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Green Finance: A Look Into Financial Institutions In Europe

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Master in Political Economy

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CIÊNCIAS SOCIAIS
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The completion of this dissertation marks the conclusion of an important stage in my life, one that I am extremely proud of. As demanding and challenging as these past years have been, I can now say that I have successfully concluded yet another milestone: the conclusion of my master thesis in Political Economy.

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Abstract

In a world where climate change seems to be taking centre stage, where every year extreme weather events keep taking place with more and more frequency and with stronger negative impacts, governments have started to realize that it is necessary to implement extraordinary measures to try to stop it, or at the very least, to mitigate it. Green finance presents itself as a route for both private and public institutions, guiding financial resources toward eco-friendly economic endeavours. This thesis addresses the importance of green finance in fighting climate change, focusing on the role of two key European institutions - the European Commission and the European Central Bank. Notwithstanding, there is still room for green finance to improve and become an instrument of even greater impact and change in the global financial system.

Keywords: Green finance; Climate change; European Commission; European Central Bank

Resumo

Num mundo onde as alterações climáticas parecem estar a assumir um papel de extrema relevância, onde todos os anos eventos climáticos ocorrem com uma frequência cada vez maior e com impactos negativos mais intensos, os governos começaram a perceber que é necessário implementar medidas extraordinárias para tentar deter, ou pelo menos mitigar, o fenómeno das alterações climáticas. Green finance surge como um caminho a ser adotado, tanto por instituições privadas quanto públicas, com o intuito de financiar projetos verdes e apoiar empresas que sejam ambientalmente amigáveis. O tema central desta tese é precisamente o papel de green finance na luta contra as alterações climáticas, focando-se igualmente nos compromissos de duas instituições europeias - a Comissão Europeia e o Banco Central Europeu. Não obstante, ainda existe espaço para que green finance se torne um instrumento de maior impacto e mudança no sistema financeiro global.

Palavras-Chave: Green finance; Alterações climáticas; Comissão Europeia; Banco Central Europeu

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Introduction

Despite not being a new concept in academic literature, green finance has been gaining momentum in the past few years, ever since the 2008 financial crisis. Furthermore, this concept is one of great importance since environmental changes have been threatening everyday livelihood. In general, green finance explores how governments, but also companies and financial institutions, can carry out their policies and businesses making financial decisions that will take the environment into account.

The year 2021 alone witnessed the highest number ever recorded of environmental catastrophes such as typhoons, flooding, wildfires or snow out of season (Hersher, 2023). Amongst other policy instruments, green finance can become an important policy tool by guaranteeing that (private and public) companies and banks are driven into investing in economic activities that comply with the standards for a green activity.

Despite not having a single official definition, green finance can be described, on very lose terms, as a strategy adopted by financial markets, banks, investors, private companies and public institutions with the final intention of mitigating climate change effects. This process is conducted by merging the concepts of finance and climate change, referring to financial flows that are directed towards new - environmentally friendly – profit opportunities.

The aim of this dissertation is to address the framework for green finance currently in place in the European Union, in particular, under the initiatives of the European Commission and the European Central Bank (ECB).

The European Commission has constructed a taxonomy where core and important concepts are defined, such as the one of green finance and in which economic activities are classified according to environmental goals. By constructing this taxonomy, the European Commission is allowing banks and other companies to know which economic activities are safer/better to invest, enabling companies to make informed decisions and transitioning the investment over to green activities.

The second institution, the ECB, is the main responsible for the monetary policy at the Euro level, subject to the main goal of guaranteeing a low and stable inflation rate in the medium term. More recently, the ECB has also been called to intervene in order to guarantee financial stability, leading to a lively discussion regarding its mandate and the scope of its functions, including the overall goal of fighting climate change.

Indeed, the ECB can play a role of a catalyst of green finance through its monetary policy instruments, modifying its asset purchasing programmes, collateral frameworks and refinancing operations to reduce brown financial flows. These instruments support the transition to a low carbon economy and help to achieve greater investment opportunities in green projects and sectors. In this way,

the ECB's can have a positive impact on companies', banks' and investors' economic decisions over which sectors/activities/projects they should invest on.

By delving into the topics mentioned above, this thesis intends to answer two related questions. First, what is the role of green finance in the process of mitigating climate change? And second, what is the role of the European Commission and the ECB in promoting green finance?

To answer this question is necessary to understand the evolution of the role of the European Commission and the ECB in green finance, from their initial set of goals and tools (taxonomy and policies, respectively) to where they stand nowadays and what could be improved in the future.

To do so, the first chapter of this dissertation will discuss and provide a definition of green finance, going through the history of the concept and its importance today. This initial analysis is complemented by a review of the three main approaches to green finance - neoliberal, reformist and progressive green finance – found in academic literature; after having established the importance of this concept, a second chapter will analyse the specificities of green finance within the European Union, going over some of the most well-known green finance tools such as green bonds and green loans, exploring as well the concept of *greenwashing*, put forward by some more critical analyses; chapters three and four describe and analyse the effectiveness of the roles, goals and tools of the European Commission and the ECB in terms of green finance.

As mentioned above, green finance is an emerging subject that gained relevancy and recognition in the last few years. Because it is a recent topic, well established academic literature and data can be rather scarce, creating some challenges to the analysis of some more technical aspects of green finance, or even of its concrete results. Given this methodological difficulty, the research was mainly based on a throughout analysis of official documents, statements and data published by the European institutions, and complemented by other sources, such as articles published in scientific magazines, for instance.

Notwithstanding, and despite this 'shortage' of information/critical reflexions over this topic, this dissertation intends to contribute to the overall understanding of how green finance can be used in the European Union to foster the development of green activities and sectors, highlighting its main risks, challenges, and advantages.

1. The concept of green finance: history and importance

The concept of green finance has been around for some time, and although it may be hard to pinpoint an exact date as to when it first emerged, according to the study conducted by Yu, Mao, Huang, Sun and Li (2021), green finance first appeared in publications in 1991. Despite this, it took over two decades for this concept to become more widely known, gaining some momentum and recognition after the 2008 financial crisis, and becoming a widely known tool and concept in 2015, with the signing of the Paris Climate Agreement.

In broad terms, green finance can be described as the basis of a strategy implemented via financial markets to fight and mitigate climate change effects by financing projects and supporting businesses which are environmentally-friendly through public and private funds (Reddy, 2018, p. 645). In other words, the concept refers to "financial stocks and flows that aim to achieve environment related sustainable development goals" (Dziwok and Jäger, 2021, p. 1).

Being an important tool to financial markets and institutions, green finance appears also as a concept of reference for governments and their policies. For instance, States can subsidise green sectors or, on the other hand, tax specific brown activities and businesses, promoting, at the same time, a shift away from brown economies[1] to green ones. Hence, green finance is yet another instrument for governments as part of their environmental policies (and of the green economy vocabulary), which will assist in the transition to an overall economic and productive transformation.

Green finance is commonly viewed as pertaining to the family of financial instruments/approaches to fight climate change and is considered a descendent of the sustainable finance concept. These two concepts differ, as the former refers to the financing of projects that focus primarily on environmental benefits, including "climate change mitigation, climate change adaptation and other environmental benefits" (Azhgaliyeva and Liddle, 2020, p. 83), and the latter is a much more inclusive term that represents the financing of projects that not only reflects environmental benefits, but also social and economic ones.

On a broader perspective, green finance describes the necessary financial mechanisms to help fight or mitigate climate change and guarantee sustainability throughout the economic spectrum and, therefore, this concept "needs to be considered an interdisciplinary research topic that encompasses and deals with policies, investment and governance on financing and investment in climate adaption" (Zhanga, Zhanga, and Managi, 2019, p. 430).

In 2010, a more serious approach to the concept was taken when 194 world economies decided to establish the Green Climate Fund (GCF) with the main goal of collecting funds and providing the

[1] Brown industries or activities are those characterized by high carbon emissions (such as steel, aluminium or cement industries) and tend to be inefficient and harming to the environment.

necessary financial support to developing economies, so that they could adapt more easily to climate change and be better prepared to take action to mitigate its effects. However, it was not until the Paris Climate Agreement, held in 2015, that the concept of green finance became more widely used by world leaders and economists alike. At this meeting, it was remarked that "2 °C temperature threshold of the Paris Agreement requires $53 trillion in energy-related investments by 2035" (International Energy Agency (IEA), 2014).

As a consequence, green finance began to appear more clearly in government and international institutions' reports and policy recommendations. For example, during the year 2021, the ECB approved a plan stating that the monetary policy takes into consideration climate change; in Hong Kong it was launched a guideline on the Green and Sustainable Finance Grant Scheme to assist possible investors and investees; and the Popular Bank of China will start grading and evaluating the Chinese commercial banks in relation to their green bond holdings and, in order to do so, they released what is denominated as a green finance evaluation system (Green Finance Platform, 2018).

Throughout the Paris Agreement discussions, it came to light the need to invest "an estimated US$95 trillion investment in infrastructure (energy, transportation, water, telecommunications) (…) by 2030 to address climate change, of which 60–70% will be needed in developing countries" (Bracking and Leffel, 2021, p. 1). It is important to note that according to Sachs, Woo, Yoshino and Taghizadeh-Hesary (2019), developing countries in Asia, who still rely exceedingly on coal, are the ones lacking infrastructures (such as water, sanitation, education health or transport infrastructures) and, therefore, this is where there is a higher demand for investment.

Moreover, and according to Afzal, Rasoulinezhad and Malik (2022), there is a correlation between the overall development/income of an economy and its respective environmental well-being. The authors better illustrate this relationship by explaining the Environmental Kuznets Curve (EKC) which is a U-shaped curve that demonstrates that, at an initial stage, extremely economically poor countries will focus on policies that will help the country's development (at this stage the environment and climate change are not a primary concern for these governments); after a country reaches economic stability, they will naturally start focusing on other variables (not growth-related) and establishing policies designed to protect the natural resources and the environment. Given this, it is understandable "that in the initial stages, environmental degradation may be rapid because the adoption of green policies may be too costly for young nations to justify" (Afzal et al., 2022, p. 4).

It should be noted, nonetheless, that the parameters established during the Paris Agreement meeting are still important, since a lot of both developing and developed countries are still based on coal as the main source of energy and are very dependent on brown energies[2]. Given these countries'

[2] Brown energies are those that derive from fossil fuels such as gas, coal, and oil, releasing harmful emissions into the air and environment.

combined dimension and economic importance, they can counterbalance the efforts made by other economies to reduce carbon emissions. According to Sachs et al. (2019), it is, therefore, very important that green finance takes centre stage in both developed and less developed nations agenda so that "sustainable development [does] not remain an aspiration and slogan; [and instead] offers the only realistic path to green global growth and high employment" (Sachs et al., 2019, p. 4). In this sense, it is of extreme importance that the funds received from these initiatives are correctly distributed in order to guarantee the most efficient and effective outcome.

1.1 The concept of green finance: different approaches

After understanding the importance of this somewhat new concept, it is relevant to define it considering today's reality. In green finance literature, this concept is often times described in comparison with two other concepts (climate finance and sustainable finance), however, no other authors have conducted an in-depth analysis into this concept as Dziwok et al. (2021), in the paper "*A Classification of Different Approaches to Green Finance and Green Monetary Policy*".

In what follows, the concept will be discussed in the context of three approaches identified by Dziwok et al. (2021): the neoliberal approach, the reformist approach and progressive approach. As this is such a complete and in-depth analysis, this thesis will follow the definitions present in the article in order to later compare and integrate the green finance instruments/tools used by the European Commission and the ECB in said approaches.

Neoliberal green finance

It is possible to generally describe the neoliberal point of view as the understanding "that market forces and individual corporate strategies in green finance and monetary policy are viable and effective in promoting sustainability" (Dziwok et al., 2021, p. 3). Overall, this term can be applied when market forces dominate the dynamics behind the concept of green finance, meaning that the private sector becomes the centre-piece in these policies.

According to the neoliberal point of view, banks assume a position of intermediaries as it is through them that people and companies can trade, buy and sell, assets that will eventually translate into economic development by protecting "the environment, clean energy, green building, climate change, social inclusion, and corporate governance in all sectors of the economy" (Akomea-Frimpong, Adeabahb, Ofosuc and Tenakwah, 2021, p. 2).

In addition, and according to the study conducted by Dziwok et al. (2021), which delves into this topic, it is possible to divide the approach of neoliberal green finance into a laissez-faire neoliberal green finance, standard neoliberal green finance and market-making neoliberal green finance.

The first neoliberal approach, the laissez-faire one, assumes an extremely active role of corporations and sets their behaviour as one of dedication towards social/economical responsibility whilst dealing and solving environmental issues, and at the same time, benefitting from an increase of their overall revenues.

This approach's main goal is to guarantee that, by making decisions at their own free-will (without State's intervention), private institutions are able to produce the best environmental outcome possible, by letting the market forces work independently. An example of the laissez-faire approach would be when the ECB does not distinguish between green and brown assets, letting the free market conduct commercial banks to make their own environmentally-efficient decisions and produce the best outcome.

The standard neoliberal approach, on the other hand, admits the introduction of environmental policies aimed at changing behaviours, namely through the taxation of environmental players or indirect subsidization of private green investment, as a form of green financing, such as de-risking Private–Public Partnerships (PPPs). These PPPs are partially supported or guaranteed by government funds in order to sustain part of the risk that is attached to such innovate project, which become more attractive to private investors.

