



**FACULTAD DE CIENCIAS ECONÓMICAS Y ADMINISTRATIVAS**

**“A financial Approach to fight Climate Change: Using Green Bonds to fund Sustainable Investments”**

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**A financial Approach to fight Climate Change:  
Using Green Bonds to fund Sustainable  
Investments**

Thesis submitted for the degree of  
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I affirm that I have independently written the enclosed Bachelor thesis, that I have not used any sources or aids other than those indicated, and that I have marked all passages in the work that have been taken over literally or accordingly.

Ettenheim, 07<sup>th</sup> of May 2020

A handwritten signature in blue ink, appearing to read 'Melanie Schwab', written in a cursive style.

Melanie Schwab

## **I. Abstract**

The present thesis deals with the research topic of how green bonds can be used to fund sustainable investments that fight climate change. A key focus lies on how the green bond market can possibly be improved in order to raise more funds and allow a better response to climate change.

This thesis uses a literature research approach.

This is done by looking at the issue of climate change and the policies and actions to fight it, first. Afterwards, the topic of environmental, social and governance (ESG) investments is treated with a particular focus on environmental investments and the types of financial assets, through which an investment can be made. Green bonds are the key subject of this work. Accordingly, their current situation is addressed by analyzing the variety of existing definitions, the market evolution, characteristics and types of green bonds, and their cost of capital. Attention is paid towards the main actors in the market, their role and what can be done by each type of actor to develop the market of green bonds. Additionally, some recent examples from the global market and the real performance of green bonds in the past years are discussed.

Concluding the most important findings of this work, the major challenges identified in the global green bond market are the following ones: the missing definition and standards, the on average lower return than on conventional bonds, and the fact that green bonds are not focused on investments in the countries most affected by climate change where urgent adaptation measures are required.

To overcome these challenges, it is recommended to establish obligatory standards for green bonds in order to provide security for issuers and investors. The standardization of the market could also provide the opportunity to develop their market in those countries where action is needed most urgently. It is further recommended for issuers and intermediaries to better address the preferences of certain types of investors and direct green bonds towards risk-averse and responsible investors.

Key words: Climate Change, ESG Investments, Green Bonds, Sustainability, Financial markets.

## **II. Acronyms**

ABS – Asset-backed securities

A&R – Adaptation and Resilience

ASEAN – Association of South East Asian Nations

CAPM – Capital Asset Pricing Model

CBI – Climate Bonds Initiative

CSR – Corporate Social Responsibility

ESG – Environmental, social and governance

ESMA – European Securities and Market Authority

EU GBS – European Union Green Bond Standard

ICMA – International Capital Market Association

ICT – Information and communication technology

IPCC – Intergovernmental Panel on Climate Change

ISIN – International Securities Identification Number

GBP – Green Bond Principles

GDP – Gross Domestic Product

GLP – Green Loan Principles

LAC – Latin America and the Caribbean

NGFS – Network for Greening the Financial System

NGO – Non Governmental Organization

PA – Paris Agreement

PRI – Principles for Responsible Investment Association

SDG – Sustainable Development Goals

SEC – Securities and Exchange Commission

SME – Small and middle-sized enterprises

SPO – Second Party Opinion

UNEP FI – United Nations Environment Programme Finance Initiative

UNFCCC – United Nations Framework Convention on Climate Change

YTM – Yield to Maturity

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### **3. Introduction**

The world is facing a global challenge – climate change.

The impact of global warming is already visible in many parts of the world. The changing weather conditions are affecting natural habitats, human living areas, water supply and agriculture. For many regions, the consequences are very severe and worrying.

In order to prevent a further substantial warming of the atmosphere caused by human activity, measures have to be taken on a global level.

The United Nations set up the UN Sustainable Development Goals in 2015 with the aim of accomplishing them by 2030. The 17 goals not only address climate action as a whole (goal 13 “climate action”), but are directed to different areas of life that are partly related to each other. For instance, advances in some other goals, such as “clean water and sanitation” (goal 6), “affordable and clean energy” (goal 7), “industry, innovation and infrastructure” (goal 9), “sustainable cities and communities” (goal 11), “responsible consumption and production” (goal 12), “life below water” (goal 14), “life on land” (goal 15) make it possible to meet the overall objective of Sustainable Development (cf. United Nations, 2020). The accomplishment of these goals can contribute to tackle climate change. With this approach, and along with all the UN countries, it is aimed to transform many areas of life into being socially, economically and environmentally more sustainable on a global scale.

Large investments are required to achieve these goals and transform many parts of the global economy.

At the same time, investors are increasingly interested in investing in projects and companies that commit to social and environmental standards and contribute to sustainable development.

In the past years, the financial sector has been adapting gradually in order to offer the framework for environmental and social investments. For instance, the United Nations Environment Programme Finance Initiative has been established to improve the corporate sustainability of financial institutions in the member states.

To fund projects that address climate change and an overall sustainable development, different instruments are available in the financial market. Generally, instruments of the conventional financial market, such as bonds, can be used to fund

sustainable investments. From the investor's perspective, bonds are a very common fixed-income instrument for debt financing in the financial market due to their foreseeable cash flow.

Recently, "green bonds" have been introduced as a new category of securities. These are essentially bonds which raise funds for projects that contribute to environmental or climate protection. The establishment of a new class of securities provides the opportunity to address particularly investors who wish to contribute with their money to sustainable investments. Besides, it also allows to assess and compare the bonds among each other with respect to their return and environmental impact.

Following this recent development, the present thesis focuses its research topic on the discussion of Green Bonds to fund Sustainable Investments as a financial approach to fight Climate Change.

It will evaluate the extent to which green bonds are able to contribute to tackle climate change, the major problems in the market and possible policy recommendations will be elaborated to overcome these problems.

This thesis uses a literature research approach. Relevant books and academic journal articles from independent authors, books and reports from international governmental and non-governmental organizations, financial data from relevant indices and, to a lesser extent, financial newspaper articles are considered in the analysis.

First, the paramount topic of Climate Change, including its origin, development, and effects is considered. Further, the current policies and actions to fight climate change will be presented.

Looking into the funding of the actions against climate change, ESG investments will be introduced. At first, an overview on the general issue will be given and later, environmental investments will be analyzed as they are relevant to tackle climate change. Regarding these investments, the two main financial types of securities used to fund these investments, including their features and differences, will be studied.

The following section will deal with green bonds as a possible investment category. With respect to the current situation, an overview of the variety of definitions and the associated problems is provided. Then, the evolution of the green bond market is explained. Further, the special characteristics and types of green bonds are shortly presented. This work also examines the cost of capital of green bonds

and the question, whether it generally differs from conventional bonds. Afterwards, different green bonds issues are addressed. The main actors in the market are each briefly introduced. Special attention in this section is paid to the role each of them plays in the market and the improvement potential of each actor in order to further stimulate the market. Following this analysis, the present work will look at three real examples of green bonds, differentiated by their issuance size, use of funds, and geographical location. Furthermore, the real performance of green bonds is analyzed. For this purpose, the distinction of issuance currency and the difference between green bonds and conventional bonds will be considered.

In the final section, the most important findings are summarized together with the identification of the major obstacles for the future enlargement of the green bond market and how these can be possibly overcome. The aim is to identify how the financial sector can better contribute to fight climate change by means of green bonds.

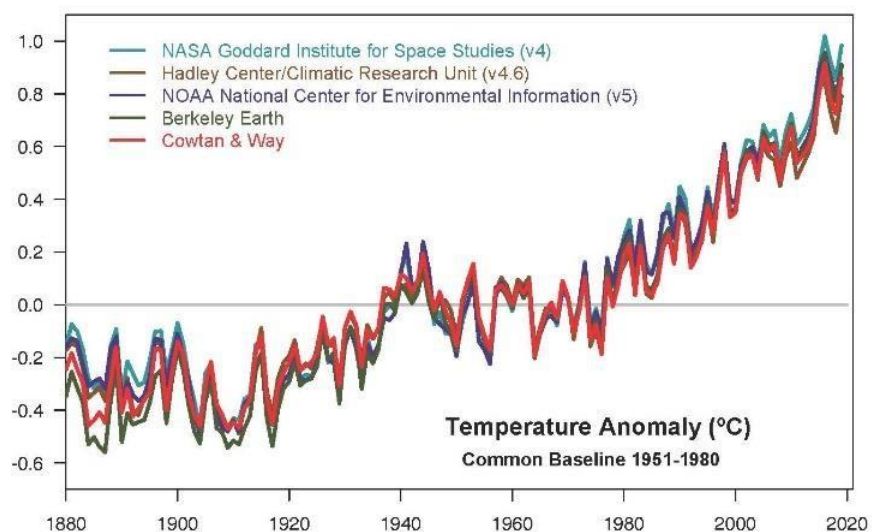
## 4. Climate Change

### 4.1 Overview

Shortly defined, climate change is referred to as a rise of global average temperatures, caused by a rising emission of greenhouse gases (carbon dioxide, methane, nitrous oxide, ozone, etc.) due to human activity which concentrate in the atmosphere, bringing the radiation dynamics out of its previous balance. The increased global temperature consequently leads to changing weather and climate parameters, which transform the natural environment on a global scale (Kromp-Kolb, 2020). In the upcoming section, the progress, effects and actions against climate change will be explained in short.

In order to illustrate the ongoing progress of climate change, the following Figure 1 depicts the variation of global temperature from the baseline of the average temperature between 1951 and 1980. It is easily observable that the temperature in the beginning of the measuring period starting in 1880 is significantly below the later average and, depending on the data source, is estimated to be between 0.08 and 0.58°C below the baseline. Furthermore, the graph illustrates a continuous rise in temperature leading to an average temperature of 1°C above the baseline in 2019. In the past four decades, an enormous rise in temperature is visible that is steadily ongoing, showing a clear upwards tendency.

Figure 1: Temperature Anomaly (°C)



Source:

[https://climate.nasa.gov/system/internal\\_resources/details/original/1987\\_yearly\\_temperature\\_anomalies\\_from\\_1880\\_to\\_2019.jpeg](https://climate.nasa.gov/system/internal_resources/details/original/1987_yearly_temperature_anomalies_from_1880_to_2019.jpeg)

It can be noticed that climate change started with the massive emission of greenhouse gases caused by the industrialization, thus human activities are the primary cause for global warming (Masson-Delmotte, 2018).

Among greenhouse gas emissions, carbon dioxide accounts for the highest share with 74%. 89% of CO<sub>2</sub> emissions are originated in the use of fossil fuels. These are especially used for the generation of electricity and heat, transportation, and manufacturing and consumption. Land-use, its change and forestry are other major contributors and account for 7% of CO<sub>2</sub> emissions, mainly due to deforestation. Methane with 17% and nitrous oxide with 6.2% make up for another significant share of greenhouse gas emissions. They are mainly emitted in agriculture, waste management and gas flaring. Fluorinated gases make up 2% of global greenhouse gas emissions. They are resulting from industrial processes and have a higher global warming potential than carbon dioxide (Ge and Friedrich, 2020).

This profound change in global climate is leading to several effects that have impacts on the lives of millions of people around the world. Among these can be extreme weather conditions such as droughts, storms and heavy rains, or the loss of coral reefs and glaciers. The loss of the latter is leading to a rising sea level which itself causes the loss of coastal areas (Fischler, 2020).

The global economy still relies mainly on energy produced by fossil fuels. The ongoing economic growth, especially in developing countries, and global population growth require a rising future demand of energy and multiple other resources. Recent human activities to get access to these resources such as deforestation further accelerate climate change. Scientists estimate an ongoing rise in global average temperature over the next decades which will lead to a growing number of effects in the future with greater intensity and broader range of occurrence. Probable effects are the modification of seasons, changes in precipitation patterns and more extreme weather conditions such as heat waves, droughts and hurricanes, among others (NASA's Jet Propulsion Laboratory, 2020).

The IPCC conducted studies about different scenarios, especially the possible effects of global warming of 1.5°C and 2°C above pre-industrial levels. According to the Special Report from 2018, it is likely for global warming to reach 1.5°C between 2030 and 2052, if temperature continues to increase at the current rate. In general, the higher the level of global warming, the higher the climate-related risks for natural systems and humanity. The risks depend on the magnitude and rate of warming, vulnerability and the implementation of adaptation and mitigation options. Moreover, the report states that climate models project the following differences in

regional climate characteristics between today and a global warming of 1.5°C and between 1.5°C and 2°C. With high confidence, a rise in mean temperatures will be observed in most land and ocean regions and hot extremes in most inhabited regions. With medium confidence, increased heavy precipitation will occur in several regions and there will be an increased probability of drought for some regions. The impact of global warming for biodiversity and terrestrial and oceanic ecosystems is projected to be lower at a warming of 1.5°C than of 2°C. In general, climate-related risks to health, livelihoods, food and water security and economic growth are predicted to increase with global warming. Similarly, a warming of 2°C further increases the risks (Intergovernmental Panel on Climate Change, 2018).

The Global Climate Risk Index (Eckstein et al, 2018) analyzes quantified effects of extreme weather events in terms of fatality and economic losses. The index revealed that the most vulnerable countries to climate-related risks in 2017 were in descending order of rank Puerto Rico, Sri Lanka, Dominica, Nepal, Peru, Vietnam, Madagascar, Sierra Leone, Bangladesh and Thailand.

However, the International Energy Agency came to the conclusion that in 2019, global energy-based CO<sub>2</sub> emissions stagnated, despite the expectation of a further increase. Even though the global economy grew by 2.9%, emissions from electricity generations declined in advanced economies mainly due to the increasing use of renewable energy. Other reasons for the sinking emissions were also the shift to natural gas and nuclear power, mainly in the USA and Japan. Additional reasons are the slowing economic growth, and therefore slower growth in energy use in some emerging markets (International Energy Agency, 2020).

The profound change in natural conditions is benefitting some areas while affecting many others adversely. The following section will provide an insight into the policies and actions to fight climate change that are currently taken.

## 4.2 Policies and Actions to fight Climate Change

As climate change is a global issue, it is necessary for countries to coordinate actions on a global scale through international agreements and policies.

The first significant step in the fight against climate change on a global level was the establishment of the United Nations Framework Convention on Climate Change (UNFCCC) in the year 1992 in Rio de Janeiro. Article 2 defines the aim of the Convention: “The ultimate objective of this Convention [...] is to achieve [...] stabilization of the greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.” (United Nations, 1992, p.9). It was by the means of this convention, that the countries first officially recognized the existence of the problem. The underlying idea of the Convention was that industrialized countries, as they are the emitters of the majority share of greenhouse gas emissions, would be expected to make the largest contribution to cut emissions and to provide financial support for actions against climate change to developing countries. All parties should report periodically about their progress whereby different reporting periods are applied for industrialized and for developing countries. Today, 197 parties have ratified the Convention (United Nations Framework Convention on Climate Change, 2020c).

The next step in the international agreements on climate change was taken with the Kyoto Protocol – adopted in 1997, entered into force in 2005 – which operationalized the UNFCCC. The Protocol suggests measures to be taken by the parties in relation to energy efficiency, sustainable forest management, sustainable agriculture, renewable energy, waste management and fiscal incentives, among others. The Protocol not only suggests that the countries take national measures, but in addition establishes flexible market mechanisms that allow the trade of emis-

sion permits between countries. These mechanisms include International Emissions Trading<sup>1</sup>, Clean Development Mechanisms<sup>2</sup> and Joint Implementation<sup>3</sup>. The basic concept of the mechanisms is that climate change requires a global solution and it is not important in which region emissions are reduced (United Nations Framework Convention on Climate Change, 1997). The mechanisms offer the possibility to implement measures in the places where it is most cost-effective, like, in developing countries. The Kyoto Protocol also implemented registry and monitoring systems in order to assure adequate monitoring of the measures taken. Currently, there are 192 parties to the Kyoto Protocol (United Nations Framework Convention on Climate Change, 2020b).

On 12<sup>th</sup> of December 2015, the UNFCCC agreed upon the Paris Agreement (PA), with the aim defined in Article 2 to “strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty” (United Nations, 2015, p.3). The agreement further emphasizes the support to assist developing countries to do so. The ambitious aim of the parties is to maintain the global temperature increase below 2°C above pre-industrial levels and to pursue the best efforts to keep the rise below 1.5°C. To achieve these goals, the agreement states that the global peak in greenhouse gas emissions must be reached as soon as possible and the emissions must then be constantly lowered. Each party obliges itself to adopt appropriate measures in a national context and to report regularly about the efforts taken. Additionally, every five years there is a stock-take in order to assess the progress made and to inform the other parties (ibid). To date, 187 of the 197 parties to the Convention have ratified the Paris Agreement (United Nations Framework Convention on Climate Change, 2020a).

In December 2019, the 25<sup>th</sup> Conference of the Parties took place in Madrid. Overall, the expectations that the countries would agree on significantly more ambitious emission cuts to meet the goal of the Paris Agreement could not be met. The parties focused more on technical issues, such as the functioning of the carbon emissions market (Harvey, 2019).

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<sup>1</sup> Committed parties to the Protocol have accepted emission targets expressed as levels of allowed emissions. Emissions trading allows countries that have excess capacity to emission units to sell this capacity to countries that are over their targets.

<sup>2</sup> The Clean Development Mechanisms allow countries with an emission-reduction commitment to implement an emission-reduction project in a developing country which can earn saleable certified emission reduction credits.

<sup>3</sup> Joint Implementation allows countries with an emission-reduction commitment to earn emission reduction units from an emission-reduction project in another committed country (Annex B-party).



The development of the most significant international agreements on climate change reflects the growing importance and pressure to take measures against it on a global scale. While the establishment of the UNFCCC in 1992 only showed the intentions and general rules to comply to, each subsequent agreement became more concrete and specific. The Kyoto Protocol already suggested mechanisms that countries could use to reach their emission targets. Later, the Paris Agreement formulated the ambitious 2°C goal that all countries should follow and whose implementation could possibly avoid many harmful effects of climate change.

However, not every party that once committed to the Paris Agreement is still doing so. The USA under the Trump administration withdrew from the Paris Agreement in 2017 and further reversed their former national policies to reduce greenhouse gas emissions. Already during the George W. Bush administration, the USA refused to ratify the Kyoto Protocol. The non-participation of the US in global climate agreements is not only counterproductive for the achievement of the common goals as it is still a major emitter of greenhouse gases. It also allows other parties, especially emerging economies with growing levels of emissions, to use this missing commitment as a justification for their own interest to take less action. Moreover, the lack of US contribution threatens climate finance, in particular for projects in developing countries (Urpelainen and van de Graaf, 2018).

