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Green Bonds issuance and the growth of the market
A comparative case study between Italy and Germany

BY
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PLAGIARISM STATEMENT

I hereby declare that I have composed the present thesis autonomously and without use of any other than the cited sources or means. I have indicated parts that were taken out of published or unpublished work correctly and in a verifiable manner through a quotation. I further assure that I have not presented this thesis to any other institute or university for evaluation and that it has not been published before.

30/07/2021 Floriana Giannotti

Table of Contents

<i>Introduction</i>	3
<i>Chapter 1</i>	7
1.1 <i>The green bond market: an overview</i>	7
1.2 <i>How to define green bonds?</i>	10
1.3 <i>The Green Bond Principles</i>	11
1.4 <i>External Review</i>	14
1.5 <i>The EU taxonomy</i>	16
<i>Chapter 2</i>	20
2.1 <i>The Climate Bonds Initiative: an overview</i>	20
2.2 <i>The Climate Bonds Taxonomy</i>	22
2.3 <i>Climate Bonds Standard and Certification Scheme</i>	23
2.4 <i>Certification</i>	24
2.5 <i>The multiple benefits stemming from the Climate Bonds Initiative</i>	25
2.6 <i>The green bond market: rating and financial risk</i>	26
<i>Chapter Three</i>	28
3.1 <i>Why issuing sovereign green bonds is convenient</i>	28
3.2 <i>Some disadvantages deriving from the issuance of sovereign green bonds</i>	29
3.4 <i>The major sovereign issuers</i>	31
<i>Chapter 4</i>	35
4.1 <i>The European Union as a driver towards a green economy</i>	35
4.2 <i>The Italian Green Bond Framework</i>	35
4.3 <i>The German Green Bond Framework</i>	41
4.4 <i>A comparison between Italy and Germany: Second Party Opinion</i>	45
4.5 <i>Implications of the recent sovereign green bonds' issuances for the growth of the market</i>	47
4.6 <i>Boosting the sovereign GSS market</i>	50
4.7 <i>The impact of Covid-19 on the green bond market</i>	51
<i>Conclusion</i>	56
<i>Appendix</i>	61
<i>Bibliography</i>	62

Introduction

Purpose

The purpose of this thesis is to understand the impact of sovereign green bonds issuance on the growth of the market as well as to understand what lies beneath the decision to issue green bonds. To that end, two case studies will be presented, namely the Italian and German sovereign green bond issuance.

Background

Climate change, biodiversity loss, resource scarcity, population growth, and assisting developing countries to address their problems all necessitate integrated and problem-solving approaches. Rapid economic growth and social progress have been accompanied in recent decades by increased environmental pressures and a depletion of natural resources.

Today more than ever, a radical change in the direction of an inclusive sustainable development is of utmost importance. This should be realized through interventions that effectively fight climate change, water crisis, and increasing desertification. Indeed, following the COP21 climate agreement in Paris in December 2015, the climate issue has become more pressing than ever. More and more actors are expressing their concerns about the irreversible damage being done to the environment, as well as the need for companies to adopt a more responsible growth model. As a matter of fact, implementing the Paris Agreement¹ requires both economic and social transformation, which is why several attempts have been made also in the capital market to boost responsible investments.

The Covid-19 pandemic will certainly have an impact, among other things, on the achievement of the Sustainable Development Goals (SDGs)². The world must recover, and this recovery must be driven by international solidarity. Notwithstanding the progress made towards sustainable development in recent years, the gap between what countries

¹ The Paris Agreement is an international legally binding treaty adopted in 2015 during COP 21 in Paris. It entered into force at the end of 2016. Its aim is to limit global warming to 1.5°C and achieve climate neutrality by 2050. The treaty represents a breakthrough not only because, for the first time, all countries are called upon to address a common issue but also because of its binding nature.

² The 17 Sustainable Development Goals (and 169 targets), to be reached by 2030, were issued in 2015 by the United Nations. Their aim is to end poverty, protect the planet and ensure peace. They are the natural outcome of the global will to balance environmental, social and economic sustainability

need to do and what they have actually done to promote a green economy and the 17 SDGs of the Agenda 2030 is widening. The universal nature of the latter implies that international cooperation along with global partnerships and arrangements will lead to success (Biermann, Kanie and Kim, 2017), which is why the COVID-19 pandemic can represent an opportunity for the governments of all countries to create a healthier, cleaner, more equal and resilient society. In other words, a new course of action is possible.

Over the years, the concept of sustainable development has been associated with different definitions. The most thorough and popular one is given by the Brundtland Commission³ in its report entitled “Our Common Future” (1987), according to which sustainable development is the "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (WCED, 1987), thus highlighting the importance of equity among generations. The so-called “holistic approach” to sustainable development integrates the achievement of economic, environmental and social goals, the three main strategic pillars of sustainable development. Indeed, the latter is a multi-disciplinary field of research and, as such, its achievement requires interlinkages among different subjects as well as addressing issues at local, national and international level. The 2030 Agenda and its 17 Sustainable Development Goals adopted in 2015 are the clear example of how global partnerships between advanced economies and developing countries are necessary and that eradicating poverty, reducing inequalities, improving health and education, promoting economic growth, and fighting climate change are intertwined.

Being climate change at the top of several political agendas all over the world, we should expect green bonds to be implemented more and more in the future. As a matter of fact, they can be really useful, especially when (and where) the traditional financial tools fail or are unfeasible. The implementation of green bonds at a global level would bring to important changes to the current situation and would help achieving the climate targets (Tukhanen & Vulturius, 2020).

Notwithstanding the common awareness that both top-down and bottom-up approaches are essential to the achievement of the goals set by the Agenda, governments

³ The World Commission on Environment and Development (WCED), also known as the Brundtland Commission, was established in 1984. Its aim was to lead the nations across the world towards the goal of sustainable development. The Brundtland report was published in 1987 and its definition of sustainable development became the most used and accredited.

still face numerous challenges to promote long-term, cost-effective policies which are able to harmonize economic, environmental and social aims (Allen, Metternicht and Wiedmann, 2016). Global and national governance as well need to adapt their arrangements to such aims, also recognizing the increasingly important role played by non-state actors at all levels (Nilsson and Weitz, 2019). The absence of a hierarchical authority, along with the non-binding nature of the SDGs, makes the achievement of the goals dependent on the compliance of national governments, which can set their own indicators to regularly monitor and evaluate their progress (which complement those established by the United Nations in the Global Indicator Framework) and publish national and voluntary, state-led reviews.

Different issues stem from managing and addressing these relations as there is still a lack of practical experience in both advanced and developing economies (Allen, Metternicht and Wiedmann, 2016). As a consequence, policymakers need to adopt integrated, multi-dimensional, non-linear, and science-based approaches to reach the ambitious objectives set by the Agenda 2030 and reduce the gaps in their implementation (Allen, Metternicht and Wiedmann, 2016). In other words, states need to institutionalize the SDGs and implement them in a cross-cutting way and monitor progress, which is why governance can be considered as a fourth pillar of sustainable development (Glass and Newig, 2019).

Nevertheless, many governments have failed to turn the visionary and transformative Agenda 2030 into concrete policies and practical solutions. However, promising reforms and practices which undertake SDGs mapping and align national frameworks to the global goals are emerging. Indeed, the financial sector's increased perception of and concern about environmental threats has given rise to a variety of financial instruments that not only ensure financial returns but also environmental and social benefits. They mainly consist of labelled bonds and loans and such instruments show how the financial markets can find solutions to global issues like climate change and COVID-19 (Climate Bonds Initiative, 2020).

Delimitations

Given that the Green bond market was born only ten years ago and that the real "take-off" only began in 2015 with a significant amount of issuances coming from the corporate market, the same analysis should be repeated at a later point in time with a more mature market, allowing the researcher to make statements based on a longer sample period and a larger sample of Green bonds, which can compensate for the unbalanced sample that this research relied on.

This thesis focuses solely on financial performance and ignores behavioral considerations or other non-financial factors that may influence performance.

It is also possible that the estimated positive effect of (sovereign) green bonds is due in part to variables not observed in this study, such as the state of technology, the issuer's innovativeness, and overall positioning.

The sovereign green bonds analyzed in this study, namely the Italian and German ones, have been issued only recently, respectively in 2021 and 2020. Hence, it is hard to assess their long-term effects for the global state of the market.

Research question

Which are the implications of the recent sovereign green bonds issuances for the growth of the market?

Chapter 1

Green bonds and the green bond market

1.1 The green bond market: an overview

After the financial crisis of 2007/2008 the current economic models have been questioned and monetary policy has been pushed to its limits showing all its weaknesses. If the international community aims at achieving the 17 Sustainable Development Goals (SDGs) it needs to adopt and implement a wide range of financial instruments and innovative policies, namely green bonds, green central banking, green funds, and fiscal policy to promote long-term investments in green projects (Demary and Neligan, 2018). Although many countries have ratified the Paris Agreement, thus setting nationally determined contributions (NDCs) to reduce national emissions and adapt to climate change, their governments need to reckon “tight budgets, lack of political will and competing policy priorities” (Park, 2018). As a matter of fact, climate mitigation and adaptation are highly expensive in the short-term, which is why the Paris Agreement calls on the private sector to support and finance the investments in green technologies and infrastructure to achieve the carbon emissions goals. In other words, achieving the targets set by the Paris Agreement and the Agenda 2030 would be impossible without aligning the investments to sustainability aims, thus making it pivotal to adjust and develop fiscal and monetary policies, enhance transparency and promote the transfer and investment of huge capital amount towards environmental-friendly projects (Maltais and Nykvist, 2020). Therefore, green finance has to involve both the private and public sectors to do effective long-term planning and implement green projects (Sachs et al., 2019). As a result of private and public investments in carbon finance, green infrastructure, climate funds, and real estate funds, the green market has exponentially grown, thus accelerating the sustainability transition process (Cigu et al., 2020). Indeed, the green bond market has been established in 2007 and has exponentially grown since 2013, abandoning its niche status thanks to the market entry of sovereign, municipal, and corporate issuers and also thank to the growing number of legal and financial instruments (i.e. securitized green bonds) and new markets (Park, 2018). The first green bond was issued in 2007 by the European Investment Bank (EIB), which was followed a year later by the one of the International Bank for Reconstruction and Development (IBRD), which is one of the two

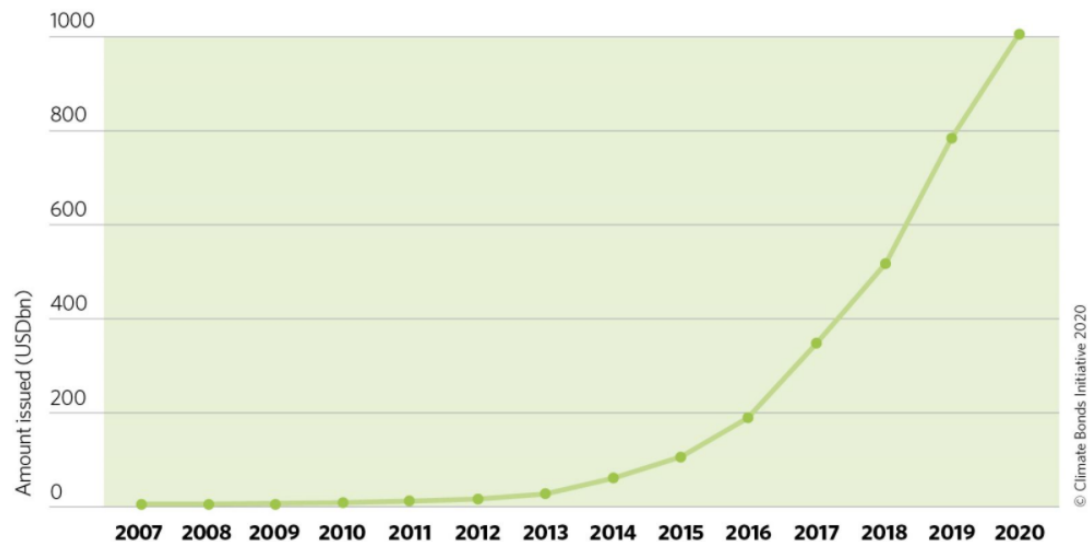
institutions of the World Bank. The first green bonds issuers have been multilateral development banks (MDBs) which is why their policies, strategies and practices shaped the governance of the green bond market. Moreover, to convince the investors of the advantages of this new financial instrument and to overcome the doubts and risks of greenwashing, MDBs promoted transparency and harmonized reporting practices, thus lowering monitoring costs. To clarify, greenwashing in the green bond market occurs when bond proceeds are allocated to assets with little or no environmental value, causing market confidence (KPMG, 2015).

Moreover, since the investors are only subject to the credit risk of the issuer, MDBs used their triple-A credit rating to engage with institutional investors. Since supranational institutions have been the very first movers in the green bond market, their position in the green market is to date well established. Furthermore, the actual nature of their mission, i.e. to promote sustainable development, rather than pure profit maximization, reduces concerns that the issuance of green bonds is simply a way of greenwashing to attract investors (Fatica, Panzica and Rancan, 2020).

If investor's preferences drive market premiums, the risk of greenwashing may deter green-minded investors from massively demanding corporate securities but not those issued by supranational institutions. In 2008, the World Bank issued the first green bond in collaboration with the Swedish bank SEB (World Bank, 2019). Since then, the global green bond market has expanded from 11 billion USD in 2013 and 36 billion USD in 2014 (OECD, 2016) to 167 billion USD in 2018 (Climate Bonds Initiative, 2019).

Cumulative issuances up to 2018 total 521 billion USD (Climate Bonds Initiative, 2019), with the total green bond market accounting for slightly more than 1% of the global bond market. As a result, the green bond market is comparatively small but quickly growing.

The \$1 trillion: cumulative progression



Source: Climate Bonds Initiative (2020)

Hence it can be stated that, despite the fact that the green bond market is relatively new and small, it is now in a growing and exciting phase since many institutional investors, who consider sustainability as pivotal in their investment decisions, are using the global capital market to promote sustainability. In particular, this means deploying financial capital to boost economic growth, environmental protection and social justice. Indeed, according to the Climate Bonds Initiative (2020), in 2019 the issuances in the global green bond market reached 230 billion euros, against the 142 billion of the previous year. However, there is still room for improvement: Europe, alone, will potentially need green investments of about 180 billion per year to achieve the targets set by the 2030 Agenda for Sustainable Development (Fatica and Panzica, 2020).