Green credit guarantee schemes are an example of Private–Public Partnerships, consisting of the intervention of the governments in assisting (financially) small and medium enterprises (SMEs) so that they can invest in green related projects or economic sectors. However, the practice of channelling public money in order to increase profits of private individuals and corporations can translate into extreme inequalities on income and wealth distribution, something that has been a target of criticism (The World Bank, 2023).

Amongst other instruments, the standard neoliberal approach proposes the implementation of a central bank digital currency (CBDC) which stands for digital money issued by a central bank, that would serve as an intermediary to enhance private green investment with the benefit of reducing costs and, at the same time, allowing the subsidization of green activities and promotes the issuing of green bonds, for instance (Yang, Q., Zheng, M. and Wang, Y., 2023). Currently, there are already some countries exploring this new tool – for instance, China is in the midst of creating and testing the digital version of their currency (the renminbi); and Europe is planning on putting in place a digital Euro during the next five years (Van Gansbeke, 2021).

Furthermore, it is important to note that this is a recent subject and very few studies have been conducted about it. Nonetheless, one of the conclusions that some scholars have reached is that CBDC reduces costs and has a lower environmental impact, when compared to other payment methods such as cryptocurrency, standard currency and cards, because it "is backed by the trust of central banks, CBDC does not need to prove its legitimacy through its technological structure [and] therefore, CBDC does not require the energy-intensive consensus or mining mechanisms used by a cryptocurrency, so its energy consumption is lower (comparable to that of a credit card system)" (Lee and Park, 2022). Since this is a recent subject, however, more research still needs to be conducted in order to ascertain CBDC's overall environmental impact.

Moreover, Lee et al. (2022) also state that because CBDC can be integrated in different technological and financial systems - such as Real Time Gross Settlement (RTGS), Distributed Ledger Technology (DLT), or a mixture of both, it can become a catalyst for financial innovation and it can also be applied in the green finance market. Given this, the European Commission is planning on redistributing CBDC to economic actors (such as households, enterprises, NGOs, SMEs etc.) who are actively combating CO2 emissions – according to the European Commission, "[t]his climate CBDC could prepare for a digitalized carbon-free economy, enhance financial inclusion, and would advance Europe to the forefront of financial and monetary innovation" (European Commission, 2021).

A third neoliberal viewpoint is the market-making perspective which is based on the creation and implementation of policies/regulations regarding, for instance, property rights and taxonomies to guarantee the better and more effective use of assets available in the markets. The European Commission's taxonomy is an excellent example of the market-making neoliberal approach, since the main idea behind it is to create a transparent and accessible breakthrough manual of the market and its financial tools.

By setting a standardisation of the criteria necessary for the classification and rating for green investments, the taxonomy allows for a fair comparison of the different products and simplifies the selection process for the investors, allowing them to make more conscious and well-informed decisions. These established taxonomies are especially important instruments when considering that banks, under this perspective, must include climate-related risks into their frameworks when considering lending opportunities.

However, it is important to point out that the taxonomies created and most policies, if not all policies related to such taxonomies, become ineffective when they do not discriminate (between green and brown activities), misclassify the activities, by claiming one is green when it in reality it still is a brown activity, or they do not introduce penalties against brown sectors/activities – instead they enable such activities to carry on, defeating their initial purpose (which are precisely criticisms that have been

pointed out regarding the European Commission's taxonomy. This topic will be analysed more in depth in chapter 3 – *European Commission's Taxonomy* - of this dissertation).

Reformist green finance

The second main approach to green finance focuses on the intervention of public policies, including monetary policy, which have in sight both the environmental and social well-being. By taking this into account, it is important to determine what is called a reformist approach, which envisages a much more "hands on" governmental approach on market regulation, by guaranteeing that income distribution is a tool used to even out inequalities in society while transitioning to greener economies. The overall idea is that the governments will work on two fronts: they will first tax the sectors that are considered to be environmentally problematic and, on a second moment, they will not only compensate families who are disproportionally negatively affected by climate change effects, but also invest and implement public environmental-related policies.

Within this approach, we witness a more active role from the government in supporting public environmental investment strategies, where they are able to regulate financial instruments, namely by defining political, fiscal and monetary policies. Thus, green finance and the financial instruments available to individuals/entities are defined and regulated in a way which needs to be compliant with the very urgent necessities to mitigate climate change and, at the same time, guarantee equal outcomes to both the population and other countries that face more difficulties in addressing climate change.

Globally, the reformist perspective tends to focus more on the social aspect of sustainability and, consequently, does not embrace the neoliberal premise that markets are the primary providers of effective solutions to environmental problems. Hence, according to this approach, public entities should play a bigger role in providing the necessary support to green finance, namely through public finance, environmental and monetary policies, in order to prevent uneven distributional outcomes. Despite this, the reformist green finance still "assumes that a reformed capitalist economic system and green capitalism will have the capacity to effectively deal with today's global environmental challenges" (Dziwok et al., 2021, p. 3).

Within this general reformist perspective, one can also identify two different approaches on environmental policy, which end up having an impact on green finance - the tax-based approach and the "command and control" approach.

The tax-based approach focuses on taxing activities/sectors which are considered as having a negative impact on environment, compensating, at the same time, those individuals who are most affected by climate change and negative environmentally-related contributions and it is also important to add that the tax-based reformist approach differs from the neoliberal one since the latter is reliant on

subsidies whereas the former views the income from these taxes as a central tool that will later translate into funds for public investment in green activities.

This dual strategy to tackle environmental issues helps central banks to become powerful and vital institutions who provide the necessary means to invest in green projects and support development projects conducting the economy towards sustainability, in the most efficient way possible.

The "command and control policies" approach argues that regulations imposed by the public sphere should be the main instrument combat environmental adversities and, therefore, the private sector should simply obey such rules and regulations. This definition can be translated into the permission/forbiddance of certain activities or investment in certain sectors, for instance.

Progressive green finance

Finally, there is one last approach which questions more harshly the ability of markets to conduct and provide solutions to the current environmental scenario. The progressive point of view recognizes that only global interactions and solidarity amongst countries can contribute to a more effective and efficient resolution of the environmental issue, by allowing equal universal access to natural resources and by guaranteeing that when conducting international financial transfers, the over-use of such resources is limited.

On a first basis, there is the "individual rights and caps and global financial transfers based on solidarity" approach, which foresees the maintenance of global sustainable welfare. This approach not only suggests that the natural resources are available to every nation worldwide, but it also establishes that the over-use of said resources should be limited by a short percentage of the world population.

Implementing a global financial transfer system is necessary to ensure that essential goods are accessible to all, including those in the global South who are economically disadvantaged, which will also help in avoiding inequalities between nations. One of the most noticeable policies associated to this approach, is the application of "debt-for-nature-transactions" policies, which are based on partially forgiving some countries' foreign debts so that they can instead redirect their focus onto environmental-related investment and spending. In addition to not having to pay entirely their foreign debt, these countries would also have access to funds which would help them acquiring the necessary means in order to develop and invest on environment policies.

On the other hand, the progressive green finance approach also recommends the "transformative global monetary and financial architecture", where sustainable welfare should be maintained and viewed as a top priority and private capital flows should be restricted, when applicable.

This last point of view even recommends that the current international financial system should be left behind and, with the global cooperation and coordination, a new one should be created where the

dependency towards one single currency is avoided (which in the present case is the dollar) and a new currency is created which favours less developed countries. In practical terms, the Bank for International Settlements and the People's Bank of China have already made proposals towards the creation of global central bank digital currency (CBDC) (Dziwok et al., 2021).

Currently, CBDC is in the realm of the reformist approach, notwithstanding, it can be transformed into a progressive green finance tool if it were to allow for a "more symmetric global monetary regime. The specific features of such a global (public) digital currency would enable very specific interventions and, at a global level, would facilitate access to and control of environmental resources. Hence, democratically controlled and based on global solidarity, such a measure and a new global monetary and financial architecture could be a powerful instrument of progressive monetary policy and support progressive finance" (Dziwok et al., 2021, p. 11).

Table 1 provides a systematisation of the several approaches to green finance covered in this section, as well as some examples of public policies which can be used by the government and some tools/guidelines to be taken and followed in order to facilitate the integration of green finance in the investors agendas.

Table 1 – Approaches to green finance

	Government role	Type of financing	Main Tools	Examples
Neoliberal	Little to no intervention from the government.	Financing is mainly via banks towards profitable investment opportunities, which will later translate into economic development by protecting the environment, climate change, social inclusion, and corporate governance in all sectors of the economy.	- Limited public financial spending on green investments; - Public support to private green investment via green subsidies; - Private allocation of funds through the implementation of an official taxonomies.	- Reduction of minimal capital requirements for green lending; - Integration of sustainability factors into central bank portfolio; - PPPs;
Reformist	More active role from the government in supporting public environmental investment strategies.	Financing can be often made through taxing "brown" activities.	- Taxes on "brown" activities and practises; - Regulations for the financial sector which forbid or enforce investment towards certain economic activities/sectors.	- Stricter rules, via monetary policy, which encourage commercial banks into investing in green activities; - Green credit rating; - Green bancassurance; - Carbon taxes;
Progressive	Role of the governments is considered vital.	Financing via global cooperation and solidarity. Debt forgiveness as source of funding for the poorest countries.	- International financial redistribution to assure equal access to natural resources; - Forgiveness of international debt, which will then allow for the allocation of funds towards green finance projects.	- Monetary policy intended to support and provide national resources; - Creation of an international and global public digital currency (CBDC).

Source: Own elaboration based on Dziwok et al. (2021), available at: https://doi.org/10.3390/su132111902

2. Green finance in the context of the European Union

The European Union has been invested in creating a system that ensures green finance as both a public and private tool to stimulate the necessary investment in crucial economic activities that will contribute to environmental protection, mitigation of climate change and an efficient use of natural resources.

Furthermore, the European Union has publicly committed to become one of the main protagonists in the green finance market – "[t]he European Union has embarked on an economic reform programme aimed at combating climate change and improving the environmental situation" (Ivanova, Katsyuba and Firsova, 2021, p. 2). According to the European Commission, "[t]hese initiatives highlight the EU's global leadership in setting international standards for sustainable finance. The Commission intends to work closely with all international partners, including through the International Platform on Sustainable Finance, to cooperate on building a robust international sustainable finance system" (European Commission, 2021, p. 1).

An important milestone was reached in 2019, when the European Green Deal was first introduced. This programme's main goal is to ensure that European countries would not only be able to significantly reduce harmful emissions (such as carbon dioxide), but they would also create new job positions and improve the overall life quality of its citizens (not only environmentally speaking, but also economically).

However, the European Green Deal is an extremely ambitious project, especially investment and finance-wise. In order to kick start this programme it is necessary to bring in around 100 billion euros of private investment until 2026, and it is also crucial to gather a total of 1 trillion euros from both public and private investors to be channelled to the European Investment Bank (also known as the European Union Climate Bank) over the next ten years. To reach the goals of this programme, the financial system is called upon to play a crucial role in guaranteeing a combination of "dedicated financing to support sustainable investments, and proposals for an improved enabling framework that is conducive to green investment" (The European Commission, 2019, p. 15).

Countries in the European Union also signed the Paris Agreement, in 2015, and embraced the Sustainable Development Goals implemented in the 2030 Agenda. These steps were important to make sure that the European Union was engaged and committed to invest in this new reality of embracing green finance in their plans and objectives. Furthermore, in 2019, the European Union started taking some action to ensure that the previously mentioned projects and goals were reached, and so, together with other countries such as Argentina, Canada, Chile, China, India, Kenya, Morocco, amongst others, they created the International Platform on Sustainable Finance (IPSF), which strives to move capital from private entities/individuals "towards environmentally sustainable investments and to serve as a forum for international cooperation" (Martínez, 2021, p. 7).

One of the reports produced by the International Platform on Sustainable Finance has been used as the basis for the European project entitled "Action Plan on Financing Sustainable Growth" (also known as the "Sustainable Finance Action Plan"). The project's main goal is to ensure that the environment strategy held by the European Union, as well as its financial system, takes into consideration environmental, social and governance (ESG) issues.

The Sustainable Finance Action Plan has as main objectives to: "1. reorient capital flows towards sustainable investment in order to achieve sustainable and inclusive growth; 2. manage financial risks stemming from climate change, resource depletion, environmental degradation and social issues; and 3. foster transparency and long-termism in financial and economic activity" (European Commission, 2018, p. 2).

The European Commission, in particular, has taken a central role in creating several tools and taken steps in order to reach these objectives: creation of a taxonomy (which will be discussed more in-depth ahead); imposition of climate and sustainability benchmarks, whilst incorporating sustainability in financial advice; introduced the Corporate Sustainability Reporting Directive (CSDR) which requires stricter ESG reporting and a widening of its scope; in 2021, introduced regulation over sustainability and environmental-related disclosures in the financial market; and, also in 2021, presented the framework in relation to the European green bond standard, which would be based on greater transparency, external review and supervision by the European Securities and Markets Authority (ESMA) (Martínez, 2021).