Under the Paris Agreement, the actions that are taken against climate change can be classified into mitigation (Art. 4 PA) and adaptation (Art. 7 PA).

Hereby, mitigation stands for all the actions taken to reduce global warming. In general, this includes any measures that reduce greenhouse gas emissions or improve the carbon capture sources. The Ministry of Environment of Peru – which is the fifth most vulnerable country to climate change (Eckstein et. al. 2018) – suggests the following mitigation actions: in the energy and industrial sector, energy efficiency and industrial processes should be improved in order to reduce carbon emissions and the use of renewable energy should be widened. In the transportation sector, it suggests to use more efficient sources of fuel and/or fuel that contains less carbon. Further actions should be taken to improve efficiency in massive transport and in a modal shift of transport. With respect to waste management, the Ministry proposes the transformation of organic waste, methane capture and burning in landfills and oxidation ponds and the use of methane as an energy source. Referring to the topic of forestation, it highly advises reforestation on degraded land and the forestation of new areas.

On the other hand, adaptation refers to reducing the vulnerability to the effects of climate change (Ministerio del Ambiente, 2010). Adaptation measures usually consist out of engineered and technological options. Often, they are integrated into existing programs, such as disaster risk management or water management which have to be adjusted to the new climatological situation. As well social, institutional and ecosystem-based<sup>4</sup> measures are becoming increasingly important in this context. The planning for sea level rise and resilient crop variety are other main aspects of adaptation (Intergovernmental Panel on Climate Change, 2018).

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<sup>4</sup> Those include for instance protected areas, conservation agreements, and community management of natural areas.

## 5. ESG Investments

### 5.1 Overview

Overall, ESG Investments have become a commonly used term to describe investments that incorporate environmental, social and governance aspects into the investor's selection and decision-making process.

In order to implement the measures that are taken against climate change, large amounts of funds are necessary. It is estimated that USD 1 trillion per year for the next decades is required to address climate change and environmental impacts and that 80% of this capital may come from the private sector (Grossman, 2013). This enormous demand for financing provides numerous opportunities for the financial sector and lets it play a key role in the global action against climate change (Steiner, 2015).

The regional division of the UN Global Compact, Red Española del Pacto Mundial (2020), highlights the fact that currently, most countries are far away from reaching the UN SDG in 2030 due to lacking public investment. However, it points out that capacities are available in the private financial sector to mobilize and redirect capital into achieving the sustainable development goals. It would only be necessary to channel these funds at the right velocity into the most urgent investment projects. It further recommends to raise awareness among financial leaders in corporations regarding their key role in the transformation of the global economy into a more sustainable one. Moreover, it emphasizes the importance of incorporating sustainability in the financing and operations of SME, which in sum would have a great impact in the economy as well. The development of a sustainable financial sector would have the positive outcomes of a lower market volatility, a long-term viability of investments and it could protect the global economy from future financial instabilities.

This plays together with the growing conscience of investors about climate change, the environment and other "good causes". In general, more and more investors have the wish to know that their money is being used for purposes that benefit society or the natural environment. Many institutional investors have recognized this change in consumer preferences. However, this fiduciary duty is not the only reason for them to invest in socially and environmentally responsible companies or projects. More reasons can be found in an intrinsic motivation of fund

managers, corporate governance aspects, reputational risks in case of not considering this aspect, external stakeholder pressure or regulatory requirements (Hertrich and Schäfer, 2015).

The broader term Responsible Investment describes the integration of ESG considerations not only into the portfolio selection process, but also into ownership policies and practices, which consist usually out of voting rights. The ESG consideration during the portfolio selection is also called “entry decision” which underlines the active decision to invest into a certain project or to divest in case of a conflict of interests. ESG considerations during the ownership are also referred to as “loyalty decision” which describes the “voice” investors have in the company and which they can use in order to influence the company to use the provided funds. Therefore, responsible investment combines financial return and social good<sup>5</sup> but distinguishes itself from ordinary investment and activism, which each incorporate only one of both aspects. The terms ethical investment or social investment usually only consider the entry decision (Zarbafi, 2011).

There are two basic assumptions for responsible investment. First, responsible investment funds perform similarly to traditional funds in the short run, while generating even higher financial returns in the long run. Second, responsible investors believe that they have the right and the ability to change corporate behavior towards a greater emphasis on social responsibility (ibid).

Historically, socially responsible investment has its origins in Jewish, Christian and Islamic traditions. The investment of religious institutions usually was required to be used in a responsible manner, which represents an ethical approach. This investment type only accounted for a niche market for a long time. In the 20<sup>th</sup> century, several events like the Vietnam War or the Chernobyl catastrophe strengthened the public awareness about unfair and harming activities. More consumers became willing to pay a premium for ethically sourced products and a larger number of investors started to include social and environmental risks into their decision making. By now, responsible investment has begun to enter the mainstream market of investment due to an increasing demand (ibid).

The entry decision about whether to make an investment or not considering ESG criteria generally consists out of a screening process or an enhanced analysis which can also be combined. Both processes can either be conducted internally by the investor or fund manager or externally by a specialized research firm or rating agency (Sullivan and Mackenzie, 2006). The screening will provide the result

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<sup>5</sup> Environmental outcomes are understood as benefitting the society as well.

of the exclusion or inclusion of companies or whole industries into the investment. There are three commonly used screening methods: negative, positive and best-in-class screening (Zarbafi, 2011).

Negative screening stands for the categorical exclusion of companies or industries based on their non-fulfillment of ESG criteria (Schueth, 2003). This approach is especially value-based and increases the integrity of the investor who is conducting the screening. Some socially responsible investment funds exclude industries like tobacco, weapons, or nuclear power from their portfolios.

On the contrary, positive screening is the search for exemplary companies that outperform in ESG criteria compared to other companies. In other words, it is the explicit inclusion of these companies into the investment portfolio (Zarbafi, 2011). Other than the negative screening, it does not “punish” companies for not being socially and/or economically responsible, but “rewards” the companies that show having an excellent performance in those areas (Schueth, 2003). The most common example for positive screening is Green Investing. However, this screening method is not very widely used in practice because of the limited portfolio diversification with only positively screened assets which leads to a generally higher risk. Moreover, assessment is difficult as it is necessary to analyze complex issues like social aspects and make them comparable.

This is what the best-in-class screening tries to improve. It aims at generating comparative criteria that allow to create a portfolio out of the best companies with regard to ESG performance from every industry. In this manner, it is possible for the investor to rely on a diversified portfolio since the screening does not exclude whole industries. An example for this screening approach are eco-efficiency funds which represent companies across all industries that are rated “best-in-class” with regard to their eco-efficiency.

All screening approaches only refer to adding or removing companies to or from the investment portfolio, the valuation of these companies is then made by the enhanced analysis (Zarbafi, 2011).

The enhanced analysis is the process of translating ESG data into financial and reputational risk measures and incorporate them into the fundamental investment analysis and the portfolio selection methodology (Sullivan and Mackenzie, 2006). It aims at shifting from a traditionally short-term oriented financial analysis towards a more long-term oriented valuation of stocks. This is justified by the assumption that it is the factors such as ESG performance that drive the (financial) performance of a company in the long run. Rather than on ethical values, it is based

on the investment belief of market imperfections<sup>6</sup> and on the assumption that the integration of ESG criteria ensures a more efficient allocation of capital and therefore, improves the overall market returns.

In practice, a combination of both screening and enhanced analysis is sometimes applied.

When the decision to make a responsible investment is taken, the loyalty decision can be either reflected by engagement or activism (Zarbafi, 2011).

Engagement is an informal approach to participate in the decision-making of the firm in which the investment is made. It stands for the dialogue of the investor with the corporate management and the intention to influence the decision-making in their favor. The investor tries to make use of their influence in the company for improving the company's social responsibility (Collier, 2004).

On the other side, activism stands for the use of the formal rights of the investor in the company which can include voting, filing shareholder resolutions, public media campaigning or divesting from the company in order to influence the decision-making of corporate management. Activist shareholders usually not only focus on CSR aspects, but also engage in shareholder value maximization in the long run (Sjöström, 2008).

It is observed that engagement is preferred in Europe, whereas activism is predominantly used in the USA (Sparkes and Cowton, 2004).

The Principles for Responsible Investment split the ESG integration process slightly different. The process consists out of four stages, from which the first can be associated with the screening procedure, the second with the enhanced analysis, then the investment decision is taken and afterwards, the active ownership is following. The first two stages consist out of a qualitative and a quantitative analysis. The qualitative analysis includes the collection of information from various sources about the economy, industry, strategy and the quality of corporate management. The quantitative analysis assesses the impact of financial factors on the portfolio and how the forecasts should be adjusted. This is followed by the investment decision, which determines whether to increase, maintain or decrease the weighting of certain shares or to not invest. The investment analysis and decision can initiate or support the company's engagement and better informed voting,

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<sup>6</sup> Investors with better ESG information are able to use this information to their advantage (Sullivan and Mackenzie, 2006).

which has a further impact on future investment analyses and decisions (Sloggett, 2016).

The predominant share of responsible investors is represented in the market by institutional investors, such as pension funds, mutual funds, insurance companies or banks. These invest in companies which they believe act in a responsible manner with respect to ESG considerations and provide shareholder value maximization. In this sense, institutional investors are financial intermediaries between their investors who contribute their savings or pension to the funds, and the companies they invest in (Ingley and van der Walt, 2004). Institutional investors constitute a major share of public equity and debt markets.<sup>7</sup> The amounts of capital that they administrate can be measured in percentage of GDP of the country they are based in. In 2018, German institutional investors held capital ranging from 16.6% of GDP in financial liabilities administrated by pension funds to 63.4% of GDP in liabilities held by insurance companies. Comparatively, in the US, the figures range from 44.9% of GDP held by insurance companies in financial liabilities to 109.5% of GDP held by pension funds in liabilities. The figures for investment funds are in between (Organisation for Economic Cooperation and Development, 2019). The data shows that institutional investors hold large shares of the financial market and the capital they provide has a significant influence on the parties they invest in. Due to the growing size of their holdings, a divestment could lead to a destabilization of a company's stock, or even of the market in total (Zarbafi, 2011).

On the one hand, this brings institutional investors into a strong negotiation position and can give them a high influence in the company's corporate decision-making. On the other hand, the large holdings also bind the investors and force them to stay with the company even in case of a conflict of interest, because a divestment would be equivalent to a loss in shareholder value.

This is the reason why engagement is becoming the more popular strategy among investors to influence a company's corporate behavior (Sullivan and Mackenzie, 2006).

Considering the side of the finance industry, many efforts have been made to understand sustainability as mitigating risks and identifying opportunities. The in-

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<sup>7</sup> In 2008, they held over three fourth of both markets in the United States (Palmiter, 2009).

dustry has developed voluntary commitments, such as the Principles for Responsible Investment, Principles for Responsible Insurance and the Equator Principles<sup>8</sup> to form global partnerships. Among financial sector leaders, the understanding that profits are not sustainable if the business approach does not take into account the environment, communities, and society at large, is constantly evolving (Steiner, 2015).

Empirical evidence is given that portfolios that are structured according to socially responsible investment consistently performs better than conventional portfolios. This was proven, among others, by Hertrich and Schäfer (2015) with their analysis of German pension insurance funds, using a Vector Error Correction methodology. Moreover, they found that derivative overlay structures enable pension funds to mitigate the downside risk exposure of their portfolio without impacting average fund performance. In summary, it was concluded that socially responsible investment portfolios outperform conventional portfolios in all observed investment scenarios, independently of the underlying investment strategy. This finding may be a major reason for the increasingly important role played by socially responsible investment in the European pension systems.

A comparison of the performance of conventional investments in the US reflected by the S&P 500 Index and ESG investments measured by the MSCI USA ESG Index in Figure 2 (Miller, 2017) shows similar results. In the analyzed period from September 2007 to September 2017, the significantly better performance of ESG stocks can especially be observed after 2008.

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<sup>8</sup> The Equator Principles is a risk management framework used by financial institutions “for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence and monitoring to support responsible risk decision-making.” The Equator Principles apply globally for all industries to four financial products related to project finance (The Equator Principles Association, 2019).



Figure 2: Performance of MSCI USA ESG Index vs. S&P 500 Index (%)



Secondary source: <https://www.advisorperspectives.com/commentaries/2017/11/13/finding-opportunities-in-the-esg-space>

A recent study conducted for the European Commission also revealed that investors who improve their environmental performance are able to mitigate their environmental and climate risk. The authors proved the existence of a significant and negative green risk premium which is priced by the market. In the analyzed sample of European stocks in the period from 2005 to 2018, green investments offered higher returns than brown investments. As a suggestion, it is proposed to use the green risk premium as a tool to assess the exposure of portfolios to the climate risk and to hedge against it (Alessi et al, 2019).

The Principles for Responsible Investment include the following topics into ESG issues.

Under social issues, it mentions human rights and labor standards, employee relations and conflict or high-risk zones.

As governance issues, it counts tax avoidance, corruption, cyber security, director nominations, and executive pay which refers to align payments of the executive management to sustainable value creation (Principles for Responsible Investment Association, 2020).

Other aspects mentioned in the context of social issues are health and safety of employees, relations to the local community, values of suppliers, diversity, and respecting the interests of other stakeholders. The social aspect can be summed up as how the firm manages the relationships it has with its stakeholders (Chen,

2019). More aspects that account to these issues are product safety and liability and human capital development (MSCI Inc., 2020).

The governance issues deal with the company's corporate leadership and include, in addition to the before mentioned, internal controls, audits, transparency, avoidance of conflicts of interest, political interference and shareholder rights (Chen, 2019). Moreover, board diversity and aspects of corporate behavior such as business ethics or anticompetitive practices are counted among the governance issues (MSCI Inc., 2020).

## 5.2 Environmental Investments

Investments that are particularly beneficial to the environment and take action against climate change currently enjoy the highest public awareness in the field of ESG investments.

### 5.2.1 Features

The Principles for Responsible Investment mention climate change, water, sustainable land use which includes (de-)forestation, fracking, methane and plastics as environmental issues in investment (Principles for Responsible Investment Association, 2020).

More aspects address the company's direct use of energy, waste management, pollution, natural resource conservation, the treatment of animals, or how a company manages the environmental risks that it faces (Chen, 2019). In terms of the climate change aspect, more specifically the focus lies on the company's carbon emissions, the carbon footprint of the product, financing the environmental impact and on climate change vulnerability. As far as the natural resource topic is considered, biodiversity and raw material sourcing must be taken into account. When looking at pollution and waste, depending on the industry, toxic emissions, packaging material, as well as electronic waste, need to be taken into consideration. When it comes to the environment, clean tech, green buildings and renewable energy offer the most significant opportunities to improve the environmental balance (MSCI Inc., 2020).

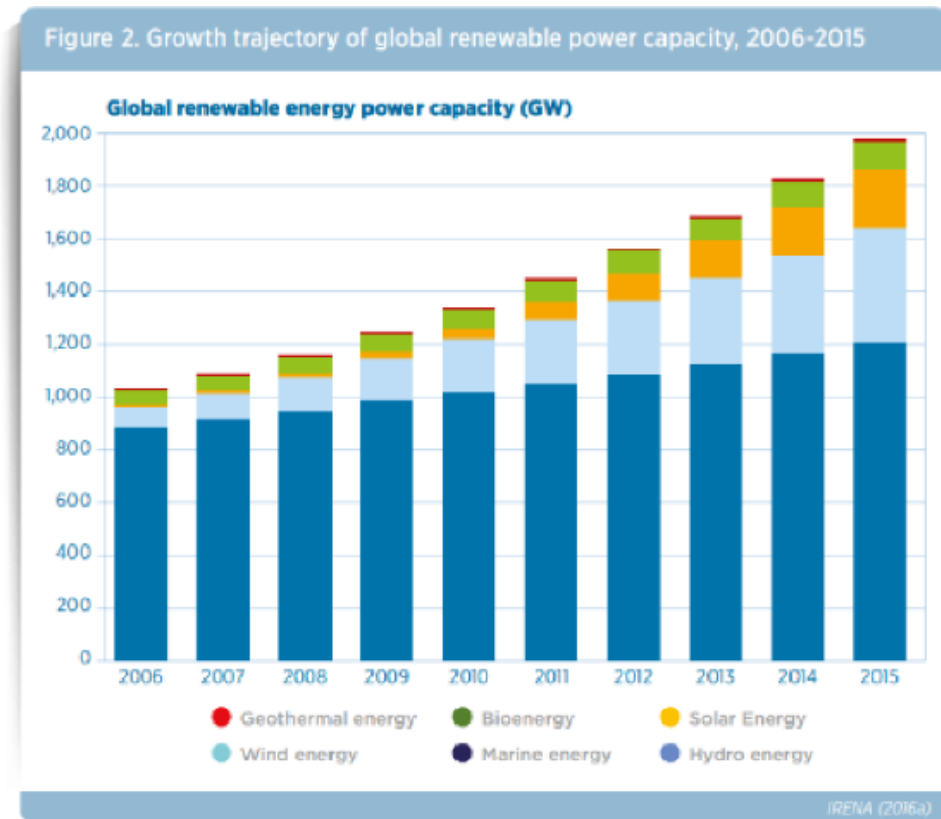
However, large international financial institutions, such as the World Bank, have continued to finance fossil fuels and are only gradually shifting their focus on investments in technologies that do not account for direct greenhouse gas emissions. The institution has been financing coal-fired power stations until 2010. It was not until 2017, that the World Bank announced not to finance oil and gas extraction

any longer after 2019. In 2017, it aimed at having 28% of its lending directed to climate action by 2020 (Elliott, 2017). However, it already reached the 30% mark in 2019 and the aspired target now is the doubling of climate-related financing from 2021 to 2025 (World Bank, 2019).

Lately, renewable energy technology costs have been falling which lowered the need for initial capital. However, the cost of capital remains high due to elevated risks and underlying market barriers. The prices for photovoltaic modules have dropped by over 75% from 2009 to 2016. Onshore wind has become one of the most cost-competitive sources of energy in many countries, without subsidies or other financial support. With sinking technology costs, the growth of renewable power generation has significantly exceeded the investment growth, as the same value of investment enables the generation of a greater amount of renewable energy on the ground. An increased growth in investment could further amplify this effect in the global transition to renewable energy (International Renewable Energy Agency, 2016).

