-0.0059	-0.0035	-0.0078
	(0.0044)	(0.0050)	(0.0061)
Inflation	0.0487***	0.0481***	0.0518***
	(0.0120)	(0.0045)	(0.0034)
Manufacturing output	-0.0513***	-0.0526***	-0.0471***
	(0.0142)	(0.0159)	(0.0119)

Agriculture output	-0.1533***	-0.1275***	-0.0930***
	(0.0282)	(0.0181)	(0.0242)
Public expenditure		0.0205	-0.4477
		(0.1483)	(0.3045)
Capital asset ratio		0.0008***	0.0007***
		(0.0002)	(0.0002)
Return on asset		0.0003	0.0002
		(0.0003)	(0.0003)
Constanta	35.4235***	34.9212***	34.8530***
	(0.5568)	(0.9080)	(1.1049)
R-squared	0.2971	0.3337	0.3776
Observation	118	117	117
Countries	22	22	22

Source: Author's calculation

Although the final model (Table 5. 1) has a lower value of R-squared, 0.3776, this does not necessarily imply that the impact is little and negligible, as many researchers believe, or in other words, a low value of R2 simply indicates that the dependent variable is affected by a variety of other factors in addition to the ones considered in the analysis. However, Moksony (1999) refutes this statement, arguing and probing that the coefficient of determination of R-squared is, in essence, a combination of three factors: the impact of the explanatory variable, the degree of variation in this variable, and the size of the spread around the regression line. Thus, a low R-squared value does not imply that the model is not well-fitting and sufficiently accurate.

The table above shows the existence of many significant variables, indicating that multiple additional factors significantly affect the achievement of sustainable forest management (SFM). In other words, the achievement of sustainable forest management (SFM) is influenced by a multitude of determinants beyond the ones highlighted in the table. Green bond is founded to be positively and highly significant in contributing sustainable forest management (SFM) in G20 and D-8 countries. To be more detailed, each one percent rise in green bond causing sustainable forest management (SFM) increases around 0.5716 percent. This finding is consistent with DuPont et al. (2015) research, which found that green bonds are being used successfully for sustainable forest management. Hellmich and Kiesel (2021) also reveal the same correlation in his research on green bonds. In addition, they identified similarities in the level of significance between green bonds and their impact on sustainable

forest management, bioenergy generation, and sustainable agriculture. Furthermore, green bonds have the potential to be a strong instrument for land conservation organizations seeking funding. Debt is regularly utilized to assist land management and other conservation efforts in land conservation. In other words, the green bonds issued by both G20 and D-8 countries have effectively accomplished their intended use of proceeds objective. From an analysis of the allocation of green bond proceeds, it becomes evident that land use and forest conservation rank as the third most allocated project, following renewable energy and clean transportation (World Bank, 2014). This implies that the impact of green bonds on forest management can be observed more swiftly compared to other sectors that benefit from the use of proceeds, such as resilient infrastructure and efficient water management. In essence, the allocation of green bond funds towards land use and forest conservation enables a faster realization of positive outcomes in terms of forest management.

Besides, there exists a positive correlation between political stability and sustainable forest management, which is quite surprising considering the definition of political stability in this context. The term "political stability" here refers to the assessment of perceptions regarding the probability of political instability and/or politically-driven violence, including acts of terrorism. So the phrase political stability appears to be political instability in this study. The study reveals that an increase of 0.0051 percent in sustainable forest management (SFM) is induced by the increasing in political stability. This contradicts the finding of Fenetahun et al. (2021) and Pulhin & Dressler (2009) that believe political stability may harm the forest management and land conservation, since it political stability breeds uncertainty and restriction which degrades land conservation and forest management like through agricultural expansion and road building. However, Galinato & Galinato (2013) support this study that political stability have positive link to sustainable forest management. The reason for this is that if the current government is deposed, current government projects, especially those that may harm forest management, are likely to be stopped. Moreover, another potential reason is during moments of political instability, governments and stakeholders might recognize the need to emphasize natural resource conservation and sustainable practices in order to maintain social stability and protect future resources. This increased commitment and awareness to sustainable forest management (SFM) may stem from a desire to reduce conflicts caused by resource depletion or to obtain international support and collaboration during times of political vulnerability.

Additionally, inflation strongly demonstrates the connection with sustainable forest management (SFM). Forest management can be improved by 0.0518 percent for every one percent of inflation that occurred in G20 and D-8 nations. As inflation increases, it typically indicates a higher amount of money circulating within society or an expansion of the money supply. Consequently, this situation can create opportunities for investments in sustainable forest management and contribute to the enhancement of forest management performance. This result almost in line with Taheripour et al. (2019), his study reveal that inflation happened due to limited stock of palm oil could help to reduce deforestation, which consequently, it improves the sustainable forest management (SFM). However, there is prior study that find the opposite result, such as Mujahid and Minhaj (2020), which believe inflation is associated to deforestation in a favourable way.

In contrast, manufacturing and agricultural output might damage the condition of sustainable forest management (SFM). The losses in forest management induced by manufacturing and agricultural production activities are around -0.0471 and -0.0930, respectively. According to the model, both have a strong relationship, with a 1 percent significant level, to the dependent variable, sustainable forest management (SFM). It is to be expected that agriculture, being the largest land use, occupying more than a third of the Earth's land surface, would contribute to the decline in forested areas due to its expansion (Dudley and Alexander, 2017). Similarly, manufacturing activities necessitate significant land space for constructing facilities, thereby posing a threat to sustainable forests. Moreover, the environmentally unfriendly waste generated by manufacturing processes within its output such as timber, pulp and others (Aswicahyono and Wicaksono, 2010) can also cause harm to forested regions.

Other than that, developing sustainable forest management within G20 and D-8 countries has been positively and significantly impacted by capital to total assets. More specifically, for every one increase in capital assets, sustainable forest management may improve by roughly 0.0007 percent. Despite the fact that the number is small, it is a solid evidence that financial bank performance, which few people are aware of, also plays a part in forest management. It is unusual for banks with larger capitalization to be seen as safer, more conservative, and less hazardous than firms with lower capital ratios (Dietrich et al., 2011). Conservative banks are more risk-averse, including in terms of environmental, social, and governance issues. The majority of G20 countries, which are mostly developed countries, have

strong financial institutions, which lowers impediments to allocating projects to forest management. So that the bank parties can influence improvisational sustainable forest management with their capital possessed.