According to Ivanova et al. (2021), the 2020 pandemic, which then translated into an economic crisis, had a negative impact on the total amount of green investment in the world, and in Europe, in particular. However, the pandemic has also shed some light onto to the necessity to recover from the crisis whilst betting on the investment on a green economy – meaning that "there is no need to restore production that does not use advanced environmental technologies, but, on the contrary, advisable measures imply adoption of clean technologies in industry, increased investment in renewable energy, and the use of environmentally friendly transport" (Ivanova et al., 2021, p.2), whilst generating the necessary financial resources to replace the current brown economic activities with green economic activities and, consequently, green investment standards.

An example as to how the 2020 pandemic and the Covid-19 crisis have provided new opportunities in the green finance market is that, in 2021, it was created the Next Generation EU (NGEU) programme that aims to boost the recovery of the European economies by increasing the EU budget, whilst at the same time guaranteeing the construction of a greener European Union – "[a]t its heart is a stimulus package worth EUR 2.018 trillion (…) [and i]t consists of the EU's long-term budget for 2021 to 2027 of EUR 1.211 trillion (…), topped up by EUR 806.9 billion (…) through

NextGenerationEU, a temporary instrument to power the recovery" (European Commission, 2021, p. 6).

Given the above, the European Union has yet again designed an extremely ambitious economic programme, where it has planned to stop using materials such as gas and oil, to diminish carbon dioxide emissions by 2030 and completely eradicate them by 2050 - the so called decarbonization of the economy. EU Member States are thus encouraged to use some specific methods/tools in order to reach the previously mentioned goals, not only through the programme to recover from the Covid-19 crisis, but also through the Paris Agreement and the European Green Deal.

Despite the above, in 2022 the European Union still heavily relied on fossil fuels, with great emphasis coming from Russia - after all, over 40% of the European Union's gas supply derived from Russian territory. For some countries, such as Finland or Estonia, this dependency from Russia reached almost 100%. After the beginning of the conflict between Russia and Ukraine, in May 2022, the European Union published the "REPowerEU" plan which aimed to approximate its agenda (which had now moved to 'second plan' due to the war that had emerged) with the previous commitments made to the transition towards a green economy.

More specifically, this plan intended to relish the European Union's dependence from Russian fossil fuels, until 2030, by funding projects which will secure the implementation of electrification of heating networks which, in turn, would guide demand towards renewable resources; nuclear power (although this can still be considered by some climate activists as a brown energy); and solar panels. In this sense, and as a consequence from the war between Russia and Ukraine, the European Union would have an opportunity to diversify its sources of energy and shut down the contact with Russia, opening up the door to investment in greener sources of energy.

However, it has also been observed that instead of taking this opportunity to accelerate the transition to a greener economy, the European Union has turned its attention to fracked gas from the USA. This resource is in fact "a controversial extraction technique that involves injecting a high-pressure cocktail of water and chemicals into the ground to release gas back to the surface. The process can induce earthquakes but also severely harm human health and the environment" (Peigné, 2022) – consequently, numerous European Union nations had prohibited the utilization of this fuel, yet there are indications that they are now reversing their stance, moving further away from their environmental goals.

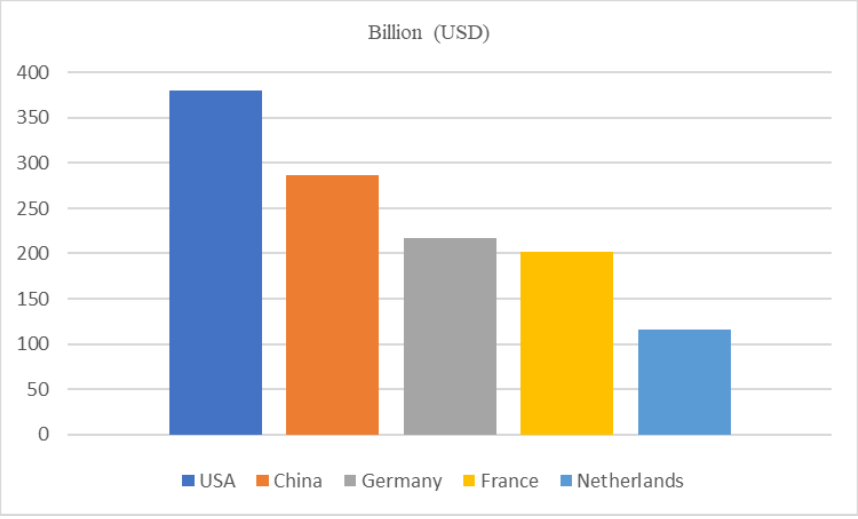
2.1 Green bonds and green loans

Green bonds are becoming increasingly used in funding several environmental programmes across the European Union. Flammer (2021) demonstrates that this instrument is extremely attractive to both the State and private investors, since its functionality, risks and structure are the same as with the 'standard' bond. The main difference being that the profit derived from the green bonds will only be applied and invested on green projects and programmes, such as renewable energy, recycling, and green infrastructure.

The first green bonds were issued in 2007 (some of which by the European Investment Bank), however, only more recently this instrument became more attractive, so much so that "in 2019, green bonds worth 255 billion US dollars were placed in the world; in total, green bonds have already been issued in 34 currencies. According to the forecast by Climate Bonds Initiative, the emission volume in 2020 will amount to 350–400 billion US dollars" (Ivanova et al., 2021, p.5). This growth and development within the global financial market has translated into the creation of the 'Green Bond Principles', coordinated by ICMA (International Capital Markets Association). The initiative intends to establishes some principles and guidelines on how to navigate this somewhat new market, ensuring investors that the issuers of the bonds will follow the standards established and, therefore, direct the bond issuing profits to environment-related projects and programmes only.

According to the Climate Bonds Initiative, which has conducted several analyses of the green bond market, the USA has issued the largest amount of green bonds in the period between 2014 and 2022, with a total amount of USD 380 billion, followed by China with a total of USD 286,9 billion, Germany, France and the Netherlands (with USD 217,5 billion, USD 201,8 billion and USD 116,3 billion, respectively), as depicted in Figure 1.

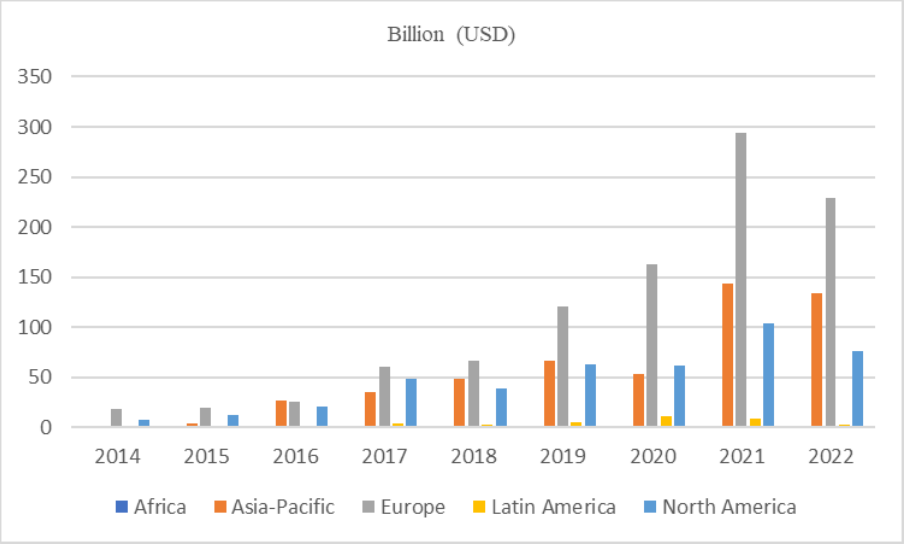
Figure 1 – Total amount of green bonds issued worldwide, 2014-2022 H1 (USD)



Source: data was retrieved from: Climate Bonds, available at: https://www.climatebonds.net/market/data/

Looking at this data from a different angle, it is possible to observe that the year 2021 witnessed a 75% increase in the issuance of bonds, breaking the half trillion mark, amounting to a total of USD 522,7 billion (Figure 2). More specifically, in 2021, Europe was the region with the overall largest amount of green bond issuance (with a total of USD 288,5 billion); the region of Asia-Pacific witnessed the biggest annual growth rate, of 129% (amounting to total of USD 147,7 billion).

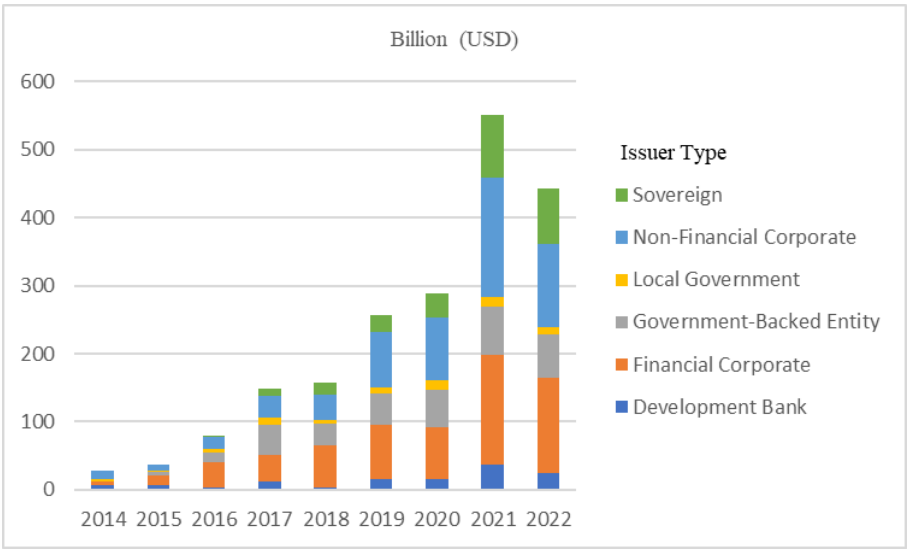
Figure 2 - Total amount of green bonds issued, per region, 2014-2022 H1 (USD)



Source: data was retrieved from: Climate Bonds, available at: https://www.climatebonds.net/market/data/

Moreover, the Climate Bonds Initiative also provides information regarding the type of issuers of green bonds. Overall, and according to Figure 3, the private sector was the biggest issuer, with financial and non-financial entities of the private sector accounting for 44% of the issuance (which represented an increase of 143% and 111%, respectively). On the other hand, sovereign entities witnessed a growth of 111%, representing 10% of the total amount of green bonds issuances, led by the UK (with 30% of the total amount of sovereign green bonds), followed by Spain, Italy and South Korea. The European Union, however, was the region which most contributed to the increase of sovereign-led green bonds supply (38%).

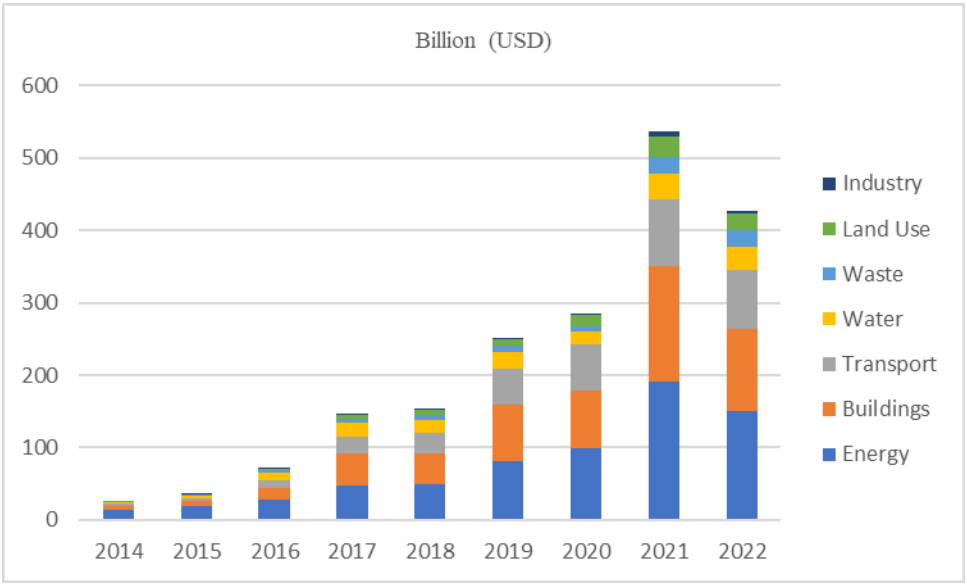
Figure 3 - Total amount of green bonds issued, per issuer type, 2014-2022 H1 (USD)



Source: data was retrieved from: Climate Bonds, available at: https://www.climatebonds.net/market/data/

Lastly, it is also important to observe that the three main sectors benefiting from the issuance of green bonds are energy, building and the transport sectors, which received a total of 81% of proceeds (experiencing a small decrease, when compared to 2020's 35%), according to Figure 4.