Figure 3 illustrates the growth in global capacity of sources for renewable energy from 2006 to 2015 (ibid). It indicates that the total capacity has nearly doubled in one decade. Hydro energy is by far the most important source of renewable energy. Wind and solar energy make up the second and third highest shares with solar energy in particular, showing a significant increase in capacity. Bioenergy is another growing source, while geothermal and marine energy represent the smallest shares.

Figure 3: Growth trajectory of global renewable power capacity, 2006-2015 (GW)



Source: [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA\\_Risk\\_Mitigation\\_and\\_Structured\\_Finance\\_2016.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA_Risk_Mitigation_and_Structured_Finance_2016.pdf) p.21

Global energy demand is predicted to rise by 30% by 2030, compared to 2016. Most of this growth will take place in developing countries, due to rising living standards, growing industrialization and therefrom resulting higher electrification rates. For power generation, transmission and distribution infrastructure, investments of around USD 70 billion per year until 2030 will be required (ibid).

In order to satisfy the growing global energy demand, reduce air pollution, and meet the 2°C goal from the Paris Agreement, it is necessary to double the share of renewable energy in global energy generation by 2030 combined with an increased energy efficiency (ibid). In 2010, the share of renewable energy in global energy consumption was 26%, while in 2017, it already reached 36% (Ritchie and Roser, 2020).

Given the fact that private investment accounts for 85% of renewable energy investment, it can be assumed that it will keep playing a key role in driving investment in this sector.

However, there are still various barriers that cause that investment in renewable energy remains below its potential. The front-loaded cost structure of most renewable energy projects is an unfavorable factor. Moreover, the lack of experience

and capacity of policy makers and financial systems leads to higher capital costs for renewable energy projects. Furthermore, investors perceive high risks related to political, regulatory and liquidity risks, or grid interconnection and transmission-line delay risks, which adds a risk premium to the capital and therefore, makes it less affordable. Accordingly, risk mitigation instruments need to be provided by public finance institutions, in order to mobilize capital for renewable energy investment. Additionally, for large-scale investors, insufficient investment deal size and high transaction costs constitute further barriers to take an investment (International Renewable Energy Agency, 2016).

### 5.2.2 Two main Financial Assets to Invest

The possibilities of funding can be categorized into equity and debt. Equity investment is especially used in the early stage of a project or company. Investors then acquire shares of the company or project according to the amount of money they invest. Afterwards, they receive a profit-participation (for instance, dividends) or a share of liquidation proceeds and are entitled to ownership rights, such as votes. One feature of equity is that it does not necessarily have to be paid back and it is the firm's responsibility to provide maximum return to the investors. When the project already is in later stages, debt financing usually is preferred because of its lower cost. Money is lent to the borrower, who is obliged to later repay it to the investor with interests. This type of financing is limited to the period until the money is returned, other than equity, which does not have a time limit. Debt financing can be made through loans or bonds. Loans are issued by a bank. Bonds on the other hand, usually transfer money from the public or market to the company or project that issues the bonds and typically involve large sums of money. Bonds most commonly have a duration between at least one and 30 years (Pyles, 2014).

Bonds and shares differ in their required performance. The expectations of returns are usually higher for shares than for bonds. Shares can reflect a rapid, short-term change in the company's value while bonds have a predetermined return rate for a longer period of time. This results in a significant difference in risk that investors take. The buyers of shares incur into a higher risk than the buyers of bonds, because in case of bankruptcy of the company, it first has to pay back its debt, while equity investors only receive the value that is remaining after all debt investors are paid. The certainty of the cash flows that the investor will receive for the duration of the bond is another factor that differentiates bonds from shares, for which it is not foreseeable how the cash flow will develop in the future (ibid).

The lower risk of debt investment is especially important for institutional investors, such as insurance companies or pension funds, which have to match forward liabilities with debt. Bond investors usually are paid before bank loan providers if the company which was invested in goes bankrupt. For the company, bonds represent a lower-cost form of capital raising than equity (Kidney and Boule, 2015).

The capital of the investment company that takes the ESG investment is structured into equity and debt as well. Their investors can either acquire shares or bonds.

The cost of equity for the firm is calculated by the Capital Asset Pricing Model (CAPM):

$$r_e = r_f + \beta (E(r_M) - r_f)$$

The cost of equity  $r_e$  equals the risk-free rate  $r_f$  plus  $\beta$ , which indicates the sensitivity of an investment activity to market movements, multiplied by the difference between the expected average market return  $E(r_M)$  and the risk-free rate  $r_f$ . The risk-free rate is referred to as the average return on treasury bills.

The cost of debt of a company is the cost that company assumes for each of its debt positions (bonds, loans etc.) weighted in relation to the amount of the debt position (Pyles, 2014).

The cost of capital of bonds is the cost that companies have to assume for the issuance of a bond. The annual return of a bond from the issuance to the maturity is referred to as Yield to Maturity (YTM). It is the rate at which the market price of a bond equals the present value of all future cash flows, i.e. the present value of the future coupon payments and the par value<sup>9</sup>. For a bond with a maturity T and annual constant coupon payments, the formula to determine the YTM would be the following:

$$Price = \sum_{t=1}^T \frac{Coupon}{(1 + YTM)^t} + \frac{Par Value}{(1 + YTM)^T} = Coupon \frac{1 - (1 + YTM)^{-T}}{YTM} + \frac{Par Value}{(1 + YTM)^T}$$

The constant coupon could be calculated as follows:

$$Coupon = i Par Value$$

Being  $i$  the fixed interest rate.

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<sup>9</sup> The par value is the amount that the investor lends to the company and which the com-

pany promises to repay at the end of the maturity of the bond.

If the coupon payments are linked to inflation rates, the expression is as follows:

$$Price = \sum_{t=1}^T \frac{Coupon_t}{(1+YTM)^t} + \frac{Par\ Value}{(1+YTM)^T}$$

The annual coupon could be calculated as follows:

$$Coupon_t = i_t Par\ Value$$

With  $i_t$  being the annual interest rate which is linked to the inflation rate.

When a bond is newly issued, a new issue premium is paid by the issuer as an extra yield in order to attract investors to buy in the primary market. Sometimes bonds can instead be issued at a higher price resulting in a lower yield compared to the outstanding debt. The bond then prices within its own yield curve. For a conventional bond, this is known as a new issue concession. In case of a green bond, it is referred to as greenium (Berk and DeMarzo, 2017)

The cost of debt for the company is determined by the expected return of investors. This is usually not equal to the YTM, because investors consider the risk of default of a company and the likelihood of repayment of the par value. The creditworthiness of a bond is most commonly determined by credit rating agencies. Depending on the ratings, investors demand a risk premium, in other words, a higher expected return to compensate for exposure to risk factors when investing. However, the more likely a default, the higher the YTM, resulting in a decrease in the price of the bond. Generally, the expected return, and thus the cost of debt for the company, is always lower than the YTM, if there is a risk of default (ibid).



## 6. Green Bonds

### 6.1 Current Situation

In the field of environmental investments, green bonds are a special instrument to fund or refinance exclusively projects that protect the environment or climate. Green bonds may have social co-benefits, however, bonds that intentionally combine green and social projects are referred to as sustainability bonds (The Green Bond Principles, 2018).

Bonds are a particularly suitable instrument for financing climate-related infrastructure because of their long-term orientation and the size of the global bond market (Kidney and Boule, 2015).

Green bonds have the potential to play a key role in financing the environmental investments needed to achieve the EU's 2030 climate and energy objectives and the UN Sustainable Development Goals. As low-carbon technologies mature and become more standardized, the role of green bonds is becoming more and more important. It is estimated that the financing of energy efficiency improvements related to property assets will lead to a 30% increase in demand for green bonds in this category (Hogg et al, 2016). They can therefore potentially have a significant impact on achieving the goals of the Paris Agreement by funding mitigation and adaptation measures.

In order to assess the potential of the green bond market to meet these expectations, the following section analyzes in detail the problem of defining green bonds, the characteristics of the green bond market and the capital cost of green bonds.

#### 6.1.1 Variety of Definitions

The term "Green Bond" is not uniquely defined. There is no legal protection for the term or official requirements for a bond to be named "Green Bond". Any issuer can title it as "Green Bond" according to internal judgement (Nord/LB, 2016).

The most widely accepted definition in the market is that of the Climate Bonds Initiative which is an investor-focused not-for-profit organization whose aim is to activate the global bond market for climate change action. It pursues the strategy to develop a large green and climate bond market in order to reduce the cost of capital for climate projects. The organization further provides support for governments, certification of bonds for issuers and regularly reports on the green bond market evolution (Climate Bonds Initiative, 2020a).

The Climate Bonds Initiative defines a green bond as “A bond [...] where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible green projects, and which is aligned with the four core components of the Green Bond Principles. A Green Bond [...] should not be considered fungible or interchangeable with bonds [...] which are not aligned with those four core components.” (Climate Bonds Initiative, 2019c, p.8).

The four core components of the Green Bond Principles (GBP) are the use of proceeds, process for project evaluation and selection, management of proceeds and reporting. The GBP are voluntary process guidelines addressed to issuers, investors and underwriters.

Suggestions for the use of proceeds are mentioned in section 6.1.3.

For the second component, the GBP state that the issuer should clearly communicate to investors the environmental objective of the investment and the process by which the issuer determines how the financed projects fit into one of the eligible categories. These are determined by the GBP. Further, the issuer should specify the eligibility and possibly exclusion criteria.

With respect to the management of proceeds, the GBP proposes that the issuer credits the net proceeds of the green bond to a sub-account or sub-portfolio, while at the same time appropriately linking the lending and investment operations through an internal process. Moreover, the GBP suggest a high degree of transparency and recommend a third party verification of the internal tracking method.

In order to provide best transparency for investors, issuers should provide up to date information on the use of proceeds in a timely basis. The annual report should include a list of the projects for which green bond proceeds have been used, a brief description of the projects, the amount of capital invested and the expected impact of each project. The use of qualitative and quantitative performance indicators is encouraged (The Green Bond Principles, 2018).

Other actors in the market make use of other definitions and generally simpler concepts of what a green bond is.

Bloomberg Businessweek considers bonds to be green bonds in case their proceeds go towards “new or existing projects that are meant to have positive environmental or climate effects.” (Pronina, 2019). Thus, it requires no aligning to the Green Bond Principles. The only determination to qualify as a green bond is the use of proceeds.

The ESG research and rating company Sustainalytics defines green bonds to be “like any other conventional bonds except that the issuer promises to use the proceeds for green investments, green projects or eligible green assets being re-financed.” (Bhatia, 2019).

While all definitions agree on the fact that the proceeds need to be destined to projects that have positive effects to climate and/or the environment, every issuer may understand this differently.

The problem of not having a protected definition leads to the danger of so-called greenwashing. This is the case when issuers deliberately declare their bonds as green bonds in order to attract environmentally conscious investors and improve their reputation in the market. Yet at the same time, the funds raised by this bond are not or only partly used for investments that help to tackle environmental and climate problems. To maintain credibility in the market, it has to be ensured that the money raised by the issuer will certainly be used for the stated projects or assets and that they actually provide a contribution to environmental protection or climate change mitigation (Kidney and Boulle, 2015).

With the aim of making the green bond declaration more transparent, the Climate Bonds Initiative provides a certification under the Climate Bonds Standard. In order to certify a specific bond, the issuer must engage a verifier who does the pre- and post-issuance certification and also reports annually for the duration of the bond (Climate Bonds Initiative, 2017a). The Climate Bonds Taxonomy identifies the projects and assets that qualify for a green bond certification by using a traffic light system to indicate the compatibility of projects and assets with the 2°C target of the Paris Agreement. In addition, it indicates whether bonds in this sector can be certified or certification criteria for this type of bond are still under development. The taxonomy is constantly evolving as the organization approves more and more specific areas where greenhouse gas emissions can be reduced or captured (Climate Bonds Initiative, 2019b).

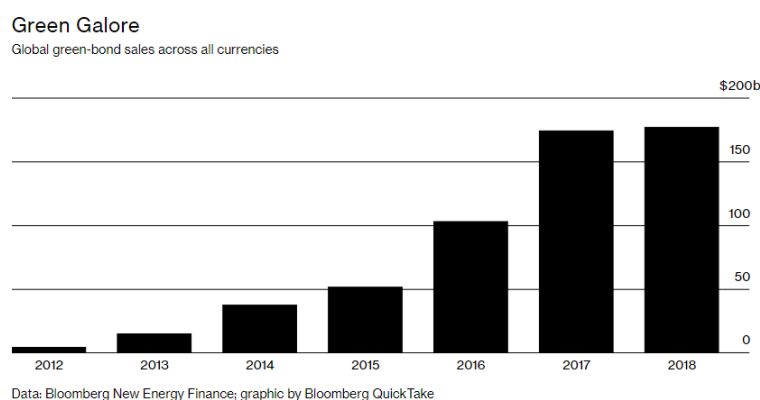
## 6.1.2 Evolution

The first green bond market emerged in 2007-08 with the first issuances of green bonds by multilateral development banks. Private sector institutions, such as corporations and banks, joined the market beginning in 2013. At the same time, the Green Bond Principles were launched (Hogg et al, 2016).

The green bonds market experienced an exponential rise of 420% from USD 4.2bn in 2012 to USD 176.6bn in 2018, measured globally across all currencies. Figure 4 illustrates the growth in this period (Pronina, 2019).

In 2019, USD 257bn were issued in green bonds globally. They were emitted by 496 issuers, from which 250 were first-time issuers (Climate Bonds Initiative, 2020d).

Figure 4: Global Green Bond sales across all currencies 2012-2018 (USD)



Source: <https://www.bloomberg.com/news/articles/2019-03-24/what-are-green-bonds-and-how-green-is-green-quicktake>

Despite the substantial growth of the green bond market, it remains a tiny fraction of the overall bond market. In 2018, it only accounted for 2.42% of the global bond market (Fatica et al, 2019). At the same time, this implies a huge potential for further growth for this instrument (Hogg et al, 2016).

In 2019, the green bond issuance was primarily driven by the European market which issued 45% of the total volume. The Asia-Pacific region accounted for 25% and the North American market for 23% of issuances. Considerable growth was experienced in the European market in particular. In 2019, the green bond issuance increased by 74% with respect to the previous year. Comparing the issuance volume of single countries, the USA, China and France lead the ranking. Their combined issuance of green bonds accounts for 44% of the global market in 2019. Geographical diversification of the market was further enhanced through first-time issuances from eight new countries, including Russia, Kenya, Saudi-Arabia and Ecuador (Climate Bonds Initiative, 2020d).

With the introduction of the Green Bond Principles by the International Capital Market Association, there were established labels and certifications for green bonds in order to provide common standards in the market (Ehlers and Packer, 2017)<sup>10</sup>. Certified issuance grew by 86% compared to 2018 and represented 17% of the global issuance in 2019. The Netherlands and France were the largest markets for certified issuance, accounting for over 40% of certified green bonds.

In order to prevent “greenwashing” and to provide investors with assurance that the funds raised with green bonds are used for environmental and climate purposes, the GBP highly recommend external reviews by independent parties (The Green Bond Principles, 2018). This is especially suggested if no formal certification is applied. In the first six months of 2015, 60% of green bonds were subject to an independent review (Olsen-Rong et al, 2015). Three years later, in 2018, 89% of the newly issued green bonds (measured by amount) have already received at least one external review (Filkova et al, 2019). The external review is categorized into pre-issuance and post-issuance reviews. A pre-issuance review may consist out of one of the types shown in Table 1 (Climate Bonds Initiative, 2020c).

*Table 1: Types of pre-issuance reviews*

<b>Type of Review</b>	<b>Coverage</b>	<b>Service Providers</b>
Third Party Assurance	Assurance report states if the green issuance complies with the GBP or the Green Loan Principles (GLP)	Accounting firms Auditing firms
Second Party Opinion (SPO)	Assessment of the actual environmental/climate performance of the project or asset	ESG service providers Scientific experts Environmental consultants
Green Bond Rating	Assessment of the bond’s alignment with the GBP and the integrity of its green alignments	Rating agencies
Pre-issuance verification of the Climate Bonds Certification according to the Climate Bonds Standard	Confirmation that the use of proceeds is aligned to the Climate Bonds Standard and further sector specific criteria	Verifiers approved by the Climate Bonds Standard and Certification Scheme

*Source: Own presentation based on information from:  
<https://www.climatebonds.net/market/second-opinion>*

<sup>10</sup> The role of labelling and rating agencies in the market will be further analyzed in section 6.2.1.4 *Rating Agencies*.

A post-issuance review may be conducted by one of the types of reviews explained in Table 2 (ibid):

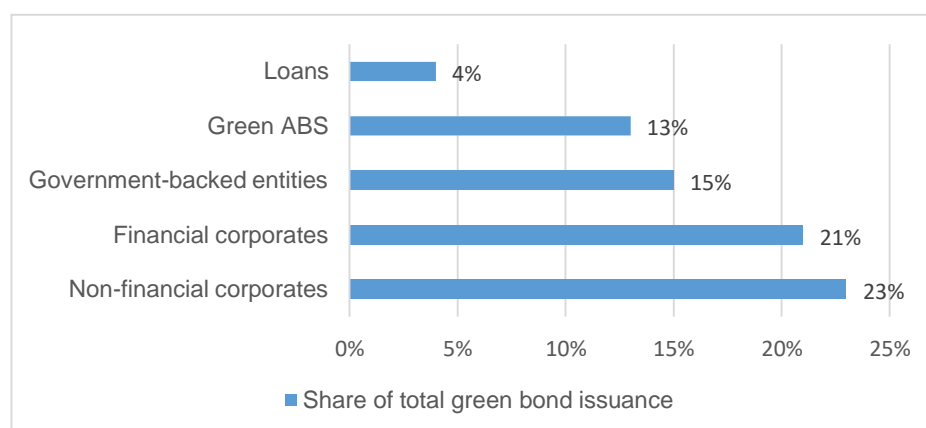
Table 2: Types of post-issuance reviews

Type of Review	Coverage	Service Providers
Second Party or Third Party Assurance Report	Assurance of the allocation of proceeds to the eligible projects/assets	Audit firms ESG service providers Scientific experts
Impact Reporting	Quantification of the environmental impact of the project/asset	Issuer Audit firms ESG service providers Scientific experts
Post-issuance verification of the Climate Bonds Certification according to the Climate Bonds Standard	Assurance that the allocation of proceeds is aligned to the Climate Bonds Standard	Verifiers approved by the Climate Bonds Standard and Certification Scheme

Source: Own presentation based on information from: <https://www.climatebonds.net/market/second-opinion>

Green Bonds are emitted by different types of issuers. Figure 5 illustrates the distribution of the main types of issuers in 2019, the year in which the non-financial corporate entities for the first time accounted for the largest share of issuance (23%). Their issuance volume almost doubled compared to the previous year. The top three companies all operate in the energy sector. Accounting for the second largest share of 21%, financial corporate institutions have shown a stable growth in recent years. The third largest group of issuers were government-backed entities with 15%. Green asset-backed securities accounted for 13% of issuances and loans for 4%, respectively. The remaining volume (24% of the total) was issued through sovereigns, development banks and local governments (Climate Bonds Initiative, 2020d).