This growth is also determined by the fact that green issuance is part of the corporate social responsibility (CSR) policy (Li et al., 2019), which is why even companies are now issuing green bonds. Indeed, they are part of socially responsible investments (SRIs), as they lead to both financial returns and social benefit (Deschryver and de Mariz, 2020).

Thus, the green issuance improves the company's image and help to raise new funds for sustainable initiatives. Undeniably, sustainable finance is not only altruistic, but

it is also a way to maximize financial returns while minimizing the risk of financial loss (Deschryver and de Mariz, 2020).

1.2 How to define green bonds?

Green bonds are innovative fixed-income debt tools issued to make our economies more sustainable and to ‘green’ the financial sector. They can be issued by any government, organization, corporation in order to finance or refinance green projects or assets. To clarify, they have the same financial properties as ordinary bonds but are used to invest in green projects only. “Green bonds are similar to plain vanilla conventional bonds, but with a dedicated green use of proceeds” (Liaw, 2020). Basically, they aim at enhancing climate resilience. The debt nature is part of their appeal. Thanks to their simple governance structure, social responsibility is inherent in the financial instrument and also, being exclusively earmarked, investors can count on an *ex ante* monitoring process which ensures that their investments will not depend on the whims of corporate management, hence mitigating the systemic risks which might derive. The regulatory risk may also encourage increased investment in green companies as a means for investors to hedge against the likelihood of carbon taxes or other future regulations. Also, because voice is restricted, green bonds allow for a relatively cheap exit. This means that, when pursuing social objectives, investors can either adopt an exit or voice strategy (Park, 2018). Hence, when a problem occurs, they may end the relationship or try to communicate to the firm to solve the problem and improve the relationship. Nevertheless, debt instruments do not manage to influence corporate behavior, which is why green bonds have a rather simple governance structure that ensures *ex ante* monitoring and incorporates social responsibility in their definition.

The investment risk of a given green bond is limited. Beyond their investment, investors are not exposed to the risks of a given project. Nonetheless, there is little information available about the implications and effectiveness of green bonds (Fatica and Panzica, 2020). It is crucial to understand why and how a bond can be defined as ‘green’ (Maltais and Nykvist, 2020).

There is not a single legal definition of green bonds, as it is the issuer who labels a bond as “green”, thus making it extremely flexible. In particular, earmarking is

fundamental in green the green bond market as it “involves integration of the solicitation of financing, the sale of the financial instrument, the selection of the project, and the allocation of funds into a sub-account or a sub-portfolio prior to disbursement” (Park, 2018) (for a more detailed classification, please see Annex 1, page 61, on the different types of green bonds). This is mainly established through the alignment of the bond with the Green Bond Principles, as we will be shown in the next paragraph.

1.3 The Green Bond Principles

Established in 2014, the Green Bond Principles (GBP) (ICMA, 2014) are voluntary guidelines set by the International Capital Markets Association (ICMA), one of the leading industry associations for market participants in the global market, used to improve the integrity of the green bond market and to involve as many actors as possible. ICMA defines green bonds as “any type of bond instrument where the proceeds will be exclusively applied to finance or re- finance in part or in full new and/or existing eligible Green Projects” (ICMA, 2016). They represent a non-binding framework for the issuance of green bonds, and they also ensure the integrity of the debt green market. As a matter of fact, the GBPs promote transparency (thus allowing to track the funds in eco-friendly projects) and total disclosure so that the information available on any given Green Bond helps to increase the capital allocation in the eligible green projects as well as to support the issuers in the transition process towards more environmentally sustainable projects. Indeed, when the issuance is in line with the GBP, it guarantees investments opportunities with transparent green credentials. According to the GBP, eligible Green Projects encompass several categories including: energy efficiency, renewable energy, pollution prevention and control, sustainable management of living natural resources, terrestrial and aquatic biodiversity conservation, clean transportation, sustainable water management, climate change adaptation, eco-efficient products, and production technologies and processes. Also, companies are allowed use green bonds to re-finance already existing debt (2018 International Bank for Reconstruction and Development / The World Bank).

The categories of eligible Green Projects previously mentioned offer a synthesis of what are thought to be the most relevant fields when it comes to fight climate change and address environmental issues. Moreover, they manage to link the different standards,

definitions, taxonomies that establish the ‘greenness’ of the projects. Indeed, the GBPs, which are usually yearly updated, are the result of the collaborative work among stakeholders, Members and Observers of the Green Bond Principles and Social Bond Principles. They are led by an Executive Committee, composed of investors, issuers, and underwriters (such as KfW, the European Investment Bank, and BNP Paribas) which detains wide-ranging authority over their process and contents (Park, 2018). NGOs, universities, consultants and other stakeholders can participate as non-voting observers.

The International Capital Market Association acts as the GBPs’ secretariat. Not only this centralized structure facilitates iterative relationships among small groups of firms, but also favors the adoption of CSR standards more effectively compared to public regulation. However, it should be noted that this approach does not allow stakeholders to directly participate in the formulation and implementation of the GBPs (Fatica and Panzica, 2020).

According to the Climate Bonds Taxonomy released in 2021, the fact that the eligibility of assets and projects is established through broad categories shows a lack of taxonomies or consistent and unique definitions of green assets. The external reviews are now basically mandatory across different jurisdictions. Annual reports are compulsory as well, at least until the allocation of proceeds is completed. The last edition of the GBP (2018) maintains the four components framework which will be later explained and encompasses five environmental objective encompassing climate change mitigation, climate change adaptation, biodiversity conservation, pollution prevention and control, and natural resources conservation. This edition also points out that both national and international initiatives to develop new taxonomies could offer guidance to the issuers of green bonds.

The GBP’s four components (ICMA, 2018) mentioned before are the following:

1. **Use of Proceeds:** description of the utilization of the proceeds of the bond for Green Projects; the issuer should clearly state and, where possible, quantify the environmental benefits as well as providing an approximation of the share of financing vs re-financing.
2. **Process for Project Evaluation and Selection:** the issuer should include the environmental sustainability objectives, define the process and the criteria through which it established the eligibility of the project in the

categories afore mentioned, along with the environmental and social risks related to the projects. Issuers should also state the standards or certifications used during the selection process. To ensure a high level of transparency and disclosure, GBP also recommend external reviews.

3. **Management of Proceeds:** the proceeds of the Green Bond should be credited to a sub-account or transferred to a sub-portfolio or in another way which allows the issuer to track the money until it is fully invested. The balance of the net proceeds should also be modified according to the changes made in the allocations to eligible green projects. As long as the Green Bond is outstanding, the balance of the tracked net proceeds should be adjusted on a regular basis to reflect allocations to eligible Green Projects made during that period. The issuer should inform investors about the types of temporary placements planned for the remaining unallocated net proceeds. Also, for as long as the Green Bond is outstanding, the balance of the tracked net proceeds should be adjusted on a regular basis to reflect allocations to eligible Green Projects made during that time period.
4. **Reporting:** issuers should annually report information regarding the use of proceeds until full allocation, including the list and brief description of projects to which the proceeds have been allocated together with their potential impact. When the level of disclosure is limited due to confidentiality agreements, the issuers should provide generic information or present them on an aggregated portfolio basis (e.g. percentage allocated to specific project categories). When it comes to the expected impact of the projects, transparency is pivotal, which is why the issuers should use qualitative performance indicators and, if possible, quantitative performance measures (e.g. energy capacity, electricity generation, reduction of water/cars use, etc.), and state the methodology applied. When it is possible to monitor the achieved impacts, these should also be included in the annual reports.

There are voluntary guidelines for energy efficiency, renewable energy, water and wastewater projects, and waste management projects that aim to create a standardized

framework for impact reporting. The guidelines contain templates for the format of impact reporting at the project and portfolio levels, which issuers can customize to their specific needs.

1.4 External Review

As anticipated, it is recommended that issuers select third-party review providers to ensure that the green bond is in line with the GBP. Indeed, external assurance has become an integral part of the governance strategy in Corporate Social Responsibility as it represents a mixture of private sector instruments (i.e., selling bonds) with public regulations (i.e., normative verification). The increasing number of green bonds standards has further promoted the need for external assurance.

There are various types of external reviewers: first of all, the issuer can choose consultants and/or institutions expert in environmental sustainability or other aspects of green bonds' issuance. However, consultancy activities imply collaboration with the issuer, thus differing from independent external reviews, which are recommended by GBP. In particular, the latter may vary in scope or address a single Green Bond program/issue. Independent external reviews can be partial (concerning only some aspects of the issuance) or full (when it evaluates the alignment of the issuance with the four components of the GBP) and encompass the following types:

- **Second Party Opinion:** it is the primary form of external assurance; it consists of a review of the regulatory framework used by the issuer and can be provided by an independent institution which has environmental expertise and assesses the issuer's alignment to the GBP in terms of strategy, policy, objectives adopted and evaluates the characteristics of the green projects selected to be part of the Use of Proceeds. CICERO, a non-for-profit climate research institute, is the largest second opinion provider on green bonds since 2008 and has developed the three-point "Shades of Green" scale, ranging from dark green to light green (Park, 2018). The grade depends on the quality assessment of the projects and their internal frameworks. It should be noted that second party opinions do not provide a projection of the environmental impacts of the projects. Regarding prescriptiveness, it is limited since the review process is done before the issuance thus not guaranteeing an *ex-post*

assurance. Second opinions are private and can be publicly available at issuers' discretion (Park, 2018).

- **Verification:** an independent verification of environmental criteria or of the list of criteria related to the business processes to assess whether they are in line with the internal or external standards or not. Verification may also consist of an assurance or attestation of the issuer's tracking method for the Use of Proceeds, declaration of the environmental impacts or to establish if the issuer is in line with the reports.
- **Certification:** green bonds or green bond frameworks can be certified against the external relevant standards or labels. Indeed, accredited third parties are called upon to ensure that they are consistent with the criteria set by these standards.
- **Green Bonds Scoring/Rating:** green bonds or green bond frameworks can be evaluated by accredited third parties such as rating agencies according to a specific scoring/rating methodology. The output could include a focus on environmental performance data, the process relative to the GBP, or another benchmark, such as a 2-degree climate change scenario. This type of scoring/rating differs from credit ratings, which may still reflect material environmental risks.

The timing of external reviews can change according to the nature of the review and their publication may also depend on the confidentiality requirements although ICMA recommends their public disclosure. The GBP have also established Voluntary Guidelines for External Reviewers to boost and develop best practices.

It is noteworthy that the GBP are not mandatory nor prescriptive and their governance structure reflects their willingness "to expand the green bond market through private standards" (Park, 2018).

Although certification and external review undeniably increase transparency and provide issuers with a high reputational benefit, they do so at a cost (Fatica, Panzica and Rancan, 2020). The question of whether and to what extent the market values this additional financial effort by issuers becomes relevant in light of the need to promote the development of the green bond market.

1.5 The EU taxonomy

The European Commission has identified one of the barriers to the development of the green bond market as the lack of a commonly agreed-upon definition as well as a unique reference framework, which is why the European green bond market boasts uniform green bond standards, credibility and effectiveness (Fatica and Panzica, 2020). While the GBP does not take a position on which green technologies, standards, claims, and declarations are best for environmentally sustainable benefits, it is worth noting that there are several ongoing international and national initiatives to create taxonomies and provide a mapping between them to ensure comparability (Park, 2018).

As aforementioned, the volume of sustainable investment funds and sustainability indices has increased in recent years. The current COVID-19 pandemic has highlighted the importance of redirecting capital flows toward sustainable projects in order to strengthen our economies, businesses, and societies, health systems particularly, against climate and environmental shocks and risks with clear health co-benefits. As a result, the action plan for financing sustainable growth called for the development of a common classification system for sustainable economic activities, also known as the "EU taxonomy" (European Commission, 2020). To accomplish this, a common language and a clear definition of what constitutes 'sustainable' are required.

Furthermore, public actors are establishing climate goals, and governments are issuing green sovereign bonds. This has resulted in a plethora of sustainability classification systems, resulting in a lack of transparency and comparability (Schuetze and Stede, 2020). The EU Taxonomy for Sustainable Activities is the first comprehensive science-based classification system designed to determine whether a particular economic activity is sustainable. Although it is still too early to quantify the impact of the EU Taxonomy on companies and investors, it is reasonable to expect significant changes in economic activity and financial flows (Lucarelli, Mazzoli, Rancan and Severini, 2020).

EU Taxonomy-related topics have now been incorporated into policy measures, reinforcing expectations for positive environmental impacts (Lucarelli, Mazzoli, Rancan and Severini, 2020). However, it remains unclear how such investments can become more commonplace without policy distorting investment decisions (Demary and Neligan, 2018). Still, the EU Taxonomy is expected to boost the credibility of green bonds in comparison to current green bond standards. Banks that use taxonomy-aligned assets as

underlying assets for green bonds may also benefit from more favorable refinancing terms (Kapraun and Scheins, 2019).

The EU Taxonomy establishes performance thresholds (or technical screening criteria) for approximately 80 sustainable activities, thereby providing a common definition for these activities (Schuetze and Stede, 2020). Indeed, the taxonomy standardizes the definition of sustainable investments and aids in the transition to a climate-neutral economy in a variety of ways. It can also help prevent greenwashing by increasing transparency about the climate impact of real-economy investments (Schuetze, Stede, Blauert and Erdmann, 2020).

The Technical Expert Group on Sustainable Finance (TEG) was established to assist the European Commission in putting the Commission's Action Plan into action. The European Commission charged the TEG with developing recommendations for technical screening criteria for economic activities that contribute significantly to climate change mitigation or adaptation (Alessi et al, 2019). The EU Technical Expert Group on Sustainable Finance published the Green Bond Standard (TEG 2019), which defines green bonds more narrowly as “any type of listed or unlisted bond or any other capital market debt instrument issued by a European or international issuer, as long as three requirements are met: needs to the issuer’s ‘Green Bond Framework’ explicitly affirm the alignment with the EU-Green Bond Standards (GBS); the proceeds will finance or re-finance ‘Green Projects’; and the alignment of the EU-Green Bond Standard is verified by ‘an accredited External Verifier’” (TEG Green Bond Standard).

