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The Role of the European Central Bank in a Sustainable Financial System

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Abstract

The Paris Agreement acknowledged climate change as an urgent threat to the planet and human society. To fulfil the aim of limiting global warming, public and private investments and especially long-term investments are supposed to shift towards sustainable practices. Given the high investments required to pursue a sustainable financial system, it will be essential to involve the financial sector, as well as its participants and authorities. This thesis discussed the role the European Central Bank (ECB) could play in a transition towards a sustainable financial system. First, the framework conditions and the need for a sustainable financial system were explained, in particular the recent developments like for instance the introduction of the EU Taxonomy regulation, a classification system for sustainable activities which aims to provide clarity and limit the risk of green washing. After that, it was outlined how climate-related risks can spread to the financial system and why central banks are concerned of them. Three links for the relation between climate change and the financial system were identified – physical risks, transition risks and liability risks. In particular, the impact of climate change on price stability, financial stability and the portfolio management of central banks were examined. The objectives and the strategy of the ECB were described, to establish a base for the subsequent analysis of their instruments. Furthermore, the European Green Deal, an answer of the European Union to the challenges caused by climate change was presented.

Keywords: Sustainable finance; green finance; central banking; sustainability.

1. Introduction

In January 2020, the World Meteorological Organization (WMO) acknowledged the year 2019 as the second warmest year ever recorded. The WMO Statement on the State of Global Climate 2019 documented the physical symptoms of climate change as well as the impact on socio-economic development. In the context of this statement, UN chief António Guterres emphasized that the world is far away from reaching the 2°C target as determined in the Paris Agreement (see United Nations, 2020, p. 1).

In 2015, the European Union and 196 states adopted the Paris Agreement to establish the target of limiting global warming below 2°C above pre-industrial levels. In 2016, the countries have set themselves the goal of limiting the global temperature increase to 1.5°C (see IPCC, 2018, p. 8-10). The Paris Agreement acknowledged climate change as an urgent threat to the planet and human society. It aims "(...) to increase the ability of countries to deal with the impacts of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway." (United Nations Framework Convention on Climate Change , 2020, p. 1). With this objective, the Paris Agreement sends a clear signal to the financial markets that a profound change in global investment flows is required. To fulfil this aim, public and private investments and especially long-term investments are supposed to shift towards sustainable practices (see Thwaites, Whitley, Wright, & Ott, 2018, p. 1).

Thence climate change poses a challenge to financial institutions. In January 2019, the European Parliament appealed to the European Central Bank to consider environmental, social and governance (ESG) factors in its policies and to revise its program for the purchase of corporate sector securities "(...) to better support environmentally sustainable initiatives" (European Parliament, 2020, p. 1). The primary mandate of the European Central Bank is to preserve price stability and an inflation target of below, but close to, 2%. The Treaty on the Functioning of the European Union emphasizes the primary objective on price stability, but also states "(...) Without prejudice to the objective of price stability, the ESCB shall support the general economic policies

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in the Union with a view to contributing to the achievement of the objectives of the Union(...)" (Estella, 2018, p. 78).

Consequently, a debate has arisen as to whether the European Central Bank should take the aspect of sustainability into account in its policies. This thesis will therefore approach the research question: "What role can the ECB fulfil in a sustainable financial system?".

First, the framework conditions and the need for a sustainable financial system will be explained. Afterwards, the effects of climate change on the financial system and particularly on central banks are evaluated. After a short introduction of the European Green Deal, the objectives and strategy of the ECB will be described to establish a base for the subsequent analysis. Different instruments in the areas of the ECB will be analysed with regards of the objective to support a transition towards a sustainable financial system. Subsequently the restrictions of the ECB to contribute be discussed. Eventually a qualitative approach to value the introduced instruments will be drawn and applied to two instruments.

2. A sustainable financial system

The term "sustainable" is defined as the quality of causing little or no damage to the environment and therefore able to continue for a long time (see Cambridge Dictionary, 2020, p. 1).

A "financial system" is described as a complex interaction of markets and institutional units, with the purpose of mobilizing funds for investment and providing facilities for the financing of commercial activities (see International Monetary Fund, 2004, p. 12).

At this point in time, there is no single definition of a "sustainable financial system". According to the European Commission, the term refers to the consideration of environmental and social considerations in investment decisions. The inclusion of this criteria leads to more investments in long-term and sustainable investments (see European Commission, 2018b, p. 2). The environmental considerations are specifically about adapting to climate change and mitigating its consequences. They also refer to general environmental aspects, like carbon dioxide pollution. Social considerations can relate to issues like inequality and employment and investment in people and communities (see European Commission, 2018b, p. 2). In 2018, the European Commission published an action plan for a more sustainable financial system, addressed to the major EU institutions, including the European Central Bank. The action plan named "Financing sustainable growth" emphasizes that, to meet the targets of the Paris Agreement, major public and private investments are required to transform the economy of the EU (see European Commission, 2019a, p. 1). The European Commission Vice-President for the Euro and Social Dialogue, Valdis Dombrovskis, argues that "(...) Europe needs between € 175 to € 290 billion in additional yearly investment in the next decades. We want a quarter of the EU budget to contribute to climate action as of 2021. Yet, public money will not be enough (...) the EU has proposed hard law to incentivise private capital to flow to green projects." (European Commission, 2019a, p. 1). In line with the action plan, the European Commission established a Technical Expert Group (TEG) on sustainable finance (see European Commission, 2018a, p. 1). The TEG mainly consists of members from the academic; public; finance and civil society sector. Their mandate is to assist the European Commission, inter alia, in the development of an EU classification system (see European Commission, 2018a, p. 1). The first section of the plan aims for an EU classification system for sustainable activities. A uniform classification system within the EU should provide clarity, which economic activities can be considered as sustainable. The European Commission followed this approach with a proposal for a taxonomy regulation. A taxonomy is defined as a uniform procedure, with which objects are classified according to certain criteria into categories or classes (see Cambridge Dictionary, 2020, p. 1). In December 2019, the European Parliament and the Council arranged a political agreement on the taxonomy (see Council of the European Union, 2019, p. 2). The TEG on sustainable finance developed recommendations for relevant criteria of the Taxonomy Regulation, culminating in a final report, published in March 2020. The aim of the EU Taxonomy is to serve as a tool to help financial market participants to identify environmentally friendly investments (see EU Technical Expert Group on Sustainable Finance, 2020, p. 2-7). The EU Taxonomy specifies performance thresholds for economic activities which "(...) make a substantive contribution to one of six environmental objectives (...) do no significant harm (DNSH) to the other five, where relevant; meet minimum safeguards (e.g., OECD Guidelines on Multinational Enterprises (...)" (EU Technical Expert Group on Sustainable Finance, 2020, p. 2). The six environmental objectives consist of climate change mitigation; climate change adaptation; sustainable and protection of water and marine resources; transition to a circular economy; pollution prevention and control as well as the protection and restoration of biodiversity and ecosystems (see EU Technical Expert Group on Sustainable Finance, 2020, p. 19-25).

Furthermore, the Taxonomy Regulation introduces detailed new disclosure requirements for two different groups. All companies belonging under the scope of the Non-Financial Reporting Directive (NFRD) are already required to publish regular reports on the environmental and social impact of their activities. Additionally, they will have to reveal the extent to which they are aligned with the Taxonomy Regulation (see EU Technical Expert Group on Sustainable Finance, 2020, p. 27). Companies under the scope of the NFRD are approximately 6000 large public-interest companies each with more than 500 employees, including listed companies, banks and insurance companies (see European Commission, 2017, p. 1). All financial market participants offering financial products in the EU are obligated to make Taxonomy disclosures, with detailed information about the sustainability of underlying investments and their proportion of the whole investment, depending on the specific financial product (see EU Technical Expert Group on Sustainable Finance,

2020, p. 37).

In conclusion, there may is no single or legal definition for a sustainable finance system yet, but the European Commission considers a more sustainable financial system a key figure in the transition process to a low-emission, more resource-efficient circular economy and seeks to reform the financial system accordingly (see European Commission, 2018b, p. 1-4). The first step was taken with the development of the Taxonomy Regulation, which will ensure a uniform definition of sustainability and classification of sustainability in the financial system. The taxonomy for climate change mitigation and climate change adaptation is scheduled for 2020, its full application by the end of 2021. For the other objectives, the taxonomy should be set up by the end of 2021, the application is scheduled for the end of 2022 (see European Council, 2020: 1).