Figure 5: Green bond issues by types of issuers 2019



Source: Own presentation based on data from: [https://www.climatebonds.net/files/reports/2019\\_annual\\_highlights-final.pdf](https://www.climatebonds.net/files/reports/2019_annual_highlights-final.pdf)

### 6.1.3 Characteristics and Types

Different types of green bonds have distinct characteristics with the difference primarily being in the risk coverage of the bond. The Climate Bonds Initiative categorizes green bonds into “Use of Proceeds” bond, “Use of Proceeds” revenue bond or ABS, project bond, securitization (ABS) bond, covered bond, loan and other debt instruments which may include convertible bonds or notes, Schuldschein, commercial papers or others (Climate Bonds Initiative, 2020b). Details of this categorization are presented in Table 3.

*Table 3: Types of green bonds*

<b>Type of Bond</b>	<b>Proceeds are dedicated to</b>	<b>Debt recourse</b>
"Use of Proceeds" Bond	Green projects	Recourse to the issuer: same credit rating applies as issuer's other bonds
"Use of Proceeds" Revenue Bond or ABS	Green projects or their refinancing	Revenue streams from the issuers though fees, taxes etc. are collateral for the debt
Project Bond	Specific underlying green project(s)	Recourse is only to the project's assets and balance sheet
Securitisation (ABS) Bond	Refinance portfolios of green projects or proceeds are earmarked for green projects	Recourse is to a group of projects that have been grouped together
Covered Bond	Eligible projects included in the covered pool	Recourse to the issuer and, if the issuer is unable to repay the bond, to the covered pool
Loan	Eligible projects or secured on eligible assets	Full recourse to the borrower(s) in the case of unsecured loans. Recourse to the collateral in the case of secured loans, but may also feature limited recourse to the borrower(s)
Other debt instruments	Eligible projects	

*Source: Own presentation based on information from:  
<https://www.climatebonds.net/market/explaining-green-bonds>*

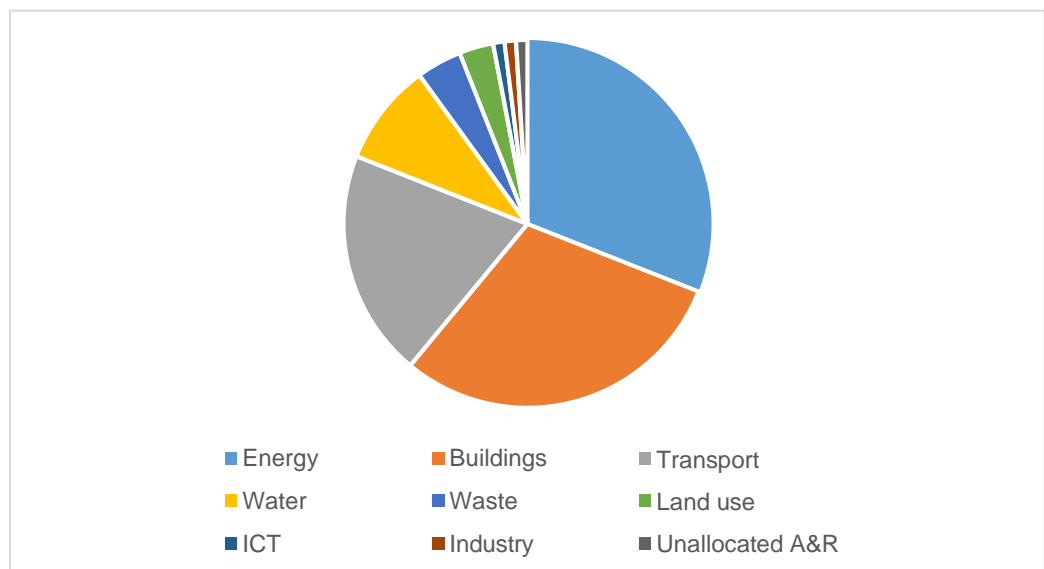
The most common type of bond in the green bond market is the “Use of Proceeds” bond. In 2016, 95% of all green bonds belonged to this type. In the case of “Use of Proceeds” bonds, the issuing company as a whole, guarantees repayment of the bond. This implies that also revenues generated from not environmentally friendly business sections are used for the reimbursement of the bond. However, companies must ensure by internal processes that the capital raised by the green

bond is only used for the indicated sustainable projects. These bonds are usually publicly listed and traded daily (Schneeweiß, 2019).

The Green Bond Principles suggest the following project categories for the use of proceeds of green bonds: renewable energy, energy efficiency, pollution prevention and control, environmentally sustainable management of living natural resources and land use, biodiversity conservation, clean transportation, sustainable water management, climate change adaptation, circular economy adapted products and green buildings (The Green Bond Principles, 2018).

Figure 6 illustrates the distribution of the proceeds of green bonds per sector in the year 2019. The highest share of proceeds with 31% was invested in the energy sector. A nearly similar amount (30%) was invested in buildings, 20% of proceeds were destined to the transport sector. Water accounted for 9%, waste for 4% of the proceeds and 3% of the raised capital was invested into land use. Minor positions encompassed information and communication technology (ICT), industry and unallocated adaptation and resilience (A&R) projects which each accounted for only 1% of the total amount (Rudden, 2020).

Figure 6: Allocation of global use of proceeds of green bonds 2019



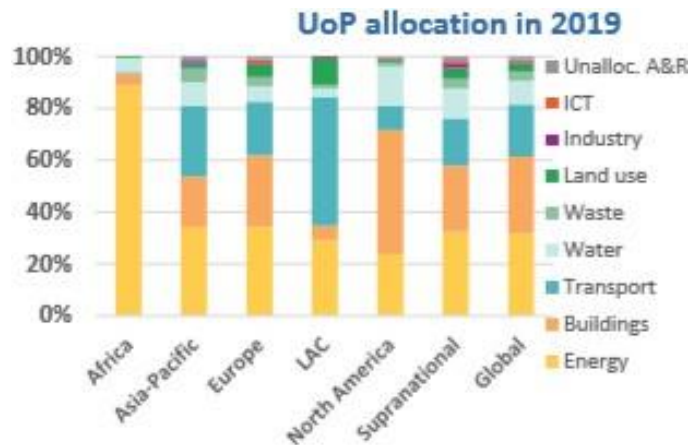
Source: Own presentation based on data from <https://www.statista.com/statistics/512542/green-bond-use-of-proceeds-share-globally-by-sector/>

Figure 7 shows the global allocation of funds raised with green bonds in 2019 and indicates the regional differences. The largest shares of capital have been invested into energy and buildings. Compared to the previous year, the share of energy in the use-of-proceeds mix tends to drop gradually due to increased diversification of issuers and projects. In all regions except Africa, transport has been another important investment target. In Latin America and the Caribbean, transport



represented the major focus of investment. Projects related to water received the highest share of investment in North America. Financing related to land use primarily took place in Latin America and the Caribbean. In all regions, smaller shares of the mix have been destined to waste, industry, information and communication technologies and further unallocated adaptation and resilience projects.

Figure 7: Use of proceeds allocation 2019 per region



11

Source: [https://www.climatebonds.net/files/reports/2019\\_annual\\_highlights-final.pdf](https://www.climatebonds.net/files/reports/2019_annual_highlights-final.pdf) p.5

#### 6.1.4 Cost of Capital of Green Bonds

In general, green bonds have - from a financial point of view - a very high similarity to conventional bonds, the characteristics of which were explained in 5.2.2. The existence of a different way of pricing is subject to investigations, which are shortly outlined in the following section.

As mentioned before, bonds may sometimes be issued instead with a higher price but a lower yield compared to the outstanding debt. The bond then prices within its own yield curve. For a green bond, this is known as a greenium.

For instance, MidAmerican Energy issued two green bonds maturing in 2029 and 2049. The 2029 bond is priced with a new issue premium outside the yield curve. The 2049 bond prices on the curve and is therefore issued with a greenium. Figure 8 illustrates the yield curve.

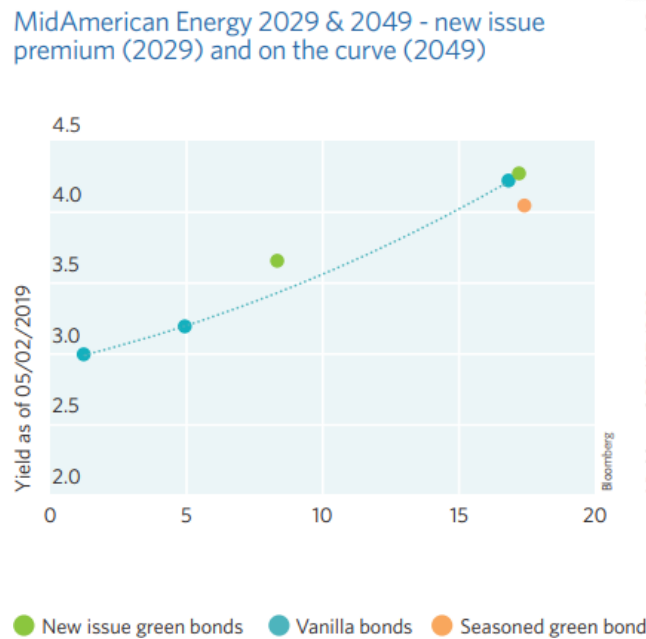
<sup>11</sup> Abbreviations:

LAC – Latin America and the Caribbean

ICT – Information and communication technologies

A&R – Adaptation and resilience

Figure 8: Illustration of new issue premium and greenium



Source: [https://www.climatebonds.net/files/reports/cbi\\_gb\\_pricing\\_h1\\_2019\\_final.pdf](https://www.climatebonds.net/files/reports/cbi_gb_pricing_h1_2019_final.pdf) p.11

What differentiates the cost of green bonds from conventional bonds, is the additional cost for third-party review and potentially certification. However, the Climate Bonds Initiative states that these costs are negligible and that there is no credit enhancement to explain pricing differences. It argues that green bonds and their conventional equivalents are subject to the same market dynamics and are therefore situated on the same yield curve.

In a sample of 32 green bonds issued in the first two quarters of 2019, 6 bonds were issued with a greenium and 15 were priced on their curves. As a result, almost  $\frac{2}{3}$  of the bonds in the sample were issued without a normal new issue premium. The author states that this underlines the strength of demand for green bonds (Harrison, 2019). It is not a requirement to attract investors and pay an extra premium, since interests are so high that investors buy these bonds without special incentives.

Fatica et al (2019) define the greenium as the market premium for green bonds by which the issuer is compensated for the additional costs that arise due to the transparency and reporting requirements.

Xuan Sheng, an ESG analyst at BNP Paribas sees the only reason for a greenium as excessive investor demand in relation to issue size. He claims that

when yield spreads between green bonds and non-green equivalents are observable, they are not caused by a different credit risk because most green bond issuers as well issue non-green bonds (Xuan Sheng, 2019).

On the other hand, a study conducted by Stanford University in the US municipal bond market came to the conclusion that green assets do not trade to a higher price than otherwise identical non-green securities. Therefore, the greenium is equal to zero. Moreover, the study revealed that in 88% of cases there is no yield difference and that investment banks, even though there is no pricing difference, tend to charge about 10% more on average for the issuance of green bonds. The authors claim that they did not find evidence of pricing benefits related to third-party certification, such as from the Climate Bonds Initiative. It is argued that in 91% of the cases analyzed, the pricing difference between CBI certified and comparable non-green assets is exactly zero. Therefore, they see independent certification as an additional cost for the issuer that does not allow for any cost savings (Larcker and Watts, 2019).

In their study, Fatica et al (2019) identified that green bonds have a lower average yield on issuance than non-green bonds issued by the same type of borrower. The study considered 1,397 green bonds and 269,915 ordinary bonds. Moreover, it was found that green bonds with an external review have a lower average yield than those without it. Therefore, it can be assumed that the costs for certification or review are indeed not negligible, as the Climate Bonds Initiative states. However, although investors receive a lower yield, issuers of certified bonds receive a higher premium than for those without a certification, according to the study.

A further finding was that there are differences in the market prices of green bonds according to the type of issuer. Evidence was found that bonds issued by non-financial corporations are more likely issued with a greenium than those issued by financial institutions. A possible reason may be that non-financial corporations usually issue green bonds to directly fund environmental or climate projects, for which they can easily report the detailed use of proceeds of the bond. On the other hand, it is more complex for financial institutions to report about the use of proceeds, as they are not in a direct manner linked to green projects, but provide indirect funding, according to the authors. Thus, non-financial corporations are more likely to provide detailed reports about the use of proceeds to the investors, which is rewarded with a greenium. This implicates that companies with a high environmental performance and transparency have lower cost of debt. In case of financial institutions, the authors found evidence that it is beneficial for the issuer

to be affiliated to the United Nations Environment Programme Finance Initiative (UNEP FI)<sup>12</sup> because it is accompanied by a price advantage of the bonds compared to institutions that are not part of it. The authors assume that this membership clearly signals to the investor that the business strategy is aligned to environmental objectives and provides transparency.

Hyun et al (2019) state that the existence of a premium at the issuance of a green bond would indicate that a significant number of investors value the label in a sufficient manner to give issuers an extra incentive to issue bonds that have a green label. At the same time, these investors still require an acceptable financial performance of green bonds over time.

Furthermore, it is worth looking at the effects of a green bond issuance on equity investment. In their study published in 2018, the authors Tang and Zhang analyzed the real effects of green bond issuances in 28 countries from 2007 to 2017. The data provided evidence for the assumption that stock prices respond positively to green bond issuance and that the stock market reactions are stronger for first-time issuers and corporate issuers than for repeated issuers or financial institution issuers. They did not find a consistently significant premium for green bonds. Therefore, it is suggested that the positive development of stock prices is not exclusively driven by a lower cost of debt. Additionally, they found that institutional ownership of shares increased and stock liquidity significantly improved after issuing green bonds. Therefore, they conclude that the issuance of green bonds is beneficial to the shareholders of the issuing company.

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<sup>12</sup> The UNEP FI is a global partnership between the financial sector, represented by over 200 members, and the United Nations. The aim is to achieve a better implementation of sustainability principles at all stages in financial institutions.

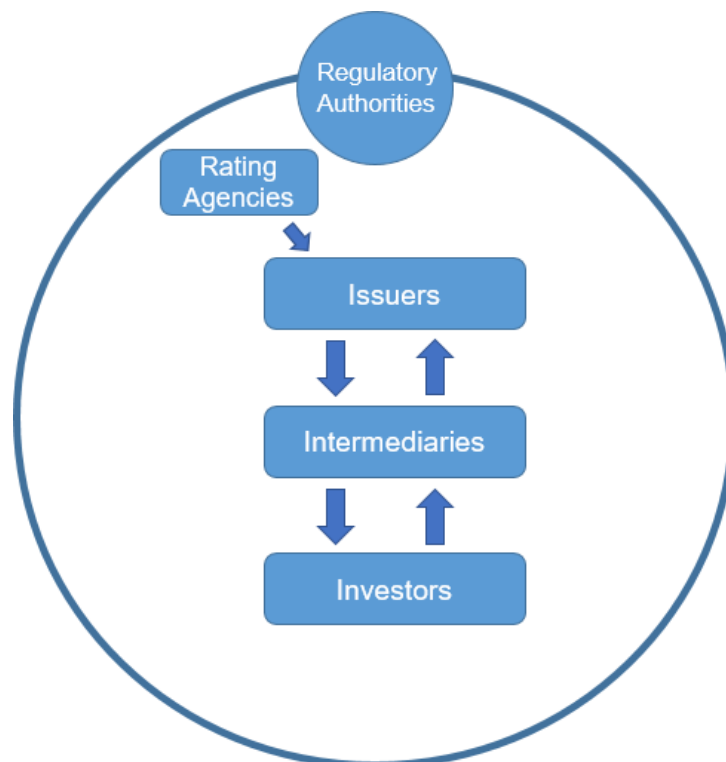
## 6.2 Green Bonds Issues

In the upcoming section, the role of the main players in the green bonds market will be analyzed. A particular focus is placed on what can be done by each of the players to further drive the growth of the green bonds market. Subsequently, three examples of green bonds from different sectors and countries will shortly be presented.

### 6.2.1 Main Actors

As main actors in the market, it is common to identify the following ones (cf. section 5.1): the *Issuers* of the bonds, the *Investors* who acquire them, the *Intermediaries* between the previous ones, *Rating Agencies* that evaluate the credit-worthiness and/or the environmental performance of the bonds and the *Regulatory Authorities* which provide the legal frame for all actors in the market. Figure 9 illustrates their relation among each other.

Figure 9: Overview of the main actors in the green bond market



Source: Own presentation

### 6.2.1.1 *Issuers*

As illustrated in Figure 5, green bonds are issued by different kinds of issuers, ranging from non-financial corporations to financial institutions or government entities.

The reasons for these organizations to issue green bonds are diverse. Green bonds offer the opportunity to attract investors who attach particular importance to sustainability and prefer to support sustainable companies or projects with their investment. This applies primarily to institutional investors that act in the interest of their clients and have a high investment volume. In this way, companies can address completely new investor groups and raise increased volumes of funds. The issuance of green bonds can improve the overall reputation of the issuer, by highlighting the sustainable practices of that company (Nord/LB, 2016).