The TEG identified a list of eligible activities for each macro-sector and then determined the “detailed technical screening criteria” required to validate whether economic activities meet the relevant substantial contribution to the environmental objectives. It should be noted that eligibility under the EU Taxonomy is determined by activity rather than entity (i.e., company) (Lucarelli, Mazzoli, Rancan and Severini, 2020). Nonetheless, defining what aspects of a company's performance can be considered sustainable is an important part of the EU Taxonomy assessment. To that end, determining the degree to which a company can be considered environmentally sustainable is based on the individual contribution of each eligible economic activity to company performance, expressed in terms of turnover or revenues when appropriate, but

also in terms of capital or operational expenditure (Lucarelli, Mazzoli, Rancan and Severini, 2020).

Companies that already disclose sustainability reports may benefit from the taxonomy's standardized reporting process, as different data no longer needs to be sent to different data providers. This can significantly improve firm comparability for financial institutions.

Building on this, the taxonomy is intended to serve as a market standard for sustainability labels for private investors, as well as to increase transparency and comparability for end customers. It can also be used as a standardized definition for government funding and investment programs.

The current dialogue between China and the European Union to develop a standardized language is an important step toward establishing a global standardized green certification scheme that extends beyond a domestic investor base (Ehlers and Packer, 2017). The Taxonomy Regulation was published in the Official Journal of the European Union in June 2020 and entered into force in July 2020. Furthermore, the taxonomy divides the analyzed economic sectors into three categories: green activities, which significantly contribute to climate change mitigation; enabling activities, which facilitate emissions reductions in other sectors; and transition activities, which require significant effort to become climate-neutral, as established by the EU regulation 2020/852 (2020).

The Taxonomy Regulation establishes six environmental objectives:

1. Climate change mitigation
2. Climate change adaptation
3. The sustainable use and protection of water and marine resources
4. The transition to a circular economy
5. Pollution prevention and control
6. The protection and restoration of biodiversity and ecosystems

It can be also implemented to boost public investments into green technologies. Moreover, it should be specified that, in general, the taxonomy can be applied at two different levels, namely the project level and the firm level. The first one is concerned with new investments, such as the building of a new power plant, manufacturing facility, or building. Regarding the latter, there are currently various sustainability ratings, none

of which use standardized criteria for rating sustainable investments (Schuetze, Stede, Blauert and Erdmann, 2020). A company's sales or expenses that correspond to the taxonomy can be used to evaluate it at the firm level.

To summarize, the Taxonomy is in line with the European commitment to achieve climate neutrality by 2050 and the Paris Agreement. It serves as the foundation for a number of related initiatives under the Commission's action plan on sustainable finance (European Commission, 2018). The EU Taxonomy will have an impact on a wide range of stakeholders, either directly or indirectly (TEG, 2020). Indeed, the EU Taxonomy regulation provides for a total disclosure of the environmental performance of the activities governments, companies and investors in general invest in (Climate Bonds Initiative, 2020).

More simply, the EU Taxonomy is a powerful tool as it represents the blueprint towards a net-zero GHG emissions economy along with transparency and comparability in the financial sector (Climate Bonds Initiative, 2020). To conclude, it is a further step forward towards a green economy.

Chapter 2

The Climate Bonds Initiative and its mission

2.1 The Climate Bonds Initiative: an overview

The Climate Bonds Initiative (CBI) is an international organization dedicated to mobilizing the world's largest capital market, the \$100 trillion bond market, for climate change solutions. They encourage investments in projects and assets that are required for a quick transition to a low-carbon, climate-resilient economy. In particular, their strategy is “to develop a large and liquid Green and Climate Bonds Market that will help drive down the cost of capital for climate projects in developed and emerging markets; to grow aggregation mechanisms for fragmented sectors; and to support governments seeking to tap debt capital markets” (Climate Bonds Initiative). Since the CBI is a non-profit organization that focuses on investors, its work is an open-source public good and is divided into three workstreams:

1. **Market Intelligence:** since 2011, the Climate Bonds Initiative has been publishing State of the Market reports that analyze the evolution of green bond market. The overarching goal is to provide a broad analysis of sustainable debt markets, integrating policy and related initiatives, and ultimately supporting the growth of sustainable finance. Likewise, it annually undertakes a survey of bonds to size the climate bonds universe. To this same end, the CBI has established the Green Infrastructure Investment Opportunity (GIIO) program to demonstrate green infrastructure pipelines, which represent a great investment opportunity at the global level.
2. **Developing a trusted standard:** through the Climate Bonds Standard and Certification Scheme and the Climate Bonds Taxonomy the CBI aims at supporting and assisting the investors and governments in making green investments.
3. **Providing policy models and advice:** the CBI develops proposals for the government, finance and industry sector, in the firm belief that a radical change towards a green economy will occur only through cooperation and collaboration among different stakeholders.

Considering the states of the market's issuance, it is worth noting that the report issued in October 2020 differs from the previous reports as it covers the full range of social, sustainability, and green labels (Climate Bonds Initiative, 2020). To be more specific, it is divided into two sections: the first one provides an introduction to green, social, and sustainability bonds. This includes a thorough examination of green bonds issued in the first half of 2020, as well as a detailed analysis of other debt themes – sustainability, social, and pandemic bonds – from 2014 to the first half of 2020; the second part provides a comprehensive description of sustainable finance policy measures from all over the world. These cover a wide range of stakeholders (i.e. governments, central banks, investors), and emphasize the importance of a greener and more sustainable global recovery in a post-COVID world (Climate Bonds Initiative, 2020).

Notwithstanding the fact that green has always dominated the sustainable debt market, the share of other themes has been increasing in recent years, both in terms of number of issuances and issuers. Generally, the market performed well in the first half of 2020, with over USD250 billion issued versus USD341 billion for the entire year of 2019 (Climate Bonds Initiative, 2020). However, as a result of COVID-19, the market composition has significantly changed this year, with a much more even split between themes than in previous years (Climate Bonds Initiative, 2020). In particular, green bond volumes have been the most affected while sustainability ones have been consistently increasing, almost achieving the same level as 2019. Social bonds as well have reached higher volumes, mostly thanks to COVID-19 (Climate Bonds Initiative, 2020).

Regarding the green bond issuance, CBI highlights this year's record issuance of USD 250 billion and the growing number of issuers such as new sovereigns (“the next most ‘resilient’ issuer type”) (Climate Bonds Initiative, 2020) like the Netherlands and Chile and the development of a market harmonization thanks to the EU Taxonomy and the Green Bond Standard (Climate Bonds Initiative, 2020). The main driver of green issuance has been Europe (55%) but also China's market has expanded (Climate Bonds Initiative, 2020).

It should be noted that the COVID-19 pandemic has been having a greater impact on private entities rather than on public/government-backed ones, which has remained robust with an issuance of USD 22 billion in the first half of 2020, well above the USD 35 billion of 2019 (Climate Bonds Initiative, 2020). However, issuance by national

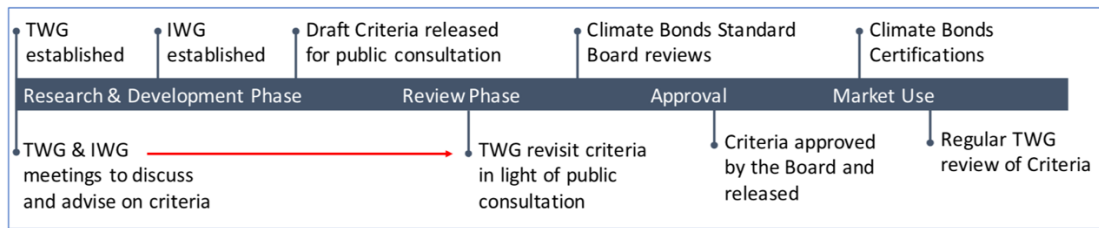
development banks such as KfW or China Development Banks has dramatically decreased from USD 15 billion in 2019 to USD 1 billion in the first half of 2020 (Climate Bonds Initiative, 2020).

2.2 The Climate Bonds Taxonomy

Although many investors expressed their will to address climate change, the lack of guidance makes it difficult for them to assess whether their investments (mainly debt-based investments) are achieving concrete results or not. To deal with this problem, the Climate Bonds Taxonomy, issued for the first time in 2013 and regularly updated, provides entities with a set of assets, projects and criteria to pursue a low carbon economy and the 2-degree target established by the COP 21 Paris Agreement. Notably, it is based on scientific evaluation and research from both the International Panel on Climate Change (IPCC) and the International Energy Agency (IEA) and several technical experts. In particular, the CBI Taxonomy of 2021 identifies the following eight sectors (Climate Bonds Initiative, 2021):

- Energy
- Transport
- Water
- Buildings
- Land use & marine resources
- Industry
- Waste & pollution control
- ICT

Since its introduction, the CBI taxonomy has grown in scope and published criteria for a growing number of industries. The process of developing the standard and sector criteria begins with the formation of working groups and proceeds through several stages, as shown in the table below.



TWG: Technical Working Group. IWG: Industry Working Group

Source: *Climate Bonds Initiative, 2018.*

2.3 Climate Bonds Standard and Certification Scheme

Following the rapid growth of the green bond market, various stakeholders of the global community (issuers, institutional investors, governments, academia, NGOs) became increasingly interested in the standardization of green bonds. A standardized and transparent market is indeed pivotal to gain the trust of all those actors involved with Socially Responsible Investments (SRI) and green bonds issuance. Indeed, standardization can lead to strong frameworks for the monitoring and reporting processes of the proceeds of green bonds. This allows investors all over the world to invest in green bonds without worrying about the viability of their investments or being concerned about economic, legal, or political risks. As a matter of fact, the green bond market owes its uniqueness and appeal mostly to the fact that it manages to guarantee transparent disclosure. In particular, to satisfy both investors and issuers, any green bond standard must be non-prescriptive, simple, and transparent. Moreover, it lowers the cost of verification and reduces the difficulties associated with greenwashing.

As aforementioned, the one of the Climate Bonds Initiative is a model of certification as a mode of governance (Park, 2018). The CBI launched The Climate Bonds Certification Scheme in December 2010, the first and also the only international science-based labeling scheme for green bonds and loans. It establishes market best practices for ambitious climate action, reporting, and disclosure.

Please note that this thesis uses the CBS Version 3.0 to describe the key features of the standard and certification process.

2.4 Certification

Certification entails establishing standards, assessing compliance with the standards, issuing a certification seal or label, accrediting the certifier, and monitoring compliance. The CBI's private governance regime depends on interconnected standards and certification regimes. The purpose of the Climate Bonds Standard & Certification Scheme is to give the green bond market the trust and assurance it needs in order to grow. It is, indeed, an important step toward developing a robust and effective certification system. It is in line with the Green Bond Principles, which is why it provides investors with specific requirements regarding the use of proceeds, tracking and reporting as well as with eligibility criteria for the green projects and assets.

Moreover, to be certified by the CBI, a green bond must meet pre-issuance requirements as well as post-issuance requirements that must be met within the first two years. Also, the CBI has established a set of internal mechanisms and processes to enable conformance with its Standard. First of all, the Use of Proceeds should list the Nominated Projects and Assets. These should become Eligible Projects and Assets and should not be nominated to other Certified Climate Bonds or other labelled green bonds, unless distinct parts of the Nominated Projects & Assets are being funded by different Certified Climate Bonds or labelled green bonds or Another Certified Climate Bond is being used to refinance the existing Certified Climate Bond. Moreover, the expected Net Proceeds of the bond should not exceed the Issuer's debt obligation to the proposed Nominated Projects & Assets, or the Fair Market Value of the Issuer's ownership of the proposed Nominated Projects & Assets. Secondly, regarding the Process for Evaluation, the Issuer must develop, document, and maintain a decision-making method for identifying the eligibility of the Nominated Projects and Assets, which includes: a statement outlining the bond's green objectives and a procedure for determining whether the Nominated Projects and Assets meet the eligibility requirements indicated in Part C of the Climate Bonds Standard (the one that establishes the eligibility of selected projects and assets). The third step is the Management of Proceeds, that provides that the Issuer's systems, policies, and processes for managing bond funds and investments must be documented and disclosed to the Verifier, and must include provisions for the following activities, as stated in the document:

- Tracking of proceeds

- Managing unallocated proceeds
- Earmarking funds to Nominated Projects & Assets

Then, the Issuer should release the Bond Disclosure Documentation containing the investment sectors, the amount of proceeds used for refinancing projects, the investment tools and the selected Verifier for both the pre-issuance and post-issuance.

Once CBI has certified an issuer, the issuer may use a certification logo for the issuance of a specific green bond under terms agreed upon by the issuer and CBI. The certifications are overseen, reviewed and approved by the Climate Bonds Standards Board (CBSB), which is composed of members from a broad array of non-profit organizations such as the Institutional Investors Group on Climate Change (IIGCC) and represents the advisory committee of the Climate Bonds Initiative Board.

Compared to GBPs, CBI is more prescriptive and inclusive. In particular, its prescriptiveness stems from the incorporation of external verification, which is a distinguishing feature of certification in comparison to principle-based standards. Unlike testing and inspection, certification entails a third party, ensuring adherence to a set of standards. CBI requires an *ex ante* external assurance to verify that an issuer complies with the Climate Bonds Standards. A CBI-approved verifier is required to prepare and submit a formal assurance report following existing auditing and assurance standards, such as ISAE 3000. Indeed, it should be highlighted that assurance is mandatory even *ex post*, hence after the issuance.

The Climate Bonds Standard is a screening tool that establishes the prerequisites and eligibility criteria for the issuers that aims at obtaining the Climate Bond Certification. It only addresses the climate attributes of projects and assets as it is a climate change standard rather than a financial one. As a matter of fact, it does not take into account the credit worthiness of the investments.

2.5 The multiple benefits stemming from the Climate Bonds Initiative

Obtaining the Climate Bonds Certification has several benefits both the issuers and for the investors (Climate Bonds Initiative). More precisely, the former can benefit from the label as they can prove that their bond complies with best practice standards for climate mitigation and transparency, thus enhancing the issuer's reputation. At the same time, issuers would profit from a broader and more diversified investors base. These

investors are also more “sticky”, meaning that they hold their debt for a longer period of time. Furthermore, due to the growing investor demand for such bonds, they could also obtain pricing advantages.

In other words, the CBI Certification helps investors to quickly find credible green bonds. While certification as conforming to the Climate Bonds Standard does not guarantee credit risks or returns, it does allow investors to economize when analyzing the low-carbon credentials of investments across sectors and asset classes. In addition, since the Certification ensures greater transparency and consistency, investors can be less careful when screening the bonds.