2.1. The link between climate change and the financial system

In the following section, the connection of climate change and the financial system will be examined in more detail. It will outline how the consequences of climate change can spread to the financial system and its participants like commercial banks; households; companies and insurers.

In 2015, climate change-related risks on the financial systems came to the fore after the Governor of the Bank of England, Mark Carney, delivered a speech named "The tragedy of the horizons". In his speech, Mark Carney defined three channels through which climate change can affect the financial system, particularly financial stability: physical risks, liability risks and transition risks (see Carney, 2015, p. 5-7).

Physical risks impact the society directly and have the potential to affect the economy: because of climate change, the world experiences extreme weather events like flooding, droughts and storms (see Bank of England, 2015, p. 4). Physical risks can spread to the financial system through the disruption of global supply chains, as well as through the damage of property of companies. An example therefore are the Thailand floods in 2011, adding up to an economic damage of US$45 billion and US$12 billion in insurance claims as well as the closing of over 10.000 manufacturing companies due to property damage (see Bank of England, 2015, p. 29). If the possible impacts from physical risks are insured, this has a direct effect on the risk management behaviour of insurance companies. If the demand for weather-related insurance rises, insurance companies need to increase fees to have a sufficient pay-out buffer (see Bank of England, 2015, p. 28). Andrew Howard, Head of Sustainable Research at Schroders Investment Management, identified oil & gas, utilities and basic resources as the sectors most exposed to the physical impact of climate change (see Howard & Hassler, 2018, p. 1). According to their study, the cost of insuring physical assets corresponds to more than 3% of their market values (see Howard & Hassler, 2018: 1). Apart from financial insurance companies, physical risks also have an impact on commercial banks. Another physical risk example would be the increase of credit losses due to an unpredictable, extreme weather event. Climate change can lead to increased credit risks for banks, therefore experts argue that banks should integrate climate-related risks into their risk management framework (see Diakatos & Bisisidis, 2020, p. 1). Institutional investors with large portfolios usually manage their risks through a balanced portfolio construction, including diversification, liquidity and asset selection (see Gründl, Gal, & Dong, 2016, p. 8). Physical risks pose a challenge on some of these investors since their well-established portfolio risk management strategies do not take into account the possible physical risks from climate change (see Benedetti et al. 2019: 21). All in all, for the financial system physical risks can be felt especially through consequences along the value chain for business customers, counterparties and equity holdings.

Liability risks are the risks that could emerge every day by parties who suffered consequences from climate change and consequently pursue compensation for their losses (see Carney, 2015, p. 6). The possible addressees can be environmentally harmful companies, but also insurance companies. A recent example is the Rhode Island's climate liability suit. The state of Rhode Island accuses 21 companies, who knowingly contributed to climate change and failed to reasonably inform Rhode Island citizens about the risks posed by their products (see Savage, 2019, p. 1). This example illustrates, that firms are also exposed to legal risks through climate change. Measuring liability risks is considered a major challenge because of the uncertainty and the variations in the different legal frameworks of different countries (see Bolton, Despres, Pereira da Silva, Samama, & Svartzman, 2020, p. 41). The Prudential Regulation Authority (PRA), a financial services regulatory body from the Bank of England, considers liability risk most relevant for general insures, because of the possibility of an increase of third-party liability claims (see Bank of England, 2015, p. 7). According to the European Central Bank, insurance companies are particularly important for a stable financial system, because they are large investors in financial markets and are often closely linked to banks, thus are likely to increase systemic risk (see European Central Bank, 2009, p. 160).

Transition risks refer to the financial risks that can occur when moving to a less polluting, low carbon economy (see Carney, 2015, p. 6). These include risks from regulatory changes and technological changes, who are implemented to pursue the target of decarbonisation (see Ferrer, 2019, p. 35). Examples for regulatory changes are strict emission limits as proposed in the Paris Agreement. Risks from technological changes refer to the speed of new technologies and the disruption of whole sectors that come with them, that may result in higher costs (see Carney, 2015, p. 11). Moreover, there is a risk of changes in demand and services in all sectors resulting from emerging consumer preferences, as the society becomes more sensitive to environmental and sustainability issues (see Ferrer, 2019, p. 35). For instance, if the policies of the government adopt the regulations of the Paris Agreement, a large proportion of fossil fuel reserves could not be used anymore. This would ultimately lead to changes in the

value of investments owned by banks and insurance companies in sectors like oil and gas (see Bank of England, 2017, p. 1). The Figure 1 below provides a summarizing overview of the mentioned risks and their potential impacts on the financial system.

After explaining the link between climate change and the financial system, the next section discusses the impact of climate change on central banks.

2.2. Climate change and central banks

Central banks implement the monetary policy and control the money supply of their nation, usually commissioned with the maintenance of a low inflation target. The current operations of central banks are often subject to frequent criticism, however their role within the economy is universally accepted (see Goodhart, 1995, p. 60). After the financial crisis in 2008, central banks worldwide injected more than USD12 trillion of extra cash into the financial system to propel economic recovery (see Goodman & McCormick, 2019, p. 1). Given the before mentioned immense investments required to swift towards a sustainable financial system, the public discussion arose whether central banks should occupy a central role in this challenge. This abstract briefly reviews recent discussions about the roles of central banks and their responsibilities.

2.2.1. The role of central banks

According to Mishkin (2005, p. 411) the six main goals of central banks and their monetary policy are high employment; economic growth; price stability; interest-rate stability; stability of financial markets, and stability in foreign exchange markets.

They can be divided into three main objectives: the maintenance of price stability, the maintenance of financial stability and the support of wider economic policy objectives (including economic growth and high employment). The financial crisis in 2008 sparked off a discussion about central banks and their inflation targeting strategy, contributing to the goal of price stability. Most economists believed that the best contribution central banks could make, was to focus on low and stable inflation rates (see Volz, 2017, p. 6). This assumption was underlined by the inflation targeting framework. The framework is characterized by the announcement of official target ranges for the inflation rate, fostering the acceptance of low inflation as the main goal of monetary policy (see Bernanke et al. 1997: 97). Following the financial crisis, financial stability shifted into focus. Thus, the inflation targeting framework has been criticized for "(...) failing to address concerns other than price stability and most importantly for its disregard of financial stability." (Volz, 2017, p. 6). Even when environmental objectives are not included by name in a central banks mandate, the inclusion of sustainability aspects may be considered to carry out the main goals, price stability and financial stability. In the following abstract, these arguments will be outlined.

2.2.2. Climate change and price stability

Climate change can affect price stability (see Batten, Sowerbutts, & Tanaka, 2016, p. 23). Physical and transition risks can influence the economy and the inflation performance. Climate-related shocks, like droughts and floods, can have an impact on monetary policy through supply-side and demand-side shocks (see Bolton et al., 2020, p. 16). Demand shocks are unpredictable events that increase or decrease the demands for goods and services, supply shocks increase or decrease the supply or cost of goods and services (see McKibbin, Morris, Panton, & Wilcoxen, 2017, p. 1). Climate change related extreme weather events can affect agriculture production and consequently food prices (see Volz, 2017, p. 9). A study from the European Central Bank states that natural disasters, particularly storms, can trigger a prompt increase in food price inflation for the first six months (see Parker, 2016, p. 25). Climate change policies like a carbon tax can affect energy production and energy prices (see McKibbin et al., 2017, p. 1-4). Both prices are components of inflation, and there is evidence that both prices are highly volatile (see Parker, 2017, p. 28).

These price changes can have indirect effects on core inflation (see Volz, 2017, p. 9). Core inflation is defined as the change in prices of goods and services without those from food and energy sectors (see Amadeo, 2019, p. 1).

Therefore, Volz (2017, p. 9) argues that "Factors driving food and energy prices thus need to be included in central banks' long-term inflation outlook analysis".

2.2.3. Climate change and financial stability

There are two main, before mentioned transmission channels through which climate change can affect financial stability.