As analyzed in the previous section, it is not yet clear if green bonds provide a lower-cost possibility of debt financing for the issuer, compared to conventional bond issuance. However, this has been measured in some cases. Reasons for this phenomenon are that the environmental and climate risks concerning the funding project are mitigated which generates more confidence of investors in the project and lowers the financing cost for the company.

Apart from that, issuers also have an important responsibility in earning the trust of investors. In the green bonds market, greenwashing is a threat that may discourage many investors from acquiring green bonds. If issuers misuse the trust of investors by not assigning the funds to the indicated purposes or by not reporting sufficiently, it will lead to the loss of funding for the company. In a broader perspective, image loss and loss of trust in green bonds in general will be the consequences (Nord/LB, 2016).

The underlying problem of greenwashing is the missing legally binding definition which might be one of the most important obstacles for the future growth of the green bonds market at a large scale (Hyun et al, 2019).

In their study for the European Union Hogg et al. (2016) sum up the key bottlenecks that still prevent the necessary growth of the green bonds market. As for issuers, they suggest that the supply of green bonds must be rapidly increased. It is claimed that issuers are currently unable to meet the huge demand for green bonds, as they are largely oversubscribed on a regular basis. From the perspective of the issuer, they see a lack of identified and bankable green projects that can be financed through green bonds. The study further proposes to better aggregate

green projects in order to reach an investment volume that is sufficient for the issuance of green bonds, and therefore easier attracts large investors. The aggregation is considered a huge opportunity, as the amount of small green projects is growing in many countries. In line with Hyun et al (2019), the authors of the study see the missing definition of green bonds as a major obstacle. Issuers on the one hand this may choose not to declare a bond as a green bond, when they are exposed to a reputational risk in case their interpretation of “green” is not aligned to those of environmental NGOs or other groups. On the other hand, a certification increases the transaction costs for issuers and may make it less attractive for them to label their bonds as green. In connection with the lack of definition and common standards, issuers lack knowledge and understanding of the requirements for issuing a green bond. Given that green investments are relatively new in many countries, it may be difficult for issuers to assess their green investments and to receive a good credit rating. Ratings are particularly important to large investors that can provide large amounts of funds. However, rating agencies tend to provide good ratings to institutions that have a certain record of financial accomplishment in the market or that have previously issued bonds. This makes it more difficult for first-time issuers to receive an adequate rating that is appealing to investors. The study evaluates the mentioned risks as being particularly high for investments related to biodiversity conservation, eco-efficient production technologies and climate adaptation, while these risks for investments in renewable energy and energy efficiency are classified as low or medium.

This assessment is reflected in the real investment preferences as illustrated in section 6.1.2. Buildings which improve energy efficiency, and energy are the main sectors to which the investments raised in the green bond market were directed.

A special role as issuer is played by the institutions that have special ties to the government. As described in Figure 5, governmental institutions, such as development banks, sovereigns, local governments and government-backed entities, accounted for 39% of green bonds issuances in 2019. In this aspect, they possess the opportunity to further grow the volume of issued green bonds. Government-related bonds are particularly used for investments in transport, water infrastructure and public buildings. In this way, the green bonds issuances directly help to achieve a country’s climate goals. However, there is still a huge growth potential in this area. Until 2018, local governments of only 14 countries have issued green bonds. (Filkova et al, 2019). It is argued that the issuance of green bonds also

provides the opportunity for governments to contribute indirectly to the achievement of national climate goals. This is, because they can overcome knowledge gaps on environmental issues and contribute to an improved capital allocation by connecting issuers with investor's expectations. The issuance of green bonds would further raise public awareness about the subject of sustainable development (Shishlov et al, 2016). The role of governments as regulatory authorities is analyzed in section 6.2.1.5.

Overall, issuers play a key role in building trust in the green bonds market and thereby assuring its future growth.

### 6.2.1.2 *Investors*

With regard to the investors, it has to be differentiated between the different types of investors in green bonds.

Hyun et al (2019) classify green bond investors into conventional investors and responsible investors. Accordingly, the investment decision making of conventional investors relies mainly on financial factors, such as profitability and cash flow. They do not have a preference for green bonds over conventional bonds. Contrarily, for responsible investors, the decision making includes not only financial, but also non-financial factors such as ESG considerations. However, the authors argue that it is not always possible to make a clear distinction between those two types of investors.

With the aim to discover the preferences of different types of investors in climate funds and the knowledge of fund managers of these preferences in Germany, Steiauf (2017) conducted a survey among these parties in 2014. 356 responses of investors and 19 of fund managers were relevant for the analysis. The survey revealed that for private investors, climate funds are primarily a means of investment, as the attribute of risk and return has the utmost relative importance in this group. The second most important attribute was the regional investment focus and the climate protection aspect was only ranked third. However, the fund managers did not recognize this and overestimated the focus of climate investment. They underestimated the importance of risk and return for private investors and generally tend to place too much emphasis on sustainable product attributes, which do not have the expected importance to these investors. Apart from that, the study also showed that all investors – private and institutional – as a whole benefit more from conventional fund features than from the climate-related ones. According to the preferences of the investors, the author classified them into clusters. Within the cluster



of the sustainability-focused investors, as expected, the climate protection aspect ranked first in importance. The second most relevant feature was the risk and the return. However, unexpectedly, the fact that the fund is awarded with an impact label only resulted to be the fifth most important category, which fund managers did estimate to be more essential to this investor cluster. Within the clusters of investment region and cost-driven investors and the risk and return focused, the fund managers were able to estimate their preferences well. To these investor groups, the impact of climate funds clearly is less important than the traditional financial objectives. They refuse to sacrifice return or donate part of it for the achievement of the climate-related objectives of the fund and can therefore be classified as Financial First Investors<sup>13</sup>. However, the sustainability-focused investors cannot be classified as Impact First Investors<sup>14</sup>, since risk and return remain a major preference for them. Across all clusters, the impact objective that is most relevant to investors is the reduction of CO<sub>2</sub> emissions. It is not specified in which areas this can be implemented, but it is mentioned as more important than the expansion of renewable energies or energy efficiency, which also contribute to this objective. Overall, the study concludes that a better product design of climate funds that is more target group oriented and better adapted to the preferences of the investors could not only maximize the benefits of investors, but also increase the total allocation of capital to these funds. In this way, climate funds could better contribute to the achievement of the German and European climate targets.

The study of Hogg et al (2016) pointed out some of the risks investors are exposed to in the green bonds market. One of the most crucial risks for particularly responsible investors is the information asymmetry on the use of proceeds. Investors claim that most issuers of green bonds do not report transparently over the use of proceeds and the actual environmental and climate-related impact of the investment. They suggest to make annual reports mandatory in order to increase the available information. But also in general, the lack of definition and a common framework lets investors doubt about the real environmental impact of the bonds. The absence of a common definition implies that there are no penalties for issuers in case the investments do not achieve the expected green impact. Penalties could include bond buy-back obligation, loss of green ratings for this or other bonds issued by the same organization or loss of potential tax benefits. These could provide more security for investors, however, issuers argue that the risk of facing a

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<sup>13</sup> Financial First Investors have an interest in responsible investment, but subordinate the impact objectives to the financial objectives (Wilson, 2014, p.7).

<sup>14</sup> Impact First Investors accept a lower return of their investment than the market return in order to achieve the impact objectives (ibid.).

penalty could prevent them from issuing green bonds which would reduce the supply in the market. Moreover, it is stated that second party opinions do not always provide reliable information to potential investors. This subject will be further analyzed in section 6.2.1.4. Additionally, the study finds evidence to support the position that some green investments are riskier than investments in conventional goods or services due to the fact that the green bonds market is still emerging and some technologies and financing instruments are less mature. Although these investments are mitigating climate and environmental risks in the long term, the investment could be riskier from investor's short-term financial perspective.

As mentioned before (see p.18), institutional investors, such as pension funds and insurance companies, participate in the market both as investors, and as well as intermediaries, due to the fact that they invest on behalf of the personal investors that invest in them.

With respect to their role as investors, the Global Sustainable Investment Alliance conducted a survey in October 2019 among 272 employees of institutional investors in order to detect challenges in the market. The majority of the respondents has a position as asset manager or service provider. One major finding was that 59% of the respondents are "very" or "somewhat" dissatisfied with the climate-related disclosure of publicly traded companies. Another important finding was that 87% do not believe that markets price climate risks consistently and correctly in company and sector valuations. 11% were not sure about this topic and only 2% stated that they did believe, this was the case (Global Sustainable Investment Alliance, 2019).

Overall, to motivate more investors to consider green bonds and increase the demand in the market, it is necessary for issuers to improve the transparency about the associated use of funds and the risks. It might be very useful for investors to have transparency requirements implemented by the regulatory authorities. Moreover, it is also necessary for issuers and intermediaries to have a better understanding of the investor's preferences in order to design and present corresponding investment products.

### 6.2.1.3 Intermediaries

The three most commonly involved intermediaries in the green bonds market and their roles are shortly summed up in Table 4. The following section discusses their role in more detail.

Table 4: Overview of intermediaries

<b>Intermediary</b>	<b>Function</b>	<b>Possible effects on bond's cost of capital</b>
Institutional investors	Aggregate investment volume	Reduced transaction costs
Brokers	Diversify investor base, achieve best price	Possibly reduced transaction costs
Stock exchanges	Provide liquidity, transparency and standardization of the market	Generally increased cost of capital through transaction costs

As formerly mentioned, institutional investors play a special role in the green bonds market, both as investors, and as intermediaries. In their role as intermediaries, they represent the interests of their personal investors, as well as their corporate interests, when investing in green bonds. Zarbafi (2011) affirms that responsible institutional investment not only helps to improve the corporate responsibility of the corporations in which is invested, but also improves the corporate responsibility of the investment company.

In line with the request of Hogg et al. (2016) to better aggregate green investment volumes, institutional investors partly provide this function in the market. The increased investment volume enables them to allocate higher amounts of funding for green purposes. Such a function can be seen as an opportunity for the green bonds market. Moreover, it can be assumed that higher investment volumes reduce transaction costs for issuers, which may reduce the cost of capital of bonds.

Other intermediaries between issuers and investors are brokers or underwriters who sell the bonds for the issuer. The advantage for issuers to work with brokers is the individual client base of each of them, which in turn diversifies the investor base. The objective for brokers is to achieve the highest possible amount for the bond in order to raise the requested money for the issuer, while ensuring that all bonds are sold. To improve their contribution to the growth of the green bonds market, it is suggested to implement standard disclosures that facilitate

transactions (Kidney and Boulle, 2015). Furthermore, effective transactions by brokers may reflect positively on the cost of capital of the bonds. Overall transaction costs can possibly be reduced.

Stock exchanges can also be counted as intermediaries in the market. They dedicate segments to listed green bonds that fulfill certain green criteria. Some of them even create platforms to trade environmentally friendly securities and green bonds, such as the Luxembourg Green Exchange (Hogg et al, 2016). The Climate Bonds Initiative evaluates the role of stock exchanges as crucial for the green bonds market. This is, because they provide liquidity and ensure that markets are regulated and transparent. The provision of information, training and performances indices, enables stock exchanges to help investors identify green investment opportunities. They are able to apply the GBP or Climate Bonds Standards for all their green securities and thus offering investors improved transparency and reducing the risk of greenwashing. In general, they are in the position to harmonize the overall standardization in the market. For issuers, they provide the possibility to reach a large range of possible investors, such as institutional investors, as well as medium-sized and individual investors. By connecting issuers and investors, stock exchanges may improve the liquidity of the market, resulting in reduced process times and transaction costs. Moreover, they have the possibility to offer market education for investors and issuers, and to foster the dialogue between all stakeholders involved in the market. Stock exchanges consider their commitment to green finance as an opportunity to enhance their credibility and reputation. It also provides international opportunities for exchanges, as the rising green bonds market in emerging economies drives trans-regional trade of securities. Overall, the role of stock exchanges is especially important in the future to avoid a segmentation of the global market through the implementation of common standards (Climate Bonds Initiative, 2017b). Bond trading on stock exchanges generally increases the cost of capital for bonds, as it does not provide direct cost savings.

In summary, the intermediaries can contribute to the growth of the market by aggregating investment volumes, providing liquidity, improving the interaction with the other stakeholders and, most importantly, helping to establish common standards.

#### 6.2.1.4 *Rating Agencies*

As explained in section 6.1.2, green bonds are subject not only to credit ratings, but also several external reviews that assess the environmental impact. These ratings already are applied for the vast majority of newly issued green bonds. The role of rating agencies and other service providers that conduct these reviews is analyzed in this section.

Even in their traditional credit rating analysis, the major rating agencies S&P Global Ratings, Moody's and Fitch Ratings already include ESG considerations. However, only to the extent that these topics materially affect the credit risk. Due to this reason and because of the rather short time horizon, credit ratings can only partially consider sustainability risks. In pure credit analysis, these mostly have an impact in the energy, resources and vehicle industry.

For green bonds, ESG ratings are conducted additionally. These analyze and rank environmental, social and governance factors into a combined ESG score. The scoring methods and weightings for each of the factors may depend on sectors and countries. For instance, for sovereign issuers, ESG factors such as institutional quality, government effectiveness, country competitiveness, social cohesion, control of corruption, rule of law, and physical climate change, are relevant for credit rating agencies (Inderst and Stewart, 2018).

It has been criticized that many ESG ratings do not consider or undervalue shareholder engagement and public advocacy of investors. Therefore, the real impact of sustainable funds is not considered (Krosinsky, 2018).

Another criticism of ESG ratings is that they make investment opportunities seem attractive for sustainable investors which do not fulfill the requirements of a certification of the GBP or Climate Bonds Initiative. The rating by a third party would not necessarily mean that the underlying project is compatible with the objectives of the Paris Agreement (Combes, 2017). Depending on the rating, this would mean that it may even have a greenwashing effect.

A similar tendency is observed by NGO representatives interviewed during the study of Hogg et al (2016). They claim that with increasing competition between service providers, the quality of green bonds assessments is decreasing. They even observe a sort of competition for developing the most favorable assessments. Another important issue mentioned in this context are conflicts of interests. Some of the providers of second opinions assess the green bonds and then rate the issuing companies. Although the rating companies claim that different services are

provided by different teams which are strictly divided from each other, this fact does not contribute to increase investor's trust.

However, in their study of 89 pairs of green and brown bonds, Bachelet et al (2018) found evidence to the contrary. Their empirical study came to the conclusion that either an established reputation of the issuer or a green verification is necessary to reduce asymmetric information and avoid greenwashing. They found that this guarantee for investors provides the possibility to finance green investments at a discount.

All in all, while there are no legally binding standards for green bonds defined yet, ESG ratings are still of high importance to many investors, even if some of the rating companies misuse this trust. Only the implementation of common standards that can be approved or not by them may improve the trust of investors in their services.

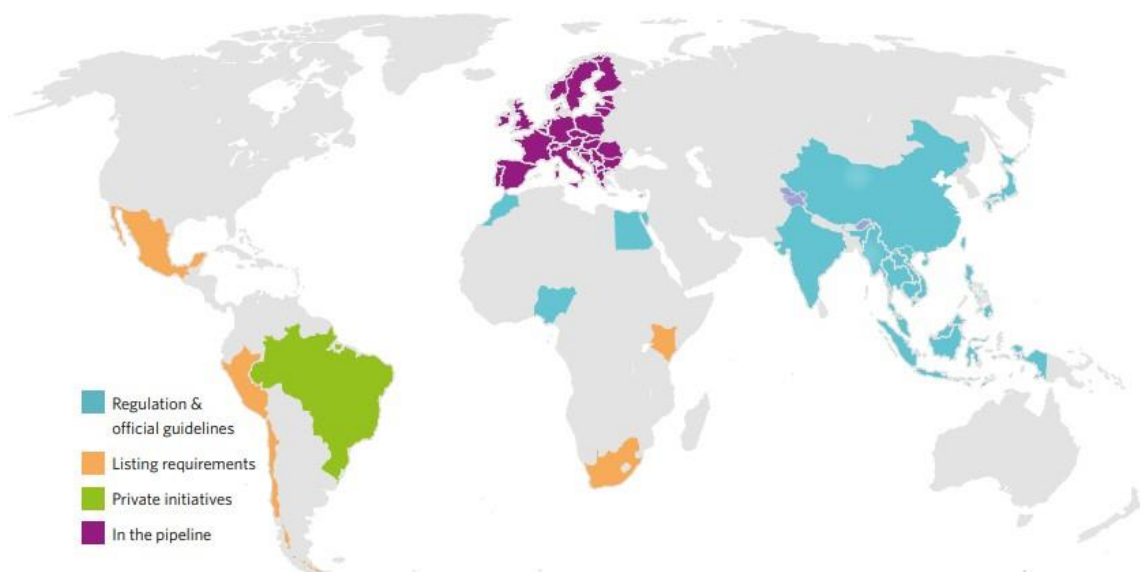
#### *6.2.1.5 Regulatory Authorities*

Certainly, governments, government agencies and bodies as regulatory authorities not only play an important role as issuers, but also influence the green bonds market through legislation and other means.

Like other countries before, Egypt and the Philippines published national guidelines for green bonds in 2018. Moreover, central banks are taking action to further stimulate the green bonds market. Some of which have started integrating climate factors into their investment strategies. They are also creating incentives for the banks they supervise to increase green lending and the issuance of green bonds (Filkova et al, 2019). In 2017, a range of central banks and supervisors founded the Network for Greening the Financial System (NGFS). Its objective is to share best practices on a voluntary basis and improve the environment and risk management in the financial sector to mobilize the mainstream financial institutions towards a sustainable economy. As of 26<sup>th</sup> of March 2020, NGFS consists of 63 members and 12 observers (Network for Greening the Financial System, 2020).

The following Figure 10 illustrates the availability of government guidance on green bonds globally (Filkova et al, 2019).

Figure 10: Availability of national and regional green bond guidance



Source: <https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Public-research-resources/CBIGBMFinal032019-120319.pdf> p.22

It shows that official regulations are mainly present in Asia. Emerging economies in other regions have some sort of governmental guidance and rely on listing requirements or private initiatives. In Europe, the decision on governmental regulations is still pending.