Table 5. 2 The estimate on the impact of green bond

	OLS			Fixed Effect			Random Effect		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Green Bonds	-1.3806	-1.9450*	-0.6123	0.0495**	0.0574***	0.0572***	0.0499***	0.0573***	0.0568***
	(0.9790)	(1.0184)	(0.9805)	(0.0199)	(0.0210)	(0.0208)	(0.0199)	(0.0208)	(0.0209)
Control of			-0.4787***			0.0175**			0.0173**
corruption			(0.1250)			(0.0089)			(0.0090)
Political stability			0.6827***			0.0051			0.0053
			(0.1278)			(0.0043)			(0.0044)
Trade	-0.0460	-0.1322*	-0.0872	-0.0060	-0.0035	-0.0079	-0.0057	-0.0029	-0.0071
	(0.0735)	(0.0753)	(0.0683)	(0.0067)	(0.0077)	(0.0078)	(0.0067)	(0.0076)	(0.0079)
Inflation	-0.3465	-0.7222	0.0936	0.0487***	0.0482***	0.0519***	0.0482***	0.0477***	0.0513***
	(0.5693)	(0.5620)	(0.5455)	(0.0167)	(0.0163)	(0.0161)	(0.0167)	(0.0162)	(0.0162)
Manufacturing	1.2327***	1.4824***	1.2861***	-0.0513	-0.0526	-0.0471	-0.0491	-0.0497	-0.0437
output	(0.2668)	(0.2721)	(0.2601)	(0.0335)	(0.0346)	(0.0340)	(0.0334)	(0.0342)	(0.0342)
Agriculture output	-0.7121	-0.7650	0.0382	-0.1534***	-0.1275**	-0.0931*	-0.1569***	-0.1324***	-0.0991*
	(0.3638)	(0.4850)	(0.4839)	(0.0487)	(0.0513)	(0.0527)	(0.0485)	((0.0506)	(0.0529)
Public		-2.0731	4.2370		0.0205	-0.4477		0.0741	-0.3830
expenditure		(8.7199)	(7.9110)		(0.5623)	(0.5858)		(0.5544)	(0.5886)
Capital asset ratio		-0.0734***	-0.0628***		0.0008**	0.0007**		0.0008***	0.0007**
		(0.0214)	(0.0193)		(0.0003)	(0.0003)		(0.0003)	(0.0003)
Return on asset		-0.0323	-0.0148		0.0003	0.0002		0.0003	0.0002
		(0.0271)	(0.0267)		(0.0006)	(0.0005)		(0.0005)	(0.0005)
Constanta	52.1772**	84.8580**	27.7752	35.4236***	34.9212***	34.8531***	32.7158***	31.9360***	31.8935***
	(23.2177)	(37.2866)	(35.3350)	(0.8296)	(1.9805)	(1.9375)	(4.3370)	(4.8337)	(4.5098)
R-squared	0.1883	0.2798	0.4327	0.2971	0.3337	0.3776	0.2970	0.3336	0.3774
Observation	118	117	117	118	117	117	118	117	117
Countries				22	22	22	22	22	22
LM test	-	-	1.000	-	-	-	-	-	-
Hausman test	-	-	-	-	-	-	-	-	rejected

Source: Author's calculation

5. 2 Green Bonds in Cutting Carbon Emissions in G20 and D-8 Countries

This particular section serves as validation for the impact of green bonds on the sustainable management of forests in G20 and D-8 areas. To assess their actual contribution, the success of green bonds in achieving sustainable forest management is evaluated using carbon intensity as a parameter. Consequently, as forest management expands or improves, the amount of carbon emissions that can be absorbed will also rise. According to the results of the Hausman test, the fixed effect model is identified as the most suitable and reliable choice for analysis. This conclusion is drawn because the model fails to satisfy the asymptotic assumption of Hausman test, further affirming the superiority of the fixed effect model for the analytical purposes at hand. Hence, the following model is depicted.

$$CO_{2it} = \alpha + \beta_1 GB_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + v_i + u_{it} \quad (5.\ 2)$$

Similar to the initial model on green bonds over forest management, this model encounters the simultaneous presence of autocorrelation and heteroscedasticity. Consequently, to mitigate these issues, the Driscoll-Kraay standard errors were employed to address the problem effectively. By utilizing this approach, the autocorrelation and heteroscedasticity concerns in the model were appropriately handled**.** Table 5. 3 displays the corrected fixed effect with Driscoll-Kraay standard errors on green bonds over carbon emissions, while Table 5. 4 displays the estimated overall regression on green bonds over sustainable forest management.

Table 5. 3 The adjusted fixed effect of Driscoll-Kraay standard errors on green bonds over emissions

	Fixed Effect		
	(1)	(2)	(3)
Green Bonds	-0.0184***	-0.0159***	-0.0161***
	(0.0048)	(0.0053)	(0.0055)
Control of corruption			0.0036***
			(0.0011)
Political stability			0.0014***

			(0.004)
Trade	0.0007	-0.0025*	-0.0035***
	(0.0023)	(0.0005)	(0.0006)
Inflation	0.0063	0.0078*	0.0086*
	(0.0039)	(0.0044)	(0.0044)
Manufacturing output	-0.0021	-0.0120***	-0.0108**
	(0.0046)	(0.0039)	(0.0043)
Agriculture output	-0.0407***	-0.0209	-0.0134**
	(0.0061)	(0.0023)	(0.0050)
Public expenditure		-0.4893	-0.5933***
		(0.1192)	(0.1139)
Capital asset ratio		-0.0000	-0.0000
		(0.0000)	(0.0000)
Return on asset		0.0000	-0.0000
		(0.0001)	(0.0001)
Constanta	20.7570***	22.3020***	22.2898***
	(0.2058)	(0.3447)	(0.2543)
R-squared	0.1546	0.2575	0.2896
Observation	118	117	117
Countries	22	22	22

Source: Author's calculation

This model (Table 5. 4) shows the same finding on low R-squared like previous model on green bonds (Table 5. 1) , again this does not necessarily imply that the impact is little and negligible, as many researchers believe. According to Moksony (1999) he proves that the R-squared is a mix of three factors, such as the size of the spread around the regression line, the impact of the explanatory variable, and the degree of variation in this variable. Hence, a low R-squared value does not imply that the model is not well-fitting and sufficiently accurate.

Numerous significant variables are present in the table examining the impact of green bonds on carbon emissions, which suggests that a number of other determinants also have a substantial impact on carbon intensity. In other words, the factors listed in the table above, there are many other factors that affect the production of carbon emissions. According to the study, green bonds have a negative and significant impact on reducing carbon emissions in G20 and D-8 nations. To be more precise, every one percent increase in green bonds results in a -0.0161 percent reduction in carbon emissions. Even though the contribution is still quite low, this demonstrates the success of the application green bonds within G20 and D-8 countries. The findings align with the earlier model examining the impact of green bonds on

sustainable forest management (SFM). They affirm that green bonds have the potential to direct funds towards carbon offset initiatives, with afforestation, reforestation projects or forest management. These endeavours play a vital role in absorbing carbon dioxide from the atmosphere, effectively counterbalancing emissions and contributing to the overall reduction of carbon emissions.