The CBI standard is the only green standard used at an international level. It should also be highlighted that it “allows corporate bonds to be linked with low-carbon activities, without compromising on the normal credit ratings of the issuer”. Indeed, it can be used as a screening tool by investors to ensure the low-carbon nature and integrity of their fixed-income investments. To be more specific, the Certification allows investors to actively boost the Low-Carbon Economy in three different ways:

- 1) By investing in a low-carbon transition to hedge against future climate risks;
- 2) By indicating to the market their desire for risk-adjusted green deal flow;
- 3) By making governments aware of the investors’ willingness to finance the low-carbon transition following stable and reliable policy frameworks and having a risk-adjusted return.

2.6 The green bond market: rating and financial risk

Bonds' investment grade or ratings, which indicate the level of risk of default, are determined by ratings agencies such as Standard & Poor's (S&P), among others. Bonds of high quality are typically rated "AAA" or "AA". Medium credit performance is measured as “A” and “BBB,” and it is still considered investment grade. The lowest credit ratings are “BB,” “B,” or “CCC” and these are called “junk bonds” (S&P 2016). S&P’s green evaluation framework is applicable to either carbon or water, and it is built around three dimensions: governance, transparency, and environmental impact (Weber and Saravade, 2019). The standing of the green project (and, by extension, the green bond that funds it) is related to factors including the project's environmental contribution, the extent to which it manages to mitigate climate change, and the project's location in

relation to local environmental conditions. Indeed, a project for reusing water taking place in New York, for example, would obtain a greater net benefit score than one in Chicago because the level of water stress in New York would be much higher than in Chicago. In other words, it is clear that the impact of a green bond varies according to the geographical area where the green project will take place and on how the projects will positively affect the local environment or mitigate the effects of climate change. As a result, standardization of bonds and assessments is difficult to achieve.

Although this thesis does not analyze and explicitly mention any specific green bond's bond ratings, it is clear that higher investment grade bonds are far more valuable to investors seeking low-risk exposure compared to lower investment grade bonds. As a result, established market participants, such as developed countries and multilateral development banks (MDBs), tend to have better ratings as well as a good reputation in the bond market. Lower risks usually result in greater demand for the majority of their bonds, and even oversubscription (Osterland, 2018). Oversubscription is popular in the regular bond market because fixed income investors consistently have money to invest. However, oversubscription has been a common pattern also in the green bond market, with a high demand in green bonds since investors seek to diversify their portfolios (Weber and Saravade, 2019). Their appetite for green bonds depends on different factors such as the size of the bond, the timing of the issuance, the price, etc (Climate Bonds Initiative, 2017).

Considering that the green bond market is still in its early stages, these factors may change over time, and oversubscription may be driven by a lack of supply. However, it should be highlighted that the green bond market's oversubscription differs from the one of the regular bond market is that there is an additional investor base of green investors or SRI-focused investors, which is why a green bond's appeal is greater compared to that of a vanilla bond. Moreover, a diverse investor base also provides more stability throughout volatile times, hence contributing to its success (Weber and Saravade, 2019).

Chapter Three

Sovereign Green Bonds. Case Studies: Italy and Germany

3.1 Why issuing sovereign green bonds is convenient

The development of financial instruments that foster climate-related risk mitigation and capital mobilization, resulting in the necessary investments in green productive capital, is pivotal. Sovereign GB issuances could be highly beneficial in meeting these aims and solving the intergenerational trade-off in climate mitigation policies (Banca d'Italia, 2021). As a result, GBs can be considered innovative financial instruments to reduce mitigation costs, increase welfare, and promote intergenerational equity and fairness. According to Auffhammer, a carbon tax could also be a practical measure to support the mitigation effort (Auffhammer, 2018). Nevertheless, it will not rise sufficiently over time, and thus its impact on the transition will be too slow (Banca d'Italia, 2021).

Instead, combining carbon pricing and sovereign GBs could be more effective in financing the transition to a low-carbon economy (Orlov, Rovenskaya, Ptaschunder and Semmler, 2017). Indeed, sovereign GBs can serve as a high-quality market benchmark, increase the liquidity of the green segment, and encourage other issuers to enter the market. Issuers may also use GBs to reach a wider audience of investors, which is easier to do for small countries or those with low public debt (Banca d'Italia, 2021). Still, there is room to attract more investors, also for seasoned issuers like France.

A sizable proportion of GB underwriters are institutional investors such as pension funds, sovereign wealth funds, and insurance companies with a long-term outlook. Due to their common buy-and-hold strategy, they help to reduce the volatility of these assets in the secondary market (Banca d'Italia, 2021). These investors are currently looking for financial resources in line with their green investment strategies. GBs reduce the cost of their search, which may result in lower yields at issue from the issuer's perspective. Indeed, due to high demand and a diverse investor base, GBs could potentially outperform benchmark indexes and traditional peers in both the primary and secondary markets (Ridley and Barnshaw, 2019).

Countries typically issue sovereign GB at the long end of the yield curve. Green bonds can raise the average maturity of outstanding debt, lowering refinancing risk, especially if there is no substitution effect with the demand for other extra-long securities

from the same issuer. In this case, as well, more benefit occurs for emerging economies as they have less stable demand for extra-long maturities in general. Aside from financial benefits, issuers also gain substantial advantages in terms of reputation. Indeed, sovereign green bond issuance shows the government's long-term commitment to a green strategy and attracts private investments in green sectors.

Concerning the use of proceeds, evidence indicates that sovereign GBs are more likely to be deployed in a broader range of eligible projects than corporate GBs. It is extremely beneficial as it allows green investors to diversify their exposure from renewable energy and energy efficiency projects, and it also serves as a guideline for other issuers.

Lastly, another reason for the establishment of sovereign wealth funds is that they allow to enhance the intergenerational transfer of sovereign wealth (Sonerud, Kidney and Tripathy, 2015). As a matter of fact, since climate change will negatively impact future generations, the intergenerational transfer motivation offers an explanation for these funds to be more and more directed to climate-friendly investments, such as green bonds (Sonerud, Kidney and Tripathy, 2015).

3.2 Some disadvantages deriving from the issuance of sovereign green bonds

One of the primary concerns of sovereign debt managers is the impact of a GB issuance on existing debt. The introduction of a new type of bond can result in a trade-off, as it would increase the number of bond lines while reducing the volumes of each of them. This would lead to a loss of liquidity for each bond and, thus, to higher funding costs for the issuers.

Balancing financial and non-financial advantages against potential drawbacks is imperative. Indeed, the issuance and ongoing costs of a green bond (namely, the definition of green criteria, tracking, monitoring, and reporting processes) are higher compared to those of traditional bonds which is why, even though these additional costs are not extremely high, the investors could be discouraged.

Additional and more consistent financial and reputational costs may also arise if investors seek penalties for a green default (Banca d'Italia, 2021). The latter occurs when a bond is paid in full and the issuer, who could not successfully carry out planned green projects or provide concrete environmental benefits, violates agreed-upon green clauses.

Since the latter are not tied to the issuer's financial obligation, they would be triggered even if the bond had been partially or completely redeemed (KPMG, 2015). In contrast, if GBs replace one of the existing bond lines, only sufficient annual green expenditures could mitigate the loss of liquidity and ensure the issuance of a new bond (Banca d'Italia, 2021). Planning green expenditures for the medium term, on the other hand, might be difficult for small countries (Banca d'Italia, 2021). Denmark recently proposed a theoretical solution to this trade-off, and Germany introduced a new issue mechanism (the so-called "Twin model", which will be further analyzed in the next chapter). Such innovative and unconventional issuance approaches are used by sovereign issuers seeking to build a green yield curve parallel to the conventional one, which is why the vast majority of issuers have chosen a single maturity issuance program for the time being.

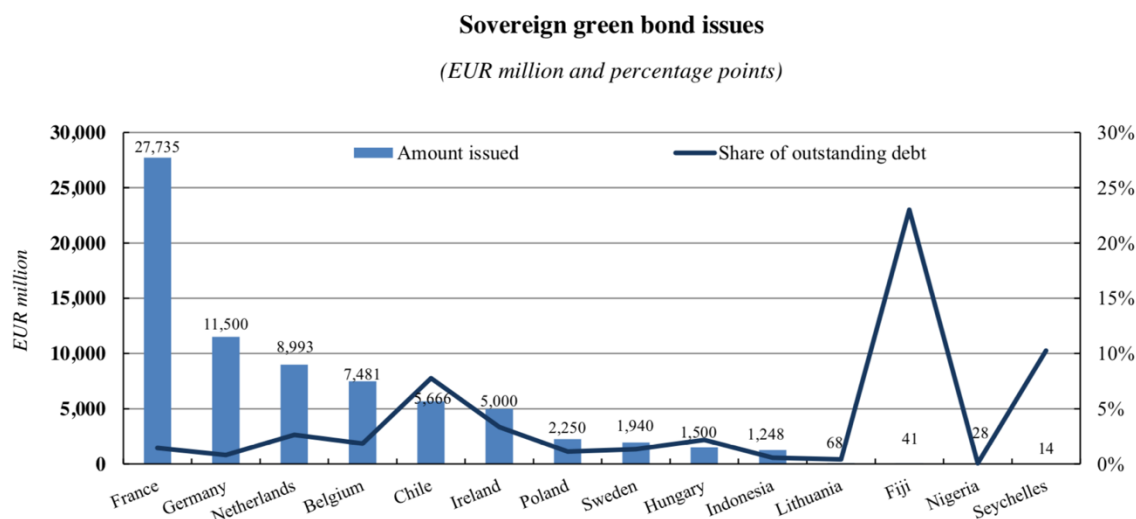
Organizational structures established to manage GB programs necessitate effective collaboration among multiple stakeholders, emphasizing the role of strong executive leadership support (Banca d'Italia, 2021). Indeed, cooperation among ministries, departments, and external institutions is necessary to search for green projects, as well as to track the funds collected, which can be difficult at times due to the disparities in communication and management practices between the institutions in charge of the project side (typically the Ministry of Environment) and those in charge of the financial side (typically the Ministry of Finance) (Banca d'Italia, 2021).

The central government financing system makes the tracking of GB proceeds even harder, especially in low-income countries, where there is often a lack of transparency and accountability. Notwithstanding all these difficulties, sovereign issuers are taking steps forward to effectively manage GB proceeds in a variety of ways, such as enacting legislation to ring-fence funds and committing to independent audits by third parties.

3.3 Green sovereign issuances: some experiences

The sovereign GB market accounted for nearly EUR 73 billion at the end of 2020, issued by fourteen countries (please see the graph below). Global sovereign GBs account for only 1.5% of outstanding debt issued by green sovereign issuers, but their share is rapidly increasing. Eurozone EUR 61 billion issues account for 83% of the market (90% including European non-Eurozone issues), which is why the vast majority of issues (94%) are denominated in euros, while a minority (5%) in US dollars. Between 2016 and early

2017, Poland and France led the market, followed by Fiji and Nigeria. Belgium, Ireland, Indonesia, Lithuania, and Seychelles launched their first GBs in 2018. The Netherlands and Chile joined the market in 2019, followed by Hungary, Sweden, and Germany in 2020 and Italy in 2021.



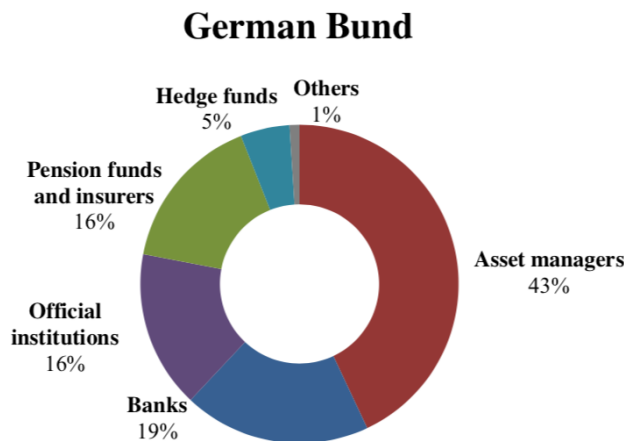
Source: Bloomberg

While some advanced economies, such as France, sovereign green issues have followed the issuance of the corporate bonds, the opposite is true for some emerging economies, such as Chile and Indonesia, where sovereign green issuances are expected to fuel the expansion of rising corporate green finance. Sovereign GBs have nearly identical terms and conditions to traditional bonds. Most sovereign GBs have maturities of more than ten years. The average maturity at issue for the sovereign market is 14 years, significantly higher than the average maturity of global sovereign issues (6.7 years). As with regular bonds, the first tranche of sovereign GBs is typically higher than the subsequent tranches and issued by syndication to profit from better pricing. The following tranches are typically issued through an auction and tapped until the outstanding amount ensures a sufficient level of liquidity. The vast majority of sovereign GBs can be stripped.

3.4 The major sovereign issuers

The French, Dutch, Belgian, and German represent the four major GB issues. They collectively account for more than 75% of the market. These countries established their GB frameworks, which included projected green expenditures along with supporting

legal documentation. Their issuance procedures adhered to the ICMA principles while the second party opinion was provided by ESG rating firms such as Sustainalytics and Vigeo Eiris. The four initial issuances drew key investors like banks, asset managers, pension funds, and insurance companies, as shown in the next graph regarding the German bond. Indeed, since these players have always had long-term interests, this was highly predictable.



Source: AFT, DSTA, BDA, FRGFA.

The vast majority of the investors who participated in the operations were European (the ones from Germany, the Netherlands, and northern countries being the most active) (Banca d'Italia, 2021). Domestic investors purchased nearly one-third of the issuance in the French and Dutch placements. UK accounts were also prevalent, particularly in the French and German syndications. The three operations involved a remarkably diverse set of investors (Banca d'Italia, 2021).

Funds raised with GBs have been used in a variety of ways across countries. For instance, France spent the proceeds on more diversified activities, primarily in the building and living resource sectors, followed by transportation, energy, and climate change adaptation (Banca d'Italia, 2021). Belgium and the Netherlands, on the contrary, allocated a greater portion of their funds to the transportation sector (Banca d'Italia, 2021). Green projects in the three countries that were eligible for funding were chosen through an inter-ministerial coordination process. Internal and external auditors were both involved in the process of verifying expenditures. Moreover, annual reports are published after expenditures verification (Banca d'Italia, 2021).