It is interesting to see how the most vulnerable countries to climate change (according to Eckstein et al, 2018) manage green bond regulation. Out of the 10 most vulnerable countries, only three – Peru, Vietnam and Thailand – implemented regulation or listing requirements for green bonds. Of the top four countries<sup>15</sup>, none has introduced legal requirements or guidelines. The same applies for the USA, which occupies the 12<sup>th</sup> place in the ranking.

The current official guidelines are mostly based on the GBP. The ASEAN Green Bond Standards (ASEAN GBS), for instance, are based on the GBP but include further specifications and additional requirements. In order to qualify for the ASEAN GBS, the issuer of a green bond must have a geographical or economic connection to the region. Furthermore, assets related to fossil fuel power generation are excluded from the ASEAN GBS (ASEAN Capital Markets Forum, 2017). In case of Peru, no legal guidelines exist, but the Lima Stock Exchange introduced the requirement that for any bond to be listed as a green bond, an independent reviewer must confirm that the bond is in alignment to the GBP. This measure was

<sup>15</sup> These are Puerto Rico, Sri Lanka, Dominica and Nepal.

developed with the help of the Mexican Stock Exchange (MÉXICO<sub>2</sub>, 2018). However, in case of Mexico, the Green Bonds Standards MX incorporate details that go beyond the GBP in some points and require an independent third-party opinion. This may consist out of a Second Party Opinion, or a certification against the Climate Bonds Standard (Climate Finance Advisory Group, 2018).

Despite being the leading country in terms of issue volume, accounting for a market share of 19.9% in 2019 (Climate Bonds Initiative, 2020d), the USA does not present official regulation specific to green bonds. Wang (2018) identifies the lack of regulation in the USA as a reason for a less rapid growth of the green bond market, compared to other countries. The author suggests that the SEC establishes regulation for issuers in order to improve investor trust which should take the form of a tiered system to determine to what extent the bond is green. The regulation should further contain a mandatory independent verification system and require quarterly reports from issuers to investors. Additionally, the regulation should impose strict penalties for greenwashing. Nevertheless, the investor information section of the SEC up to now does not provide information on green bonds, it does not mention them as a type of bond (cf. Securities and Exchange Commission, 2020).

For the European Union, the European Commission is currently developing several mechanisms for the further development of green finance.

In June 2018, the EU set up a technical expert group with the aim to develop recommendations for methodologies for EU climate benchmarks, guidelines to improve corporate disclosure on climate topics, an EU classification system (“EU Taxonomy”) that determines the environmental sustainability of economic activities and an EU Green Bond Standard – referred to as EU GBS (TEG, 2019).

The EU Taxonomy defines six environmental objectives, which are climate change mitigation, climate change adaptation, protection of water and marine resources, transition to a circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems. An economic activity aligned to the EU Taxonomy needs to make a substantial contribution to one of these environmental objectives, while doing no significant harm to the other five, and comply with minimum safeguards, such as the UN Guiding Principles on Business and Human Rights. Only if these three criteria are met, a measure can be classified as environmentally friendly (EU Technical Expert Group, 2020a). The EU Taxonomy



provides detailed tables to identify the impact of economic activities on environmental objectives. An abstract of the table of activities that comply with climate change adaptation is displayed in Annexes **and Appendices I**.

In December 2019, the European Commission presented the European Green Deal, which is a wide framework and a program of actions with the underlying objective to make the EU's economy sustainable and the continent climate neutral by 2050. It emphasizes the importance of the private sector for achieving these goals. The Green Deal acknowledges the EU Taxonomy and includes the possible development of an EU Green Bond Standard (EU Technical Expert Group, 2020b).

It is suggested that the EU Green Bond Standard should be a voluntary standard proposed to issuers. The relevance of it should apply for issuers located in and outside the EU. The TEG states that the EU GBS is built upon best market practices, such as the GBP and would consist out of the following four core components. The first is that the use of proceeds would be aligned to the EU Taxonomy to identify eligible green projects and the second component is a Green Bond Framework that will be applied by the issuer. By the use of this framework, the issuer will be able to demonstrate to the investor how the green bond issuance is aligned to the strategy of the issuer, explain the project, proceeds allocation and how the reporting and verification will take place. Furthermore, the EU GBS requires allocation and impact reporting. Guidance on how to provide this reporting is disclosed in the third component of the standard. Moreover, the standard includes requirements for the external verification by approved verifiers<sup>16</sup> which is about to be mandatory (EU Technical Expert Group, 2019). The draft of the EU GBS (cf. *ibid.*) is outlined in 9.2 Annex II.

All in all, the EU GBS might be a necessary approach to standardize the market and reduce information asymmetries and uncertainties for both issuers and investors. Nevertheless, it does not provide legislation and it will depend upon issuers, whether or not the standards will be predominantly used in the European market.

Another possibility for governments to contribute to the expansion of the green financial market are tax incentives capable of attracting investors. However, these incentives mean that the expected return is only high as long as the policy is in place. Investors are principally skeptical towards “new” sectors that rely on subsidies which is why in practice, tax incentives may even keep potential investors from participating in the market (Hogg et al, 2016).

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<sup>16</sup> The verifiers would have to be registered, authorized or supervised by the European Securities and Market Authority.

The European Securities and Market Authority (ESMA) is another important regulatory authority in the European market and has a key role in orienting the private sector towards sustainable investment. In February 2020, the ESMA announced to support the EU GBS (EU Technical Expert Group, 2020b).

Other regulators in the green bonds market are the Climate Bonds Initiative and the International Capital Market Association (ICMA). The former is a key player in defining standards, providing certification and reporting on the market development (see 6.1.1) and the latter has published the GBP which also offer guidance for other market participants. Moreover, the ICMA provides advice and facilitates the information exchange between issuers, investors, and other stakeholders (The Green Bond Principles, 2018).

As it has been seen in the cases of some countries, stock exchanges may also act as regulatory authorities by setting requirements for the listing of green bonds in the absence of formal regulation.

In conclusion, the most relevant regulatory authorities are already providing guidance in many regional bond markets. However, this consists mainly out of voluntary approaches, many countries are still lacking any guidance, and legislation has not yet been used in many countries to regulate the green bonds market. In order to significantly assist the market growth, further engagement of governments will be necessary.

### 6.2.2 Examples

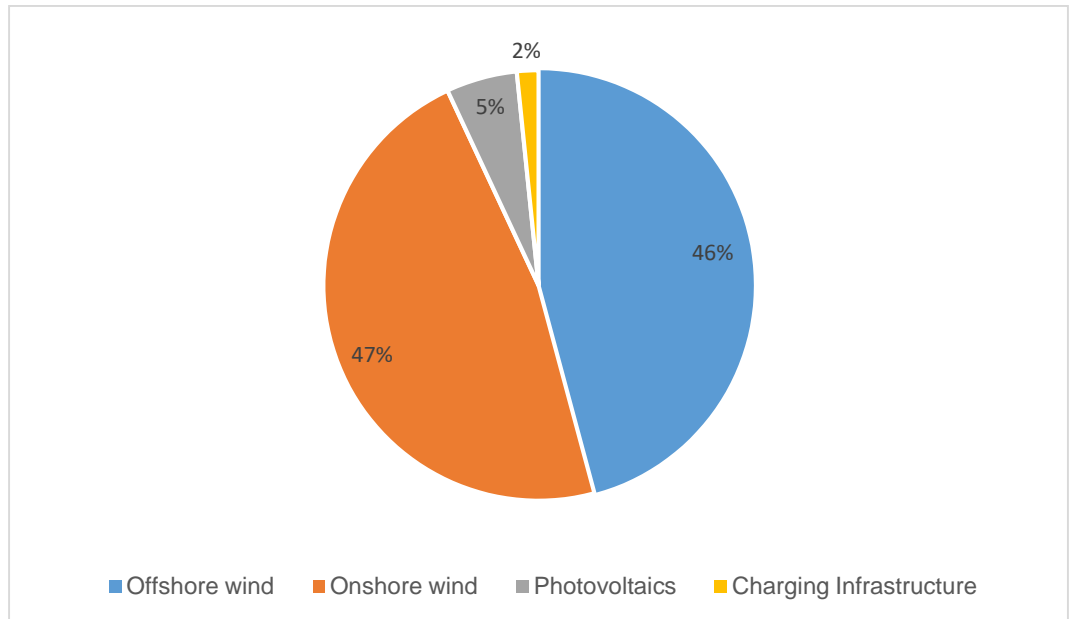
In this section, three green bonds of the past two years will be explained in detail. The examples are selected from different sectors to which the proceeds are directed to. The first bond represents a renewable energy bond, the most common type of green bond. The second bond is directed to the improvement of industrial processes regarding energy efficiency, (waste) water treatment and pollution control. The third bond raises funds for the expansion of low-carbon urban transport. The last two bonds were issued in Peru and Thailand both of which are highly vulnerable to climate change and have already introduced regulation or listing requirements regarding green bonds (see previous section). The following Table 5 summarizes the main features of the three examples.

Table 5: Overview of examples

Issuer	Use of Proceeds	Issue volume	Maturity	Coupon rate
EnBW AG	Renewable energy	€500 million	15 years	1.875%
Protisa Peru	Energy efficiency, (waste) water treatment	\$30 million	6 years	6.625%
BTS Group	Low-carbon transport	\$408 million	Up to 10 years	2.51% to 3.86%

On 24<sup>th</sup> of October 2018, the German energy company EnBW launched its first green bond with the ISIN XS1901055472. The issue size was EUR 500 million with a par value of EUR 1,000, and a time to maturity of 15 years, until 2033 and the coupon rate is 1.875%. The first coupon was paid on 31<sup>st</sup> of October 2019 with the bond being rated A3 by the credit rating agency Moody's and A- by Standard & Poor's. The guarantor for the bond which is traded on the Luxembourg Stock Exchange, is EnBW Energie Baden-Württemberg AG. BBVA, DZ Bank, LBBW and Morgan Stanley are functioning as underwriters. According to company information, the bond has met rising demand for sustainable investment, as it was oversubscribed within hours after the issuance. The sustainability agency ISS-oekom confirmed the bond's alignment with the Green Bond Principles and was further certified by the Climate Bonds Initiative. Its proceeds are allocated towards projects in the areas of wind power, photovoltaics and electric mobility (EnBW, 2018). The company's Green Bond Impact Report reveals the attributable capacity of the projects to the bond. For the sum of EUR 496.42 million that have been allocated, Figure 11 shows the share of each project category. Accordingly, 46% or EUR 227.5 million have been invested in two German offshore wind projects under construction and EUR 234.4 million (47%) into several smaller onshore wind projects. In total, the investment into wind projects accounts for 93% of the raised funds. EUR 26.5 million (5%) were invested in photovoltaics and the smallest sum of EUR 8.05 million (2%) into the expansion of quick-charge infrastructure for electric vehicles at 89 locations on the German autobahn network.

Figure 11: Projects financed with the EnBW green bond (%)



Source: Own presentation based on data from:  
[https://www.enbw.com/media/bericht/bericht\\_2018/investors/enbw-green-bond-impact-report-2018.pdf](https://www.enbw.com/media/bericht/bericht_2018/investors/enbw-green-bond-impact-report-2018.pdf) p.6

The environmental impact of the bond is the avoidance of 184,820 tons of CO<sub>2</sub>-equivalent per kilowatt-hour of generated energy at the planned capacity after completion of the projects (EnBW, 2019).

The second issuance of green bonds in Peru is the PEN 100 million (equivalent to USD 30 million) issued by the company Protisa Peru on 23<sup>rd</sup> of October 2018 with a maturity of 6 years and an interest rate of 6.625%. It received a credit rating of AA. The company is a fabricant of tissue products. The proceeds are allocated towards energy performance, water and wastewater treatment and pollution control related to the industrial production. The Climate Bonds Initiative has not certified the bond. It has, however, been assessed with a Second Party Opinion by the company Sustainalytics (Climate Bonds Initiative, 2018). Sustainalytics confirmed the bond's alignment to the GBP. According to the structurers and underwriters of the issuance, the bond has been oversubscribed 3.6 times, demand being driven primarily by domestic pension funds, insurance companies and foreign investors (El Comercio, 2018).

The first green bond in Peru has been issued in 2014 by the energy company Energía Eólica. After the issuance of the bond of Protisa, three further bonds have been issued, reaching volumes of up to USD 400 million (United Nations Environment Programme Finance Initiative, 2020).

Thailand's third green bond was issued on 24<sup>th</sup> May 2019 by the BTS Group with an investment volume of THB 14 billion, equivalent to USD 408 million. It has

been issued in 5 tranches of maximum 10 years, therefore, the maturity date is 2029. The coupons range from 2.51% to 3.86% and the bond received a credit rating of “A / stable” by TRIS. It has been oversubscribed 8 times, with a high demand in particular from institutional investors. The bond has not been subject to a Second Party Opinion, however, it was assessed with a pre-assurance report and is certified by the Climate Bonds Initiative. It is furthermore the first bond in Southeast Asia to be certified against the Low Carbon Transport criteria. The issuing company owns the Bangkok Skytrain. The proceeds of the bond are allocated to the extension of the electric rail network, adding 64 km of new track and 53 new stations. According to Climate Bonds Initiative, in order to face the urbanization and population growth in Southeast Asia, green bonds can play a crucial role in directing financing towards low-carbon transport modes (Climate Bonds Initiative, 2019a).

### 6.3 Green Bond Markets

The following section will provide insights into the real performance of green bonds and special features in different markets.

According to Inderst and Stewart (2018), there are several indices that exclusively measure the performance of green bonds. They incorporate different types of bonds and currencies and have different requirements towards green criteria. Table 6 provides an overview over the different indices based on information by the GBP-SBP Databases & Indices Working Group (2018).

Table 6: Overview of green bond indices

Index	Currencies	Green criteria	Credit criteria
Bank of America Merrill Lynch Green Bond Index	Multi-currency	Climate change mitigation and adaptation or environmental sustainability	Only investment-grade bonds based on an average of Moody's, S&P and Fitch ratings
Bloomberg Barclays MSCI Green Bond Index	Multi-currency	Own green criteria broadly aligned with GBP	Only investment-grade bonds based on an average of Moody's, S&P and Fitch ratings
S&P Green Bond Index	Any currency	Aligned to CBI	No credit requirements
Solactive Green Bond Index	USD	Aligned to CBI	No credit requirements
ChinaBond China Green Bond Index	RMB	Eligible if bond meets at least one of the following standards: Green Bond Category, Green Bond Issuance Guidelines, GBP, CBI	No credit requirements

Source: [https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/June-2018/2018\\_Green-and-Social-Bond-Indices-140618.pdf](https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/June-2018/2018_Green-and-Social-Bond-Indices-140618.pdf)

Figure 12 shows the performance of the S&P Green Bond Index, as it takes into account any currency and represents only those green bonds that are conform with the detailed requirements of the Climate Bonds Standard and are therefore certified as contributing to the Paris Agreement.

Figure 12: S&P Green Bond Index 10 years



Source: <https://us.spindices.com/indices/fixed-income/sp-green-bond-index>

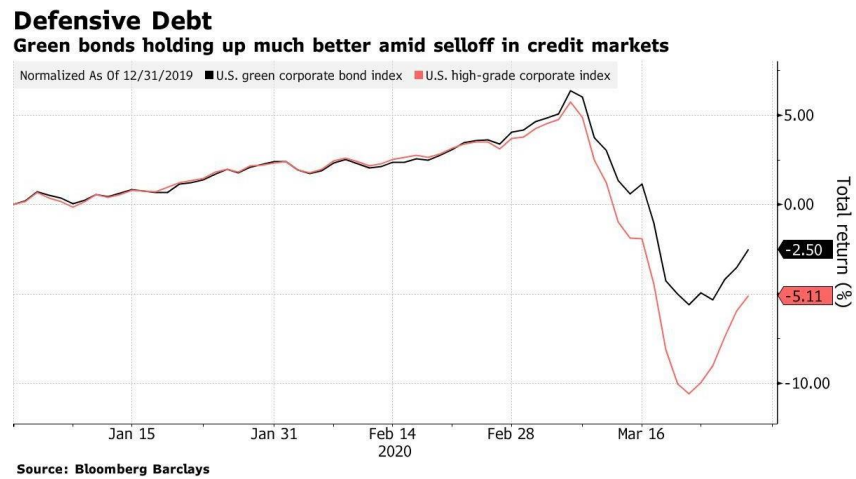
It can be observed that the development of the performance over the last 10 years has been rather stable with a modest growth of 1.98% in annual returns (S&P Dow Jones Indices LLC, 2020).

The stability of green bonds is also demonstrated in the current global crisis due to Covid-19. According to industry experts, green bonds better resist to the volatility that the markets experienced in recent weeks (as of April 2020) due to the nature of the underlying business of the bonds. Between 1<sup>st</sup> of January and 14<sup>th</sup> of April 2020, the issuance of green bonds increased by 21.1% compared to the previous year according to data from Thomson Reuters. Recently issued green bonds experienced a significant oversubscription, however, it is not clear how the corona crisis will impact the further development of the green bonds market. It is possible that firms will rather rely on bank loans in the near future due to higher bond market spreads (Escribano and Simón, 2020).

Figure 13, provided by Bloomberg, proves that green bonds have incurred into fewer losses than conventional investment grade debt since the beginning of the Covid-19 crisis, on the basis of US data. It can be noted that their development has been rather similar from January to February 2020. By the end of March 2020, the US high-grade corporate index accounted for a negative return of 5.11%, while for the US green corporate bond index, this equaled only 2.5%. Possible reasons

for this difference are named to be the concentration of sustainable debt in more conservative sectors, such as banks and utilities, and only to a lesser extent into cyclical industries. Green debt has almost not been affected by the oil-price drop caused by the global crisis, other than conventional corporate debt. Moreover, it is pointed out that green debt had lower spreads before the crisis which during the crisis resulted in lower risk-premiums than those for non-green debt. A possible reason for this might be that green bonds are primarily held by institutional investors, who are long-term oriented and tend not to sell during a crisis. The greater steadiness of the green bond market which can be currently observed might even be a motive for potential issuers to consider green debt, if they already have qualifying projects (Mutua, 2020).