First, financial stability can be impaired through the effects of extreme weather events and natural disasters, referred to as physical risks as explained in abstract 2.1. Secondly, the financial system can be impacted by the "(...) the uncertainties related to the timing and speed of the process of adjustment towards a low-carbon economy, including the impact of the related policy action and potentially disruptive technological progress on the asset prices of carbon-intensive sectors", referred to as transition risks (Giuzio et al., 2019, p. 1). Physical risks refer to the economic costs and financial losses caused by extreme weather events and the effects of long-term changes in the environment (see Bolton et al., 2020, p. 17). Through damages to assets, capital depreciation may take place, resulting in abrupt repricing of whole asset classes. As outlined in abstract 2.1, weather-related losses can affect the solvency of firms, insurance companies and households, and consequently the whole financial system.

Transition risks are the risks that are associated with mitigation challenges. They include policy and legislation changes, reputational impacts, technological limitations as well as shifts in market preferences (see Bolton et al., 2020, p. 18). To reach the climate targets of the Paris Agreement, a major part of fossil fuel reserves is required to stay in the

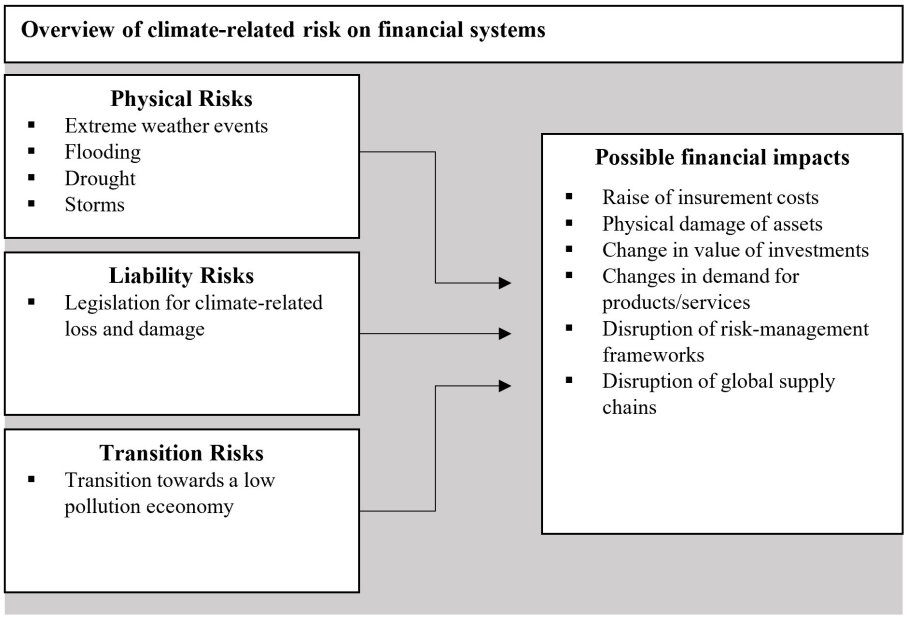

Figure 1: Overview of climate-related risk on the financial system (Own illustration)

ground (see Verkuijl, Piggot, Lazarus, van Asselt, & Erickson, 2018, p. 1-3). If these fossil reserves are not extracted, so-called stranded assets can arise (see Ivlevia, 2017: 1). Stranded assets refer to assets which "(...) suffer from unanticipated or premature write-offs, downward revaluations or are converted to liabilities (...)" (Ansar, Caldecott, & Tilbury, 2013, p. 9). These stranded assets pose a risk on companies that rely on fossil fuels, since these assets contain the risk of experiencing a devaluation or depreciation, that is not reflected in the value of the company (see Bolton et al., 2020, p. 19). Consequently, possible new regulations and legislation with the aim of decarbonizing will significantly impact carbon businesses.

A report by the Carbon Disclosure Project (CDP) states that out of 859 analysed companies, 75% consider transition risks as a major factor influencing their business in the future (see CDP, 2019, p. 1).

Carney (2016, p. 7) argues that an abrupt movement towards a low-carbon economy could significantly influence financial stability by destabilizing markets, as costs and challenges that come with regulations require a reassessment of asset values. In conclusion, the main risk for financial stability from climate change is a widespread fall in financial asset prices that could impact the financial system (see Fisher & Alexander, 2019, p. 16). Therefore, Volz (2017, p. 20) argues that these risks need to be addressed in the financial stability and macro prudential policy frameworks of central banks, at least to the extent that central banks have the task of maintaining financial stability.

2.2.4. Climate change and portfolio management

As outlined before, the effects of physical and transition risks may require reassessments of financial assets. Thus, climate change will also affect the investment portfolios under central banks' management. Investment portfolios under the central banks' vary depending on their mandates, but they may include policy portfolios; own portfolios; pension portfolios and third-party portfolios (see NGFS, 2019a, p. 7). Therefore Cecot (2019, p. 2) argues that central banks need to consider environmental, social and governance (ESG) risks in their portfolio management. Central banks are committed to consider the demands of third-parties for whom they may manage assets (see Cecot, 2019, p. 2). As public institutions, they "(...) would face reputational risk if they fail to address stakeholders' concerns related to climate change and if they don't lead by example." (Cecot, 2019, p. 2). To address this concern, the Network for Greening the Financial System (NGFS) developed a sustainable investment guide for central banks' portfolio management (see NGFS, 2019a, p. 1-21). The Network for Greening the Financial System is a global network of central banks and supervisory authorities. It was established in 2017 with the aim to contribute to the transition towards a sustainable, low-carbon economy and to analyse consequences for the financial system related to climate change. In April 2019, the NGFS released "A call for action", acknowledging climate change as a financial risk and providing recommendations for central banks, supervisors, policy makers and financial institutions to manage climate-related risks (see NGFS, 2019a, p. 1-4).

Apart from the financial system, calls for further climate action resulted in the European Green Deal, a concept from the European Commission, introduced in December 2019 (see European Commission, 2019b, p. 2). The main targets and areas of the European Green Deal will be outlined in the next abstracts.

2.3. The European Green Deal

The European Green Deal was presented by the European Commission by Ursula von der Leyen in December 2019. Its main aim is to reduce the net emissions of greenhouse gases in the European Union (EU) to zero by 2050, making it the first continent to become climate neutral (see European Commission, 2019b, p. 2). The European Green Deal belongs to the six priorities of the European Commission from 2019-2024. In the following abstract, the areas, measures and targets of the concept will be outlined.

2.3.1. Main aspects of the European Green Deal

"We are determined to tackle climate change and turn it into an opportunity for the European Union.", concludes Ursula von der Leyen, president of the European Commission, after introducing the European Green Deal, also referred to as the "roadmap" towards green transition, to the European Council in December 2019 (see European Commission, 2019b, p. 1).

The European Green Deal is a response to the climate challenges posed on the EU. It aims to transform the EU's economy into a resource-efficient with zero net emissions of greenhouse gases by 2050. To reach this target, in March 2020 the European Commission proposed the European Climate Law to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions. The European Climate Law contains a legally binding target of zero greenhouse gases by 2050 and measures to control the progress towards it (see European Commission, 2020a, p. 1-4). The Green Deal aims to divorce the growth of the economy from the use of resources (see European Commission, 2020a, p. 2-4). The natural capital of the EU should be safeguarded, as well as its citizens, from climate change related risks (see European Commission, 2019b, p. 22). The term "natural capital" refers to natural resources like air; water; soil; minerals; forests and plants (see Cantrell, 2020, p. 1). The Green Deal states that the transition that comes with it, needs to put people first, just like everyone who faces major challenges coming with it. Moreover, a close cooperation of citizens and EU authorities and institutions is required to enable a fundamental transition (see European Commission, 2019b, p. 20-22). A huge amount of public investment will be required to carry out the transition. The creation of a sustainable, financial system which facilitates sustainable investments is considered as essential. Further, the European Green Deal states that the EU can use its competences to encourage neighbouring countries to pursue sustainability goals and, where appropriate, form joint alliances (see European Commission, 2019b, p. 20-22). The main purpose here is to establish global standards for sustainability and to integrate climate issues into international relations (see European Commission, 2019b, p. 2; 9).