France and Belgium also publish performance reports which outline the details concerning the outcomes of their spending. The Netherlands issues an impact report to evaluate the ex-post effectiveness of the measures implemented.

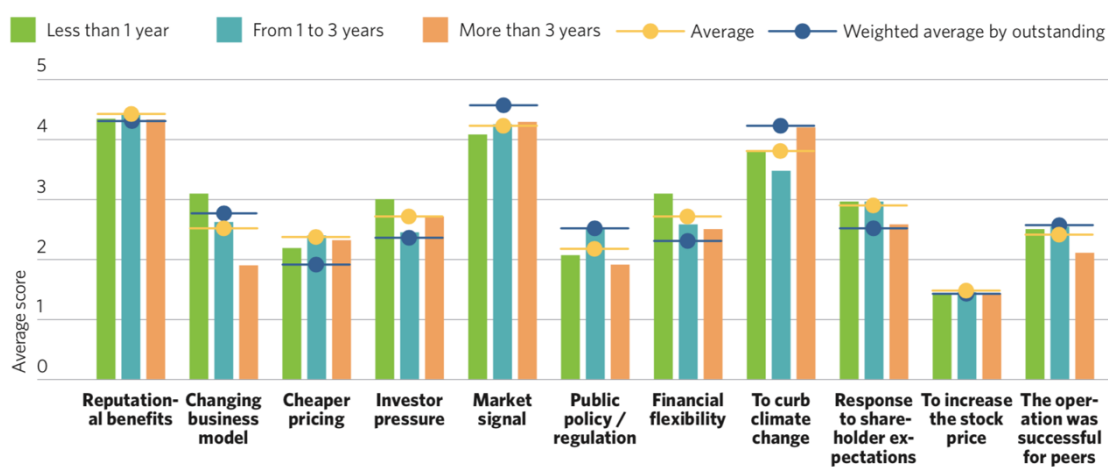
Standardized measures such as the EU Green Bond Standards may encourage a surge in sovereign issues. However, some European sovereigns have not issued sovereign green bonds yet because of the uncertainty surrounding the timing and exact content of the EU Green Bond Standards (Banca d'Italia, 2021). As a matter of fact, in some jurisdictions, the process may be slowed due to legal frameworks that prohibit the use of public debt as a constraint. Except for Germany, which issued its first GB under a "twin model" scheme, issuers do not typically launch a GB and a non-green equivalent at the same time. Still, according to the OECD, several sovereign States will soon begin issuing GBs (OECD 2017, 2018).

It can be stated that GBs are efficient financial instruments to boost the transition towards a greener economy. Nonetheless, the contribution of these bonds to the green transition is critically dependent on the definition of sustainable investments, which is why policymakers are so interested in the subject, as evidenced by the recent European Taxonomy regulation. The rising number of sovereign issuances serves as a driving force, setting the stage for more green debt sales across all market segments. Compared to traditional bonds, GBs have additional administrative, legal, and marketing costs but these do not outweigh their benefits. Financially speaking, despite the fact that the green bond market is characterized by activities and interactions of multiple buy-and-hold investors, their presence has not hampered the secondary market's functioning, since GBs are priced close to their non-green peers. In other words, primary and secondary market analyses reveal no significant and systematic price difference between sovereign green and conventional bonds.

Because of the increase in issuances, it was possible to build sizable portfolios. Sovereign issuances have been successful since they have demonstrated that large issuances can be made without causing distortions in existing debt or other difficulties in the pricing mechanism. Some Sovereigns have recently adopted innovative approaches that allow them to increase the liquidity of their GBs without jeopardizing the liquidity of their existing conventional bonds, which is more likely if the public debt management policy provides constant market monitoring and close contact with dealers.

The introduction of a greenium would have been a new opportunity for issuers and, therefore, a new driver of the sovereign GB market.

Despite a lack of clear evidence of a cost advantage, the demand for green bonds is strong, and green finance is increasingly popular. Moreover, this state of uncertainty should not deter more Sovereigns from entering the green market as governments are aware of the fact that issuing these securities goes beyond pure economic convenience, as demonstrated by a survey taken by the Climate Bonds Initiative (Harrison, Muething and Tukiainen, 2020). In particular, the graph below shows that the respondents’ main reasons for going green are “reputational benefits” and “market signal”.



Source: Climate Bonds Initiative, 2020

Chapter 4

The Italian and German sovereign green bond issuances

4.1 The European Union as a driver towards a green economy

The European Union has set out on a path toward a low-carbon and sustainable economy. A successful transition in Germany and Italy will not only aid in the fight against climate change and environmental degradation but will also help to strengthen the innovation capacity and competitiveness of the European economy as a whole.

Notwithstanding the coronavirus pandemic and the fact that it is putting society under unprecedented strain, the European Union (EU) is paving the way for global warming mitigation (Pietrapertosa et al., 2021), as shown by the launch of the European Green Deal in December 2019. The EU's long-term growth strategy provides a solid foundation for economic recovery and a long-term transition to the world's first climate-neutral continent by 2050. Indeed, the Covid-19 pandemic is not the only global crisis that humanity has to face. The year 2021 will be fundamental to fight against climate change, and Italy and Germany will be at the forefront. The behavioral changes caused by the pandemic are another consequence of the COVID-19 crisis that must be considered when revising National Energy and Climate Plans (NECPs) as they will cause structural changes in energy demand and energy mix. For instance, teleworking and teleconferencing will reduce demand for transportation while increasing demand for electricity.

Member States should follow the European Council Decision and allocate 30% of the budget to climate-related projects when using funds from the Next Generation EU and the Multiannual Financial Framework.

Both the Italian and German approaches are intended to attract multiple investors and issuers to the green bond market, acting as a catalyst to boost investments into a sustainable and greener economy.

4.2 The Italian Green Bond Framework

Since the Paris Agreement, the Republic of Italy has committed to sustainable finance and to keeping funding flows in line with low greenhouse gas emissions. During the G7 meeting in 2016, Italy pledged with other countries to “remove inefficient subsidies to fossil fuels by 2025”, encouraging other nations to follow suit. This

commitment was reaffirmed in the 2017 G20 Climate and Energy Action Plan for Growth.

Italy recognizes the critical environmental, economic, and societal benefits that these assets provide and is thus fully committed to environmental protection and climate change mitigation on a national and global scale. To that end, Italy published its Integrated National Plan for Energy and Climate (INPEC) in December 2019, setting national targets for 2030 on energy efficiency, renewable energy, and CO2 emissions reduction. Italy has also integrated the SDGs in the National Sustainable Development Strategy (NSDS).

Furthermore, the Italian Republic acknowledges that transitioning to a climate-neutral economy by 2050 will require major investment in its building sector and industry, as well as transformation of its energy and transportation infrastructure. The public and private sectors cannot meet this investment challenge alone. As a result, significant amounts of sustainable finance will need to be mobilized by the public and private sectors working more closely together than ever before to achieve these common goals.

This is a major reason for the issuance of the first Italian Sovereign Green Bond (SGB) in 2021, which will help provide additional momentum in a market dominated, so far, by private companies. Because of the increase in private-sector issuance of Green Bonds, corporate Green Bonds are quickly becoming an important segment of the Italian bond market. By the end of 2020, this category's outstanding balance had surpassed 15 billion Euro. When all sustainable bonds issued in Italy are added together, the total number of issuances in 2019 and 2020 exceeds 20 billion Euro (over 12 billion Euros in 2019 and over 8 billion Euros in 2020). The Republic of Italy now intends to promote collaboration between the public and private sectors in order to expand the supply of sustainable finance. Initiatives and measures have been undertaken towards this end by the Government (by implementing the Non-Financial Reporting Directive and issuing SGB), the Bank of Italy (by encouraging the purchase of more green assets), and the Borsa Italiana (by listing environmentally friendly and social bonds).

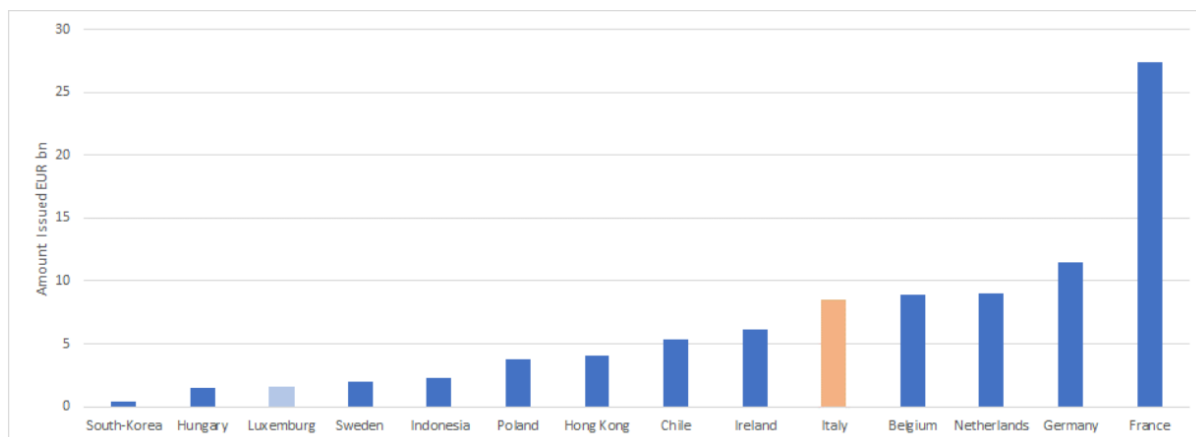
Italy will finance public expenditures through the issuance of SGBs in order to support the implementation of one or more of the EU Sustainable Finance Taxonomy's environmental objectives, namely climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular

economy, pollution prevention and control; protection and restoration of biodiversity and ecosystems. Further, the proceeds will be used to assist Italy in meeting the SDGs by contributing to:

- Goal 6: Clean Water and Sanitation;
- Goal 7: Affordable and Clean Energy;
- Goal 11: Sustainable Cities and Communities;
- Goal 12: Responsible Consumption and Production;
- Goal 13: Climate Action;
- Goal 14: Life below Water; and,
- Goal 15: Life on Land.

The Framework for the Issuance of Sovereign Green Bonds, a document that collects and summarizes the characteristics of the SGBs that the Italian Treasury will issue, has been published by the Italian Ministry of Economy and Finance (MEF) and on March 3, the Republic of Italy issued the world's largest sovereign green bond, the €8.5 billion 24-year green Buoni del Tesoro Poliennali (BTP), as the Italian long-term treasury bonds are known.

Major sovereign green bond issuers (amount issued in EUR billion)



Source: Bloomberg, 2021

The BTP Green was issued in accordance with the provisions of Budget Law No.160 of December 27th, 2019 and its formulation takes into consideration the most recent scientific evidence (i.e. Intergovernmental Panel on Climate Change's reports, the

goals set by the Paris Agreement and the United Nations Framework Convention on Climate Change)

This document aims at illustrating the Italian environmental strategy, as well as the core mechanisms of each BTP Green issuance, namely the eligibility criteria for expenditures included in the Italian State budget and classified as eligible, the use of proceeds from each issuance, monitoring, and the environmental impact of these expenditures. In terms of the process for selecting eligible expenses, the Department of the Treasury (MEF) designates an array of possible expenses based on a preliminary review of budget data obtained from the General Accounting Department. Then, bilateral interactions with the relevant Ministries are carried out to ensure that individual expenses are eligible. Eventually, the Committee receives a portfolio of eligible expenditures for information and review.

The Framework will be periodically reviewed, including its alignment with updated versions of the ICMA Green Bond Principles, the EU Taxonomy for Sustainable Activities, and, when available, future EU Green Bond Standards. Indeed, this Framework complies with the ICMA Green Bonds Principles and the draft of the EU Green Bond Standard.

The Second Party Opinion of the Framework, provided by Vigeo Eiris, an independent review body selected by the Treasury for this purpose, has been published alongside the Green Bond Framework. This Opinion is an *ex-ante* validation of the approach's coherence and consistency with the sustainability goals and the Republic of Italy's overall sustainability strategy.

An Inter-ministerial Committee⁴ has been established for the purpose of the Sovereign Green Bonds, and it is responsible for laying out the information regarding the eligible expenses. In this respect, in order for the expenses to be eligible, they must be included in the definition of one of the following six green sectors:

- Renewable electricity and heat
- Energy efficiency

⁴ It includes representatives from various Ministries, namely the Ministry of the Environment, of the Economy and Finance, of Economic Development, of Agriculture, of Infrastructures and Transportation, of the University and Research as well as from the ones of Tourism and Cultural Goods. An *ad-hoc* Decree of the President of the Council of Ministers from the 9th of October 2020 sets the rules for a correct functioning of the Committee.

- Transport
- Pollution prevention and control and circular economy
- Protection of the environment and biological diversity
- Research

Moreover, their eligibility has to be in line with three criteria, namely: the importance of the expense's contribution to the achievement one or more of the six environmental goals; the (in)significance of the same expense's contribution to impeding any of the six environmental objectives, and the conformity with the legal framework's minimum social protection criteria in which the expenditure is made.

It should be noted that the Committee has refused to include expenditures concerning:

- Exploration, manufacturing and transport of fossil fuels;
- Nuclear power (fission);
- Energy plants (including biomass) with CO₂ emission level of more than 100g CO₂/kWh;
- Manufacturing and production of alcoholic beverages;
- Military contracts;
- Gambling;
- Arms manufacturing;
- Manufacture and production of tobacco products;
- Mining

All eligible expenses (thus capital expenditures, tax expenses, etc...) will have to be comprehended in the Italian State budget. They must be funded by general taxation and contribute to the green growth. The assets that are the subject of the expenditure can be both tangible and intangible. Eligible expenses also exclude expenses, or parts of expenses, for which the Italian government has set aside specific sources of revenue or financing. The proceeds from the SGBs will benefit private or public enterprises, public agencies, local governments, education and research institutions, and households.

For each issuance envisaged by this Framework, please note that the eligible expenses will be chosen from a period between three years before and one year after the issuance of bond. The Committee is in charge of the monitoring process of the expenditures throughout the entire life of the bond. If an expense is not eligible, the Committee will replace it with an eligible one. If a legal controversy by a certain Ministry occurs, the

MEF will work together with the Ministry to determine whether to maintain or remove the expense. The Committee will also establish the procedure by which the State administrations in charge of managing the eligible expenses will provide the information required for the annual report. Indeed, an annual report titled “Italian Sovereign Green Bond Allocation and Impact Report” will be published to keep investors and the general public up to date on the management and allocation of bond proceeds, as well as their environmental impact, using appropriate indicators and data sets.