Figure 4 - Total amount of green bonds issued, per use of proceeds, 2014-2022 H1 (USD)



Source: data was retrieved from: Climate Bonds, available at: https://www.climatebonds.net/market/data/

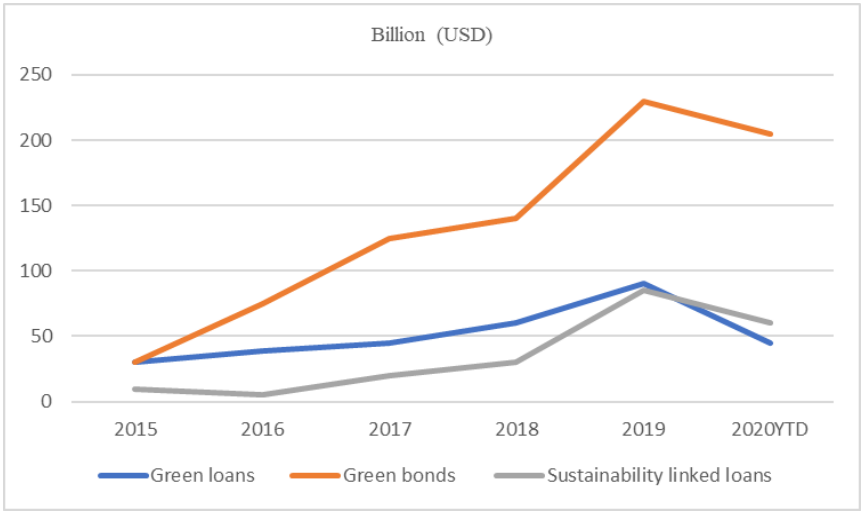
Apart from bonds, financial markets have also seen the emergence of the green loans, which date as far back as 2005, and function in a similar way to the green bonds, i.e. the risks, structure and aim of this instrument are similar as the ones of a 'conventional' loan, however, green loan funds must be strictly directed to green and environment-related projects: "a green loan is similar to a green bond in that it raises capital for green eligible projects. However, a green loan is based on a loan that is typically smaller than a bond and done in a private operation. A green bond usually has a bigger volume, may have higher transaction costs, and could be listed on an exchange or privately placed" (World Bank, 2021).

Studies show that despite not having the same recognition and importance as green bonds, green loans are rapidly becoming one of the most utilized green finance tools and, according to the World Bank (2021), "[d]eveloping countries currently account for just $1.6 billion of the estimated $33 billion in outstanding green loans. But the market is growing rapidly, outpacing the growth of the green-bond market in the near term" (World Bank, 2021).

Ramel and Michaelsen (2020) have examined closer the evolution of green loans, whilst comparing it with the evolution of sustainable-linked loans. These two types of loans differ in the sense that the former loans are a way of financing green projects, which are already pre-defined, and the latter "allow the proceeds to be allocated to general purposes but give the borrower an incentive to fulfil pre-defined sustainability targets" (Ramel et al., 2020).

As showed in Figure 5, overall interest in green loans has been increasing in the last few years, however, there was an obvious decrease in 2020 due to the beginning of the Covid-19 pandemic and the following economic crisis. Sustainable-linked loans, on the other hand, have become even more attractive to investors since they "provide an alternative for borrowers in sectors that lack clear definitions of green, such as the food and beverage industry or companies within sectors that may not have green assets and projects but can decrease their environmental footprint, such as transportation and logistics. The format is also an alternative for entities pushing an overall sustainability strategy by combining raised green debt with a sustainability-linked loan, for example utilities investing in renewable energy solutions (green) and targeting a reduced carbon footprint (sustainability-linked)" (Ramel et al., 2020).

Figure 5 - Total amount of green loans, green bonds and sustainability-linked issued, worldwide, 2015-2020 (USD)



Source: data was retrieved from: Ramel, E. and Michaelsen, J. (2020), available at: https://www.nordea.com/en/news/the-sustainable-loan-market-a-snapshot-of-recent-developments

When looking into the main sectors targeted by green finance investments, it is possible to analyse that investors tend to direct their profits mainly to the renewable energy sector (47%), followed by power generation (23%), utilities (8%), real estate (6%) and financial services (3%). As explained above, the sustainable-linked loans have a more diverse list of sectors, including chemical and food related industries, which account for 11% of total investment (see Table 2).

Table 2 - Top five sectors and their respective shares split by sustainable debt format, worldwide, (%)

Sustainability-linked loans		Green loans	
Utilities	14%	Renewable Energy	47%
Transportation & Logistics	9%	Power Generation	23%
Chemicals	7%	Utilities	8%
Industrial Other	6%	Real Estate	6%
Food & Beverage	5%	Financial Services	3%

Source: data was retrieved from: Ramel, E. and Michaelsen, J. (2020), available at: https://www.nordea.com/en/news/the-sustainable-loan-market-a-snapshot-of-recent-developments

Finally, and according to Table 3, Europe leads the investment in both green loans and sustainable-linked loans (54% in 2019 and 58% in 2020). As stated by Ramel et al. (2020), “Sustainable loans are raised most actively in the European market, constituting about half of the market since 2015. Asia is the second largest market, and together the two regions make up 80% of the sustainable loan market in 2020”.

Table 3 – Regional distribution of sustainability-linked loans and green loans, 2015-2020 (%)

	2015	2016	2017	2018	2019	2020
Europe	55%	53%	46%	65%	54%	58%
Asia Pacific	17%	24%	22%	18%	27%	19%
Americas	19%	20%	24%	11%	13%	13%
Africa	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%
Nordic	< 3%	< 3%	< 3%	< 3%	4%	10%

Source: data was retrieved from: Ramel, E. and Michaelsen, J. (2020), available at: https://www.nordea.com/en/news/the-sustainable-loan-market-a-snapshot-of-recent-developments

The World Bank provides more specific examples regarding where green loans are being applied, namely through the International Finance Corporation (IFC), responsible for structuring and supervising projects associated to green loans in Mexico, Brazil, South Africa and Romania, for instance:

- In Mexico, for example, the "IFC structured and mobilized a $541 million, 15-year Green Loan facility to support Infraestructura Energetica Nova (IEnova) [which] will finance the construction of five solar plant projects in Mexico with a total installed capacity of 526 MW (….) [which supports] IEnova's transition towards a greener business model. Following IEnova's adoption of the Green Loan Principles, this investment became the first certified IFC Green Loan in Mexico" (The World Bank, 2021);

- The IFC is assisting in the development of climate-friendly/green projects in Brazil, with a special focus on the energy sector, via a green loan to $120 million to Sicredi (Sistema de Crédito Cooperativo);

- In South Africa, on the other hand, IFC assisted with the issuance of the first certified green loan to the commercial bank Absa Bank Ltd., in order to receive greater amount of funding for renewable energy-related projects;

- Lastly, in Romania, IFC provided a €73.5 million green loan to NE Property BV, "which will help build a strong green business infrastructure in the country, prompting low-carbon economic growth" (The World Bank, 2021).

As in the green bond market, the Green Loan Principles report establishes the main guidelines and principles in which this market is based on, in order to transmit trust onto possible investors. Green loans, just like green bonds, have gained immense interest over the last few years, since they are seen as essential "to influencing increased responsiveness of companies to ecological sustainability (…) [and]

promising means of achieving a green economy via greening the financial system itself" (Gilchrist, Yu and Zhong, 2021, p. 2). The signing of the Paris Agreement only came to intensify the interest in these assets.

The Green Loan Principles standardises the guidelines which should be followed in order to guarantee maximum transparency and that the proceeds from the green loans are applied in green projects/activities. In this sense, the World Bank (2021) summarizes the four principles that should be applied:

1) Use of proceeds: green loans proceed must be used over environmentally friendly projects. These projects, in turn, must "provide clear environmental benefits, which will be assessed, measured, and reported by the borrower" (World Bank, 2021);
2) Process for project evaluation and selection: the borrower of said green loan must explain the eligibility of certain projects to receiving loan proceeds, as well as the overall plan on how to use such proceeds on the project;
3) Management of proceeds: in order to guarantee the maximum of transparency and integrity, the green loans' proceeds must be credited into an account, where its sole purpose is to hold the amount of money, or be tracked by the borrowers themselves;
4) Reporting: "The principles recommend the use of qualitative performance indicators and, where feasible, quantitative performance measures (for example, energy capacity, electricity generation, greenhouse gas emissions reduced/avoided, etc.)" (World Bank, 2021).

As previously mentioned, the European Union has been putting a lot of emphasis on the necessity of providing risk disclosure and transparency to private and public investors, issuers (in the case of green bonds and loans) and financial institutions (for instance, by providing the European green bond standard, explored below). By following this framework of greater transparency, financial institutions are strongly encouraged to keep economic actors updated and informed of the environmental impact of their investments, which intends to encourage investors to turn their decisions towards green finance. In turn, investors can compare and evaluate different companies' dedication to environmental sustainability and/or prevent the practice of greenwashing from companies.

2.2. Central banks

Central banks (including the ECB) can play a major role in the green finance market. Generally speaking, central banks can "play a central role in supporting the development of financial markets and encourage active trading in bond [and loan] markets to encourage other actors to participate" (Dikau, 2018, p. 5). Apart from the two most well-known green finance instruments (green bonds and loans),

which have already been explained and discussed, central banks can also apply green credit rating where they would be able to measure a certain project's 'greenness' that would ultimately encourage more green investments.

Moreover, central banks could also implement some innovative mechanisms such as green bancassurance, providing insurance for green-related investments such as buildings, cars and other insurable assets or liabilities; energy subsidy optimization which, as the name suggests, would allow the private sector (in particular SMEs) to benefit from energy subsidies which, in turn, would lower the cost of green investments; provide necessary liquidity to commercial banks, who will apply PPAs[3], i.e. a "reliable policy for financing energy transition in emerging markets and concludes that they may lead to a long-term, predictable price for clean electricity" (Taghizadeh-Hesary, Yoshino, Rasoulinezhad and Rimaud, 2021, p. 3).

Central banks are also able to provide liquidity to commercial banks against collateral as security. "This could mean offering preferential rates for banks lending money to green companies. Another option would be to demand higher rates from banks that invest heavily in carbon-intensive sectors. Furthermore, the central bank can adjust which assets are eligible as collateral to incentivise investment in green bonds" (Spinaci, Höflmayr and Hofmann, 2022).

Lastly, central banks can be an important source of financing in particular by implementing carbon, climate and green infrastructural finance. Via these policies, central banks would directly finance renewable energies-related projects (such as solar panels or biogas plants, for instance), which, in turn, would help deviate from fossil fuels; create funds to help fight the climate change; and implement "sustainable financing options to build mega infrastructural projects such as roads, schools, railway and hospitals (…) [and t]he green infrastructure support is often long-term nature which gives a wide range of flexibility to borrowers to repay" (Akomea-Frimpong et al., 2021, p. 12).

Several green finance tools and mechanisms that could be used by the central banks have been presented in this chapter and, at the moment, the two most recognized and successful instruments have been green bonds and green loans. However, central banks, including the ECB, could start implementing the above-mentioned mechanisms as a strategy to reach economic growth, whilst applying and promoting policies that are environmentally friendly (Taghizadeh-Hesary, et al., 2021).

[3] Power Purchase Agreements - Contract between the public (purchaser - often a state-owned electricity utility, in jurisdictions where the power sector is largely state operated) and private sector parties which support a power sector PPP.

2.3. The private sector

Reputation can be strongly linked to corporate success (especially of public-listed entities) and, therefore, companies' stated commitment to green practices plays an important role in corporate strategies. According to Gilchrist et al. (2021) "the rise of public awareness in corporate environmental responsibility as well as the implicit and explicit ramifications of corporate environmental wrongdoing is undoubted" (Gilchrist et al., 2021, p. 4). Moreover, these authors state that two main benefits arise from the participation in green projects (by engaging in green bonds or loans, for instance): a strategy as a precautionary tool for corporate environmental risk; and strategy to boost a company's reputation and, therefore, the value of its social capital.

Besides a company's reputation, there have been numerous studies that quantitatively demonstrate the negative economic impact that companies already face when they do not take into account the externalities of the environmental impact that their main activity has. Bolton and Kacperczyk (2020) state that companies that produce high level of carbon emissions despite being characterised with having high stock returns, also face higher level of costs of equity capital; Chava (2014) has found that more environmentally-harmful companies also face higher interest rates on issued loans.

Tang and Zhang (2020), Wang et al. (2020) and Flammer (2018) have all come to similar conclusions, i.e. that there is a correlation between stock returns and green bonds, meaning that once a company increases the issuance of green bonds, their stock returns also increases, alongside with their equity return and the creation/increase of the company's value, due to the following reasons:

- Positive market perception: any type of green finance investment showcases a company's commitment to sustainability, fostering an overall positive image in the eyes of investors, consumers, and stakeholders. This will inevitably lead to an increase of the company's reputation and create a more favourable market perception towards it, leading to increased investor confidence;
- Improved access to capital: this can attract socially responsible investors and institutions specifically looking to invest in environmentally sustainable projects. This broader investor base can improve the company's access to capital and potentially lower the cost of capital, allowing the company to fund its operations or green initiatives more efficiently;
- Regulatory incentives and subsidies: governments often provide incentives or subsidies for companies that undertake environmentally friendly projects. This can include tax breaks, subsidies, or preferential treatment in government contracts, all of which can positively impact the company's bottom line and, consequently, its stock returns;
- Long-term cost savings: investing in green projects or sustainable practices can lead to long-term cost savings through improved energy efficiency, reduced waste, and optimised resource

management. These cost savings can positively impact the company's profitability and, in turn, contribute to increased stock returns and company value.

- Attraction of ESG-focused investors: Environmental, Social, and Governance (ESG) considerations are increasingly important for investors. Companies that prioritise ESG factors, including the issuance of green bonds, are more likely to attract investors focused on sustainable and responsible investment practices, leading to an increase in stock demand and potentially higher stock returns.