Figure 13: US green corporate bond vs US high-grade corporate index 2020 (%)



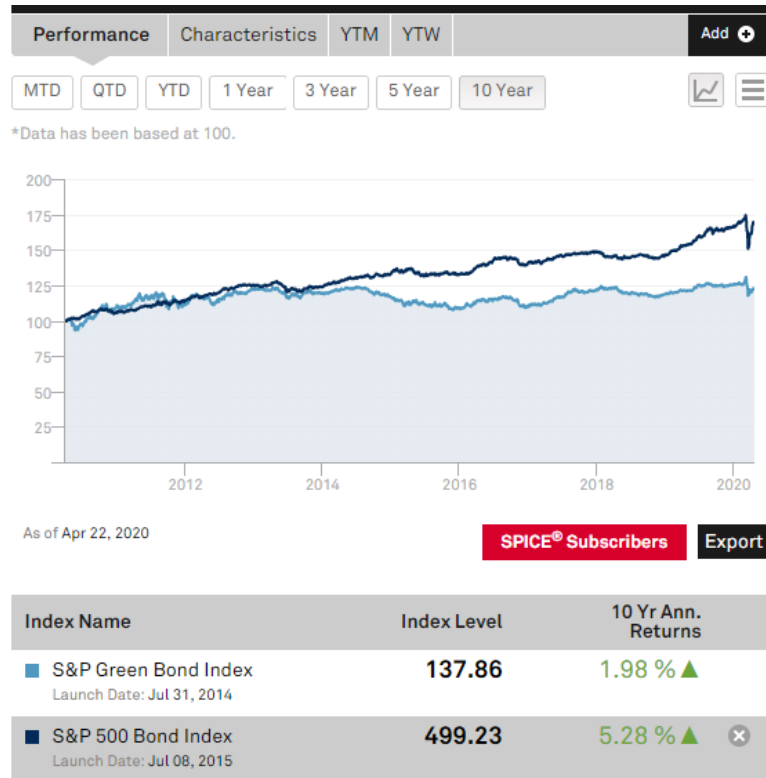
Source: <https://www.bloomberg.com/news/articles/2020-03-30/ubs-says-investors-should-prefer-green-bonds-over-regular-debt>

For a longer-term perspective, the comparison of the S&P 500 Bond Index<sup>17</sup> and the S&P Green Bond Index over a period of 10 years illustrates this feature. Figure 14 clearly illustrates that the S&P 500 Bond Index is less steady than the S&P Green Bond Index, but has been generating higher returns since approximately the year 2011. On average, the annual return of the S&P 500 Bond Index has been 3.3% higher than the one of the S&P Green Bond Index.

<sup>17</sup> The S&P 500 Bond Index considers bonds issued by the top 500 US corporations that form part of the S&P 500 (see <https://us.spindices.com/indices/fixed-income/sp-500-bond-index>).



Figure 14: S&P 500 Bond Index vs S&P Green Bond Index 10 years

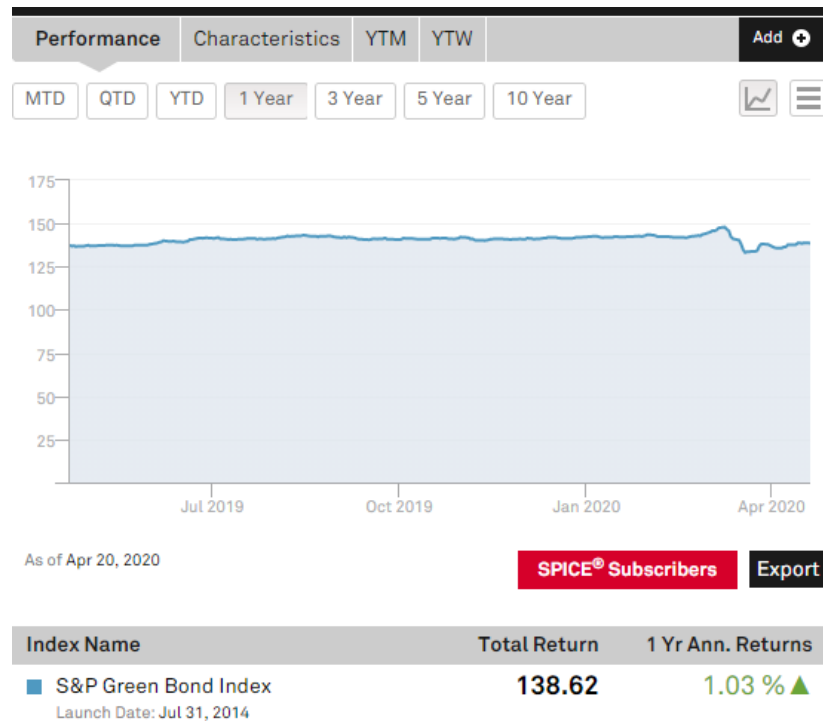


Source: <https://us.spindices.com/indices/fixed-income/sp-green-bond-index>

This shows that, unlike ESG investments in equity (cf. Figure 2), green bonds have on average a lower return than conventional bonds.

For the short run, Figure 15 illustrates the performance of the S&P Green Bond Index over the past year up to 21<sup>st</sup> of April 2020. It is observable that in the past month, return decreased slightly but a positive tendency is expected afterwards.

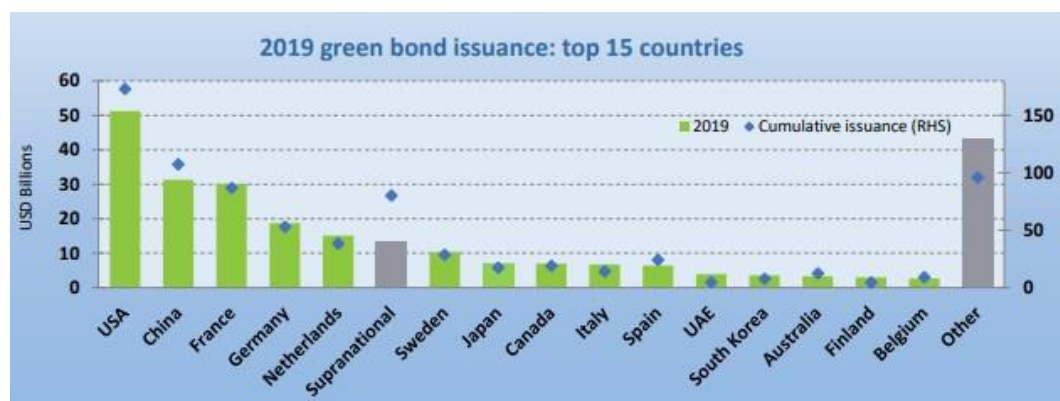
Figure 15: S&P Green Bond Index 1 year



Source: <https://us.spindices.com/indices/fixed-income/sp-green-bond-index>

It is worth taking a look at the recent development of different markets. Figure 16 shows that the USA has been the country with most green bond issuances in 2019 with a total issuance volume of USD 51.3bn and accounting for 19.9% of global issuance (cf. section 6.1.2). In the following, the US green bond market will be further analyzed. Afterwards, the Asian and European markets will be examined.

Figure 16: Top countries in green bond issuance 2019



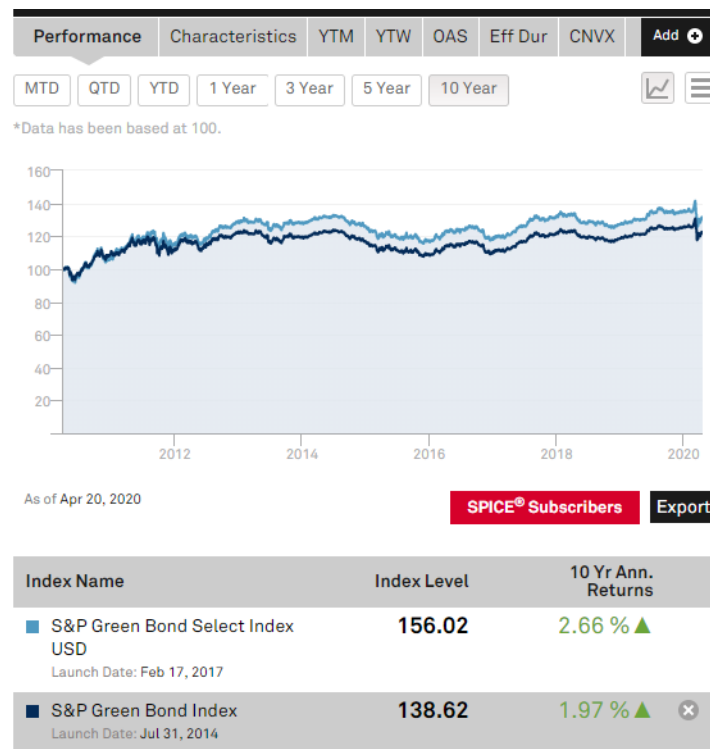
Source: [https://www.climatebonds.net/files/reports/2019\\_annual\\_highlights-final.pdf](https://www.climatebonds.net/files/reports/2019_annual_highlights-final.pdf) p. 1

The top position of the USA in the ranking is partly a result of the high issue volume of Fannie Mae, which was the world's largest issuer in 2019. Fannie Mae issued USD 22.9bn, predominantly in green agency mortgage-backed securities.

The overall issuer mix in the region has not remarkably changed compared to previous years. Regarding the use of proceeds in the North American market, it is the only regional market where energy is not the main sector to be invested in. Instead, the largest share is represented by buildings with 48% in 2019. (Climate Bonds Initiative, 2020d). For a more detailed comparison of the use of proceeds among regions see Figure 7.

When looking at the development in the US market, it is evident that the green bonds in the S&P Green Bond Index only issued in USD perform better than the global index. Figure 17 shows that especially after the year 2012, this tendency becomes clearly observable. Overall, green bonds issued in USD performed on average 0.69% better in the 10-year period. However, it has to be considered that the S&P Green Bond Index also includes the bonds issued in USD and that not all bonds issued in USD are related to the USA. They might have been issued in other countries.

Figure 17: S&P Green Bond Select Index USD vs S&P Green Bond Index 10 years



Source: <https://us.spindices.com/indices/fixed-income/sp-green-bond-select-index-usd>

In order to evaluate the performance of the second biggest national market - China - the ChinaBond China Green Bond Index shown in Table 6 is used (Luxembourg Stock Exchange, 2020). Figure 18 indicates that this index experienced a significantly stronger growth in the past 10 years than the previously described indices. Between the 21<sup>st</sup> of April 2010 and the 22<sup>nd</sup> of April 2020, it

increased by 66%. Therefore, the average growth rate was 5.2%. Over the past year, the growth rate was 8.36%.

Figure 18: ChinaBond China Green Bond Index 10 years



Source: <https://www.bourse.lu/index/CBA04901/1000004>

In 2019, China issued USD 31.3bn in green bonds, only counting the issuances that comply with international green standards. Recently, Chinese regulators are aligning local definitions of green to international definitions. A further growth in green bond issuance can therefore be expected in the near future (Climate Bonds Initiative, 2020d).

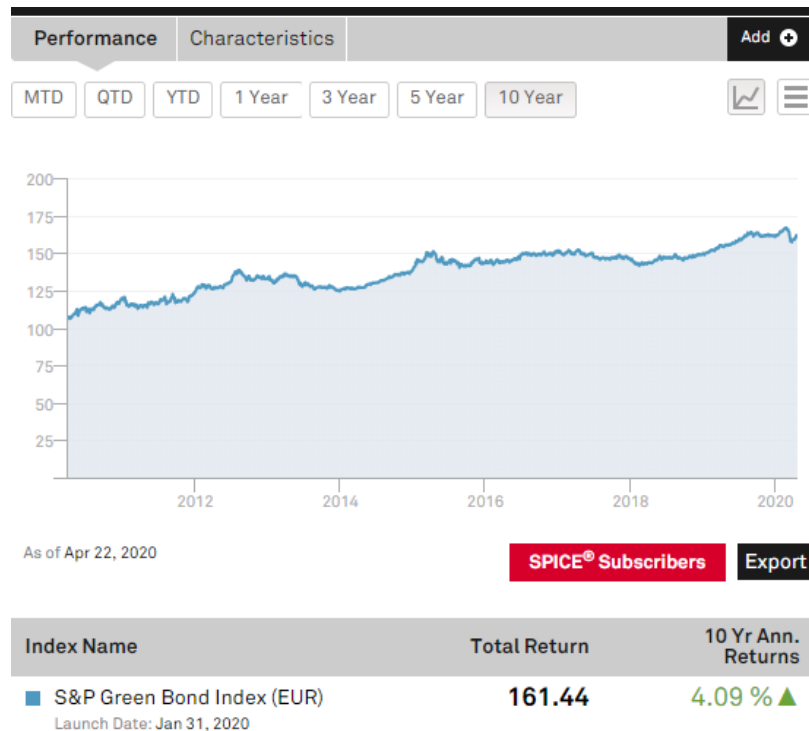
Green Bond issuance in the ASEAN region reached USD 7.8bn in 2019 and almost doubled with respect to the previous year. It accounted for 3% of global and 12% of the Asia-Pacific issuance, while Singapore contributed with 55% of the ASEAN issuance. Many other national green bond markets are still in an early stage of development. With respect to the use of proceeds, buildings and energy are the main sectors in which investments are made (Rimaud et al, 2020).

The overall Asia-Pacific region had a share of 25% of global issuances in 2019 and was able to increase their issuance by 29% with respect to 2018. The issuer mix in the region changed slightly in 2019, as evidenced by an increase in non-financial corporate and a decrease in financial corporate and development bank issuance. Regarding the use of proceeds, the investment in buildings and transport significantly increased, primarily driven by Chinese issuance in these sectors (Climate Bonds Initiative, 2020d).

With regard to the development of green bonds issued in EUR, in Figure 19 shows a steady growth over the past 10 years. The annual return of 4.09% has

been higher than the one of green bonds in USD and also as the global index (see Figure 17).

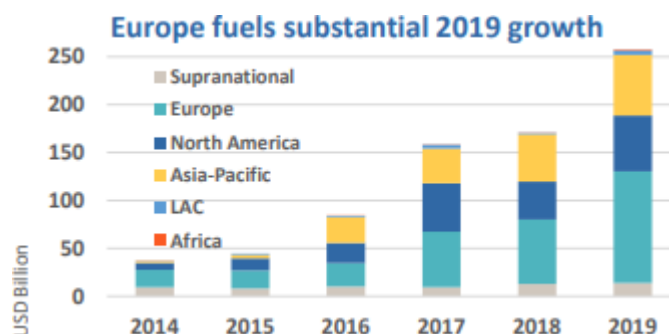
Figure 19: S&P Green Bond Index EUR 10 years



Source: <https://us.spindices.com/indices/fixed-income/sp-green-bond-index-eur>

In 2019, the European market accounted for 45% of global green bond issuances. The volume issued in Europe increased by 74% respective to the previous year, reaching a total volume of USD 116.7bn. Europe has therefore been a major driver of global growth in the green bond market. Its contribution is also illustrated in Figure 20 (Climate Bonds Initiative, 2020d).

Figure 20: Growth of the global green bonds market by region (bn USD)



Source: [https://www.climatebonds.net/files/reports/2019\\_annual\\_highlights-final.pdf](https://www.climatebonds.net/files/reports/2019_annual_highlights-final.pdf) p.4

Out of the top three issuers, two originate from Europe. These are the German development bank KfW and the Dutch State Treasury Agency. Together, they issued a total of USD 15.7bn in green bonds. With regard to the use of proceeds, the investment in energy remained at 34% of the issuance volume, equally to 2018. The allocation towards buildings and transport each grew by 6% with respect to 2018. The mix of issuer types is generally the most balanced of all regions (Climate Bonds Initiative, 2020d).

## 7. Conclusion and Recommendations

This work has examined how green bonds can be used to finance sustainable investments for mitigation and adaptation activities towards climate change and what can possibly be done to bolster the global green bonds market.

The analysis of the current situation on climate change has shown the following results. For decades, global warming generated by greenhouse gas emissions has been rising steadily as a result of human activity. Global warming provokes rising sea levels and extreme weather conditions that are affecting an increasing number of regions. The majority of the countries most exposed to climate change are developing countries. It has been found that actions to fight climate change must be coordinated at a global level, as climate change is a world-wide challenge. The most important agreement that defines global objectives for climate action is the Paris Agreement from 2015 which has been ratified by 187 countries, so far. The parties agreed upon a reduction of greenhouse gas emissions of 2°C, preferably 1.5°C, over pre-industrial levels. To achieve this target, the measures are classified into mitigation of the global warming and adaptation to its consequences.

For the implementation of measures to fight climate change, a large financing gap still persists. It is estimated that USD 1 trillion per year will be required for the next decades to finance this climate action and that around 80% of these funds will be provided by the private sector. The financial sector is thus assigned a key role in the fight against climate change.

At the same time, more and more investors are interested in investing their money into socially and environmentally friendly causes. The term ESG investments is used to describe investments that incorporate environmental, social and governance aspects into the selection and decision-making process. These aspects can be considered when selecting specifically investment opportunities that commit to these issues. During the investment lifespan, investors have the possibility to influence a company's behavior towards higher levels of sustainability. Furthermore, the financial industry provides several voluntary commitments on ESG investment that companies can refer to.

An important finding on ESG investment is that different studies and indices confirm that stocks in ESG investment indicate a better performance and reach higher returns than their conventional equivalents. Furthermore, it is argued that those companies that pay particular attention to ESG issues are able to minimize their environmental and climate risks.

Environmental investments are made in different categories. These include the use of energy, water, waste management, natural resource conservation, forestation, among others. The renewable energy sector in particular has experienced rapid growth in recent years. Hydro energy, wind and solar energy are the most important sources of renewable energy. In order to reach the 2°C goal of the Paris Agreement, it is necessary to double the share of renewable energy in the global energy mix (as of 2016) by 2030. The increasing global energy demand provides huge opportunities for environmental investments.

Bonds are a means of fixed-income debt investment for which Investors receive regular coupon payments. In contrast to shares, the return expectations are generally lower because the investors incur less risk. Moreover, bond investors are not entitled to ownership rights, such as votes, to promote change in the company. The cost of debt for the company is determined by the expected return of investors. The creditworthiness of a bond is most often evaluated by credit rating agencies.

Green bonds are a special type of bonds which uses the funds raised to finance or refinance projects related to environmental or climate protection. One major problem is that the term “Green Bond” is neither legally protected nor officially defined, which implies that it is the responsibility of the issuer to declare a bond as a green bond. Accordingly, the lack of a consistent definition implies the threat of “greenwashing”, when the bond declared as green bond is not or only partially funding green projects. Hence, it is possible that issuers use this term to enhance their reputation in the market and attract environmentally conscious investors. Private initiatives such as the Climate Bonds Initiative and Green Bond Principles established the commonly used definition and provide voluntary guidelines to follow for issuers of green bonds. In 2019, 17% of issuances were certified to these guidelines.