This report will first show the distribution of proceeds from SGBs issued in the previous year, as well as in the years preceding the most recent reporting year. It will also cover the progress of the proceeds' allocation, at least at the sector level, and it will also contain a summary sheet outlining the status of the funded interventions' implementation. It will also provide information regarding the environmental impact of green expenditures, based on data and insight provided by state bodies, to enhance the monitoring of the SGBs proceeds, along with information about the contribution of each project to the indicators of sustainability and the accomplishment of the green objectives. As it is stated in the paragraph 5.1 of the Framework, the Report may also provide:

- a description of the Green Projects;
- the Environmental Objectives pursued by the Green Projects;
- an overview of Green Projects based on the type of financing (e.g. assets, capital expenditures, operating expenditures, etc.), the share of financing (i.e. the number of Green Projects financed after the bond issuance) and the share of refinancing (i.e. the number of Green Projects financed before the bond issuance);
- information on the methodology and assumptions used to evaluate impacts arising from the Green Projects.

Prior to release, the report will be independently and externally verified. The revenues of the SGB are treated exactly like all other government securities and are transmitted to the MEF's general Treasury Cash account at the Bank of Italy. Green bond sales are "virtually" tracked as an accounting entry that is initially credited with the bond amount and then gradually debited as projects require funding. Actual transfers to projects are made via the issuer's own financial management system, with the virtual green account

tying equivalent debits back to the original bond amount. All expenditures in support of this project may be included in SGBs under Art. 1, Par. 92 of the Budget Law for 2020. Italy intends to identify suitable expenditures related to issued bonds, thus the eligible portfolio, at an early date (within six months of issuance at the latest).

Furthermore, the Republic of Italy has committed to allocating the net proceeds to the designated expenditures as soon as possible, in any case no later than two years, which is the so-called “allocation period”. To guarantee that the balance of recorded net proceeds matches the allocations to eligible expenditures and to support reallocation (if necessary), the eligible portfolio will be larger than the amount of the bond issuance.

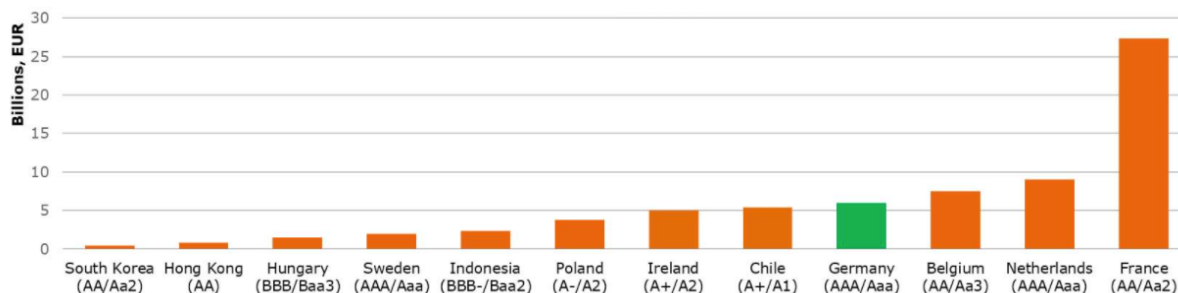
4.3 The German Green Bond Framework

Globally, Germany is fully committed to the Paris Climate Agreement and to the achievement of the 17 SDGs. Indeed, it devotes significant budgetary resources to achieving these objectives and has pledged to be nearly carbon-neutral by 2050. The German Federal Government adopted the Climate Action Plan 2050 in November 2016, making the country among the first to submit a long-term greenhouse gas emission strategy to the United Nations, as required by the Paris Agreement.

Climate change and the transition to a more sustainable global environment pose a number of economic risks, as well as physical and transitional ones, but they also open up investment opportunities. As a result, it is critical that the financial sector incorporates a sustainable growth into decision-making processes. Transparency is crucial for the success of sustainable finance, and Green Bonds are an important tool for increasing transparency.

The German Federal Government has issued the first German Sovereign Green Bond (“Green German Federal security”, a 10-year security worth EUR 6.5 billion through bank syndication) in September 2020, which will represent a liquid and steady reference point for European green bond markets. German federal security will be a turning point, capable of significantly strengthening and developing the global and German markets for green and sustainable investments.

Major sovereign green bond issuers

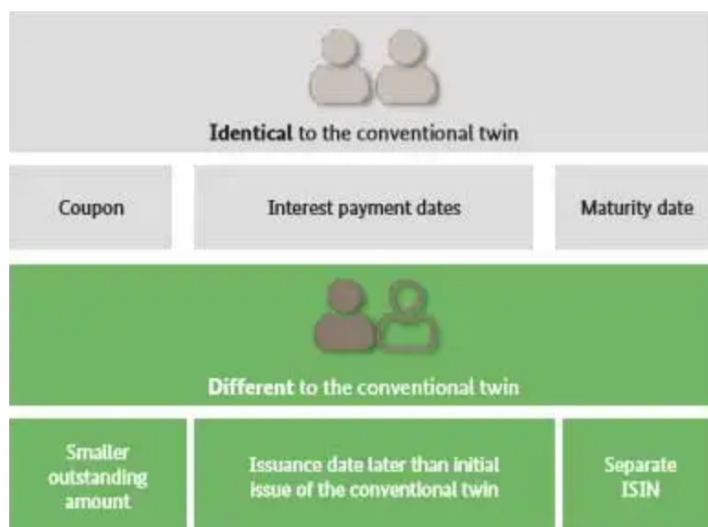


Source: Bloomberg, 2020

The first issuance followed the publication of the German Green Bond Framework, which was in line with the most recent ICMA Green Bonds Principles and was compliant with the draft EU Green Bond Standard. This development is also a natural progression, as German issuers have already played a significant role in advancing the global Green Bond market, particularly the promotional bank Kreditanstalt für Wiederaufbau (KfW), as well as many other issuers such as local governments and private companies. In practice, Germany intends to create a green yield curve for the eurozone, with the same standard maturities as the conventional curve. Different market participants will have access to a green, transparent investment opportunity with first-rate credit quality.

To that end, an innovative issuance strategy has been implemented: each new Green German Federal security will always be issued together with an already existing, conventional one that has the same characteristics, hence identical maturity and coupons. This is the reason why they are known as “twin bonds” or “twin German Federal securities”. This approach should allow issuers to avoid liquidity decline in existing bonds while also increasing the liquidity of the GB itself. Their issuance volume, on the other hand, is quite different, with conventional issues being issued in significantly greater quantities than their green counterparts. They also differ in their ISIN code, thus allowing them to be traded separately. As a result, market prices can directly predict investors' preference for GBs, allowing greenium to be measured directly. Moreover, the twin model allows the German government to involve a wide range of potential green investors, as it labels the various maturity requirements of different types of investors.

Presentation of the green twin bond approach



Source: Green Bond Framework, Federal Ministry of Finance (Germany)

The first German GB was the green equivalent to the traditional 10-year bund, which had already been issued three times prior to the GB's introduction. This initial issuance led to a -1 basis point spread in the primary market yield.

The Green Bond Framework has been approved by an Inter-Ministerial Working Group ("IMWG"), that is also in charge of identifying the Eligible Green Expenditures and the allocation of funds, as well as of the impact reporting. The Ministries involved are the following:

- The Federal Ministry of the Interior, Building and Community
- The Federal Ministry of Economic Affairs and Energy
- The Federal Ministry of Food and Agriculture
- The Federal Ministry of Transport and Digital Infrastructure
- The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- The Federal Ministry of Education and Research
- The Federal Ministry for Economic Cooperation and Development

The German government has also established a Core Green Bond Team (CGBT) to oversee all necessary activities associated with Green German Federal securities and the

elements outlined in this Framework. The CGBT collaborates with relevant ministries to select the eligible expenditures. If necessary, it may also ask for the consultation by KfW. They may include any type of Federal expenditure, namely both the real assets (such as infrastructure and buildings, along with landscapes, and forests) and the intangible ones (including, among others, research and innovation).

In general, Green Eligible Expenditures will exclude any expenditure that has previously been identified as being used by other public German issuers in their own Green Bonds. This issue has been discussed with other German public issuers. Subsidies for energy-efficient buildings, for example, which are currently used in KfW Green Bonds, will not be considered.

According to the German GBF, expenditures primarily linked to the sectors of armaments, tobacco, alcohol, fossil fuels, nuclear energy, gambling, and all those activities that violate the EU Charter of Fundamental Rights do not meet the green eligibility criteria. Any expenditure (that will annually reviewed by the CGBT) will indeed be related to the following Green Sectors:

- Transport
- International Cooperation
- Research, innovation and awareness raising
- Energy and industry
- Agriculture, forestry, natural landscapes and biodiversity

As highlighted by the Climate Bonds Initiative in its report written in collaboration with HSBC, the German GB Framework has pointed out the global threat of climate change adding international cooperation among the eligible expenses. In particular, the aim set by the framework is to “assist emerging market and developing countries in their transition towards a more environmentally friendly economy and support international cooperation in that field (i.e. mitigation of and adaptation to climate change, transition towards more renewable energies, protection of habitats and biodiversity, sustainable use of natural resources and energy including developing renewable energy generation facilities and sustainable agriculture)”.

Regarding the proceeds deriving from the issuance of Green German Federal securities, they will be used to finance the Federal Republic of Germany's operational activities. As a result, the German Finance Agency will manage the proceeds in

accordance with the German Federal Government's treasury policy. Individual Green German Federal securities can be issued in larger quantities (tapped). A bond's increase is immediately fungible with the previously issued and outstanding bond. However, when it comes to management and reporting, a tap is treated as if it were a new issuance, which is why, if the initial offering of Green German Federal securities and any subsequent increase fall throughout different calendar years, the issuer may report distinct use of proceeds and impact between the initial offering and the resulting increase.

As previously mentioned, the Federal Republic of Germany commits to ensure transparency, thus it publishes a detailed annual report (starting this year) not only on the use of proceeds but also on the impact of the expenditures for each one of the green sectors listed above. The latter will be published one to three years after the respective issuance. It can be valid for several years and may be updated over time (when/if needed).

The GBP Framework has been evaluated by ISS ESG (Second Party Opinion) before the issuance of the sovereign green bond. Moreover, an independent external body will regularly verify the allocation reports and their compliance with the GBF. This procedure will be carried out on an annual basis, and the results will be published together with the relevant reporting.

4.4 A comparison between Italy and Germany: Second Party Opinion

The Federal Republic of Germany (Germany) entrusted ISS ESG to provide an evaluation of the three core elements of the Green German Federal Security in order to determine the bond's sustainability quality:

1. **Germany's Green Bond framework** – compared to the International Capital Market Association's (ICMA) Green Bond Principles (GBPs). According to ISS ESG, the Use of Proceeds description presented in the Germany's Green Bond Framework is in line with the Green Bond Principles, as well as the Process for Project Evaluation, the Management of Proceeds and the reporting. The eligible expenditures are plausible and aligned with Germany's broader environmental strategy, and the projected environmental impacts from each Use of Proceeds category are expressly stated. Due to the unique financial structure, there are only a few indirect allocations of actual expenditure where details are not immediately available, which is why the exclusion criteria should be interpreted as an intention that was applied to the best of our ability. Moreover, the frequency, scope, and

duration of allocation reporting are clearly outlined, and the impact indicators that will be included are already specified. The allocation and impact reporting will be made public in accordance with best market practices.

- 2. The asset pool** – to establish whether the expenditures effectively contribute to the UN SDGs and match the issue-specific key performance indicators of ISS ESG (KPIs). This evaluation is presented on the following 5-point scale:

Significant Obstruction	Limited Obstruction	No Net Impact	Limited Contribution	Significant Contribution
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that is based on an examination of the underlying technologies used throughout the Use of Proceeds category. As stated by ISS ESG, the contribution to the SDGs 7, 11, 13, 14, 15 is significant in all the 5 sectors identified by the Use of Proceeds.

- 3. Germany's performance in terms of sustainability** - as measured by the ISS **ESG Country Rating**. It assigns a rating to each country and then categorizes them as 'Prime' or 'Not Prime' based on their performance on basic ESG requirements. It is also given a Decile Rank, which indicates its relative performance, with 1 representing excellent relative ESG performance and 10 the worst one. The Federal Republic of Germany's status is 'Prime', with B as rating and 1 as decile rank. Hence, it means that Germany satisfies all of the fundamental requirements for sustainable development. The overall performance takes into account the results achieved in eight areas, namely: social rating, political system and governance, human rights and fundamental freedoms, social conditions, environmental rating, natural resources, climate change and energy, and production and consumption. Indeed, except for what concerns natural resources, Germany is far above average.

Regarding the Republic of Italy, Vigeo Eiris (V. E) has been commissioned to provide a Second Party Opinion. Even in this case, its mission is to verify the accordance of the Italian Green Bond Framework with the ESG criteria and the ICMA GBP. V.E also assessed Italy's sustainability performance through the Sovereign Sustainability Rating. The Issuer's level is Advanced, with a rating of 77/100. Italy, indeed, ranked 18th out of 37 OECD countries.

Italy as well is in line with the GBP's four components (Use of Proceeds, Evaluation and Selection, Management of Proceeds, and Reporting). As a matter of fact,

the Eligible Category has been clearly specified, and the Issuer has communicated the nature, the eligibility requirements, and the location of Eligible Expenditures. Moreover, the Environmental Objective is well described, appropriate, and aligned with the green objectives outlined in international standards.

The overall assessment of the expected positive impacts on sustainability is 'Robust' (being 'Advanced' only in the renewable electricity and heat and protection of the environment and biological diversity categories).

4.5 Implications of the recent sovereign green bonds' issuances for the growth of the market

Given most central governments' budget and resource allocation commitments – particularly for large-scale infrastructure projects – sovereign issuers can expand GSS investments more than any asset class (Harrison and Muething, 2021). In particular, sovereign GSS bonds can help governments in domestic and international capital markets to attract the investment needed for sustainable development (Harrison and Muething, 2021). In the meantime, they can meet the greenhouse gas (GHG) emission reduction targets set by the country's Nationally Determined Contributions (NDCs) under the 2015 Paris Agreement.