Overall, the increase in stock returns and company value following an increase in green bond issuance is often a result of a combination of improved market perception, access to capital, regulatory incentives, cost savings, and attraction of ESG-focused investors. These factors collectively contribute to a more robust financial position and a positive outlook for the company's future growth and sustainability.

Moreover, Taghizadeh-Hesary et al. (2021) believe that it is at the hands of private entities to make up for the government's inability to invest in green projects. These authors state that an option would be betting on PPAs, for instance, as a way to increase investment in green projects is one way to go forward, where the governments would partially pay the spillover of tax revenues to private investors, which would, in turn, increase their long-term return on investment. Moreover, the authors also believe that "institutional investors (insurance companies and pension funds) are potential long-term investors in green infrastructural projects because they hold long-term financial resources" (Taghizadeh-Hesary et al., 2021, p. 8).

Commercial banks, for instance, have also been encouraged to participate and implement green finance policies. In fact, according to authors Akomea-Frimpong et al. (2021), central banks have been demanding commercial banks to "attain green certifications, green credit scores, environmental innovation, and social inclusion (…). Competitively, banks that adhere to these requirements on green finance enjoy tax holidays and other incentives from the central banks" (Akomea-Frimpong et al., 2021, p. 14)". Moreover, commercial banks also have the capacity to influence the interest rates and the risk-related control measures that they enforce, which may have a 'domino effect' onto the attractiveness of green credit, i.e. when banks state that green credits have lower interest rates and/or are associated with a lower risk, then investors will be more willing to invest in such green assets.

Nonetheless, Gilchrist et al. (2021) describe best the relationship between the private sector and green finance when they state that "a non-opportunistic social reputation is important for companies in the long run. When corporate environmental misconduct is on the horizon, high social capital companies or eco-friendly companies can mobilize community support, easing tension between firms and regulators, and reducing compliance costs. (…) [T]he use of green bonds improves a firm's long-term value and operating performance, green innovations, and the ownership of long-term and green

investors, which further supports financial motives" (Gilchrist et al., 2021, p. 5-6). Despite this, it is also true that companies and private institutions can take advantage of some gaps in the market, as it will be analysed next.

2.3.1. Greenwashing

All these positive correlations between a company's success/profit and investment in green finance must be carefully analysed having in mind the non-neglectable phenomenon of greenwashing. The concept "first emerged in a 1986 essay written by Jay Westerveld, an environmentalist, that denounced hotels' practices encouraging customers to reuse towels, apparently to protect the environment but rather as a mean to cut costs and improve profit margins" (Azzouz, Merle, 2021). Nowadays, this definition is a much broader one and is considered as "a form of misinformation often used to entice an aspiring green consumer [where c]ompanies promising to be sustainable, biodegradable, or environmentally conscious sometimes fail to meet the promises they make to consumers" (Gibbens, 2022).

Companies and institutions often purposefully deceive their target consumers and investors, by making "unsubstantiated or exaggerated claims that an investment is environmentally friendly" (Ozili, 2022, p. 7). Because green finance and green-related concerns have become of extreme importance to most investors, greenwashing has been on the rise, it is, however, difficult to identify such cases since there is a lack of global and universal reporting standards and a lack of transparency and data regarding a company's green-related activities (Regtank, 2021).

Gabor (2021) further explores the issue of greenwashing, stating that "investors strive to become the epistemic guardians of green taxonomies. By controlling the grammar of green finance, they can apply the 'green' or 'sustainable' label to asset classes that have a negative environmental impact, a greenwashing exercise that effectively waters down climate regulations in order to protect profits" (Gabor, 2021p. 19). More specifically, the author provides us with a clear example regarding this matter, where carbon financiers construct their own ESG taxonomies in order to escape the "constraints" set by the public taxonomies (for instance, the European Commission's taxonomy), and as way to be able to greenwash their own portfolios and present them to possible investors as green finance opportunities, when they may not even fulfil all the requirements to be considered as such.

By implementing private-based ESG regimes, these companies are able to control the narrative and push the understanding that they hold high ESG ratings, which ends up attracting investors, via greenwashing, and promoting their own portfolio.

Azzouz et al. (2021) highlight 7 tools through which companies generally practice greenwashing:

1. Hidden trade-off: this is seen when a company suggests that the product they are promoting is green by highlighting the few aspects that it would make the product qualify as green, however, they overlook the major negative traits, which would overall disqualify it as a green product;

2. No-proof: perhaps the easiest way of practicing greenwashing is the fact the certification and confirmation that a product is indeed green or not is still somewhat difficult to implement – there is no standardized set of guidelines implemented to define what can be and what cannot be considered as a green product - despite already having some international principles set out, which have already been described throughout this thesis, these are still not mandatory and, as such, companies are able to overcome such principles;

3. Vagueness: the definition and the reason why a product is green may be so purposefully vague and poorly defined that the consumer may be easily confused and/or tricked into believing that it does indeed qualify as a green product;

4. Irrelevance: the company's claims over the product's greenness are irrelevant and/or unimportant for the consumers' who are searching for green products to invest on;

5. Less of two evil: once again, despite a company's true statements regarding the fact that a product is sustainable, they may be purposefully overlooking the greater environmentally negative impact that it may have;

6. Fibbing: one form of greenwashing that is less witnessed since it can be more easily detected and break the consumer's trustworthiness is when the company's claim that a product is green is simply false;

7. Worshipping false labels: "either through words or images, it gives the impression of a third-party endorsement even though such an endorsement does not exist" Azzouz et al. (2021).

Moreover, the authors identify the food and beverage, fashion, cosmetics, transports and the electronics sectors as the most prone to the practice of greenwashing – the Volkswagen brand and company, for instance, whilst advertising that it was obeying with the emission rules set out by the European Union, was in fact caught fabricating and cheating on clean diesel vehicles' carbon emission tests (and other automobile brands have been caught performing similar deceitful activities).

Given the above, the European Union has taken on several positions to combat the practice of greenwashing. For instance, the European Green Deal proposes that companies who promote green

products, should prove such claims against a standard methodology in order to evaluate its impact (whether this may be positive or negative) over the environment.

For this purpose, the 2020 Circular Economy action plan has proposed that the European Commission will assist companies sustaining their environmental claims through the *Product and Organisation Environmental Footprint methods.* The European Commission has also introduced the Sustainable Finance Disclosure Regulation (SFDR), in order to try and fight any attempts of greenwashing, by guaranteeing that companies within the European Union classify their products and allow full transparency for the consumer's decision. In this sense, companies should classify its products as: 1) products which promote environmental or social characteristics (article 8 of the SFDR); 2) products that do have environmental or social purposes, however, follow minimum governance standards (article 9 of the SFDR); or 3) products that do not fit the descriptions under articles 8 and 9 of the SFDR (article 6 of the SFDR). This categorization would imply a decrease of companies' self ESG evaluation, which tends to lead to greenwashing.

France, in particular, is taking serious measures in this field, having introduced sanctions over greenwashing practices. In practice, companies who are found be guilty of such practice, can be fined up to 80% of the revenue raised with the campaign which practiced greenwashing; in addition, these companies also have to correct the false claims previously made and that led to the accusations of greenwashing in the first place.

Lastly, Quilter Investors conducted a survey regarding sustainable and ESG-related investments, and a conclusion was reached that 44% of investors main concern, when investing in these types of assets, is greenwashing, causing the constant worrying that companies may be in fact overpromising and taking advantage of investors who simply wish to invest on sustainable and green projects/assets.

2.4. Constraints on green finance

Despite all that has been said, green finance faces some constraints and struggles deriving especially from the fact that this is a somewhat new topic and, therefore, there is still a lack of a stable policy and regulatory framework. In fact, investors have been raising questions regarding the lack of tangible policies from the government regarding the matter in question, since it creates a sense of instability, unpredictability and uncertainty regarding the risks and long-term returns of such green investments (Reddy, 2018).

Green finance also seems to face some issues due to the lack of visibility and disclosure on the eyes of the consumer and investor. Although this is something that the European Union is already addressing and taking measures to improve on (by creating a taxonomy and emphasising the necessity to provide risk and sustainability-related disclosures, for instance), investors do not always proceed with

their investment intention because they feel that they do not have sufficient information regarding the environmental and social performance/responsibility of the institution where they planned on investing.

In addition, there is also overall less awareness amongst both investors and consumers regarding the type of green finance products that exist, which becomes a constraint in the development of this sector. According to Reddy (2018), the private "sector will produce green products only when there is sufficient market for that [and b]ecause of high cost and lack of awareness about the importance for green products people hardly buy green products" (Reddy, 2018, p. 647). This means, then, that producers only invest in green products when the market conditions are favourable, however, since there is a high cost and lack of awareness in relation to green products, then consumers end up not buying this type of products and the market itself is not able to develop (becoming a vicious cycle).

Lastly, a major constraint to the development of green finance is the low profitability of this industry which, in turn, is related with the lack of existing mechanisms to measure the viability of these investments. Because there are no trustworthy mechanisms that measure the viability and profitability of green investments, investors tend to lean on more conventional projects (which are usually related with the polluting industries), which also have a short-term nature, a lower cost and a higher return rate, when compared with green investments.

On the other hand, however, it can also be argued that private entities could still be making a bigger effort and achieving better results regarding the employment of environmental and green finance policies and application of the respective tools, despite their claims of lack of overall regulation.

In fact, some companies have pledged to a net zero society - to guarantee the end of greenhouse gas emissions until 2050 (and, as consequence, the investment behind it), walking hand in hand with the efforts to limit global warming to 1,5/2 degrees Celsius – by signing the Net Zero Banking Alliance. Notwithstanding, some of the same companies and private institutions who signed the Alliance still rely heavily on coal-based investment, instead of drifting away to greener projects, as promised.

Seizov (2022), states that commercial banks alone spread a total flow of capital of USD 1,5 trillion to the coal industry, between 2019 and 2021. More specifically, in this time period, a total of 376 banks provided USD 363 billion in loans to this industry, however, out of these 376, 12 banks made up for almost half (48%) of the total in loans to the coal industry – the top five banks who have contributed are as follows: Mizuho Financial, Mitsubishi UFJ Financial, SMBC Group, Barclays and Citigroup (despite this, all these five banks have also signed the Net Zero Banking Alliance).

Commercial banks, however, are not the only culprits when it comes to this subject. A total of 4.900 private companies have invested a total amount of over USD 1.2 trillion directly onto the coal industry. Once again, only 12 companies amount to 46% of the total of the investment in this industry and, out of this 12, there are two companies which stand out: BlackRock and Vanguard, who have

invested a total of USD 109 billion and USD 101 billion in shares and bond holdings, respectively. Once again, it is worth noting that these companies have also pledged to a net zero society.

According to Jasper Jolly (2021), from The Guardian, BlackRock, the world's largest asset manager, has investments totalling USD 85 billion in coal companies, even after pledging to sell most of its shares in fossil fuel producers. A loophole in their policy allows BlackRock to retain shares in companies generating less than a quarter of their revenue from coal. Consequently, it has kept investments in major coal miners and polluters, including Adani, BHP, Glencore, and RWE, as reported by Reclaim Finance and Urgewald, two advocacy groups.

Given the environmental concerns associated with coal production, including its significant contribution to global heating and climate change, the divestment pledge made by BlackRock in January 2020 was initially seen as a victory by activists. Nevertheless, the recent research has prompted calls for BlackRock's CEO, Larry Fink, to fully withdraw investment from coal, including the $24 billion in assets tied to companies planning to expand coal production (Jolly, 2021).

Activists have criticized BlackRock for what they perceive as greenwashing, urging the company to align its actions with its sustainability commitments. Perhaps even more astonishing is the fact that despite the several warnings from the United Nations Secretary General, the United Nation Environment Programme and other institutions, that investment should no longer be directed towards companies which are actively on a phase of development of new coal plants, coal mines or other infrastructures, there was still an investment of USD 460 billion between 2019 and 2021 towards these activities/sectors, instead of steering away from them, as suggested by the United Nations and other institutions.

3. European Commission's taxonomy

As it has already been stated throughout this thesis, the European Commission's main contribution in the green finance realm is the creation of a taxonomy which establishes a standardised criterion, provides performances thresholds and definitions with which an economic activity must comply to be considered as a green activity. The taxonomy was published in the Official Journal of the European Union on June 22nd, 2020, and became law on July 12th, 2020 (European Commission).

The taxonomy proceeds with the analysis of the different economic sectors and activities which are divided in three different categories: sustainable activities, that contribute to climate change mitigation; enabling activities, that do not necessarily affect climate change directly but facilitate the reduction of harmful emissions in other economic sectors; and, finally, transition activities, which are a group of activities that are far from becoming climate neutral (Schütze, Stede, Blauert, and Erdmann, 2020).

The standardization and universalization of a criteria to categorize different economic activities and sectors is especially important since the European Union is set out to become carbon-neutral until 2050. The taxonomy is, therefore, a tool for public and private investors who will be able to have a trustworthy institutional guideline which determines the economic sectors that are sustainable, environmentally friendly and that support climate-neutral economy. This can become an incentive for investors since, as we have seen, one of the constrains of green finance is the lack of knowledge and awareness from both investors and consumers. Not only does the taxonomy create a "common ground" for both investors and investees, but it also allows for greater transparency and becomes a token of comparability between companies, which can, on the one hand, help preventing greenwashing from companies and, on the other hand, facilitate the assignment of public funding to deserving entities.