Furthermore, control of corruption strongly illustrates the link with carbon emissions. Carbon emissions can be improved by 0.0036 percent for every one percent of corruption control achieved in G20 and D-8 nations. Masron and Subramaniam (2018) display that pollution levels are higher in countries with a higher level of corruption, negating the benefit of income on environmental preservation. In addition to that, the allocation of fund for reduction and environmental project can be embezzled into private pockets. Especially if corruption control is accompanied by a lack of political stability. Where within this study political stability has had a positive and significant effect on the development of carbon intensity among the G20 and D-8 countries. More specifically, each increase in political stability may elevate carbon emissions by about 0.0014 percent. Political instability and corruption lead to the bending or non-compliance of rules requiring the implementation of environmental standards (Sofuoğlu and Ay, 2020). Hence, it stands to reason that current carbon emissions will thicken.

Besides, the model of the green bonds' role on carbon emissions reveals the positive link between carbon emissions and inflation. Carbon emissions can be increased by 0.0086 percent for every one percent increase in inflation in G20 and D-8 countries. As mentioned by Xu et al. (2023) in their paper on "Trade-off between environment and economy: The relationship between carbon and inflation" that inflation frequently stimulates economic activity and consumer expenditure. Individuals and organizations may select cheaper, less environmentally friendly products and services that contribute to higher carbon emissions as purchasing power declines. Furthermore, inflation may raise production expenses, resulting in price increases for energy sources and raw materials. This can discourage investments in cleaner technologies while incentivizing the use of less expensive, more carbon-intensive alternatives (Musarat et al., 2021).

Other than that, the rest of macroeconomic activities in this model have a negative association with carbon emissions. These include trade openness, manufacturing, agriculture,

and public expenditure. It implies that for every one percent increase in these variables, carbon emissions may reduce by around -0.0035, -0.0108, -0.0134, and -0.5933 percent, respectively. This support the findings of Fang et al. (2020); Aleksandra et al. (2021); and Nisa' (2022). Additionally, trade openness, manufacturing, agriculture, and public expenditure play significant roles in reducing carbon emissions. Trade openness facilitates access to global markets and the adoption of sustainable technologies, leading to cleaner production methods and the importation of low-carbon products (Nisa' an Sunni, 2023). Manufacturing industries can invest in energy-efficient technologies, while the agricultural sector can implement sustainable farming practices, both contributing to lower greenhouse gas emissions. Moreover, directing public expenditure towards environmentally friendly initiatives, such as renewable energy projects and sustainable forest management, further aids in cutting carbon emissions (Aleksandra et al., 2021). By leveraging these factors, countries can make substantial progress towards a low-carbon economy and contribute to global sustainability efforts. This becomes positive sign, because macroeconomic activities can assist domestic economic growth without impeding attempts to reduce carbon intensity. Thus, countries may focus on improving economic growth while also attempting to reduce carbon emission.

Finally, the empirical research findings provide evidence of the correlation between green bonds, Islamic financing, and sustainable forest management. The role of green bonds is proven to have a positive and highly significant impact on achieving sustainable forest management in both G20 and D-8 countries. This is further supported by the results of the regression analysis, which show that green bonds also contribute to the reduction of carbon emissions. Other factors such as macroeconomics and political matters were found to be linked with sustainable forest management and carbon emissions. However, the return on assets of the bank was not found to be significant in any models, while capital assets were significant in the green bonds on sustainable forest management model. In conclusion, the variables considered in this study have significant contributions to the sustainability of forest management, emphasizing the importance of financial instruments such as as green bonds in promoting sustainable forest management practices.

Table 5. 4 The Estimates on the impact of the green bond in cutting carbon emissions

	OLS			Fixed Effect			Random Effect		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Green Bonds	0.1511	0.1749*	0.1341	-0.0185***	-0.0159***	-0.0162***	-0.0182***	-0.0160***	-0.0162***
	(0.0939)	(0.1018)	(0.1092)	(0.0059)	(0.0061)	(0.0061)	(0.0058)	(0.0059)	(0.0058)
Control of corruption			0.0147			0.0037			0.0036
			(0.0139)			(0.0026)			(0.0025)
Political stability			-0.0223			0.0015			0.0014
			(0.0142)			(0.0013)			(0.0012)
Trade	-0.0280***	-0.0242***	-0.0256***	0.0007	-0.0026	-0.0035	0.0004	-0.0026	-0.0035
	(0.0070)	(0.0075)	(0.0076)	(0.0020)	(0.0022)	(0.0023)	(0.0019)	(0.0021)	(0.0022)
Inflation	-0.0163	-0.0239	-0.0522	0.0064	0.0079*	0.0086*	0.0065	0.0078*	0.0086*
	(0.0546)	(0.0562)	(0.0608)	(0.0049)	(0.0047)	(0.0047)	(0.0049)	(0.0046)	(0.0045)
Manufacturing output	0.0024	-0.0022	0.0033	-0.0021	-0.0121	-0.0109	-0.0020	-0.0116	-0.0105
	(0.0256)	(0.0272)	(0.0290)	(0.0099)	(0.0100)	(0.0099)	(0.0097)	(0.0097)	(0.0095)
Agriculture output	0.0571	0.0854*	0.0575	-0.0408***	-0.0209	-0.0135	-0.0390***	-0.0224	-0.0149
	(0.0349)	(0.0485)	(0.0539)	(0.0143)	(0.0148)	(0.0154)	(0.0138)	(0.0139)	(0.0144)
Public expenditure		0.8888	0.6779		-0.4893***	-0.5934***		-0.4705***	-0.5750***
		(0.8719)	(0.8810)		(0.1622)	(0.1710)		(0.1537)	(0.1611)
Capital asset ratio		0.0006	0.0003		-0.0000	-0.0000		-0.0000	-0.0000
		(0.0021)	(0.0021)		(0.0001)	(0.0001)		(0.0001)	(0.0001)
Return on asset		0.0045*	0.0038		0.0000	-0.0000		0.0000	-0.0000
		(0.0027)	(0.0030)		(0.0002)	(0.0002)		(0.0002)	(0.0002)
Constanta	18.2714***	14.4265***	16.3416***	20.7571***	22.3020***	22.2899***	20.6421***	22.0702***	22.0770***
	(2.2262)	(3.7283)	(3.9351)	(0.2443)	(0.5711)	(0.5655)	(0.4438)	(0.6558)	(0.6650)
R-squared	0.2162	0.2271	0.2448	0.1546	0.2575	0.2896	0.1542	0.2573	0.2894
Observation	118	117	117	118	117	117	118	117	117
Countries				22	22	22	22	22	22
LM test	-	-	1.000	-	-	-	-	-	-
Hausman test	-	-	-	-	-	-	-	-	rejected

Source: Author's calculation

CHAPTER 6

RESEARCH FINDINGS ON ISLAMIC FINANCING

This part discusses the study findings from the regression process, highlighting the significance of Islamic financing in attaining sustainable forest management in D-8 countries. Additionally, this part would concentrate on the impact of Islamic financing on the spread of carbon emissions in D-8 countries as well. The analysis of the statistic relationships is structured and estimated by using the unbalanced panel regression. Furthermore, this section will also disclose the panel data regression model that was utilized in each subsection. As support and enrichment for the discussion, additional variables that could have an impact on the study, such as macroeconomic activity, financial bank performance, and politics, will also be explored.