The Green Deal contains various policy areas for actions. The area of sustainable food systems pursues a sustainable agriculture in the EU by modernising agriculture with innovative technologies and following the Common Agriculture Policy (CAP), which supports farmers (see Stolze, Sanders, Kasperczyk, Madsen, & Meredith, 2016, p. 9). The policy area of clean energy focuses on the decarbonisation of the EU's energy system inter alia by integrating renewable energy sources (see European Commission, 2019b, p. 6). The area "Sustainable Industry" includes a new circular action plan that aims to modernise the economy of the EU, especially tackling resource intense sectors like steel and cement (see European Commission, 2019b, p. 7). Further areas include the protection of biodiversity; the elimination of pollution as well as the promotion of sustainable mobility (see European Commission, 2019b, p. 4-10). In May 2020, two core strategies of the Green Deal were introduced. The "Farm to Fork Strategy" is designed to make the food system of the EU more sustainable, inter alia by reducing the use of chemical pesticides and by a revision of the date marking in order to minimize food waste (see European Commission, 2020b, p. 1). The "EU Biodiversity Strategy for 2030" is intended to protect the biodiversity of the European Union, planned measures include the establishing of more protected areas of land and sea, the planting of 3 billion trees until 2030 and a zero pollution action plan for air, soil and water (see European Commission, 2020b, p. 1).

The figure below provides an overview of the main aspects and measures in the different policy areas. It shows, that two of the key points of the Green Deal are the financing of the whole transition as well as the mantra "Leave no one behind", which aims to foster the message of an inclusive Europe. In addition to that, the figure shows that the framework of the Green Deal is based on the enhancement of innovation and research.

In January 2020, the European Commission proposed a € 100 billion "Just Transition Mechanism", which includes three pillars – the "Just Transition Fund" (JTF), a just transition scheme as well as a public sector loan facility (see European Commission, 2020c, p. 1).

The Just Transition Mechanism is an element of the € 1 trillion investment plan for the Green Deal. In May 2020, they published details regarding the public sector loan facility in cooperation with the European Investment Bank (EIB). The facility will include € 1.5 billion from the EU budget and around € 10 billion in loans from the EIB.

For the JTF, the European Commission proposed € 10 billion from the EU budget and € 30 billion from the "Next Generation EU" fund (see European Commission, 2020e, p. 1). The emergency instrument "Next Generation EU" is a temporary measure to support the reconstruction of the EU, it increased the EU budget by additional € 750 billion (see European Commission, 2020d, p. 1).

After the presentation of the European Green Deal by Ursula von der Leyen, the president of the European Central Bank, Christine Lagarde, announced that she wants the European Central Bank to contribute more actively towards the challenges of climate change. She stated that the role of sustainability will be subject during the strategy review of the European Central Bank in 2020 (see European Central Bank, 2020b, p. 11). As a result, the public discussion emerged, whether the European Central Bank should intervene in the

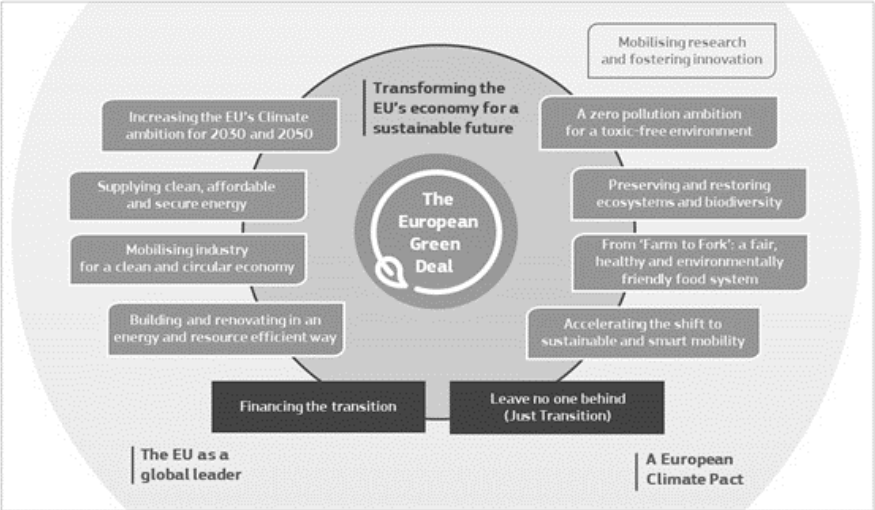

Figure 2: Overview of the European Green Deal (European Commission, 2019b)

fight against climate change or even include the topic of climate change in their strategy. To further investigate this topic, in the next abstract the objectives and the mandate of the European Central Bank will be outlined.

3. The possible roles of the ECB in a sustainable financial system

In the following, the possible roles of the ECB in a sustainable financial system will be discussed. Since there is widespread disagreement whether climate-related activities should be in scope of the ECB, the objectives, mandate and strategy of the ECB will be outlined first. Central banks can employ various policy instruments to pursue sustainability targets (see Volz, 2017, p. 20). The following section distinguishes four different policy areas, including central bank soft power, macro prudential regulation, micro prudential supervision and monetary policy. For each of the four areas, different policy instruments and tools, which could be introduced to support the transition towards a more sustainable financial system, will be discussed.

3.1. Objectives and mandate of the ECB

The Treaty on the Functioning of the European Union assigned objectives and a normative mandate to the ECB (see Thiele, 2013, p. 18). The Article 127 TFEU states that the primary objective of the European Central Bank is to maintain price stability (see European Union, 2012, p. 56). With the maintenance of price stability, the ECB can make the best contribution within their monetary policy to the growth of the economy and the creation of jobs (see European Central Bank, 2011, p. 7).

Price stability is not only the primary objective of the ECB's monetary policy, but also an objective of the whole European Union (see European Union, 2012, p. 303). Moreover, the ECB "(...) shall support the general economic policies in the Union (...) and act in accordance with the principle of an open market economy with free competition, favouring an efficient allocation of resources (...)" (European Union, 2012, p. 56). The Article 127 para. 2 TFEU defines four basic competences: definition and conduct of monetary policy of the Union, the operation of foreign exchange ports, the holding and management of the Member States' official foreign reserves and the promotion of the smooth operation of payment systems (see European Union, 2012, p. 56).

The Article 128 of the TFEU authorises the ECB to issue banknotes in the community. Banknotes issued by the ECB and national central banks are the sole banknotes having the exclusive status of legal tender (see European Union, 2012, p. 57). The TFEU also entrusts the ECB the responsibility for specific tasks concerning the prudential supervision of credit institutions. The ECB performs these tasks within a single supervisory mechanism (SSM) consisting of the ECB and the national competent authorities (see European Union, 2012, p. 56-58). To achieve its primary objective, the ECB pursues a monetary policy strategy, that will be outlined in the next abstract.

3.2. The strategy of the ECB

The monetary policy strategy is the general approach of the ECB to achieve its primary objective – the maintenance of price stability. The strategy establishes a comprehensive framework within which decisions are taken on the appropriate level of short-term interest rates (see European Central Bank, 2011, p. 55-63). The main aim of the strategy is to secure a consistent and systematic approach to monetary policy decisions. Since monetary policy should be "(...) forward-looking and preemptive, focusing on the medium term, firmly anchoring inflation expectations and be broadly based." (European Central Bank, 2011, p. 63), the ECB's strategy contains two core elements.

The first element is the quantitative definition of price stability. To enumerate the objective of price stability, the Governing Council of the ECB provided a quantitative definition in 1998: "Price stability shall be defined as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%. Price stability is to be maintained over the medium term." (Gerdesmeier, 2009, p. 8).

The HICP measures consumer price inflation in the member states of the European Union, Norway, Iceland and Switzerland by measuring the change over time in the prices of consumer goods and services, used or paid for by euro area households (see Eurostat, 2019, p. 1-3). In 2003, the Governing Council clarified that it aims to maintain inflation rates "below, but close to 2% over the medium term." (European Central Bank, 2011, p. 64). The quantitative definition of price stability aims to make the primary objective of the ECB more transparent and comprehensible. It also provides a measure for the public to make the ECB liable to account in the event of deviations from the target. The definition also serves as a guide for the public to form expectations about future price developments (see European Central Bank, 2011, p. 64).

The second element is a two-pillar approach which serves as a tool to organise and evaluate relevant information for the risk-assessment of price stability (see Gerdesmeier, 2009, p. 63). This approach consists of two analytical perspectives: the economic analysis and the monetary analysis.

The economic analysis serves to assess the short and medium-term determinants of price developments. It concentrates on the real activity and financial conditions in the economy from the perspective of the interplay between supply and demand in goods and services (see Gerdesmeier, 2009, p. 63).