Since the current COVID-19 pandemic will have an unprecedented impact on the global economy in 2020, governments will likely lead the subsequent recovery (Harrison and Muething, 2021). Many countries have already established that they will pursue a green recovery to 'build back better.' Indeed, governments play a vital role in promoting the future growth of the green bond market, which goes beyond capital raising: they can guarantee safe and liquid investment opportunities to investors, making capital available for less liquid securities (Harrison and Muething, 2021): “More than 62% of the 2020 green bond volume had a maturity of up to 10 years, with almost 40% having a 5-10-year maturity, which was the largest individual bracket. Among the 5-10-year 100 bonds, half of the amount originated from financial and non-financial corporates. As expected, the longer-dated (10-year+) paper mostly originated from the public sector. Key issuers included government-backed entities, sovereigns, and utilities categorised as non-financial corporates” (Harrison and Muething, 2021).

The 'Sovereign Green, Social, and Sustainability Bond Survey,' sponsored by HSBC, was conducted at the end of 2020 to put together and analyze the experiences of

sovereign GSS bond issuers and their role in the growth of the market. This survey examines 97% of the entire sovereign issuance, with 19 out of 22 issuers taking part in the project and exchanging their experiences (Harrison and Muething, 2021). In particular, eight of them were from Developed Markets (DM) and eleven from Emerging Markets (EM).

The recent issuances of sovereign green bonds certainly have a market changing potential (Harrison and Muething, 2021). Because of their size and influence, sovereign issuers have the ultimate power to broaden and deepen the GSS bond markets (Climate Bonds Initiative, 2021). In 2020, ten new sovereign issuers joined the GSS bond market, bringing the total number to 22 (totaling USD96 billion as of November 2020) and at least 14 other sovereign governments around the world have expressed an interest in issuing GSS bonds (Harrison and Muething, 2021), which is why the authors of the last report of the CBI are overly optimistic on the future growth of this market. Egypt, Germany, Hungary, and Sweden have issued their first sovereign green bonds in 2020, while Chile, France, the Netherlands, Lithuania, and Indonesia have increased their assets through re-openings or additional bonds (Harrison and Muething, 2021).

The survey shows that in both developed and emerging markets, ministers play a pivotal role in the decision-making process to issue a green sovereign bond (Harrison and Muething, 2021). Indeed, France decided to issue a sovereign green bond after a careful assessment of financial and reputational risks by the Ministry of Environment (MoE) and the Ministry of Budget. Also, Belgian Prime Minister Charles Michel announced in 2017 his intention to issue a green bond. In this case, the motivation was to develop a local green finance market and demonstrate Belgium's commitment to long-term environmental goals. In February 2018, Belgium issued its first green bond. It should be noted that development banks play a key role in supporting emerging countries throughout the entire green sovereign issuance process. For instance, the World Bank provides technical assistance to EM public sector issuers to enter the green capital market, enhance transparency, promote sustainable solutions, design environmental policies, strengthen the role of institutions. As a matter of fact, the World Bank Treasury acts as an impartial broker that shares with the issuers its own knowledge, experience and tools.

Naturally, this rapid growth had an impact on the shape and size of sovereign green bond markets. Sovereign green bonds are significant due to their size and profile,

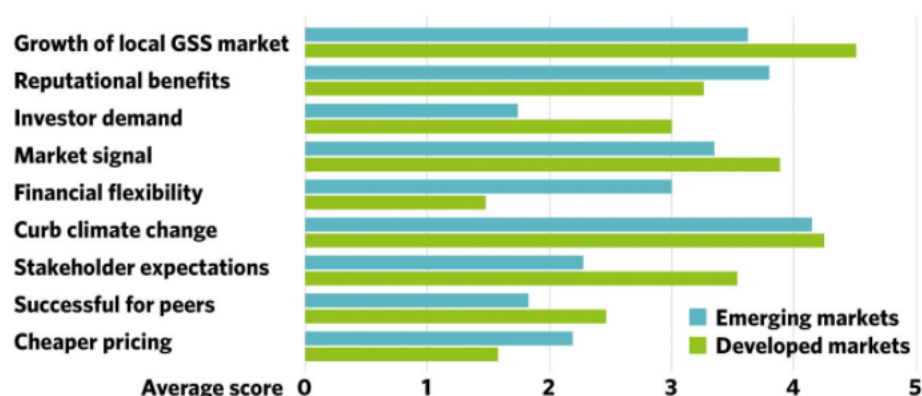
which help to accelerate green market creation and make it more accessible to various issuers.

To deepen our understanding of the sovereign green bond market, it is imperative that we acknowledge the logic behind the issuance of sovereign green bonds. First of all, for most countries, issuing a sovereign GSS bond is a way to encourage the development of local green bond markets (Harrison and Muething, 2021). In many cases, issuing green bonds also allows governments to achieve NDC targets, address SDGs, mitigate climate change and reduce social inequalities, along with the implementation of policies aimed at reducing emissions as well as meeting net-zero ambitions. The labeling process, along with the periodical reports on the allocation of proceeds and their impact (which are all parts of the process of issuing a sovereign GSS bond) ensures transparency for ministries and parliament, as well as for external stakeholders (i.e. investors) (Harrison and Muething, 2021). Moreover, issuing a sovereign GSS bond broadens and diversifies the investor base, allowing for more competitive pricing (Harrison and Muething, 2021). If this trend continues, the authors of the report expect that domestic Debt Management Offices (DMO) will encourage governments to identify and develop a pipeline of appropriate GSS expenditures (Harrison and Muething, 2021). Indeed, many countries worked with DMO counterparts both before and after the issuance through knowledge forums and bilateral discussions. The use of proceeds can also represent a driver of international coordination, through funds used to finance projects outside of the issuing country's borders (Harrison and Muething, 2021).

To sum up, sovereign GSS bonds have great market-changing potential for both developing and developed countries, namely they:

- enhance local markets
- promote transparency
- diversify and enlarge the investor base
- guarantee pricing benefits
- facilitate international collaboration
- increase reputation and visibility

Curbing climate change was the top reason to issue



Source: *Climate Bonds Initiative, 2021*

Overall, it can be stated that the benefits obtained by governments, including increased visibility and reputational benefits, typically outweigh the risks and initial costs. However, despite the fact that there are several reasons to be optimistic about the green bond market's prospects, several challenges remain. Clear guidelines are required, particularly in taxonomy, certification, and regulation.

4.6 Boosting the sovereign GSS market

The following are seven ways for sovereign issuers to promote the growth of the green bond market listed in the previously mentioned report recently published by the Climate Bonds Initiative:

- 1. Stimulating investor demand through supply:** If there is a designated pool of capital, corporate and other types of treasurers will be more willing to issue GSS bonds. Wherever possible, sovereign issuers should consider “benchmark size to add liquidity and scale to the market and encourage more dedicated investment mandates” (Harrison and Muething, 2021).
- 2. Assuming the role of green investor and enabler:** Governments must serve as both investors and enablers by implementing GSS mandates for public-sector pension funds and investing public-sector funds in GSS-labeled investments (Harrison and Muething, 2021).
- 3. Governments must create more expenditures:** Sovereign GSS bonds give DMOs more elasticity by bringing a broader investor base, which can provide a

variety of benefits (e.g. tighter pricing) (Harrison and Muething, 2021). This can energize policy priorities and foster a culture of developing suitable projects to facilitate repeat issuance. Enhanced taxonomies that include adaptation and resilience will provide ministers with new sources of eligible green bond expenditures (Harrison and Muething, 2021). The EU taxonomy and the China Green Bond Endorsed Project Catalogue are both being expanded to include a wider range of potential assets (i. e. social assets).

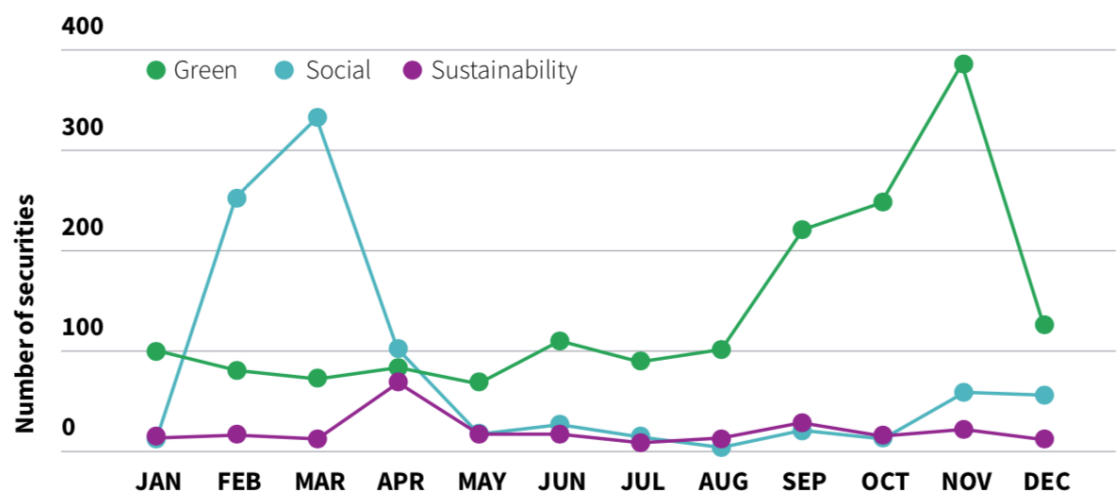
4. **Fund high-profile projects:** to highlight the market changing potential of GSS bonds, sovereign GSS bonds should invest in necessary projects of national importance that can also aid in gaining political support for future bond issuance (Harrison and Muething, 2021).
5. **Develop and promote best practice standards:** government should promote initiative to provide clear, transparent and standard green definitions for the financial sector (such as the EU Taxonomy). This will foster market development without being overly restrictive and would prevent greenwashing practices (Harrison and Muething, 2021). The International Platform on Sustainable Finance is in the frontline in the harmonization process. Therefore, it encourages countries to exchange best practices.
6. **Work collaboratively on Sovereign GSS bonds:** as afore mentioned, GSS bonds allow finance ministries to work together with other ministries, as well as with supranational organizations (Harrison and Muething, 2021). This is critical because, in order for the transition to take place, developing these types of relationships is imperative.
7. **Prepare for the whole economy transition:** to achieve the goals set of the Paris Agreement, not just a few sectors must be ‘greened’, but entire economies must become carbon-neutral by 2050 (Harrison and Muething, 2021). One key tool to favor an economy-wide transition is certainly the sovereign GSS market.

4.7 The impact of Covid-19 on the green bond market

The global green bond market, which has seen tremendous success over the last decade, has had to deal with the repercussions of the COVID-19 infection. However, in recent studies, this effect has only been evaluated in a conjectural and fragmentary manner.

Historically, the proceeds from social bonds were primarily used for social housing and the creation of new jobs. However, agencies and supranational organizations have recently begun to employ them to assist in mitigating the severe impact of Covid-19 (i. e. healthcare, job preservation). Indeed, following the outbreak of the COVID-19 pandemic, the green bond market was outweighed by social and sustainable bonds, driven by an increasing need to fund inclusive and poverty alleviation projects, as well as to meet the approaching SDGs.

Social Bonds Dominated the early months of 2020

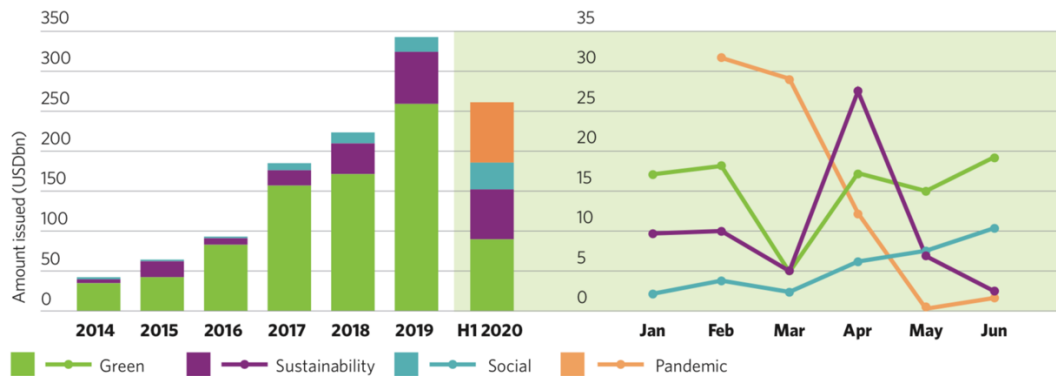


Source: Climate Bonds Initiative, 2021

The green bond market witnessed a drastic decline in the first half of 2020, due to the effects of the COVID-19 on financial markets and the economy as a whole (Oxford Analytica, 2020). The pandemic had at least three effects on the green bond market (Keliuotyte-Staniulienene and Daunaraviciute, 2021):

1. Green bond issuance fell sharply in March 2020, reaching its lowest level since 2015 (Keliuotyte-Staniulienene and Daunaraviciute, 2021), as brilliantly exemplified by the following Climate Bonds Initiative's graph:

Most even split in H1 2020; Green volume fell most in March

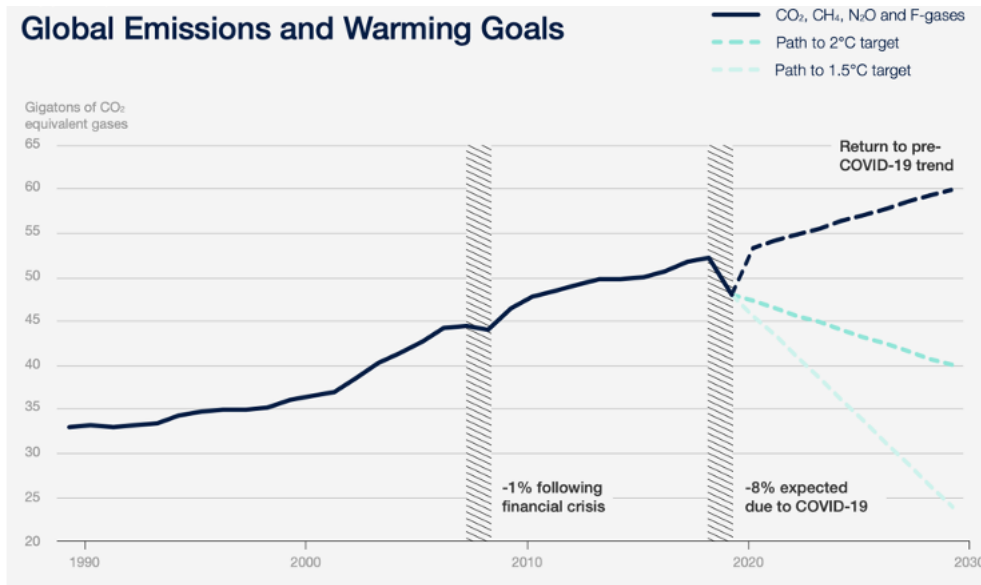


Source: Climate Bonds Initiative, 2020

- In March 2020, corporate spreads greatly expanded as a result of bond yield volatility, a reduction in risk assets and market liquidity, and an adverse impact of green bond mutual funds and Exchange Trade Funds (ETFs), thus putting the achievement of climate-related goals at risk (Keliuoty -Staniul nien  and Daunaravi i t , 2021). As a result, the world after COVID-19 must adopt a green financial system by implementing new financial instruments.
- Even so, “at the same time, the green bond market experienced a positive cash flow and increase of total assets” (Keliuoty -Staniul nien  and Daunaravi i t , 2021). Notwithstanding the negative impacts of the pandemic, it has recovered in the second half of 2020. The increased state of uncertainty has been temporary as well.