6. 1 Islamic Financing on Sustainable Forest Management in D-8 Countries

This subsection explores at how Islamic funding provided by Islamic banking has affected the development of sustainable forest management in Muslim nations, which in this study are represented by the developing-eight countries (D-8) group. This financing is typically distributed to entrepreneurship in small and medium level. The findings of the Lagrange Multiplier test indicate that the random effect model is the optimal choice. However, when the results are cross-verified using the Hausman test, similar to previous findings, the test rejects the model due to issues with the asymptotic assumptions. Consequently, indicating that the fixed effect model is the most suitable option for the analysis. Moreover, due to the inclusion of a dummy variable for the D-8 countries in the model specification, the fixed effect results reveal the presence of omitted variables. If this model is selected, it may introduce bias in the analysis (Collot & Hemauer, 2021). The occurrence of omitted variables is primarily attributed to the high collinearity between the dummy variable and the individual effects in the fixed effect model, indicating a lack of substantial variation between countries. To mitigate this bias, the Ordinary Least Squares (OLS) approach was chosen as an alternative method. By opting for OLS, the potential bias caused by omitted variables can be avoided. The ultimate model is displayed below.

$$FOM_{it} = \alpha + \beta_1 ISF_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + \beta_9 D_{1it} + u_{it} \quad (6.\ 1)$$

Upon thorough examination, it has been determined that this model is unaffected by autocorrelation and heteroscedasticity issues. The F-statistic surpasses the significance level (alpha), indicating the absence of these aforementioned problems in the model. Furthermore, to ensure the model's consistency and address any concerns regarding multicollinearity, variables were incrementally added and their impact was carefully assessed, confirming the model's stability and reliability. Table 6. 1 shows the whole regression of the model on Islamic financing towards sustainable forest management, including the estimation of the OLS result.

Based on the Ordinary Least Squares (OLS) results, it is evident that Islamic financing has a detrimental impact on sustainable forest management. This implies that an increase in Islamic finance would negatively affect existing forest management. This outcome is disheartening and goes against the expectations derived from the theory. The theory suggests that Islamic financing, being rooted in its own principles, is more environmentally conscious compared to conventional financing. However, the finding reveals that the increase in Islamic financing transactions in developing eight nations accounts for the -3.2199 percent reduction in sustainable forest management. The findings are consistent with what Aksak and Asutay (2015) wrote in their article, that Islamic financing provided by Islamic financial institutions has not entirely adhered of the fundamental principles upon which it is based. Hence, the realized results diverge from the anticipated goals. Furthermore, the contribution of Islamic banking to economic development is rather ambiguous, as Islamic banking prefer short-term financing, which yields a significantly higher return as the maturity of their financing, such as the real estate market rather than financing agriculture and industry using profit-loss sharing schemes. Additionally, to suit the needs of the real estate business, occasionally puts at risk the viability of sustainable forest management (Asutay, 2012). In sum, the results of this study demonstrate that the implementation of Islamic financing in D-8 countries is not yet optimal. Since the fact that many Islamic banking institutions face a dilemma between adhering to their ideals and the need to generate profits to cover their operational costs. This dilemma may hinder the full realization of Islamic financing principles, which prioritize ethical considerations and sustainability alongside financial viability.

Furthermore, sustainable forest management and political stability are positively correlated. It is highly unexpected, much like the earlier outcome. Since in this study, greater political stability equals greater political instability. The study finds that rising political stability generates a 0.9522 percent rise in sustainable forest management (SFM). The findings are similar to the previous results on the entire sample of G20 and D-8 countries (model 5. 1) and the coefficient denotes much higher. Additionally, within the Islamic financing model, trade openness amply supports the connection with sustainable forest management (SFM). For each percent of trade openness experienced by D-8 countries, forest management might be improved by 0.1584 percent. The findings supported Nathaniel and Bekun (2020) result. Trade openness gives countries that comply with sustainable forest management more access to international markets, allowing them to sell forest goods and services. Due to the growing market demand, there are economic incentives to maintain and improve sustainable forest management (Ruiz-Pérez et al., 2004). Trade openness also allows countries to share technology, skills, and knowledge, allowing them to learn from one another and improve their own forest management practices. Furthermore, trade openness encourages foreign direct investment in the forestry sector, giving financial resources for projects to promote sustainable forest management. International investors are more likely to invest in nations with strong forest management practices, motivated by sustainability criteria and market preferences (Laaksonen-Craig, 2004). This relationship between trade openness and sustainable forest management demonstrates that forest management in the D-8 countries is pretty great.

Conversely, public expenditure displays a negative association with sustainable forest management (SFM). This means that a one percent increase in government spending or public expenditure may lead to a deterioration of existing sustainable forest management. To elaborate further, for every -5.8021 percent increase in deforestation. Since the allocation of public expenditure do not prioritize to project or sector that support sustainable forest management. If the budget is allocated toward activities such as infrastructure development, industrial expansion, or agriculture without adequate environmental safeguards, it can result in deforestation, ecosystem degradation, and a deterioration in sustainable forest management. Combes et al. (2018) and Abid (2017) also find the same evidence that higher levels of government spending are more likely to be devoted to deforestation-related activities, creating a case for an environment development trade-off. Moreover, given that D-8 countries consist of developing countries, the allocation might be to fill other pressing issues within their

countries such as poverty alleviation, education or healthcare, rather than focusing on forest project. Thus, forest management receives limited resources, impeding its progress.

The advancement of sustainable forest management within D-8 countries can be seen from the dummy variable of D-8 countries. According to the study, the D-8 countries still have poorer forest management than the G20 countries did. The approximate difference is for about -19.2827 percent. Again, this might be because the D-8 countries comprise primarily developing nations with limited financial resources, technological capabilities, and institutional competencies (Schaffner, 2014). In addition, they have different policy priorities, with a higher emphasis on economic development, poverty reduction, and fulfilling basic necessities. These issues may hinder the application and advancement of sustainable forest management processes within their respective countries.