The monetary analysis provides a medium to long-term perspective on risks to price stability. It focuses on the long-run link between money and prices and is used as a cross-checking tool for the indications from the economic analysis (see European Central Bank, 2011, p. 69-79).

In conclusion, the two-pillar approach aims to ensure that "all relevant information is used in the assessment of the risks to price stability and that appropriate attention is paid to different perspectives and the cross-checking of information in order to come to an overall judgement of the risks to price stability" (Gerdesmeier, 2009, p. 63). The strategy of the ECB in general also provides a guidance for explaining monetary policy decisions to the public in a transparent way. The figure below shows an overview of the stability-oriented monetary policy strategy of the ECB. On the fundament of a sufficient set of information, the two analyses are made and cross-checked against each other. Based on the result of the two analyses and the overall risks to price stability, the Governing Council adopts monetary policy decisions, which should contribute to the primary objective.

In January 2020, the ECB started its strategy review process which was extended until mid-2021 due to the Covid-19 pandemic. The last review of the strategy was in 2003, and since the world experienced fundamental changes in the economy since then, the ECB decided to review its strategy (see Lagarde, 2020, p. 1). The review will cover the definition of price stability; the inflation rate; the monetary policy instruments; the analysis process of the economy as well as topics related to employment and communication practices. Furthermore, it will deal with the topic of climate change and the effects of it on monetary policy (see Schnabel, 2020, p. 1; Lagarde, 2020, p. 1). Closely linked to the communication practices of the ECB is their soft power, therefore the next chapter will discuss the possible role of soft power of the ECB in a sustainable financial system.

3.3. The role of soft power of the ECB

Soft power refers to the use of power by political institutions, actors and states over the society and other states. This power is not based on military resources (see v. Von Voss-Wittig, 2006, p. 1-2). Soft power dispenses with coercive measures. It is based on the persuasive power of the actors to convince them of their interests. Its resources include the function to lead by example, attractiveness and the communication of own norms and values (see v. Von Voss-Wittig, 2006, p. 1-2). Joseph S. Nye defined soft power as "the power of attraction" (see Nye, 2017, p. 2).

As Chandavarkar (1987, p. 4) states "More than statutes and formal powers it is the central bank's status, expertise, and influence, in relation to the government (...) and the financial community, which defines its promotional opportunity-set as a regulator, innovator, participant, guarantor, and catalyst of financial development". Consequently, the ECB can highlight the importance of climate change challenges by soft power. It already engaged in promoting the discussion on green finance by dedicating an own chapter on their website to climate change and by publishing various speeches and research on the topic. With the membership in the Network for Greening the Financial System (NGFS) as well as the inclusion of the topic in their strategy review, the ECB signals that it is aware of the importance of the whole challenge. The next abstract will discuss a specific possible measure of soft power: the introduction of voluntary green finance guidelines and frameworks.

3.3.1. Voluntary green finance guidelines and frameworks

The aim of voluntary green finance guidelines is the enhancement of sustainable finance. There are various possibilities of their exact design. In this case, green finance guidelines with the aim of the promotion of green lending will be discussed. So far there are no uniform standards of green loans. The Loan Market Association (2018, p. 2) defines green loans as "(...) any type of loan instrument made available exclusively to finance or re-finance, in whole or in part, new and/or existing eligible Green Projects." . The LMA published a list of indicative categories for Green Projects, including renewable energy; pollution prevention; clean transportation and wastewater management (see Loan Market Association, 2018, p. 4). To support banks with a guidance towards green lending, green credit guidelines are required

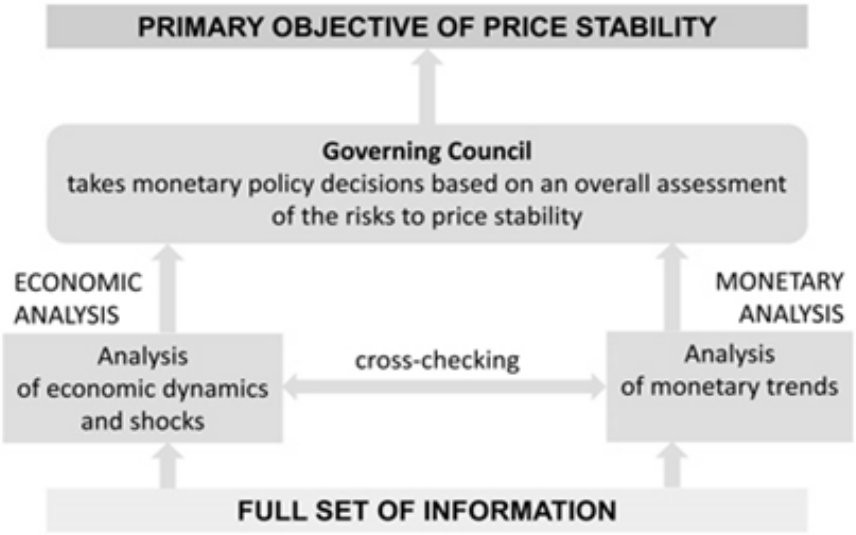

Figure 3: The stability oriented monetary policy strategy of the ECB (European Central Bank, 2020j, p. 1)

(see Volz, 2017, p. 16). One possibility for the ECB would be to develop and publish such voluntary guidelines to provide banks with guidance towards green lending.

A country that already introduced green credit guidelines is China. In 2012, the China Banking Regulatory Commission (CBRC) published the "Green Credit Guidelines" which aim to encourage Chinese banks to support low-carbon economies, manage environmental risks in the credit lending process and to foster sustainable performance in their operations (see Qingrong, Wang, Yiting, & Lina, 2013, p. 4-6).

The second chapter of the "Green Credit Guidelines" focuses on the organisation and management of banks and pleads that the board of directors should create and support green credit concepts (see China Banking Regulatory Commission, 2012, p. 1). It transfers the responsibility of defining exact roles within the green credit concepts to the senior management (see China Banking Regulatory Commission, 2012, p. 1). However, as of today the green credit policy of China did not fulfil its aims. Causes of the failure to comply with the guidelines are a lack of environmental information and unclear policy standards (see China Banking Regulatory Commission, 2012, p. 12). Furthermore, Volz (2015, p. 30) argues that clearly binding regulations which include compulsory components are required to cause a meaningful change in the lending behaviour of banks. However, voluntary principles offer the advantage of supporting the progress of green finance without the potential costs and delays which might occur with some binding regulations (see United Nations Environment Programme, 2017, p. 20).

A voluntary green guideline framework of the ECB could resemble like the following. The framework could include two stages with two different time horizons. The foundation of the first stage was already established by the publication of research and education from ECB, as well as the recognition of an absence of a standard definition of the terms "green" and "sustainable" (see Mersch, 2018, p. 1). In the first stage with a time horizon of 1 year, the ECB could deliver advice for banks and financial institutions in line with the Taxonomy regulation that will start applying in December 2021. The ECB could encourage banks to send their staff to regular information events and workshops related to green finance, or even offer them (see Volz, 2015, p. 42). With these measures the ECB could try to establish a uniform level of knowledge. Banks should become aware of what measures they can implement, and what opportunities and risks those entail. In the second stage with a time-range of 3-4 years, the ECB could introduce a non-compulsory target with regards to the share of green finance in the bank's portfolios (see Volz, 2015, p. 42). Furthermore, the ECB could prompt the banks to select a board member responsible for green finance topics similar to the guidelines of the CBRC. This measure could prevent the issue from drowning among all other challenges that banks experience (see Kirmße, 2017, p. 297-299). Other measures that the ECB could introduce include "(...) annual awards for banks with a high share or a rapidly increasing share of green lending" or even penalty fees, in case of the introduction of compulsory targets (Volz, 2015, p. 42). Nevertheless, these measures contain limits due to the ECB's special position of independence, which will be explained in more detail later.

What the possible measures of the voluntary guidelines all have in common is a communication of a clear definition of sustainability and green finance, avoiding a lack of understanding that "(...) may result in financial markets not realizing their full potential and failing to provide the amount of finance required to reach the EU's long term objectives and global commitments." (Kahlenberg 2017: 1). With the introduction of the Taxonomy Regulation in 2021 progress should be made at this point, since the Taxonomy will make recom-

mendations of for instance green loan criteria (see EU Technical Expert Group on Sustainable Finance, 2020, p. 42).