Looking at the long-term, by providing the necessary green finance-related information to investors through the taxonomy, they will be able to identify future growth opportunities, R&D needs and invest in such assets and economic activities better aligned with the European Union goals (namely the Paris Agreement and the European Green Deal). According to the report from the Principle for Responsible Investment (PRI, 2021):

- The European Commission's taxonomy will encourage the creation and development of more transparent financial products in the market, as well as assist investors in defining their transition to a green portfolio/investment opportunities;
- The taxonomy also mandates that both parties disclose the investment being made, providing the significant ESG data which are necessary for the financial institutions to disclose to the regulatory officials;
- Lastly, by providing a standardised framework, the taxonomy allows investors to assess the products and their alignment with the Paris Agreement goals, for instance.

3.1. Industries defined according to the taxonomy

Looking closely to what is described in the European Commission's taxonomy (2020), an economic activity is considered to be sustainable when, cumulatively, :

- makes a substantial contribution to at least one of the six environmental objectives identified in the taxonomy regulation, that are 1) climate change mitigation, 2) climate change adaptation, 3) sustainable use and protection of water and marine resources, 4) transition to a circular economy, 5) pollution prevention and control, and 6) protection and restoration of biodiversity and ecosystems;

- if it aims to achieve one or more of the previously stated objectives, it must not cause substantial detriment to any other environmental goals of the European Union;

- and, also, complies with the minimum social safeguards, defined in the United Nations Guiding Principles on Human Rights, the OECD guidelines and International Labour Organization core labour conventions.

Given the aforementioned criteria, there are three distinct designations for economic sectors/industries, reflecting their progress in transitioning to a fully green economy: i) sustainable activities, meaning that they make substantial contributions to the environment; ii) enabling activities, referring to the activities that enable others to reach their environmental goals by contributing with their own products and/or services; and iii) transition activities, characterized with very high levels of greenhouse gas emissions, not complying with any of above-mentioned conditions set by the European Commission.

A straightforward example of a sustainable activity is the renewable energy sector. Gilchrist et al. (2021) provide the following example to differentiate enabling activities from the transitional ones: "using solar panels to generate electricity is an example of a transitional activity, while producing the solar panel itself is an example of an enabling activity (Gilchrist et al., 2021, p. 12).

Currently, most economic sectors are considered transition sectors, according with the European Commission's taxonomy– "[t]hese sectors in particular are very capital-intensive and have long-term investment cycles (…) [and] new investments run the risk of a lock-in of emission-intensive technologies, which can lead to stranded assets for investors" (Schütze et al., 2020, p. 492). Schütze et al. (2020) state that, for instance, the industry of the 'basic materials' (such as steel and cement production) does not yet have a path to climate neutrality and should, therefore, be considered a transition sector.

3.2. Taxonomy and other disclosure regulations

The European Union's taxonomy has had an impact in the implementation of the Sustainable Finance Disclosure Regulation (SFDR), established in 2021, which imposes "mandatory ESG disclosure obligations for asset managers and other financial market participants (…) [by] extending the already existing disclosure requirements" (Brühl, 2021, p. 326). The SFDR, was put in place to complement the already existing taxonomy by focusing on the transparency and disclosure aspects of green transactions, which is something heavily criticized as lacking in the European Commission's taxonomy.

According to Brühl (2021), this SFDR regulation adds on to the already existing requirements by instructing the disclosure of sustainability risks related to investments by managers and financial advisors and of principal adverse impacts (PAIs) on sustainability factors which could influence the investors' decisions; by enforcing the disclosure of information regarding a company's sustainability risk during its investment process; and demanding a more in-depth information of a company's products and services and on how they promote environmental and social features, highlighting their alignment with the European Commission's taxonomy's principles and guidelines.

On the other hand, the taxonomy regulation does not go into depth regarding the key performance indicators (KPIs[4]) related to financial institutions' turnover, capital and operational expenditures (whether these institutions be banks, asset managers, investment firms, insurance and reinsurance firms). Instead of only glazing over the KPIs, the Disclosure Delegated Act "provides precise definitions, calculation methods and reporting requirements for each KPI (…) [and] specifies the content, methodology and presentation of information to be disclosed by [both] large financial and non-financial companies on the share of their business, investment or lending activities that are aligned with the EU taxonomy" (Brühl, 2021, p. 326-327).

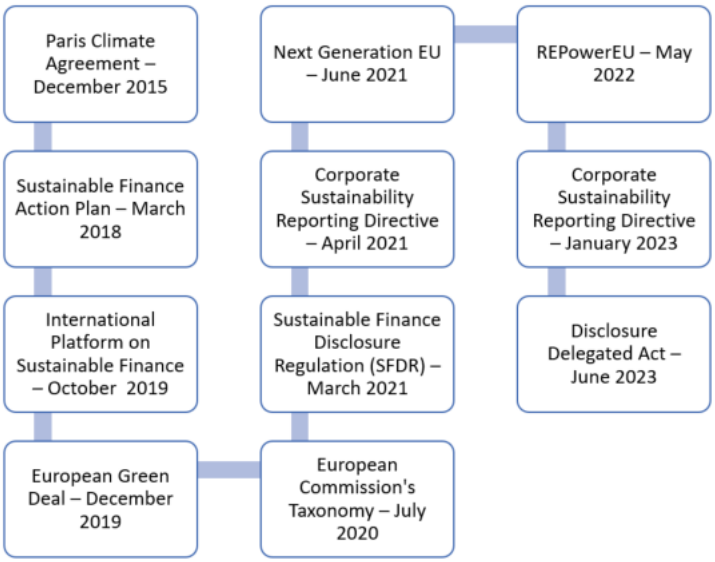
Given the above, the Disclosure Delegated Act comes as a helpful tool to the taxonomy and allows investors to fairly evaluate financial institutions' environmental performance in light of the taxonomy guidelines. Financial institutions, on the other hand, would need to disclose further information. Assets managers and investment firms would need to reveal the percentage of taxonomy-aligned investments made; credit institutions would need to disclose the amount of exposures to taxonomy-aligned assets, in comparison to the rest of the assets (the green asset ratio); and banks "have to disclose the allocation of their trading book and the proportion of their fees and commission income derived from taxonomy-aligned activities of their clients. Similar obligations apply to insurance and reinsurance companies, for example to disclose the taxonomy-aligned proportion of their underwriting and investment activities" (Brühl, 2021, p. 327).

[4] KPIs stands for "Key Performance Indicators" and are a measurable and quantifiable metric which helps to audit progress towards a specific goal, identify strengths or weaknesses and optimize performance to the fullest

On April 21st, 2021, the European Commission approved the establishment of the Corporate Sustainability Reporting Directive, which main proposal was to expand the sustainability reporting to a larger number of companies, since the previous directive (the Non-Financial Reporting Directive), in place since 2017, only focused on the disclosure of certain business-related aspects. Moreover, this directive is set out to be in line with the taxonomy guidelines and principles, as well as the Sustainable Finance Disclosure Regulation (SFDR) and become an additional tool to guarantee transparency and a standardized mechanism in the European financial system, which would enable investors to make wiser and better-informed decisions, for instance.

Below (Figure 6) it is possible to find a summary of all the European Union's initiatives in chronological order, to better understand and visualize their work and commitment to the climate change issue at hands.

Figure 6 – Chronology and summary of different legislative acts and initiatives within the European Union



Source: own elaboration

3.3. Green bond standard

The European Commission's taxonomy is also having an important impact on the creation of a European Green Bond Standard, which, in turn, would not only help broaden the reach of green finance, but also create conditions to facilitate green investment. This framework was first proposed by the European Commission on July 6th, 2021.

The green bond market has been experiencing an exponential increase worldwide and, according to Brühl (2021), reached a total issuance of USD 270 billion in the last five years alone, which corresponds to an annual growth of around 60%. However, there has been a big concern with the attempt

of greenwashing by private entities and, therefore, the International Market Association came up with the Green Bonds Principles in order to mitigate this matter (as it has been mentioned before).

Despite being widely used as a reference in Europe, the Green Bonds Principles serve more as a list of green economic activities and industries which are considered as advisable to invest on via green bonds, not establishing however any criteria or regulation on to how navigate this new financial market. Given this, the European Union plans on establishing the European Union Green Bond Standard, where bonds would be qualified as green when its proceeds are entirely directed towards sustainable economic endeavours in line with the Taxonomy Regulation. Furthermore, the issuer is required to provide an annual report detailing the utilization of the funds in a European Green Bond Allocation Report.

Moreover, and in order to guarantee full transparency and compliance, external assessments by the European Securities and Markets Authority would be necessary. This authority would also be responsible for publishing evaluations before and after the issuance, assessing the utilization of the revenues from the green bonds. Lastly, "a European Green Bond Impact Report on the positive and potentially negative environmental effects of the activities has to be prepared at least once during the maturity of the bond. These strict criteria are designed to foster market integrity by avoiding greenwashing, enhancing investor confidence and issuer transparency" (Brühl, 2021, p. 328).

3.4. Criticism over the European Commission's taxonomy

Despite its stated' goals, the European Commission's taxonomy is considered by some scholars to be lacking some important aspects and is considered a 'work in progress' – so much so that the Commission itself has introduced new directives to atone for this situation. However, one of the main criticisms that has been pointed out by authors and scholars alike is the lack of distinction between what are considered green activities and brown activities. Afterall, "[a]s it is currently formulated, the Taxonomy tells us which activities are green, but not necessarily which are at risk of causing significant harm. Nor does it identify those which may have a negligible impact on the environment" (EU Platform on Sustainable Finance, 2021, p. 9)

It is important to start by remarking that the three categories into which the European Commission divides economic activities (sustainable, enabling and transitioning) are all considered to be green activities and, therefore, advisable for investment. However, the taxonomy does not state nor identify which economic sectors and industries are considered brown activities which ends up leaving room for companies to take advantage of and greenwash their brand.

Gabor (2021) states that the taxonomy should ensure a complete definition of what brown activities are and that, on the other hand, the definition of green activities should only include activities that are already low-carbon or enable low-carbon investments and not include those that are on the

transition level. Moreover, the author states that "non-green activities should be assigned a degree of brownness. Transition and enabling activities would qualify as 'lowbrown', with the remaining activities 'high brown'. The European Commission should commit to a clear and tight timeline to develop the green/brown taxonomy within the Renewed Sustainable Finance initiative" (Gabor, 2021, p. 4).

Since the taxonomy is not a mandatory guideline, private entities are able to choose between the taxonomy and private ESG (Environmental, Social and Governance) frameworks, which in itself is subject to criticism as well. Private ESG frameworks do not follow standardized methods and are based on unshared data, which can impact the performance-related assessments and allow for greenwashing by not providing full transparency to the investors regarding the assets they are investing on. Since the taxonomy intends to prevent greenwashing and provide a standardized criteria in the green finance market, becoming mandatory would mean that private entities are not able to choose which framework 'fits them best'.

Following this last point, it is also true that the taxonomy thresholds can be stricter when compared to any set of criteria previously used (for instance from the ESG) in order to evaluate economic activity's level of sustainability, which disincentivizes the voluntary adherence from private entities, who prefer to follow their own (more lenient) ESG criteria.

Given the above, it is important to readjust the thresholds in the current taxonomy since if they are too strict it could result in fewer sustainable investments and/or a rise in financing costs; and if thresholds are too loose, they can lead to "carbon lock-in effects", which would mean that activities characterized with high emissions, fossil fuels and technologies would become irremovable from society.

Furthermore, some authors do believe that the European Commission's taxonomy should go one step further and create an "exclusion list" where it would name the economic activities that could be replaced by more sustainably and technologically available alternatives, not only informing investors of industries that should not be invested in, but providing an immediate and more sustainable alternative where they could invest (Schütze et al., 2020).

It could be argued that the European Commission's taxonomy could also be a useful instrument to encourage top management in the private sector to ensure that their companies comply with the target for the reduction of greenhouse gas emissions, or even lower. Since the taxonomy sets the technical criteria and the corresponding targets necessary to reach in order to evaluate and measure the performance (in sustainable and environmental terms) of companies, most of them public-listed – these results would influence their market reputation and, consequently, the remuneration of top management.

This instrument/method of criteria-setting then indirectly encourages the management of companies and industries to comply with the sustainability targets that the European Union has agreed

to reach. However, because this instrument is of indirect nature, and since it is not guaranteed that a company's market reputation and market value would decrease as a consequence of the non-compliance of the taxonomy's criteria and EU targets, it is not possible to guarantee that top management would in fact take the necessary action and that this instrument would be successful.

Despite all programmes and initiatives taken by the European Union, it can also be argued that there are additional instruments that could be applied and perhaps with more efficient and accelerated results, especially when looking into the ambitious programmes, plans and deadlines the European Union has signed and agreed with. Apart from the taxonomy initiative, and according to Brühl (2021), the European Union could start by implementing tax incentives, for instance "allowing accelerated depreciation schedules for green capital expenditures in the industrial sector*"* (Brühl, 2021, p. 329) to the private sector to foment interest and perhaps increase the amount of green investments.