Table 6. 1 The Estimate on the Impact of Islamic Financing

	OLS			Fixed Effect			Random Effect		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Islamic Financing	-4.0581***	-0.9659	-3.2199***	-0.7483***	-0.7100**	-0.7220***	-4.0581***	-0.9659	-3.2199***
	(0.8234)	(1.2093)	(0.5551)	(0.1951)	(0.2092)	(0.1932)	(0.8234)	(1.2093)	(0.5551)
Control of corruption			-0.0047			-0.0331**			-0.0047
			(0.0734)			(0.0137)			(0.0734)
Political stability			0.9522***			0.0446**			0.9522***
			(0.0669)			(0.0188)			(0.0669)
Trade	0.4057***	0.6362***	0.1584***	0.0216**	0.0213*	0.0090	0.4057***	0.6362***	0.1584***
	(0.0457)	(0.0694)	(0.0497)	(0.0108)	(0.0115)	(0.0114)	(0.0457)	(0.0694)	(0.0497)
Inflation	-0.5244**	-0.5690***	-0.0763	-0.0086	0.0017	0.0100	-0.5244**	-0.5690***	-0.0763
	(0.2088)	(0.1837)	(0.0911)	(0.0140)	(0.0171)	(0.0160)	(0.2088)	(0.1837)	(0.0911)
Manufacturing output	1.5219***	0.3109	-0.0793	0.0790*	0.0702	0.0300	1.5219***	0.3109	-0.0793
	(0.4252)	(0.5453)	(0.2483)	(0.0444)	(0.0486)	(0.0468)	(0.4252)	(0.5453)	(0.2483)
Agriculture output	0.0640	1.5299***	-0.0108	-0.1559**	-0.1201	-0.0985	0.0640	1.5299***	-0.0108
	(0.4047)	(0.4457)	(0.2287)	(0.0749)	(0.0765)	(0.0710)	(0.4047)	(0.4457)	(0.2287)
Public expenditure		-22.1220***	-5.8021**		0.9694	0.8351		-22.1220***	-5.8021**
		(5.9227)	(2.8509)		(0.8352)	(0.7784)		(5.9227)	(2.8509)
Capital asset ratio		-0.0429***	-0.0072		-0.0014	-0.0006		-0.0429***	-0.0072
		(0.0159)	(0.0075)		(0.0010)	(0.0009)		(0.0159)	(0.0075)
Return on asset		-0.0504	-0.0014		0.0005	0.0018		-0.0504*	-0.0014
		(0.0304)	(0.0138)		(0.0019)	(0.0018)		(0.0304)	(0.0138)
D-8 countries	-15.8880***	-33.4366***	-19.2827***	0.0000	0.0000	0.0000	-15.8880***	-33.4366***	-19.2827***
	(3.1150)	(5.7285)	(2.8416)	(.)	(.)	(.)	(3.1150)	(5.7285)	(2.8416)
Constanta	33.8099**	67.9009***	62.3432***	34.8206***	31.8664***	33.2552***	33.8099**	67.9009***	62.3432***
	(14.0652)	(19.2482)	(8.5331)	(2.5476)	(3.6001)	(3.4624)	(14.0652)	(19.2482)	(8.5331)
R-squared	0.8664	0.9145	0.9845	0.4079	0.4608	0.5657	0.2242	0.0349	0.1410
Observation	58	58	58	58	58	58	118	117	117
Countries				7	7	7	22	22	22
LM test	-	-	1.000	-	-	-	-	-	-
Hausman test	-	-	-	-	-	-	-	-	rejected

Source: Author's calculation

6. 2 Islamic Financing towards Carbon Emission in D-8 Countries

The model's primary emphasis is on determining the impact of Islamic financing provided by Islamic banking institutions in D-8 countries on carbon emissions. The correlation is on entrepreneurial activities that receive funding from Islamic banking, sometimes they may induce or decrease carbon emission. This subsection also verifies the prior result on Islamic finance for sustainable forest management, whether this result support the previous result on sustainable forest management (SFM) or not. According to the Hausman test results, the fixed effect model is the most suitable and accurate choice for analysis. Yet the presence of omitted variables, which can introduce bias in the model, OLS (Ordinary Least Squares) can serve as an alternative method to appropriately address this issue. By employing OLS, the model can be adjusted in a manner that mitigates the potential bias caused by the omitted variables. The model is as follows.

$$CO_{2it} = \alpha + \beta_1 ISF_{it} + \beta_2 TRADE_{it} + \beta_3 CPI_{it} + \beta_4 AGR_{it} + \beta_5 MNF_{it} + \beta_6 PE_{it} + \beta_7 CA_{it} + \beta_8 ROA_{it} + \beta_7 COC_{it} + \beta_8 PS_{it} + \beta_9 D_{1it} + u_{it} \quad (6.\ 2)$$

The results of the Breusch-Pagan test show a probability of 0.565, indicating the absence of heteroskedasticity within the model. Similarly, regarding autocorrelation, the probability is higher than the significance level (alpha), suggesting that the model is not affected by autocorrelation issues. In essence, the model exhibits robustness and is well-suited for analysis. The entire regression of the model on how Islamic financing affects carbon emissions is presented in Table 6. 2

Table 6. 2 The Estimates on the impact of the green bond in cutting carbon emissions