3.3.2. Disclosure of the ECB carbon impact

Large-scale asset purchases, referred to as Quantitative easing (QE) is a form of unconventional monetary policy. The central bank purchases securities from the open market to increase the money supply and thus encourage lending and investment (see Benford, Berry, Nikolov, & Young, 2009, p. 91-93). The ECB introduced an Asset Purchase Program (APP) in 2014 in line with their unconventional monetary policy. It consists of the corporate sector purchase program (CSPP); public sector purchase program (PSPP); asset-backed securities purchase program (ABSPP) and the third covered bond purchase program (CBPP3) (see European Central Bank, 2020a, p. 1). This abstract will focus on the CSPP. A wide variety of corporate bonds issued by non-bank corporations are eligible for the CSPP. Criteria include the minimum requirement of credit quality 3 on the Eurosystem credit assessment framework (ECAF) and the denomination in euro. Credit quality step 3 is equivalent to an investment grade of BBB- of an external credit rating agency, like for example Standard & Poor's (see European Central Bank, 2020e, p. 1). The securities need to have a remaining maturity of maximal 31 years and minimum 6 months (see De Santis, Geis, Juskaite, Vaz Cruz, et al., 2018, p. 67). There is no minimum bond volume under the CSPP to include the purchase of bonds issued by small companies (see De Santis et al., 2018, p. 67).

In 2017 the research report "The climate impact of quantitative easing" was published by the Grantham Research Institute on Climate Change and the Environment at the London School of Economics (LSE). It states that "(...) low-carbon assets and sectors seem to be relatively underrepresented, with neither the ECB nor the Bank of England purchasing any bonds from renewable energy issuers. "(Matikainen, Campiglio, & Zenghelis, 2017, p. 18).

The study of the LSE also states that there should be a revision of the ECB eligibility criteria, since three of four chosen renewable energy companies are not eligible under the ECB's collateral framework (see Matikainen et al., 2017, p. 14; 20). Issued bonds from corporations belonging to carbon-intensive sectors (e.g. oil, gas, automotive) that are purchased under the CSPP result in a reduction of financing cost for the respective corporations. As a result, their emission of greenhouse gases will not stop and is even further supported through this easy access to funding (see Solana, 2019, p. 556; 562). Jordan and Kalinowski (2019, p. 1) argue that there is misalignment between the policy of the ECB and the climate targets of the European Union. According to them, with the CSPP the ECB reflects the current situation at the corporate bond market "(...) even though financial markets seem misaligned with a mitigation path limiting the global warming to 1,5°." (Jordan & Kalinowski, 2019, p. 1).

The main policy recommendation of the LSE study is to make the whole process more transparent: the ECB should disclose their carbon impact around their purchases (see Matikainen et al., 2017, p. 2; 19). The disclosure could act as a "lead by example" instrument, with positive efforts to the whole financial system and public institutions. With the disclosure of their own carbon impact, the ECB could introduce a voluntary disclosure requirement for banks on their carbon-intensive assets, as a result they might aim for a better capital allocation (see Cecot, 2019, p. 5).

In conclusion, the two introduced measures under the scope of the ECB's soft power show that the ECB can use its convening role to promote the development of sustainable financial market practices (see Volz, 2017, p. 7). By the introduction of voluntary green finance guidelines, the ECB can encourage other financial market participants to address the topic. With a disclosure of their own carbon impact through their CSPP, they would emphasize how important the whole challenge is for them, and underline their own transparency and credibility, which are two characteristics that the ECB considers as crucial (see European Central Bank, 2020k, p. 1).

3.4. The role of the ECB in macroprudential regulation

During the time of the financial crisis in 2008, macroprudential regulation developed to address the risk of the financial system as a whole - referred to as "systemic risk" (see Kenç, 2016, p. 1). The main goal of macro prudential policy is to maintain financial stability.

To achieve this goal, the ECB supervises developments in the banking and financial sectors of the EU together with the other central banks of the EU and the European System of Central Banks (ESCB). Through the application of macro prudential policies, the emergence of possible systemic risks is addressed (see Constâncio, 2016, p. 1-5). Sources for the emergence of systemic risk include asset-price bubbles, excessive risk-taking by banks and excessive debt by companies or households (see European Central Bank, 2017a, p. 1; Constâncio et al., 2019, p. 30). Macro prudential measures of the ECB include different regulations that focus on the capital buffers and the leverage ratio of banks as well as a macro stress testing framework (see Henry et al., 2013, p. 5-9). In the following abstract, the possible role of sustainability-related measures in the macro stress testing framework of the ECB will be discussed.

3.4.1. Climate-related stress tests

Macro stress-testing is a policy tool that is used to identify possible vulnerabilities in the financial system and to measure the degree of systemic risk (see Henry et al., 2013, p. 7-12). It also helps to determine the position of the economy in the financial cycle and eventually the appropriate application of macro prudential policies (see Constâncio, 2016, p. 5-6). Stress tests picture the performance of the banking system in certain scenarios (see Budnik et al., 2019, p. 4). They show if the capital positions of institutions are sufficient and able to preserve financial stability in the system. Hence, they are an important instrument to provide information for regulation authorities (see Budnik et al., 2019, p. 4).

As outlined in chapter 2.2.3, climate-related risks can affect the financial system and financial stability. Therefore, the question arises whether the ECB should include climate-related risks into their stress tests. According to Batten et al. (2016, p. 19), to develop a robust climate-related stress test addressing physical risks, four key factors need to be considered. First, an appropriate stress testing scenario with an impact on the whole financial system needs to be created. Here, the ECB would need to choose a plausible scenario that would affect the whole economy of the EU, including for instance the damage of long-lasting physical damage like infrastructure, large cities with systemic relevance and industrial plants (see Batten et al., 2016, p. 19-20). Second, the most affected sectors of the chosen scenario need to be identified. As highlighted in chapter 2.1, insurance companies may be affected significantly more than other institutions, and since they are of systemic relevance for the financial system, it is important to identify them.

Third, suitable data needs to be gathered to ensure the validity of the test. Fourth, the transmission mechanism of the climate-related shocks across the financial system needs to be illustrated (see Batten et al., 2016, p. 19).

According to Borio, Drehmann, and Tsatsaronis (2012, p. 1), it is difficult to develop stress tests for a specific purpose. As a first step towards a climate-related stress test, the ECB could focus on a specific initial shock related to climate change (see Batten et al., 2016, p. 20-22). One possibility would be to carry out a carbon stress test, based on the scenario of an abrupt repricing of carbon-intensive assets (see Schoenmaker, Van Tilburg, & Wijffels, 2015, p. 24). For the development of a carbon stress test, a sufficient base of information of the carbon-intensity and dependence of sectors is required (see Batten et al., 2016, p. 21). The goal of carbon stress tests would be to determine and quantify the exposure of financial institutions to carbon-intensive assets (see Dikau & Ryan-Collins, 2017, p. 15). Depending on the results of the test, counteract measures like capital buffers could then be imposed to the respective institutions (see Dikau & Ryan-Collins, 2017, p. 15). Crucial for a reliable carbon stress test is a common disclosure standard and measurement procedure, to identify large exposures of carbon intensive assets (see Schoenmaker & Van Tilburg, 2016, p. 2). In 2017, the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) published recommendations for disclosures related to climate change. They should support companies to understand why the disclosures are important and how they can benefit in terms of their investors' needs (see De Guindos, 2019, p. 1). The Vice President of the ECB argues that "(...) before making it mandatory we need to determine what constitutes high-quality disclosure." (De Guindos, 2019, p. 1).

Moreover, Schoenmaker and Van Tilburg (2016, p. 14) suggest the development of a carbon stress test which is based on the scenario of an abrupt transition towards a low carbon economy. According to them, capital instruments and large exposure restrictions are the most efficient measures for carbon-intensive assets (see Schoenmaker & Van Tilburg, 2016, p. 14). They argue that it is crucial to illustrate scenarios of various sustainability risks, including water shortage, carbon asset bubbles and material shortage, to identify the most critical scenarios "(...) from a financial stability perspective." (Schoenmaker & Van Tilburg, 2016, p. 14).