The European Union might also contemplate an additional measure called the "green supporting factor." Under this proposal, banks could potentially face reduced capital requirements when issuing green loans, leading to lowered financing expenses for environmentally friendly investments. Conversely, for loans to carbon-intensive industries, the requirement for capital commitment would likely increase in comparison.

Naturally, the aforementioned regulation is expected to greatly appeal to commercial banks, prompting them to prioritize green loans over non-environmentally friendly ones. Nevertheless, implementing such a "green supporting factor" would essentially signify a shift from the fundamental risk-based capital regulation for banks and other financial institutions, which was put in place in the aftermath of the financial crisis.

4. The European Central Bank

The ECB has as a main responsibility to guarantee price stability throughout the Eurozone (in accordance to the Treaty on the Functioning of the European Union, Article 127), this same Treaty also states, however, that "[w]ithout prejudice to the objective of price stability, the ECB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union" (Dikau et al., 2020, p. 6), meaning that it is within the ECB's goals to guarantee sustainable development, and other environmental objectives, based on economic growth and price stability.

Besides the implementation of monetary policy, mainly through the definition of short-term interest rates (which influences the borrowing costs and, consequently, controls spending and investment), the ECB has other tools at its disposal in order to control and guarantee a stable inflation in the European Union. Some of these tools include the following:

- Monetary policy operations – with open market operations, such as buying and selling government securities, the ECB is able to influence the money supply and interest rates;
- Reserve requirements - by altering the reserve requirements for commercial banks, the ECB can influence the amount of money banks can lend, thereby affecting the overall money supply and inflation;
- Forward guidance - the ECB provides forward guidance to signal its future policy intentions, which can influence market expectations and shape inflationary pressures;
- Asset purchase programmes - by engaging in quantitative easing (QE) programmes, the ECB purchases assets like government bonds and corporate bonds to increase the money supply and stimulate economic activity;
- Macroprudential policies - the ECB can use macroprudential tools, such as setting limits on loan-to-value ratios and debt-to-income ratios, to manage systemic risks and prevent financial imbalances that could contribute to inflationary pressures.

In addition, by conducting the extraordinary policy of QE programme, the ECB also focus on offsetting its unavoidable emissions. Since 2018, the ECB has looked after carbon credits certified by Gold Standard and Verified Carbon Standard to counterbalance its documented greenhouse gas emissions. These selected carbon credits are utilized in sustainable projects worldwide.

In 2022, the purchased credits, aimed at offsetting the 2021 residual carbon footprint, contributed to initiatives such as the installation of boreholes for clean drinking water access, thereby enhancing the health and well-being of local communities. Additionally, the credits supported a project facilitating access to clean and affordable energy through the development of a regional wind farm. In 2022, the ECB continued this approach to offset its residual carbon emissions (European Central Bank, 2023).

Moreover, and very importantly when talking about green finance, the ECB also defines the criteria for eligibility of assets which are used as collateral for loans. Here lies an opportunity to include green goals in the ECB's policy, by allowing green bonds to be eligible as to be used as. Simultaneously, the ECB can also incorporate climate risk assessment into its collateral framework and commercial banks, by being obliged to disclose their exposure to climate risks, could see some assets eligibility as collaterals diminish.

However, and despite the role that the ECB, and central banks in general, may play on climate change and on the financial system (which will be explored in the section below), it is not always clear how climate change may impact monetary institutions and policies. Three possible groups of climate-related risks affecting the financial systems can be: physical, transitional and liability risks (Dikau et al., 2020).

Physical risks are related to natural environmental events (such as floods or droughts) that may directly cause damages to the economy, depreciation of capital stock, as well as the disruption of international production, companies, sectors and financial stability. Secondly, transitional risks describe the inevitable risks associated with "the transition from the current economic system to a decarbonized economy" (Breitenfellner, Pointner and Schuberth, 2019, p. 59), which will imply policy and price variations and instability. Lastly, liability risks encompass environmental-related risks that arise from uncertainties regarding potential financial losses and claims for compensation resulting from damages caused by natural hazards linked to climate change.

In spite of the ECB's primary goal of maintaining low and stable inflation through appropriate monetary policies, as mentioned in the beginning of this chapter, this approach should also foster sustainability within the financial system. (Dikau and Volz, 2020). Hence, it is crucial for central banks to integrate a climate change-focused agenda into their mandates, as they serve as a vital catalyst for promoting the integration of green finance across the board.

Benoît Cœuré (2018), former member the Executive Board of the ECB, does not entirely agree that the ECB should put the environmental objectives ahead of economic stability and disputes the argument presented above by stating that, instead of focusing on guaranteeing that environmental objectives are met, the ECB could redirect its resources on promoting industries that will guarantee the maximum employment growth and, consequently, economic growth. However, he admits that climate change will still affect monetary policy, which can "complicate the correct identification of shocks relevant for the medium-term inflation outlook, […] increase the likelihood of extreme events and hence erode central banks' conventional policy space more often, and […] raise the number of occasions on which central banks face a trade-off forcing them to prioritise stable prices over output" (Cœuré, 2018).

Tilburg and Simić (2021) present a different approach, since they believe that maintaining a stable climate and reducing environmental effects may be a precondition to guarantee price stability in

the medium/long term. Moreover, they believe that "the ECB needs to extend its current time horizon as the Treaty does not limit its obligation to safeguard price stability to a particular (limited) time horizon" (Tilburg and Simić, 2021, p. 3). These authors claim that even though the EU Treaty does not establish a timeline when it comes to price stability-related policies, they tend to present monetary policies which are focused in the future 2 to 3 years, due to the nature of the traditional factors which affect the prices.

On the other hand, when it comes to the influence that the physical and transitional risks may impose on price stability, the ECB may be forced to look further ahead the timeline when implementing its policies. "For instance, if it were to decide that climate change is a big enough threat to price stability in the long term, the ECB may deploy its monetary powers to help mitigate this threat. It could even accept higher inflation in the short and medium term if that would help prevent a much worse price instability in the long term" (Tilburg et al., 2021, p. 9).

Tilburg et al. (2021) also observe that throughout history several reconstruction projects, which were supported by the large involvement of central banks, culminated in a low inflation, which resulted in the following two corollaries: "targeted investments into productive capacity do not necessarily lead to high inflation periods (…) [and] "macroeconomic shocks can be sudden, large, unpredictable and incompatible with price stability, rendering central bankers incapable of achieving their primary objective [which] could induce the ECB to take on a precautionary and proactive role and mitigate the worst effects of climate change before they manifest themselves" (Tilburg et al., 2021, p. 11-12). By observing this, the authors are stating that it is possible to guarantee low inflation (which is ECB's main goal), whilst tackling environmental issues and its consequential risks.

4.1 The impact of climate change on monetary policy

"Central banks and other financial regulatory authorities can influence investment decisions and the allocation of resources and credit through a number of different policy implementation instruments. Their regulatory oversight over money, credit, and the financial system puts central banks in a uniquely powerful position that enables them to incentivize or direct resources away from carbon-intensive sectors and towards green investment" (Dikau et al., 2020, p. 14). The ECB is no exception and is also capable of influencing and redirect investment decisions towards green activities, via its monetary policies and tools.

Since the ECB, and central banks in general, rely so heavily on monetary policy to keep their objectives and mandates (namely price stability), it is important to examine how climate change impacts this policy and, more specifically, evaluate how physical and transition risks impact price stability.

Since climate change can result in extreme weather events, which are becoming more frequent and severe, economic activities and financial markets can negatively be influenced. This instability resulting from climate change poses challenges for central banks, including the ECB, impacting their capacity to ensure price stability, the overall economic growth rate, and subsequently, the formulation of effective short and long-term policies.

Batten, Sowerbutts and Tanaka (2016) state that a natural disaster derived from weather-related causes can lead to a reduction in effective labour supply growth since there is an imminent reduction of labour productivity and supply directly linked to the reduction of the population's performance and the increase of mortality and diseases amongst the human capital, respectively – these two consequences are caused by the extreme weather events, such as extreme heating, cold or flooding.

Secondly, extreme weather events will also have a negative impact on the productivity rate of capital accumulation, due to long term damage of production resources (such as human capital and land), and/or the increase in the capital depreciation rate. These negative impacts on the overall productivity will, according to Batten et al. (2016), lead to a decrease of the growth rate of the world economy.

Finally, the authors affirm that there will also be a decrease in the total factor productivity growth rate, since companies will prefer to direct their research and development budget onto the climate change adaptation. As a consequence, there will be less productivity gains in companies (and the overall economy) leading, once again, to a slower or even reduction of the overall economic growth rate.

Moreover, Batten et al. (2016) claim that the three above mentioned effects, which are an inevitable result of climate change, can "potentially lead central banks to misjudge the evolution of the output gap and inflationary pressure. However, the impact of these effects in the first half of the 21st century could be modest, as the increase in global temperatures itself is likely to be limited during this period" (Batten et al., 2016, p. 23). Given this, the authors state that central banks and the ECB may not have to take these ramifications into account in their monetary policies so soon.

Notwithstanding the above, when a natural disaster hits a country/region, and in case it results in the destruction and/or significant reduction of capital stocks, then there could be an increase of aggregate demand – this positive output gap creates and upward pressure on inflation, leading to a more conservative and tightening monetary policy from the central banks. On the other hand, and in case an environmental disaster has a negative impact on demand and on output gap (where households, companies and drastically reduce their consumption and investment), then central banks will implement a less conservative monetary policy.

Extreme weather and climate-related events, which lead to the disruption of supply chains will inevitably affect the goods and services' production, their allocation and availability to consumers. This chain of events translates into increased volatility in output and prices, meaning that central banks have

to face the difficult task of guaranteeing a stable inflation and, at the same time, economic growth, which will then lead to adjustments to the monetary policy in place.

More specifically, and regarding inflation, natural disasters are often associated with the impact they have on agricultural products and their prices, especially in countries that import food (situation which can be exacerbated if the countries exporting the products implement protectionist measures in order to keep their domestic food prices lower). However, since this price and inflation volatility is expected to exist only on the short term, central banks do not have "to react to it if the price moving is a flexible price and hence it does not induce distortions in the allocation of resources and the effects on inflation is short-lived and monetary policy cannot affect inflation over that horizon" (Batten et al., 2016, p. 25-26).

Given the above, it is important to note that central banks in countries with less well-established credibility "where sectoral price shocks risk de-anchoring inflation expectations and triggering a second-round effect that increases inflationary pressure in the medium term" (Batten et al., 2016, p. 26), the volatility of prices can become an extra burden.

Given all the above, and considering the impact that climate change can have on the economy and the stress it may cause over the central banks' monetary policy, it is important that they take a step back a re-assess the current policies being implemented and try to incorporate climate-related risks into its frameworks, for instance, integrate climate objectives in monetary policy operations, collateral frameworks and risk assessments.

4.2 The role of the European Central Bank

Central banks, including the ECB, may implement monetary policies which will actively and directly impact climate change and a low-carbon economy. Krogstrup and Oman (2019) mention that the ECB should go one step further and adapt ESG criteria in their overall asset purchases and even consider adding green assets to their corporate portfolios, whilst eliminating high carbon assets at the same time - this process is referred as "green quantitative easing".

Further to the above, it has already been mentioned in this thesis some of the instruments that can be, and are, implemented by the ECB as part of their climate change initiative. To begin with, the ECB has supported the issuance of and purchase of green bonds as part of its asset purchase programme, which, indirectly, promotes the investment in green and environmentally-friendly projects and economic sectors.

Moreover, the ECB has also been analysing how they can incorporate sustainable goals into its collateral framework, by updating its eligibility criteria. This tool can have an impact over the

attractiveness of green projects and the commercial banks' willingness to finance them. In addition, the ECB has been investing, researching, and conducting stress tests that can evaluate the resilience of the financial sector to climate-related risks (as the ones explained above) and intends to better understand how it can overcome and potentially avoid these risks (ECB, 2022).

Notwithstanding the above, and to this day, financial markets still have a tendency to allocate capital towards carbon-intensive activities and, ultimately, the portfolios purchased in asset purchase programmes are mostly carbon intensive. (Krogstrup et al., 2019). In fact, 62,1% of the ECB's corporate bond purchases constitutes of manufacturing, electricity and gas production related assets, which in turn are sectors "responsible for 58.5 % greenhouse gas emissions, in the euro area (ECB, 2021).

The ECB announced in 2021 that it is planning "to incorporate climate change considerations in their corporate bond holdings under their monetary policy portfolios" (ECB, 2021, p. 18). It is important to note, however, that corporate bond holdings represent a small share of the overall asset portfolios of the ECB and, therefore, these changes will have a limited and small impact on the greening of the financial markets. Nonetheless, these measures can represent an important step of encouragement and stimulation for other central banks to take similar approaches with their policy portfolios, as explained above.

The New Economic Foundation (2020) believes that the ECB can expand and make more sustainable their Targeted Longer Term Refinancing Operations (TLTRO), which are mechanisms where the ECB provides cheaper loans to banks who, in turn, must prove they are stimulating more lending to private entities. However, and as previously explained, there can be a bias in the financial market and, in the event where the ECB were to bet on more sustainable TLTRO, it is possible that the lending of commercial banks to households and businesses, under these operations, does not distinguish between carbon and non-carbon-intensive sectors. According to these authors, here lies an opportunity for the ECB to promote green investment by guaranteeing that only activities who are aligned with the objectives of the Paris Climate Agreement and European Green Deal can obtain the loans from the commercial banks which were subsidized by the ECB.