	OLS			Fixed Effect			Random Effect		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Islamic Financing	0.3156***	0.2012***	0.1191***	0.2027***	0.2020***	0.2061***	0.3156***	0.2012***	0.1191***
	(0.0397)	(0.0610)	(0.0372)	(0.0341)	(0.0352)	(0.0355)	(0.0397)	(0.0610)	(0.0372)
Control of corruption			-0.0147***			-0.0003			-0.0147***
			(0.0049)			(0.0025)			(0.0049)
Political stability			0.0439***			-0.0044			0.0439***
			(0.0045)			(0.0035)			(0.0045)
Trade	0.0098***	0.0105***	-0.0062*	0.0031	0.0036*	0.0037*	0.0098***	0.0105***	-0.0062*
	(0.0022)	(0.0035)	(0.0033)	(0.0019)	(0.0019)	(0.0021)	(0.0022)	(0.0035)	(0.0033)
Inflation	0.0178*	0.0088	0.0250***	-0.0038	-0.0017	-0.0023	0.0178*	0.0088	0.0250***
	(0.0101)	(0.0093)	(0.0061)	(0.0024)	(0.0029)	(0.0029)	(0.0101)	(0.0093)	(0.0061)
Manufacturing output	-0.0996***	-0.0553**	-0.0860***	0.0051	-0.0005	0.0002	-0.0996***	-0.0553**	-0.0860***
	(0.0205)	(0.0275)	(0.0166)	(0.0078)	(0.0082)	(0.0086)	(0.0205)	(0.0275)	(0.0166)
Agriculture output	0.0618***	0.0990***	0.0200	-0.0508***	-0.0416***	-0.0440***	0.0618***	0.0990***	0.0200
	(0.0195)	(0.0225)	(0.0153)	(0.0131)	(0.0129)	(0.0130)	(0.0195)	(0.0225)	(0.0153)
Public expenditure		0.2794	1.0867***		0.2260	0.2077		0.2794	1.0867***
		(0.2987)	(0.1910)		(0.1406)	(0.1430)		(0.2987)	(0.1910)
Capital asset ratio		-0.0019**	0.0000		-0.0002	-0.0002		-0.0019**	0.0000
		(0.0008)	(0.0005)		(0.0002)	(0.0002)		(0.0008)	(0.0005)
Return on asset		-0.0032**	-0.0007		-0.0003	-0.0003		-0.0032**	-0.0007
		(0.0015)	(0.0009)		(0.0003)	(0.0003)		(0.0015)	(0.0009)
D-8 Countries	-1.5420***	-1.6494***	-1.2161***	0.0000	0.0000	0.0000	-1.5420***	-1.6494***	-1.2161***
	(0.1502)	(0.2889)	(0.1903)	(.)	(.)	(.)	(0.1502)	(0.2889)	(0.1903)
Constanta	17.5337***	17.5686***	17.6432***	17.8296***	17.3127***	17.4346***	17.5337***	17.5686***	17.6432***
	(0.6783)	(0.9709)	(0.5715)	(0.4452)	(0.6060)	(0.6362)	(0.6783)	(0.9709)	(0.5715)
R-squared	0.7769	0.8439	0.9501	0.6741	0.7247	0.7358	0.0154	0.1111	0.1062
Observation	118	117	117	58	58	58	58	58	58
Countries				7	7	7	7	7	7
LM test	-	-	1.000	-	-	-	-	-	-
Hausman test	-	-	-	-	-	-	-	-	rejected

Source: Author's calculation

According to the Ordinary Least Squares (OLS) analysis, it is evident that Islamic financing has a positive influence on carbon emissions, indicating that an increase in Islamic financing will likely result in higher carbon emissions in D-8 countries. As stated in previous findings on Islamic financing of sustainable forest management models, this finding contradicts existing Islamic financing theories. However, this result cannot be disregarded as it stems from empirical research, which describes the actual situation observed in the research context. To be more specific, the rise in Islamic financing in the eight developing countries contributed approximately 0.1191 percent to an increase in carbon emissions. This confirms the previous finding on the impact of Islamic financing towards sustainable forest management that indicates a negative correlation. Within this model of Islamic financing on carbon emissions reveals a positive correlation. It means that Islamic financing in the D-8 countries is still not optimal in applying the principles they hold, including environmental-friendly, because of several challenges that have been mentioned previously. Thus, its contribution to decreasing carbon emissions cannot be achieved yet.

Interestingly, a noteworthy negative correlation is observed between the control of corruption and carbon emissions, which is quite unexpected considering the definition of control of corruption within this context. The term "control of corruption" in this context refers to the perceptions regarding the extent to which public power is utilized for personal benefits, encompassing various forms of corruption, including both minor and major instances, as well as the influence of elites and private interests on state affairs. However, the study reveals that an increase in the control of corruption results in a decrease of -0.0003 percent in carbon emissions. In other words, a higher level of control of corruption corresponds to lower carbon emissions. The result aligns with Galinato and Galinato (2013), which they argue that one possible explanation is that control of corruption induces more technological productivity coupled with clean energy used. Therefore, it would be beneficial for the reduction of carbon emissions. The author believe that sometimes control of corruption may contribute in reducing carbon emissions, but still with under specific conditions, if accompanied by sharing knowledge and clean technology. The corrupt individuals seeking personal profit may invest in advanced technologies that mostly utilize clean energy sources. By doing so, they can enhance their profits while inadvertently reducing carbon emissions. This scenario assumes that corrupt individuals prioritize maximizing profits and recognize the financial benefits associated with clean energy technologies.

While for political stability has had a positive and significant effect on the development of carbon intensity within D-8 countries. More specifically, each increase in political stability may elevate carbon emissions by about 0.0439 percent. Apart from prior explanation in the third model about the link political stability may cause band for implementation of environmental standard. Political stability can lead to increased human mobility as individuals actively engage in political activities. However, this increased mobility often relies on transportation systems that utilize fossil fuels, leading to the production of carbon emissions. This is linear with what Fenetahun et al. (2021) stated in his study.

Additionally, it has been demonstrated that within this model, manufacturing and trade openness have a negative impact on carbon emissions. Demonstrating that an increase in the manufacturing and the trade openness can each result in a -0.0860 and -0.0062 percent reduction in carbon emissions. This suggests that trade and industry in the D-8 countries are already utilizing sustainable energy and technology, allowing these two sectors to reduce carbon emissions in tandem. As previous finding in the third model, the result represents the study of Fang et al. (2020); Aleksandra et al. (2021); and Nisa' (2022) that show trade and manufacturing could cause decarbonization.

Conversely, public expenditure is found to have a highly significant impact on the reduction of carbon emissions. With a contribution of 1.0867 percent, in every one percent increase in public expenditure leads to a notable improvement in carbon emissions. Moreover, this coefficient holds the highest value among all the coefficients in the model, highlighting the crucial role played by public expenditure in managing carbon emissions. This implies that public expenditure in the D-8 countries prioritizes economic development over carbon emission mitigation. Being developing countries with a long history of poverty, their budget allocations are inclined towards economic growth. This also has been agreed by Cheng et al. (2021) study, that increased the budget of government spending did not indicate increased investment in CO2 mitigation. This is due to a lack of government incentives for lowering CO2 emissions. He also notes that local residents may not directly experience the impact of local CO2 emissions in their daily lives, resulting in insufficient pressure on governments to prioritize emissions reduction. This situation differs from developed countries that have addressed numerous environmental challenges (Masron & Subramaniam, 2018), as their governments and societies are more aware of carbon intensity and its consequences.