A few central banks already focused on climate-related stress tests: The Central Bank of Brazil (BCB) requires banks to carry out stress tests that measure the possible impact of environmental catastrophes on their balance sheets in order to check their capital sufficiency (see Dikau & Ryan-Collins, 2017, p. 3-4; 23). The Bank of England (BoE) announced to introduce climate stress tests for the largest banks and insurance companies of the UK in 2021. Key factors that the BoE will consider in their climate-related stress tests are: a longer time horizon since climate risks develop over a long time in comparison to conventional risks, as well as different scenarios that aim to capture an early, a late and no policy introduction (see Bank of England, 2019, p. 1) With the climate stress test, the BoE aims to identify the risk exposure of the institutions rather than to test their capital sufficiency (see Bank of England, 2019, p. 1; 5). The ECB stated that it is currently in the process of developing a framework for conducting climate risk stress tests, which will include physical and transition risks and their interaction (see De Guindos, 2019, p. 1).

3.5. The role of the ECB in micro prudential supervision

In general, macro prudential and micro prudential supervision share some instruments. However, the focus of micro prudential supervision is the stability of individual financial institutions while macro prudential considers the financial stability of the financial system as a unit (see Boissay & Cappiello, 2014, p. 135). While holding ultimate responsibility, the ECB conducts supervisory tasks within the Single Supervisory Mechanism (SSM) (see European Central Bank, 2018, p. 4). The SSM consists of the ECB and the national competent authorities (NCA). It aims to share responsibilities between the ECB and the national competent authorities, while the ECB supervises from a European perspective. The mission statement of the SSM states that "The ECB is responsible for the effective and consistent functioning of the SSM, with a view to carrying out intrusive and effective banking supervision (...)" (European Central Bank, 2018, p. 4). Tasks of the ECB include the development of a common approach of supervision, ensuring the consistent application of regulations and supervisory policy as well as unified supervisory and corrective actions (see European Central Bank, 2020i, p. 1). As a result, the ECB is allowed to "(...) grant or withdraw banking licences, assess banks' acquisition and disposal of qualifying holdings, ensure compliance with EU prudential rules, set higher capital requirements (...)" (European Central Bank, 2020i, p. 1). In general, there is a wide range of financial regulation instruments that the ECB could use to encourage financial institutions to consider climate-related risks and challenges. In the following, disclosure requirements and environmental, social and governance (ESG) standards will be discussed.

3.5.1. Disclosure requirements

As mentioned in chapter 3.4.1, in 2017 the TCFD published recommendations regarding disclosures for financial institutions, highlighting the importance of disclosure for the correct pricing of risks in financial markets (see Task force on climate-related financial disclosures TCFD, 2017, p. 2). They argue that disclosure requirements are a fundamental factor in dealing with climate change and environmental risks. The TCFD emphasizes that a lack of information about risks can result in a mispricing of assets and thus in a misallocation of capital, which eventually can lead to sudden price corrections endangering financial stability (see Task force on climate-related financial disclosures TCFD, 2016, p. 2). As of today, the TCFD encourages companies to apply its recommendations, but there is no mandatory regulation yet. Consequently, the introduction of mandatory disclosure requirements by the ECB for all financial institutions could be a possible solution to make sure that assets are correctly priced. An example for a mandatory disclosure is the article 173 of the Energy Transition Law of France: listed companies need to disclose financial risks related to climate change in their annual report, as well as their measures that aim to reduce those risks and the effects of climate change on their operating activities (see UNEP Finance Initiative , 2016, p. 7). Banks are required to disclose the risks uncovered by stress tests and the risk of excessive leverage (see UNEP Finance Initiative , 2016, p. 7). In addition to that, Volz (2017, p. 14) states that the transparency that comes with disclosure requirements is essential for macro prudential policies, like stress tests, which were discussed in chapter 3.4.1 before.

3.5.2. ESG risk management standards

Environmental, social and governance (ESG) risks refer to the inclusion of non-financial risks which result from "(. . .) environment and sustainability, reputation or brand, legal, technological, product or service quality, labor, ethical conduct, compliance, and strategic considerations." (see Idowu, Capaldi, Zu, & Gupta, 2013, p. 1025). The European Commission aims to put ESG considerations in the centre of the financial system to pursue the goal of transforming the European economy into a circular system (see European Commission, 2018a, p. 1). The role of the ECB at this point could be to require banks and other financial institutions to adopt ESG risk management standards (see Dikau & Volz, 2018, p. 6). Banks and financial institutions could include ESG risk management standards in their governance frameworks to consider possibly damaging environmental effects of financial products and services (see Cecot, 2019, p. 5). Moreover, commercial banks could include ESG risks as a criterium in their credit approval process (see Cecot, 2019, p. 5). As a result, there may be less investments in polluting and carbon intensive companies (see Dikau & Volz, 2018, p. 6).

Recently, the ECB engaged in that topic: in May 2020, the ECB issued a draft guide for banks on climate-related and environmental risk management (see European Central Bank, 2020f, p. 3-7). The guide is not legally binding, but it aims to promote awareness of environmental and climate change related risks in the banking sector. The ECB requires banks to assume responsibility for the risks that can ultimately affect the real economy (see European Central Bank, 2020d, p. 1). In the guide, the ECB formulates its expectations towards banks to include climate-related and environmental risks in their risk management frameworks. Moreover, the ECB highlights that it anticipates banks to engage in environmental disclosures to be more transparent (see European Central Bank, 2020d, p. 1). The ECB asks for comments until September 2020 and is willing to finalize the guide afterwards (see European Central Bank, 2020d, p. 1). Next to its role in micro prudential supervision, the ECB is entrusted with the implementation of monetary policy. In the next abstract, the possible role of the ECB in a more sustainable monetary policy will be discussed.

3.6. The role of the ECB in monetary policy

The overriding priority of the ECB is to maintain price stability (see European Union, 2012, p. 56). The implementation of monetary policy is based on their monetary policy strategy, as outlined in chapter 3.2 (see Verbeken, Rakić, & Patemoster, 2020, p. 2-3). To achieve their goals, the ECB applies different monetary policy instruments. A distinction is made between conventional and unconventional measures. The conventional instruments include open market operations, standing facilities and the holding of minimum reserves (see Verbeken et al., 2020, p. 3-4). To handle the financial crisis and its consequences, the ECB introduced new monetary instruments: unconventional monetary policy instruments (see Potter & Smets, 2019, p. 26). In the following, the main emphasis will be on the unconventional instrument quantitative easing (QE). In 2015, the ECB started their QE program, by buying bonds from commercial banks. The theory states, that the price of bonds increase and thus liquidity increases (see Zappalà, 2018, p. 18). Yields decrease and loans become cheaper, so companies and households can borrow more money to pay back their debt. Hence, investment and spending increase, which ultimately leads to an increase in prices and an inflation rate of close to 2% (see European Central Bank, 2020h, p. 1). In general, the QE is often criticized, but nevertheless the discussion emerged whether QE could aim towards the purchase of green financial assets, like green bonds to support the transition towards a more sustainable economy (see Volz, 2017, p. 16). In the next abstract, a quantitative easing variation focused on the environment, called green quantitative easing (GQE), will be examined.

3.6.1. Green quantitative easing (GQE)

The main procedure of green quantitative easing (GQE) is similarly to general quantitative easing (see Zappalà, 2018, p. 21). The central bank expands its balance sheets by the purchase of assets, hence injecting a great amount of liquidity in the financial system (see Ferron & Morel, 2014, p. 9). The idea of GQE is, that those liquid assets could be used to finance sustainable, environment friendly projects (see Ferron & Morel, 2014, p. 9). The first difference to normal QE