Lastly, the ECB has emphasized the significance of persistently integrating climate-related risks into its monetary policy, economic models, and associated risk evaluations. This approach enables a deeper comprehension of how climate change can impact inflation and the broader economy. Moreover, the ECB aims to facilitate green finance and foster the transition of the financial system into an environmentally conscious, effective, and robust entity.

4.3 Criticism over the role of the European Central Bank

In the previous chapter, "*4.2 The role of the European Central Bank*", several areas and steps have been identified where the ECB could enhance its current policies. Notwithstanding, several authors and institutions have criticised the ECB's overall slow and hesitant involvement in the fight of climate change.

For instance, Client Earth (2021), which is an environmental law charity, claims that it is imperative that the ECB starts by excluding brown bonds, bonds issued by brown activities or activities who have a high transition risk, from its corporate asset portfolio; they also criticise the ECB for not excluding from their portfolio any bonds or assets issued by companies who are not willing to align with the Paris Climate Agreement by January 2023, and take the necessary measures to accomplish such goals; and finally they believe that the ECB should "[s]et a comprehensive strategy to align its monetary policy portfolios and activities with the Paris Goals and EU emissions reduction targets" (Client Earth, 2021, p. 2).

Looking a little closer, the Client Earth organization explores how the continuance of purchase of brown and greenhouse gas intensive assets by the ECB goes against the goals of the Paris Climate Agreement and the European Green Deal previously mentioned, but also exponentially increases the ECB's vulnerability (and of its balance sheets) to climate-related risks. This situation could potentially create price instability, which would go against the ECB's main and most important economic goal. By implementing the three approaches mentioned in the previous paragraph, the ECB would potentially eliminate subsidies to companies which are not aligned with the goals of the Paris Agreement and it would provide bigger transparency in the assets markets and improve the overall standards.

The New Economic Foundation (2020) tends to agree with the previously mentioned actions that should be taken by the ECB, adding that they should encourage, to the best of their abilities, a more sustainable and more Paris-aligned bank lending programme; create a closer relationship with the European Investment Bank in order to support green investment; and apply measures that will maintain the European banking sector more stable and prepared to face climate risks and the reduction of brown financial flows, whilst leading "by example on climate disclosures and transparency by assessing and regularly communicating to elected officials the alignment of its operations with the Paris Agreement and that of the European banking sector" (The new economics foundation, 2020, p. 2).

Lastly, Gabor (2020) identifies what can become a common struggle between the European Commission's Taxonomy and the ECB's role in the mitigation of climate change. Since there are no well and strict definitions for different "shades" of green and brown sectors in the Taxonomy (as we have previously seen), the ECB may misidentify green financial assets and instead of transforming its balance sheets into green ones, it can in fact subsidise greenwashing and appropriate assets which may bear physical and transition risks. Instead, Gabor, states that "the ECB should green its balance sheet,

and advocate for sustainable finance regulations that combine a green supporting factor with brown penalizing factors calibrated according to the [respective] degree of brownness of the assets" (Gabor, 2020, p. 5).

This last point is especially important since the European Commission's lack of preciseness in its taxonomy, can have a strong impact over the ECB's role with the preparation and respective application of the most appropriate monetary policies and/or other instruments. Since the European Commission's taxonomy does not present a clear definition of the different shades of both green and brown activities, the ECB may not be able, or can, at least, have some difficulties in correctly identifying green financial assets, which are appropriate for and deserve the investment.

Further to the above, it is easy to understand that the European Commission's work on the taxonomy heavily influences the ECB itself and it is, therefore, of extreme importance to make sure that the fragilities that both institution present are fixed. In this sense, it is extremely important that what has been pointed out as faults in the European Commission's and the ECB's policies/objectives need to be addressed and rectified as soon as possible in order to allow that green finance tools are correctly utilized by investors and its outcomes maximized and with the most effectiveness as possible (this way green finance can, in fact, become an ally of climate change).

Conclusion

Green finance first made an appearance in academic literature in 1991, however, it only became a popular concept almost two decades later, after the 2008 financial crisis. Despite not having a set definition, different scholars agree that green finance is a tool of reference, which intends to mitigate climate change effects whilst and by providing new profit opportunities, mobilised through the financial sector. It is also agreed that this tool should somehow be promoted by public policies, whether from a regulatory, fiscal or monetary stance.

It is possible to distinguish three different approaches, as proposed by Dziwok et al. (2021), when debating the application of green finance: the neoliberal, where the main drive and "decider" is the market itself and the private sector is the main target of any policies laid out; the reformist, where public policies take into consideration the environmental and social consequences; and, lastly, the progressive green finance where it is believed that it is fundamental and vital that global solidarity and interactions are a norm and that natural resources are globally available, whilst limiting its over-use.

After the 2015 Paris Climate agreement, climate change took a centre role in the world stage, and with it, green finance received more attention than ever before. At this meeting, it was defined the total amount necessary to invest worldwide (USD 95 trillion) in infrastructure (energy, transportation, telecommunications, etc.), until 2030. It is worth noting that around 60-70% of this investment should be applied in developing countries since these countries tend to focus on policies with (mostly) economic development in sight and, at this stage, environmental policies tend to not be of concern. In case this effort is not made, these countries may cancel out the progresses and accomplishments made by other nations when it comes to this topic.

The European Union has been committed to establishing programmes and initiatives to fight climate change and implementing environmental policies. In this sense, it has created several programmes aiming to reorient capital flows towards sustainable investment and to guarantee that the objectives set out in the Paris Climate Agreement are met. For instance, the European Green Deal, the Sustainable Finance Action Plan, and the Next Generation EU were designed taking in account the current environmental concerns and goals.

Through not just these programmes, but also various other endeavours discussed within the dissertation, the vital role of green finance as both a supporter and a leading actor in the battle against climate change has been markedly evident. After all, green finance is helping to provide a way to channel financial resources toward environmentally-friendly projects and economic activities, whilst assisting the financial markets in becoming more efficient. Green finance enables financial entities to expand their investment choices, contingent on their desired levels of risk and profitability. Consequently, investment in sustainable practices and eco-friendly economic activities proliferates on a wider scale.

Within the area of green finance, green bonds and loans are perhaps the most attractive/most well-known tools, since they function the same way as ‘standard’ bonds and loans (risks and structure, included), channelling its funds to green projects and programmes, such as renewable energy, recycling and green infrastructure.

Further to the above, central banks can play a major role in spreading the bond and loan markets, as well as implement other less-known green finance tools (such as green credit rating, green bancassurance, energy subsidy optimization, Power Purchase Agreements) and be a direct source of financing, namely by implementing carbon, climate and green infrastructural finance.

Conversely, the corporate sphere often allocates its resources to the implementation of green finance as part of its business approach. This is largely because of the strong connection between stock returns and green bonds. Essentially, when a company increases its issuance of green bonds, its stock returns tend to rise as well. This, in turn, amplifies the overall value of the company, highlighting its dedication to environmental sustainability and cultivating a favourable perception among investors, consumers, and stakeholders. This can enhance the company's reputation and create a more favourable market perception, leading to increased investor confidence.

Notwithstanding, due to the increase of interest surrounding green finance, there is also room for the increase in greenwashing from companies, which is “a form of misinformation often used to entice an aspiring green consumer [where c]ompanies promising to be sustainable, biodegradable, or environmentally conscious sometimes fail to meet the promises they make to consumers” (Gibbens, 2022). It remains a hard task to recognize cases where greenwashing is playing a part, since there are no global reporting standards regarding a company’s green-related activities – the fact that private companies are able to create their own and more lenient ESG taxonomies (instead of following a mandatory standardized one) enables them to escape from public taxonomies, which would have stricter parameters and guidelines.

Thus, green finance still faces some constraints which discourage investors from investing in these types of assets such as lack of a stable policy and regulatory framework, lack of visibility and disclosure on the eyes of the consumer and investor, low profitability and greenwashing. All these factors contribute to a sense of instability, unpredictability and uncertainty regarding the risks and long-term returns of such green investments (Reddy, 2018).

Given all the above, the European Commission has created a taxonomy where it standardizes the criteria and provides performance threshold/definitions in order to classify the activity’s/sector’s greenness in three groups: sustainable activities, enabling or transition activities. With this taxonomy, investors have easier access to the necessary information since they are now able to compare companies’ willingness to comply with the environmental guidelines. It is, therefore, possible to prevent (to a certain

extent) corporate greenwashing and, on the other hand, facilitate the distribution of public funding to the deserving entities (when applicable).

Despite being a step in the right direction, the European Commission's taxonomy is still lacking some important vital points. Since there is no distinction between green and brown activities, and the taxonomy only mentions the activities advisable for investment, there is space for companies to practice greenwashing and/or to take advantage over this gap. Additionally, and since the taxonomy is not mandatory, companies can choose between the taxonomy and their private ESG taxonomy/framework – this again, can lead to lack of transparency for investors and greenwashing.

Considering the three approaches highlighted above, the European Commission's taxonomy is an example of a neoliberal green finance tool. By creating this standardized taxonomy, the European Commission is simply offering a handbook with guidelines to investors and investees, however, no government is enforcing these rules into their domestic financial markets, meaning that market forces and private sector dominate the dynamics behind green finance instruments.

Apart from the European Commission, the ECB can also make use of its monetary tools and policies to promote green finance and promote environmentally friendly investment practices. The financial system can be impacted by climate changes, which increase risks (physical, transitional and liability risks), that can impair the overall economy, namely through the depreciation of capital stock, price variations and instability, amongst others. Given this, the ECB should target sustainable development and other environmental objectives along the goals of price stability and economic growth.

The ECB it is starting to incorporate climate-related risks and considerations within its monetary policies and risk operations, whilst supporting the issuance of and purchase of green bonds as parts of its asset programmes and expanding their collateral framework and respective eligibility criteria. At the same time, the ECB is conducting research and stress testing on the resilience of the financial market and its ability to withstand future shocks from related with climate change.

Despite the above, the majority of ECB's corporate bond purchases are still related with industries which emit high percentage of greenhouse gas emission in the euro area (manufacturing, electricity, and gas production). One way to contradict this pattern would be for the ECB to start implementing monetary policies such as adapt ESG criteria in their overall asset purchases and add green assets to their corporate portfolios and eliminate the high carbon assets ones (Krogstrup et al., 2019).

The ECB has in fact announced, in 2021, that it will "incorporate climate change considerations in their corporate bond holdings under their monetary policy portfolios" (ECB, 2021, p. 18), which could also serve as a means of representation and encouragement for other central banks to adopt comparable measures.

Most of ECB's green finance related tools (as described above), if not all, can fit into the reformist green finance approach since we witness a much more active role from this institution in supporting public environmental investment strategies and in the financial market itself, mainly via its monetary policy which intends to support green investments and activities.

In sum, this thesis concludes that green finance can indeed play a role in mitigating climate change, as it is able to mobilise important resources from both public and private sources, involving key policy areas and decision makers, at the fiscal, monetary and regulator levels. Indeed, its growth and recognition in the past few years shows how much governments and international institutions believe that the tools accompanying this concept are essential and indispensable to decrease States' dependence on carbon activities, being vital to shift towards green-friendly activities and economic sectors.

In the background of an overall growing interest in green finance, both the ECB and the European Commission are taking decisive steps towards the creation of a framework for green finance to operate at the European level, and the incorporation of its main principles in the prosecution of public policies. This thesis focused on two most examples of these efforts, namely the creation of a taxonomy by+ the European Commission, and the steps taken by the ECB to incorporate climate-related criteria in both its regular and non-conventional operations.

With that being said, it should be noted that green finance, as interpreted and incorporated by the European institutions, still faces some important constraints. As previously noted, the absence of uniform definitions, regulations and frameworks, market instability, fluctuations, and limitations on liquidity has significantly discouraged investors. These factors have a high impact on investors' ability to predict profitability and returns on their investments.

All of these limitations should incentivise regulators, governments and international organizations to invest on more research over climate change and how green finance can support the transition to a greener economy so that they can, on the one hand, have the necessary knowledge and expertise in green finance-related projects (which can often times be very complex) and, on the other hand, diminish the overall risks associated with green finance and improve the conditions available for investors and investees.

This thesis aimed to contribute to a better understating of a relatively complex (and loose) concept, of its importance and fragilities, in the specific context of the European Union. Going forward, it is important to reflect on and further analyse the ways in which the European Commission, the ECB, and central banks in general can intervene more effectively in the green finance market. After all, green finance can still improve and become an instrument of even greater impact and change in the global financial system.

Studying the necessary product adaptations and comprehensive analysis is crucial to enhance the accessibility of green finance, particularly for small and medium-sized enterprises. Presently, the accessibility of green finance remains predominantly limited to larger entities. This emerging concept holds significant relevance for our society's future, necessitating continuous research, development, and investment within this sector. Measures such as reducing minimal capital requirements for green lending, green bancassurance, implementing carbon taxes, establishing green credit ratings, and exploring central bank digital currencies (CBDC), for instance, require further exploration as they lack sufficient coverage in current literature. This pursuit is crucial not only for distinguishing between green finance and greenwashing but also for ensuring transparency for both investors and consumers.

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