The first green bond was issued in 2007. Since then, the market has been growing rapidly. Between 2012 and 2018, global green bond issuance grew by 420%. However, in 2018, it accounted only for a tiny share of 2.42% of the global bond market. Growth in the green bond market is primarily driven by the European market. In order to assess the environmental impact of the bond, several forms of pre- and post-issuance reviews are available. Green bonds can be issued by different types of issuers in different types of bonds. The highest shares of green bond proceeds in 2019 have been directed towards the energy, buildings and transport sector. Generally, regional differences in the use of proceeds of the green bonds can be observed.



Regarding the cost of capital of green bonds, literature discusses if there is a “greenium” for green bonds, i.e. if green bonds are subject to a market premium. In this case, investors would receive a lower yield compared to conventional bonds in order to compensate issuers for the higher cost of issuance (for external review etc.) of green bonds. There is no conformance between the studies of different authors. The existence of a greenium might also depend on the type of issuer. However, evidence was found that for the fact that stock prices of equity investors in the issuing company respond positively to the company’s green bond issuance. Therefore, the issuance of green bonds facilitates raising funds for the company also on the stock market.

The main actors in the green bonds market are the issuers of the bonds, the investors that acquire them, the intermediaries between the previous ones, rating agencies that evaluate the creditworthiness and the environmental performance of the bonds and regulatory authorities that provide the legal frame for all actors in the market.

For issuers, the motivation to make use of green bonds lies in the opportunity to attract environmentally conscious investors, to broaden their investor base and therefore, raise greater amounts of funds. If green bonds are a less expensive source of financing is still under discussion. In the market, issuers have the responsibility to build investor’s trust in the instrument green bond and to not practice greenwashing. The growth of the green bonds market highly depends on the issuance volume. Currently, issuers cannot meet the high demand for green bonds and should increase the overall issuance volume as long as there are environmental-focused projects to fund.

Various types of investors can be identified in the green bond market. Conventional investors are primarily motivated by expected return while responsible investors highly consider ESG criteria for their investment. It became evident that for many green bond investors, the transparency of issuers concerning the use of proceeds is insufficient and discourages them from having more confidence in this instrument. Moreover, it turned out that issuers and intermediaries many times are unaware of investor’s actual preferences and as a result, the products do not meet investor’s expectations well.

The main intermediaries in the green bonds market are institutional investors, brokers and stock exchanges. Institutional investors play a double role in the market, acting both as investors and intermediaries between their personal investors and the issuers. Their function is to aggregate investment volume. Brokers are able

to diversify the investor base and achieve the best price for the bond, whereas stock exchanges provide liquidity and contribute to the transparency and standardization of the market. Institutional investors and brokers might reduce the overall transaction cost, while trading on stock exchanges generally increases transaction costs. Using these functions, the intermediaries can contribute to make the market grow and establish common standards.

Green bonds are not only assessed by credit rating agencies on their credit worthiness and investment grade, but also in terms of their environmental performance through ESG ratings. While there are still no legally binding requirements for green bonds in the market, the ESG rating is an important consideration for responsible investors. However, it is observable that ESG ratings are not always consistent with the 2°C goal of the Paris Agreement and in some cases may contribute to greenwashing.

The role of governments in the green bonds market is both to act as issuer, thereby expand the market, and to provide a regulatory frame for all actors in the market. There are substantial differences in the regional availability of legislation or official guidelines on green bonds. Regulations can most commonly be found in Asia and in some countries in Africa and Latin America. For Europe, official guidelines have yet to be decided, and in the USA, there is no regulation. The existing official guidelines are mostly oriented on the Green Bond Principles. When relating the ten most vulnerable countries to climate change to green bond regulation, it can be observed that only three of them present some kind of guidelines. The EU is currently developing an EU Green Bond Standard which would define green criteria for green bonds and impose several review requirements. However, it would still be a voluntary guideline to follow for issuers.

In order to evaluate the real performance of green bonds in the global market, different indices are available that have distinct credit requirements and green criteria for including bonds in their index. For this analysis, the S&P Green Bond Index was chosen as it only considers green bonds that are aligned to the Climate Bonds Standard and therefore contribute to the 2°C goal of the Paris Agreement. The analysis revealed that the return of green bonds experienced a modest growth over the past 10 years (from 2010 to 2020). Furthermore, regional differences exist. It was found that green bonds issued in EUR and USD showed a stronger growth than the overall average during this period. The Chinese green bond market experienced an even higher growth over the same period. However, at the comparison between the S&P Green Bond Index with the S&P 500 Bond Index, which takes conventional bonds into account, revealed that the S&P 500 Bond Index showed

a less steady development over the period from 2010 to 2020. However, it had a 3.3% higher growth rate than the S&P Green Bond Index. Therefore, although ESG investments in general perform better than conventional investments in the stock market, there is no evidence so far that this applies to green bonds.

All in all, it can be concluded that the market for green bonds is currently facing numerous challenges. Although green bonds have proven to be a suitable instrument to raise financing for investments that tackle climate change, the market is still tiny and currently unable to close the financing gap. The major problems identified in the global green bond market are the lack of globally accepted standards, the on average lower return than conventional bonds, and the fact that green bonds are not concentrated on investments in the countries most affected by climate change.

It is recommended to establish obligatory standards that define the requirements a green bond has to meet. A standard definition would provide transparency over the use of proceeds and security for issuers and investors which in turn would further increase the issuance volume of green bonds.

In order to overcome the lower return of green bonds compared to conventional bonds, it is vital to better understand and address specific investors. Potentially, issuers and intermediaries may specifically target risk-averse investors who are willing to take a lower return on the one hand. On the other hand, they can particularly address responsible investors who accept a lower return when it is assured that the investment contributes to climate action.

The funding gap for urgently needed adaptation measures in the countries most affected by climate change might be reduced by globally valid standards in the green bonds market. These can potentially drive the market growth and raise more funds that can be directed to this action.

Summing up, by implementing these improvements, the green bonds market could provide a contribution to climate change mitigation and adaptation to an even higher extent. It is considered that green bonds are an adequate and for the future promising instrument to address the challenge of climate change on a global scale.

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## 9. Annexes and Appendices

### 9.1 Annex I

The following abstract from the EU Taxonomy for economic activities that contribute substantially to climate change adaptation shows their impact on the other environmental objectives. DNHS stands for “do no significant harm”.

**5.2 SUBSTANTIAL CONTRIBUTION TO CLIMATE CHANGE ADAPTATION**

Classification		Environmental Contributions					
NACE Macrosector	NACE Activity	1. Climate change mitigation (DNSH)	2. Climate change adaptation (Substantial Contribution)	3. Water (DNSH)	4. Circular economy (DNSH)	5. Pollution (DNSH)	6. Ecosystems (DNSH)
	Afforestation	✓	✓	✓		✓	✓
	Rehabilitation, Reforestation	✓	✓	✓		✓	✓
	Reforestation	✓	✓	✓		✓	✓
	Existing forest management	✓	✓	✓		✓	✓
	Conservation forest	✓	✓	✓		✓	✓
	Growing of perennial crops	✓	✓	✓	✓	✓	✓
	Growing of non-perennial crops	✓	✓	✓	✓	✓	✓
	Livestock production	✓	✓	✓	✓	✓	✓

Source:

[https://ec.europa.eu/info/sites/info/files/business\\_economy\\_euro/banking\\_and\\_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy\\_en.pdf](https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy_en.pdf) p.60

## 9.2 Annex II

### *Draft Model of the EU Green Bond Standard*

#### **1. Scope of the EU Green Bond Standard (EU-GBS)**

The European Green Bond Standard ('EU-GBS') is a voluntary standard proposed to issuers that wish to align with leading best practices in the market. It is designed to be globally relevant and accessible to issuers located in the EU as well as to issuers located outside the EU. It builds on market best practices such as the Green Bond Principles (GBP).

#### **2. Objective of the EU-GBS**

The EU-GBS is intended to provide a framework of core components for EU Green Bonds, as defined below, thereby enhancing transparency, integrity, consistency and comparability of EU Green Bonds.

The ultimate objective is to increase the flow of finance to green and sustainable projects.

#### **3. Definition of an EU Green Bond**

An EU Green Bond is any type of listed or unlisted bond or capital market debt instrument issued by a European or international issuer that is aligned with the EU-GBS, and is therefore meeting the following requirements:

1. The issuer's Green Bond Framework shall confirm the alignment of the green bond with the EU-GBS;
2. The proceeds, or an amount equal to such proceeds, shall be exclusively used to finance or re-finance in part or in full new and/or existing Green Projects as defined in section 4.1, as it shall be described in the bond documentation; and
3. The alignment of the bond with the EU-GBS shall have been verified by an accredited Verifier in accordance with section 4.4.

An issuer may only use the term 'EU Green Bond' if the above criteria are met. European and international issuers may decide to voluntarily requalify their existing green bonds as EU Green Bonds in the same manner and, for the avoidance of doubt, after verification by an accredited Verifier.

It is important to note that EU Green Bonds are only fungible with green bonds issued as EU Green Bonds or requalified as EU Green Bonds.

## **4. Core components of the EU-GBS**

### **4.1 Green Projects**

Proceeds from EU Green Bonds, or an amount equal to such proceeds, shall be allocated only to finance or refinance Green Projects ('Green Projects') defined, subject to confirmation by an accredited Verifier (see section 4.4), as

(a) contributing substantially to at least one of the Environmental Objectives as defined in the EU Taxonomy Regulation ('the Environmental Objectives'), namely (i) climate change mitigation, (ii) climate change adaptation, (iii) sustainable use and protection of water and marine resources, (iv) transition to a circular economy, waste prevention and recycling; (v) pollution prevention and control and (vi) protection of healthy ecosystems, while

(b) not significantly harming any of the other objectives and (c) complying with the minimum social safeguards represented by the principles and rights set out in the eight fundamental conventions identified in the International Labour Organisation's declaration on Fundamental Rights and Principles at Work.

When the EU Taxonomy will be in force and where Technical Screening Criteria (i.e., principles, metrics, thresholds) have been developed in the Taxonomy for specific environmental objectives and sectors, Green Projects shall align with these criteria allowing however for specific cases where these may not be directly applicable as a result of factors such as the innovative nature, the complexity, and/or the location of the Green Project(s). An accredited Verifier shall either confirm alignment with the Technical Screening Criteria, or alternatively in cases where no technical screening criteria have been developed or in the above mentioned specific cases, that the projects nonetheless meet the requirements under the EU Taxonomy framework i.e. that they (a) contribute substantially to at least one of the Environmental Objectives (b) do not significantly harm any of the other objectives and (c) comply with the minimum social safeguards.

The issuer shall provide a description of such Green Projects in their Green Bond Framework (see section 4.2) and in the Green Bond legal documentation (for instance in the Prospectus or in the Final Terms). The information provided in the legal documentation may be summarised or may be limited to a reference to the Environmental Objectives and the GBF. In case that the Green Projects are not identified at the date of issuance, the issuer shall describe the type and sectors and/or environmental objectives of the potential Green Projects.

Green Projects can include:

- Physical assets and financial assets such as loans. Green assets can be tangible or intangible, and they can include the share of working capital that can reasonably be attributed to their operation.
- Any capital expenditure and selected operating expenditures such as maintenance costs related to green assets that either increase the lifetime or the value of the assets, and research and development costs. For the avoidance of doubt, operating costs such as purchasing costs and leasing costs would not normally be eligible except in specific and/or exceptional cases as may be identified in the EU Taxonomy and future related guidance.
- Relevant public investments and public subsidies for sovereigns and sub-sovereigns.

Green assets shall qualify without a specific look-back period provided that at the time of issuance they follow the eligibility criteria listed above. Eligible green operating expenditures shall qualify for refinancing with a maximum three [3] years look-back period before the issuance year of the bond.

For the avoidance of doubt, a specific green asset or expenditure can only qualify as a Green Project for direct financing by one or several dedicated green financing instruments (such as bonds or loans) up to the combined equivalent of its full value. It is understood that green financing instruments can be refinanced by other green financial products.

#### **4.2 Green Bond Framework**

The issuer shall produce a Green Bond Framework ('GBF') which confirms the voluntary alignment of the green bonds issued following this GBF with the EU-GBS and provides details on all the key aspects of the proposed use of proceeds and on its green bond strategy and processes. The draft standard foresees inclusion of the use of proceeds to be specified in the legal documentation:

The issuer shall indicate the following elements in their GBF:

1 The Environmental Objectives of the EU Green Bond or EU Green Bond programme and how the issuer's strategy aligns with such objectives, as well as their rationale for issuing.

2 The process by which the issuer determines how Green Projects align with the EU Taxonomy and, if applicable, qualitative or quantitative technical screening criteria with reference to section 4.1 and with the support of an accredited Verifier. Issuers are also encouraged to disclose any green standards or certifications referenced in project selection;

3 A description of the Green Projects to be financed or refinanced by the EU Green Bond. In case where the Green Projects are not identified at the date of issuance, the issuer shall describe, where available, the type and sectors of the potential Green Projects. Where confidentiality agreements, competitive considerations, or a large number of underlying projects limit the amount of detail that can be made available, information can be presented in generic terms or on an aggregated portfolio basis.

4 The process for linking the issuer's lending or investment operations for Green Projects to the EU Green Bond issued. The issuer shall track the amount allocated to Green Projects in an appropriate manner until such amount equals the net proceeds and document the allocation through a formal internal process;

5 Information on the methodology and assumptions to be used for the calculation of key impact metrics: (i) as described in the EU Taxonomy, where feasible; and (ii) any other additional impact metrics that the issuer will define;

6 A description of the Reporting (e.g. envisaged frequency, content, metrics).

For the avoidance of doubt, it is understood that subsequent changes to the Taxonomy will not apply to outstanding EU Green Bonds (grandfathering). Conversely new issues shall be aligned with the most recent version of the Taxonomy and as relevant to their Green Projects.

The GBF shall be published on the issuer's website or any other communication channel before or at the time of the issuance of an EU Green Bond and shall remain available until the respective maturity of the EU Green Bond.

#### **4.3 Allocation and Impact Reporting**

Two types of reporting are required under the EU-GBS: Allocation Reporting and Impact Reporting.

Allocation Reporting: Issuers shall report at least annually, until full allocation of the bond proceeds to Green Projects and thereafter, in case of any material change in this allocation. Verification is only required for the Final Allocation Report.

**The Allocation Report shall include:**

- A statement of alignment with the EU-GBS
- A breakdown of allocated amounts to Green Projects at least on sector level, however more detailed reporting is encouraged
- The geographical distribution of Green Projects (recommended on country level)

For the avoidance of doubt, the Final Allocation Report for an EU Green Bond to be published upon full allocation shall comprise information on all allocated amounts to Green Projects at least on sector level.

Impact Reporting: Issuers shall report on impact of Green Projects at least once during bond lifetime after full allocation of the bond proceeds to Green Projects and thereafter, in case of material changes in this allocation.

**The Impact Report shall include:**

- a description of the Green Projects,
- the Environmental Objective pursued by the Green Projects
- a breakdown of Green Projects by the nature of what is being financed (assets, capital expenditures, operating expenditures, etc.), the share of financing (i.e., the amount of Green Projects financed after the bond issuance) and refinancing (i.e., the amount of Green Projects financed before the bond issuance),
- information and, when possible metrics, about the projects' environmental impacts, which needs to be in line with the commitment and methodology described in the Issuer's GBF.
- if it hasn't been already detailed in the GBF, information on the methodology and assumptions used to evaluate the Green Projects impacts.

Verification of the Impact Reporting is not mandatory, however issuers are encouraged to have their Impact reporting reviewed by an independent third party.

Allocation Reporting and Impact Reporting can be either on a project-by-project level or on a portfolio level, where confidentiality agreements, competitive considerations, or a large number of underlying projects limit the amount of detail that can be made available.

For the avoidance of doubt, the Allocation Report as well as the Impact Report may cover several bond issuances under the same Green Bond Framework. The issuer

may also decide to publish separate Impact Reports for separate project categories. Allocation and Impact Reporting can be presented in a combined report or in separate reports. In case full allocation and or impact is already determined upon issuance of a bond, issuers may choose to publish one report comprising information on allocation and impact at issuance, for the avoidance of doubt in case of material change of allocation, further reporting will be required.

Recommended draft reporting formats are further included in Annex 2, while leaving issuers the

flexibility to adapt them as may be necessary.

Allocation Reporting and Impact Reporting shall be published on the issuer's website or any other communication channel. The Final Allocation Report and Impact Report published upon full allocation shall remain available until maturity of such EU Green Bonds unless replaced by further reports in case of material changes of allocation.

#### **4.4 Verification**

Issuers shall appoint an external Verifier to confirm:

- before or at the time of issuance, through an initial Verification, the alignment of their GBF with the EU-GBS, in accordance with section 4.1 (Green Projects) and 4.2 (Green Bond Framework); and
- after full allocation of proceeds, through a Verification, the allocation of the proceeds to green eligible projects in alignment with the Allocation Reporting as outlined in section 4.3 of the EU-GBS.

For the avoidance of doubt, an initial Verification can be valid for several bonds issued under a programme with the same GBF.

It is also understood that for transactions that are fully allocated at issuance (e.g. as in the case of refinancing) the verification of the Allocation Reporting can be incorporated in the initial Verification.

Verification(s), and any subsequent ones, shall be made publicly available on the issuer's website and through any other accessible communication channel as appropriate. The Verification of the GBF shall be made publicly available before or at the time of the issuance of its EU Green Bond(s). Verification of the Final Allocation Report should be made publicly available together with the publication of the Final Allocation Report, however at the latest one year after the publication.

Verification provider(s) will be subject to accreditation including explicit requirements related to (i) professional codes of conduct related to business ethics, conflicts of interest and independence; (ii) professional minimum qualifications and quality assurance and control; and (iii) standardised procedures for Verification.

Verification providers shall also disclose their relevant credentials and expertise and the scope of the review conducted in the Verification report.

Before the accreditation of verifiers is in place, a Voluntary Interim Registration Scheme may be established.