Dummy variable for the D-8 countries yields an unanticipated finding. where prior research shows that forest management is less advanced than in G20 nations. However, in this model, it demonstrates that the D-8 countries have around 1.216% fewer carbon emissions than the G20. In other words, despite with poor forest management, they can still mantain their carbon emission performance. Moreover, there could be several factors contributing to the D-8 countries having lower carbon emissions compared to the G20 countries. One possible factor is the difference in industrial structure and economic activities. The D-8 countries may have a smaller industrial base and less energy-intensive sectors compared to the G20 countries, resulting in lower carbon emissions. Like evidence that has been revealed by Friedrich et al. (2023) that China, United States and India are among the top greenhouse gas emitters in the world, along with other G20 countries, highlights their high level of economic productivity and industrial activity. Additionally, the D-8 countries may have a larger share of their economy based on agriculture or services (Quadrelli & Peterson, 2007), which typically have lower carbon emissions compared to manufacturing and heavy industries Moreover, the D-8 countries might have lower energy consumption per capita than G20 countries, which can lead to lower carbon emissions.

Finally, the empirical research findings reveal an unexpected negative correlation between the practice of Islamic financing in D-8 countries and sustainable forest management. This suggests that the current implementation of Islamic financing may not prioritize the sustainability of forests and other environmental aspects as much as desired. Furthermore, the regression analysis indicates that Islamic financing is associated with higher carbon emissions as well. The study also identifies links between sustainable forest management with other factors such as macroeconomics and political matters, while financial bank performance does not show significant influence in any of the models. In conclusion, the variables examined in this study play significant roles in the sustainability of forest management, highlighting the importance of financial instruments like Islamic financing provided by Islamic banks in influencing sustainable forest management practices.

CHAPTER 7
CONCLUSION

In this chapter, it would provide an overview of the research methodologies employed and present the key findings that have been derived from our investigation. The first section summarizes the key results of panel data regression. The second section of this chapter presents policy recommendations for academic purposes, as well as input for the government, forestry councils, and the party that supplying forest finance, in this case, green bonds or climate agent as well as the banks, both conventional and Islamic banking. The research findings presented in this study contribute to the existing literature on sustainable forest management (SFM) within the G20 and D-8 contexts. it provides some insights into the relationship between green bonds, Islamic financing, and SFM, deepening knowledge of this important link. Moreover, these findings provide guidance to G20 and D-8 governments in formulating strategic and decision-making processes on policies focusing on sustainable forest management. The information derived from the study also serves as a material resource for green bond issuers and Islamic banking institutions, aiding them in evaluating and refocusing their use of proceed to achieve enhanced sustainable forest management outcomes. Lastly, the study acknowledges its limitations while offering recommendations for further research on sustainable forest management.

7. 1 Conclusion

This thesis has two focuses of discussions, examining the role of green bonds in achieving sustainable forest management in G20 and d-8 countries as well as investigating the impact of Islamic financing given by Islamic banking toward sustainable forest management in Muslim countries, which here represented by D-8 countries. It employs panel data regression to obtain empirical result on the correlation of green bond and Islamic financing to the existing of sustainable forest management. This thesis comprises a total of four models, two of which have been discussed earlier. The remaining two models serve as confirmatory analyses, employing carbon emissions as a parameter to assess the successful achievement of sustainable forest management through the utilization of green bonds and Islamic financing. These additional models provide further validation and support for the previous findings,

strengthening the understanding of the relationship between carbon emissions, green bonds, and Islamic financing in the context of sustainable forest management.

The model 5. 1 highlights the positive and significant role of green bonds in achieving sustainable forest management in both G20 and D-8 countries. It confirms that green bonds have successfully achieved their intended use of proceeds objective. Surprisingly, there is a positive correlation between political stability and sustainable forest management, which quite surprising given that the phrase of political stability here equals to political instability, suggesting that moments of political instability may emphasize the need for conservation and sustainable practices. Inflation also shows a strong positive connection with sustainable forest management, as it creates opportunities for investments in forest management. However, manufacturing and agriculture can negatively impact sustainable forest management due to land use expansion and environmentally harmful waste. Additionally, capital to total assets has a positive and significant impact on sustainable forest management in developed G20 countries, indicating the influence of strong financial institutions in promoting forest management initiatives.

The model 5. 2 examines the impact of green bonds on carbon emissions in G20 and D-8 countries. The results indicate that green bonds have a negative and significant effect on reducing carbon emissions in these nations. This finding confirms the earlier model that explored the role of green bonds in sustainable forest management. Green bonds allocate funds to carbon offset projects like afforestation and reforestation, which effectively absorb carbon dioxide and contribute to overall emissions reduction. Additionally, political stability and control of corruption are linked to carbon emissions, as they may lead to non-compliance with environmental standards. The model also reveals a positive correlation between carbon emissions and inflation, as lower purchasing power can result in the selection of cheaper, more carbon-intensive products and services. Conversely, macroeconomic activities such as trade openness, manufacturing, agriculture, and public expenditure exhibit a negative association with carbon emissions. This is considered a positive development because macroeconomic activities can support domestic economic growth while simultaneously promoting efforts to reduce carbon intensity. Therefore, countries have the opportunity to prioritize both economic growth and the reduction of carbon emissions.

The model 6. 1 examines the impact of Islamic financing on sustainable forest management in D-8 countries. Surprisingly, the results show that Islamic financing has a detrimental effect on sustainable forest management, indicating that its implementation in D-8 countries is not yet optimal. This may be due to the dilemma faced by Islamic banking institutions, as they balance their ideals with the need for profitability. Additionally, sustainable forest management is positively correlated with political stability, which is an unexpected finding like the prior result. Trade openness has a significant and positive correlation with sustainable forest management. It facilitates the sharing of technology, knowledge, and skills among countries. It also attracts foreign direct investment, providing financial resources for forest management projects. On the other hand, public expenditure displays a negative association with sustainable forest management, as developing D-8 countries allocate resources to other pressing issues such as poverty alleviation, education, and healthcare, limiting the resources available for forest management initiatives. Furthermore, the study reveals that D-8 countries have poorer forest management compared to G20 countries, it might be because limited financial resources, technological capabilities, and institutional competencies. These factors, coupled with different policy priorities, it hinders the advancement of sustainable forest management in D-8 countries.

The model 6. 2 investigates the impact of Islamic financing on carbon emissions in D-8 countries. The results indicate that Islamic financing has a positive effect on carbon emissions, revealing that increased Islamic financing may lead to higher carbon emissions in these countries. This finding confirms the earlier discovery of a negative correlation between Islamic financing and sustainable forest management. Surprisingly, there is a significant negative correlation between control of corruption and carbon emissions, indicating that stronger control of corruption leads to lower carbon emissions. One possible explanation is that corruption control promotes the adoption of clean technologies and increased productivity, resulting in reduced emissions. Political stability has a positive and significant impact on carbon intensity in D-8 countries, as increased political activities lead to higher human mobility and the use of fossil fuel-based transportation, contributing to carbon emissions. Manufacturing and trade openness show a negative relationship with carbon emissions, indicating that these sectors in D-8 countries are adopting sustainable energy and technologies, hence it can reduce emissions. However, public expenditure has a significant positive impact on carbon emissions, this implies that public expenditure in the D-8 countries prioritizes economic development over carbon

emission mitigation. The difference in industrial structure and economic activities between D-8 and G20 countries may also contribute to lower carbon emissions in D-8 countries.