The pandemic, as well as economic downturns, caused a significant drop in fossil fuel prices, which is detrimental to the development of renewable energy projects as it makes renewable energy resources less competitive (Taghizadeh-Hesary, Yoshino and Phoumin, 2021).

Although global lockdowns led to a reduction of around 9% CO2 global emissions in the first half of 2020 (please see the graph below), data regarding the financial crisis that occurred in 2007/2008 suggest that emissions may rebound (World Economic Forum, 2021).



Source: PBL (Netherlands Environmental Assessment Agency), 2019 and UNCTAD, 2020.

As countries begin to recover from the immediate health crisis and work to restart their economies, possible future divergent trends regarding the role of sustainability will take place (World Economic Forum, 2020). On the one hand, a variety of leaders' calls for an environmentally friendly recovery, where large economies' employ green stimulus packages and change their production processes and models and consumers modify their behavior in order to help to advance the sustainability agenda. Brown stimulus measures, reductions in sustainable investments, weaker obligations to climate and environmental action, and the repercussions of low gas prices, on the other hand, are likely to slow down the transition process (Taghizadeh-Hesary, Yoshino and Phoumin, 2021). This could likely result in a scenario underpinned by climate crises, biodiversity loss, and future pandemics like the one we are currently experiencing, thus having serious consequences for the 2030 Sustainable Development Agenda.

The European Union's innovative approach of linking the Green Deal to Covid-19 recovery plan is a clear example of how it is possible to integrate the economic reboot with sustainability goals, emphasizing also the role of new technologies and of the green/circular economy.

To summarize, despite its recent success, the green bond market, like other financial markets, has been impacted by the COVID-19 pandemic and the resulting economic and social restrictions. Indeed, investors' decisions were inevitably influenced by growing market uncertainty (Keliuotyte-Staniulienė and Daunaravičiūtė, 2021).

Nonetheless, a transition to greener economies cannot be postponed until the pandemic's shocks have subsided and, while the recurring and widespread lockdowns may have slowed some issuance, the underlying market dynamics may become even stronger as we exit the crisis.

To address these major issues of our time, creative solutions will be required. And these projects will continue to necessitate funding from responsible investors. Furthermore, green initiatives along with regulatory support will drive issuance in the future. Climate-related or green bonds are once again being touted by world leaders as critical to a green recovery. While green bonds remain a small part of the global bond market, the sector is expected to grow in the face of Covid-19. This follows a record issuance in 2019 and a strong first quarter of 2020. As a matter of fact, empirical evidence suggests that green bonds not only contribute to a low-carbon transition, but also have a positive impact on economic growth (Glomsrod & Wei, 2018).

Conclusion

This research aimed to identify the main implications of the recent sovereign green bonds issuances for the growth of the market. It clearly illustrates the pivotal role played by governments in driving the transition to a low-carbon, climate-resilient economy, but it also highlights that, in order to be successful, this transition necessitates the participation of different types of issuers in the GSS bond market.

Nowadays, it has become clear that the improvement of the economic performance of a country is closely linked to environmental and social sustainability. Indeed, humanity is beginning to come to terms with the harsh reality that climate change is a threat to our very existence: “among the highest likelihood risks of the next ten years are extreme weather, climate action failure and human-led environmental damage” (World Economic Forum, 2021).

Sovereigns account for nearly half of the volume in the global bond market, which is why their role as leaders is paramount: by increasing issuance volume in local markets, they can encourage investment while also facilitating the development of the necessary institutional frameworks and technical expertise for the growth of the green bond market. Sovereign GSS bonds can thus help to create green markets, and many governments include this among the reasons for issuing. Please note that also the private sector and local governments are involved in the market creation.

However, the green bond market is still marginal. First of all, being in its infancy, it lacks both the credentials and the supply that investors are looking for. As a matter of fact, green bonds' benefits are uncertain to most issuers, who associate them with high costs and complex procedures. Notwithstanding the progress made in this direction, the lack of standardization represents a significant barrier for all market participants. Greenwashing as well is still a big concern for all stakeholders, along with the demanding criteria and the liquidity issue (Deschryver and de Mariz, 2020). Moreover, not only investors but also financial institutions must address operational and management issues when engaging with their clients on green bond issuance. All these barriers prevent the use of green bonds as a key tool to fight against climate change.

Nonetheless, the introduction and development of different standards and principles demonstrates the market's dynamism, with a number of bodies actively attempting to deal with the lack of green standardization. In particular, the European taxonomy could

potentially unify the green bond market (Deschryver and de Mariz, 2020). The discussions of the European Commission's International Platform on Sustainable Finance, which started in 2019, will be critical, especially with Canada and China, as they are already developing their own classifications. To improve and increase the size of the green bond market and effectively achieve long-term green growth, different stakeholders must, indeed, work together to develop a common language (Vuong, Ho, Nguyen and Nguyen, 2019). It would be pivotal for the expansion of the market in developing countries. Indeed, green bond investors can use their capital to finance or refinance emission reduction projects in emerging economies, where environmental information is more scarce and less accurate. As a result, it becomes even more critical to implement and standardize the various frameworks and verification processes associated with green bonds.

This research also investigated the challenges and opportunities stemming from the implementation of green bonds, pointing out the urgent need for governments to rethink and adjust all public and financial policies to cope with climate change and social injustices, and achieve the SDGs. Updating national frameworks and enhancing international cooperation are the only feasible and viable solutions: permanent, cross-sectoral and effective coordination structures are key to success.

Despite the numerous steps forward in the engagement of national governments to develop strategies which integrate the SDGs into the national framework, there is still room for improvement. Ensuring horizontal and vertical coordination is imperative, as highlighted also by the German Sustainable Development Strategy, which emphasizes interdependency and collaboration of all Federal Ministries. Indeed, it is widely recognized that coordination among ministries and different levels of government as well as with multiple stakeholders is pivotal to take substantial action to reach the comprehensive and multi-dimensional targets. Hence, governmental efforts to pursue proactive policies towards sustainable development are pivotal: fiscal policies have to be reconsidered (to reduce socio-economic inequalities), the legal framework should be reinforced (establishing new legally binding instruments) to ensure, among other things, a higher level of transparency and accountability, which is also why data gaps should be filled. Further, governments are expected to be flexible and willing to adapt their

institutions and policies to develop national sustainable development strategies (Glass and Newig, 2019).

If climate change and wider environmental degradation alone do not manage to encourage stronger action on a large scale, perhaps the serious and universal threat of COVID-19 will unite the global community around a common understanding of the IPCC's 1.5°C report and its urgent call to significantly reduce (and adapt to) climate change. The need to re-energize economies around the world represents a great opportunity to 'build back better'. Governments can accomplish this through the use of their own assets-and-liabilities or by actually trying to reduce the cost of private capital through different forms of financial assistance, reforms and policy measures (Climate Bonds Initiative, 2020). Labeling debt is undoubtedly the best option, as many sovereigns are already proceeding in this way and this clearly allows them to achieve a more diverse investor base and enhance the development of the green financial markets, as it was thoroughly explained in the third chapter of this thesis.

The Covid-19 pandemic will have unprecedented economic and social consequences. Poverty rates are on the rise, as well as unemployment rates. Economic growth has suffered the sharpest slowdown since the Great Depression, far worse than that caused by the 2008/2009 financial crisis. Certainly, the negative effects of this crisis will be long lasting. However, even before the pandemic, the international community was not on track to fight against desertification, conserve the oceans, ensure access to clean energy and combat climate change by 2030, as scheduled by the Agenda 2030. Most recently, Covid highlighted the significance of Donella Meadows' statement: "The world is a complex, interconnected, finite, ecological- social- psychological- economic system. We treat it as if it were not, as if it were divisible, separable, simple, and infinite. Our persistent, intractable global problems arise directly from this mismatch" (Meadows, 1982). This is the reason why the achievement of the SDGs no. 7, 11, 12, 13, 14, and 15, respectively "Affordable and clean energy", "Sustainable cities and communities", "Responsible consumption and production", "Climate action", "Life below water", and "Life on land" is even harder than before.

Indeed, as stated in the CBI Global State of the market, governments will be heavily influenced by financial constraints (Climate Bonds Initiative, 2020). However, advanced economies should not have such a problem thanks to their low interest rates and

robust debt affordability. On the contrary, emerging economies are likely to face greater difficulties as they are already experiencing significant drops in FDI because of the pandemic (Climate Bonds Initiative, 2020). It is undeniable that the developing countries are paying a higher price compared to the advanced economies, which is why cooperation among countries and integrated approaches are of utmost importance, now more than ever. In this perspective, the UN issued a call for collective action, so that advanced economies will bring forward inclusive policies to support the most vulnerable countries.

Recovery plans should thus set long-term emission reduction goals, consider resilience to the damaging effects of climate change as well as fight and end biodiversity loss. Green projects and programs could assist in restarting the economies while lowering the risk of future financial crises linked to climate change. Not only governments, but also central banks and other actors have to be involved in this green recovery: global economic policies brought forward by governments, regulators, financial institutions, and related networks are crucial.

Far-reaching policy changes are needed now and this is why COP26 will be crucial in addressing unsolved issues, such as the one of how to reach an overall mitigation of global emissions. Bringing forward - through the creation of a policy framework – a multilateral economic growth through extraordinary sustainable investments in natural climate solutions, research in clean technologies, agricultural innovation, and low-carbon transportation would provide the creation of millions of jobs as well as the achievement of a total clean energy power in the near future. Hence, the focus should be on green infrastructures and energy.

Since climate change represents a threat to the financial stability of the global market, bold measures are necessary. Among them, the development of a common green taxonomy would help to protect the investors by scaling up sustainable investments. Since the European Commission has established a Green Bond Standard (GBS) at the EU level, it is fundamental to harmonize the international law. However, given the limits of a plurality of actors and perspectives, which are usually interwoven, and the risk of inconsistencies and conflicts of interest, coordinating the actions at a global level will be a challenge. The ultimate goal is to speed up the energy transition avoiding inaction by all means. Including sustainable finance in international trade policies and agreements will hence be fundamental in the promotion of a green growth.

Enhancing multilateral relations within the G20 to address climate transition and drive a more inclusive growth is not an option anymore. The European Green Deal is a clear example of the European engagement in that sense. Countries should adopt and implement common transatlantic policies to reach net-zero emissions by 2050 and develop a green trade as well as bring forward shared initiatives at a WTO level. Agreeing on transatlantic green sanctions could also be crucial in enhancing companies' commitment in the direction of a cleaner production process, not to mention the importance that financial commitments would have in developing new green technologies which would help, among other things, to achieve the 17 SDGs.

According to the Climate Bonds Market Intelligence, the European continent surpassed a total of USD500 billion in green issuance at the end of April thanks to several green finance developments in the region, which have resulted from the increased efforts of both national and supranational governments. European national governments are also making progress (please see Annex II, page 61): Italy issued its first sovereign green bond in 2021, and Spain, Denmark, and the United Kingdom have all indicated plans to follow the same path. As highlighted in the last chapter of this thesis, with a record-breaking EUR8.5 billion green bond issuance in 2021, Italy became Europe's tenth sovereign issuer and the overall Italian green market now exceeds USD20 billion as a result of this sovereign issuance. The German market accounts for more than USD100 billion and will continue to increase. Its (blockbuster) green bond debut, along with vanilla equivalents, arrived late last year, allowing green yield curves to be recorded and used as a benchmark for companies and other nations looking to enter the market. The \$500 billion mark is an impressive accomplishment and certainly attests how green finance is becoming increasingly popular in Europe.

In conclusion, the picture outlined so far appears undeniably complex. As a number of initiatives begins to take place in various countries, the international collaboration for the development of the green bond market becomes extremely important (Sonerud, Kidney and Tripathy, 2015). To have the greatest impact, these various initiatives must be accelerated and, ideally, coordinated.

Appendix

Annex 1

Types of green bonds

Type	Proceeds raised by bond sale are	Debt recourse	Example
"Use of Proceeds" Bond	Earmarked for green projects	Recourse to the issuer: same credit rating applies as issuer's other bonds	EIB "Climate Awareness Bond" (backed by EIB); Barclays Green Bond
"Use of Proceeds" Revenue Bond or ABS	Earmarked for or refines green projects	Revenue streams from the issuers though fees, taxes etc are collateral for the debt	Hawaii State (backed by fee on electricity bills of the state utilities)
Project Bond	Ring-fenced for the specific underlying green project(s)	Recourse is only to the project's assets and balance sheet	Invenergy Wind Farm (backed by Invenergy Campo Palomas wind farm)
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 (e.g. solar leases or green mortgages)	Tesla Energy (backed by residential solar leases); Obvion (backed by green mortgages)
Covered Bond	Earmarked for 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	Berlin Hyp green Pfandbrief; Sparebank 1 Bolligkredit green covered bond
Loan	Earmarked for 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).	MEP Werke, Ivanhoe Cambridge and Natixis Assurances (DUO), OVG
Other debt instruments	Earmarked for eligible projects		Convertible Bonds or Notes, Schuldschein, Commercial Paper, Sukuk, Debentures

Source: Climate Bonds Initiative, 2020

Annex 2



Source: Climate Bonds Initiative, 2021

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