7. 2 Policy Recommendation

This section identifies real actions which could be undertaken to achieve sustainable forest management in G20 and D-8 countries. It focuses on providing policy recommendations for the government of G20 and D-8 area. The policy recommendations are divided into several aspects, on the financing streams (green bonds and Islamic financing), macroeconomics, financial bank performance, political factors examined in this thesis and their relationship to sustainable forest management.

The empirical results on financing streams that consist of green bonds and Islamic financing. From the green bonds, it suggests that the government and especially for International Capital Market Association (ICMA) with Climate Bonds Initiative (CBI), to develop more detailed outline and standards for the use of proceeds from green bonds, ensuring that funds are allocated on significant project that fulfill the established standard to initiatives that promote reforestation, afforestation, and sustainable forest management practices. Given that currently there are only guidelines for the use of proceed green bonds in general, without specifying the exact types of the official use of proceeds agreed by international standards. This lack of specificity in the guidelines leaves room for interpretation and potentially allows issuers to allocate the proceeds to a broader range of projects, which may vary in terms of their environmental impact and sustainability. Therefore, there is a need for more standardized and internationally recognized definitions and criteria for the official use of proceeds for green bonds to ensure transparency and accountability in the market. Addressing this issue would enhance the potential impact of green bonds in improving the environment, including sustainable forest management.

While responds to the result of Islamic financing that negatively associate with sustainable forest management. It suggests that the government of D-8 countries can enact or strengthen regulations that encourage Islamic banks to prioritize environmentally sustainable projects, including those related to forest conservation. These regulations can include guidelines for project financing, mandatory sustainability reporting, and incentives for green financing. By providing clear guidelines and incentives, the government can create a conducive environment for Islamic banks to align their activities with sustainable principles. Besides,

Islamic banks in D-8 areas also can create specialized financial products that specifically cater to environmentally sustainable projects, including those focused on forest conservation. These products can offer attractive returns to investors while adhering to Islamic principles and contributing to long-term environmental sustainability. Moreover, the government can facilitate partnerships and collaboration between Islamic banks, environmental organizations, and forest management agencies. These partnerships can enable the sharing of expertise, resources, and best practices, fostering a supportive ecosystem for sustainable forest management.

The empirical result on macroeconomics factors suggests that the government of G20 and D-8 countries, in collaboration with the forestry council, can take significant actions to address the challenges posed by manufacturing, agriculture, and public expenditure that contribute to the decline of sustainable forest management in both G20 and D-8 countries. Firstly, stricter regulations and standards should be implemented for manufacturing industries to ensure environmentally sustainable practices. This can include mandating the use of clean technologies, promoting energy efficiency, and enforcing proper waste management strategies to minimize the impact on forested areas. Secondly, the government should actively promote sustainable farming practices in the agricultural sector. This can be achieved by providing education, training, and financial incentives to farmers to adopt eco-friendly techniques such as agroforestry, organic farming, and precision agriculture that safeguard against deforestation and protect biodiversity. Additionally, policies should discourage the conversion of forested lands for agriculture and promote responsible land use planning. Lastly, the suggestion for public expenditure which is specifically designed for D-8 countries, due to they are developing countries that have limited allocation for natural conservation. Governments of D-8 countries can prioritize capacity-building programs for forest management agencies and local communities to enhance their knowledge and skills in sustainable forest management. This empowers them to actively engage in conservation efforts and take ownership of forest management. Fostering collaboration among government agencies, civil society organizations, and local communities is crucial to leverage diverse expertise, resources, and community involvement, maximizing the effectiveness of sustainable forest management initiatives. Integrating sustainable forest management into broader development strategies and policies is essential, considering the interconnectedness of poverty alleviation, education, and forest

conservation. This integrated approach allows governments to address multiple development priorities simultaneously.

Moreover, the result from financial bank performance suggests that bank parties of G20 and D-8 countries can proactively allocate a portion of their capital towards financing environmental and forest projects. By actively investing in sustainable initiatives, banks can demonstrate their commitment to environmental stewardship and sustainable practices. They can also develop specialized financial products and services that specifically cater to environmental projects, including those focused on forest conservation. By actively engaging in sustainable forest management and effectively communicating their efforts, banks can not only contribute to environmental conservation but also enhance their reputation and attract more environmentally conscious consumers. This alignment with sustainability can create a positive impact on the banks' image and foster a greater commitment to environmental responsibility within the financial sector.

The result of political matter suggests that society within G20 and D-8 area can play a crucial role in influencing political conditions and maximizing the potential of politics for forest conservation. By raising awareness and advocating for sustainable forest management, individuals and organizations can exert pressure on governments to prioritize environmental issues and make informed policy decisions. This can be achieved through public campaigns, education initiatives, and engagement with policymakers. Additionally, civil society organizations and environmental groups can monitor and report any political activities that may negatively impact forest conservation, serving as monitors and promoting accountability. Moreover, synergy between the government and the society in controlling political conditions are essential. By working together, they can influence political agendas, foster dialogue, and develop consensus-based approaches for sustainable forest management. Engaging in multi-stakeholder platforms and participatory decision-making processes allows for diverse perspectives to be considered and helps build political support for forest conservation.

7. 3 Limitation of the Study

The study conducted in this thesis focuses on examining the role of green bonds and Islamic financing in sustainable forest management within G20 and D-8 countries. It is important to note that the study does not aim to compare these financing sources but rather investigates their individual contributions. Additionally, the study takes into account other

potential determinants that may influence sustainable forest management. However, there are limitations to this research, particularly related to the data obtained. Due to limited data availability on green bonds and Islamic financing, the study utilizes unbalanced panel data, which could potentially affect the regression results. As a result, the findings may not fully represent the overall situation of sustainable forest management in G20 and D-8 countries, nor provide insights into the specific contributions of individual countries within these groups.

Another limitation is that the study's variable for sustainable forest management does not differentiate between productive and non-productive forests. It encompasses both natural and planted tree stands with a minimum height of 5 meters, excluding trees in agricultural systems or urban settings. Consequently, the findings provide a general overview but lack depth in understanding specific types of forests influenced by green bonds and Islamic financing. However, it is outside this thesis framework to go into detail about the types of forests that are influenced by green bonds and Islamic financing. Future research could explore the correlation between these financing sources and specific forest types based on productivity.

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