is that central banks are required to purchase inter alia green bonds (see Cecot, 2019, p. 6). A purchase of solely green bonds by the ECB is considered as controversial, since the green bond market is still relatively small (see Sustainable Banking Network (SBN), 2018, p. 11). There is no global legal definition of green bonds yet, but the Green Bond Principles (GBP) provide orientation (see Doran & Tanner, 2019, p. 4). The GBP define Green Bonds as "(...) any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects (...)" (International Capital Market Association (ICMA), 2018, p. 3). Thus, the main concept of the GQE is rather than buying any type of bonds, central banks should purchase bonds that have been issued with the intention to finance projects on sustainable investments (see Dafermos, Nikolaidi, & Galanis, 2018, p. 2). Green bonds could be issued by private as well as public entities, the ECB could buy them on the primary or secondary market, depending on the issuer (see Ferron & Morel, 2014, p. 12). As a result, investors would be stimulated to invest more capital towards sustainable projects (see Dhomps, 2019, p. 32). Moreover, the risk of investing in sustainable projects will decrease since they are often associated with more risk than conventional assets (see Dhomps, 2019, p. 32). The primary objective of GQE would not be economic growth, instead its main purpose would be to support the transition of the economy towards sustainability (see Dafermos et al., 2018, p. 2). Additionally, the GQE program could have a positive impact on job creation, because it can increase economic activity "(...) in the green sector which tends to be more labour intensive." (Dafermos et al., 2018, p. 2, see Dillon 2010: 3-4; see Ferron & Morel, 2014, p. 9). According to a study from the Greenwich Political Economy Research Centre, a GQE program by the ECB could support the fight against climate change: the interest rate on green bonds would decrease in comparison to conventional bonds, as a result investments in sustainable projects would increase (see Dafermos et al., 2018, p. 4). However, the study concludes that many other policies besides to GQE are needed to reach the target of limiting global warming to 2°C as stated in the Paris Agreement (see Dafermos et al., 2018, p. 5). The authors also investigated if a green corporate quantitative easing program could affect climate-related financial stability (see Dafermos et al., 2018, p. 234). Their results demonstrated that "(...) by increasing the price of green corporate bonds, the implementation of such a green QE program can reduce climate-induced financial instability and restrict global warming." (Dafermos et al., 2018, p. 234).

Next to economists like Alain Grandjean, who calls for a the introduction of a GQE program by the ECB, particularly green activists demand for the support of the ECB by financing sustainable and environmental projects (see De Grauwe, 2019, p. 1, see Grandjean, 2016, p. 1). On the opposite, conventional economists argue that the environment is not in the scope of the ECB but within the remit of the government (see De Grauwe, 2019, p. 1). They fear that the ECB will commit itself to injecting too much money in the financial system and therefore fuel inflation (see De Grauwe, 2019, p. 1). This gives a first insight into the ongoing discussions regarding the competences and the mandate of the ECB, that will be outlined in more detail in chapter 4.

3.6.2. Green collateral framework

Commercial banks can borrow money from the central bank under the condition of providing sufficient collateral, examples for eligible collateral are financial securities like bonds (see European Central Bank, 2016, p. 1; see Debelle, 2013, p. 4-7). The collateral aims to protect the balance sheets of central banks against the risk of default by the borrower (see Deutsche Bundesbank, 2018, p. 1). The borrower is the respective commercial bank that obtains liquidity, and if it is unable to pay back the loan, the ECB uses the provided collateral to avert a financial loss (see Blot, Creel, & Hubert, 2018, p. 9). The criteria of eligible collateral are stated in the Eurosystem Collateral Framework (ECF) and the national central banks are responsible to identify eligible assets (see Bindseil, Corsi, Sahel, & Visse, 2017, p. 6, 10). The framework is divided in two frameworks, the "general" and the "temporary" framework, whereas the "temporary framework" overrules the general one (see European Central Bank, 2016, p. 1).

Because collateral is the limit on banks' access to liquidity, it is of particular importance (see Bindseil et al., 2017, p. 3). Commercial banks are granted financing advantages if they pledge sufficient collateral. The assessment of the collateral is based on three criteria to mitigate the risk: "(...) the credit risk associated with the collateral accepted (...) the market risk of an adverse movement in the price of an asset accepted (...) the liquidity risk of an adverse movement in the price of an asset." (European Central Bank, 2015, p. 12). The ECB retains risk discounts on loans to banks. The worse the creditworthiness of the provided collateral, the greater the risk discount. Consequently, a correct valuation of the eligible assets is crucial for an adequate risk management (see Blot et al., 2018, p. 22).

To contribute towards a sustainable financial system, the ECB could revise its collateral eligibility framework. Schoenmaker (2019, p. 7, 16), Jordan et al (2019: 4) and Campiglio et al. (2017, p. 5) propose to integrate low-carbon eligibility criteria into the collateral eligibility framework, to facilitate funding for low-carbon businesses. For commercial banks, environment-friendly assets would become more pleasant, thus the financing conditions for low-carbon companies would improve (see Campiglio et al., 2017, p. 5). Schoenmaker (2019, p. 16) states that the effort to green monetary policy operations could also "(...) give a powerful signalling effect to other financial market participants (...) boosting the case for greening the financial system.". One national bank that already introduced a similar measure is the central bank of Norway (Norges Bank). They have excluded selected companies which are involved in the production of coal-based energy, nuclear weapons and environmental damage from their state pension fund (see Norges Bank, 2020, p. 1).

In terms of their own risk mitigation, the ECB could aim to incorporate climate-change related risks in their collateral framework (see Campiglio et al., 2017, p. 7). As outlined before, climate change poses risks on the financial system and its participants. In order to appropriately measure the default risk of their counter parties, the ECB should therefore take into account climate-related risks into their determination process of eligible assets (see Van Lerven & Bryer, 2020, p. 4). As of today, the assessment by the ECB to evaluate which collateral can be accepted are derived from private sector credit rating agencies, and climate-related risks are not incorporated in their ratings yet (see Van Lerven & Bryer, 2020, p. 4). Consequently, this circumstance grants a relative advantage to carbon-intensive collateral that include climate risks, in comparison to securities that are safer in climate risks terms (see Van Lerven & Bryer, 2020, p. 4). Bolton et al. (2020, p. 54) argue that: "The goal of this proposal is not that central banks should step out of their traditional role when implementing monetary policies, but rather to recognise that the current implementation of market neutrality, because of its implicit bias in favour of carbon-intensive industries (...) could end up affecting central banks' very own mandates in the medium to long term.". Furthermore, Van Lerven and Bryer (2020, p. 5) propose that a greening of monetary policy operations with a long-term approach could support the EU's Green Deal and the transition towards a circular economy by supporting green financial flows. Moreover, the ECB would reduce its own vulnerability to climate-related risks (see Van Lerven & Bryer, 2020, p. 5).

4. Restrictions of the ECB to engage

Despite all the different, presented ways in which the ECB could support the transition towards a sustainable financial system, the special role of the ECB also entails some restrictions. Among them is the role of independence of the ECB, which will be discussed first.

4.1. The role of independence

The independence of central banks refers to "(...) the freedom of monetary policymakers from direct political or governmental influence in the conduct of policy." (see Walsh, 2010, p. 21). As stated in article 282 of the Treaty on the European Union, the ECB "(...) shall be independent in the exercise of its powers and in the management of its finances. Union institutions, bodies, offices and agencies and the governments of the Member States shall respect that independence." (European Union, 2012, p. 121). The political independence of the ECB is essential to pursue its main objective of price stability (see European Central Bank, 2017b, p. 1). Otherwise, politicians would have the incentive of using instruments (e.g. lowering interest rates) of the ECB to influence their political actions which would affect the economy negatively in the long run (see European Central Bank, 2017b, p. 1; see Groepe, 2016, p. 7). To maintain their independence, the ECB needs to ensure their accountability through clear communication and transparency (see Eichengreen et al., 2011, p. 31; see Howarth & Loedel, 2005, p. 123). Economists warn that central banks are putting their independence at risk by taking up the issue of climate change (see Honohan, 2019, p. 2). They argue that central banks were not granted in-dependency to expand their mandate (see Issing, 2019, p. 1). Even if environmental topics may belong to their secondary objectives, central banks should admonish against unrealistic expectations with respect to their contribution towards climate change measures (see Honohan, 2019, p. 2). Groepe (2016, p. 1) argues that the greatest risk to the independence of central banks "(...) is the possible backlash from being unable to deliver on unreasonable expectations.". In concrete terms, they fear that the ECB moves away from its core mission by pursuing political interests and thus loses its credibility and independence, which is essential to achieve their primary objective.

4.2. The connection of climate risk and credit risk

As outlined in chapter 2.2.1, one of the main responsibilities of central banks is to maintain financial stability (see Mishkin, 2005, p. 411). With a sudden change in regulatory, companies that rely on fossil-fuel are exposed to transition risks (see Solana, 2019, p. 572). They may not be able to use fossil fuels anymore (see Bank of England, 2015, p. 51-52). Thus, their profitability and value can be affected negatively (see Bank of England, 2015, p. 50). According to the European Systemic Risk Board (2016, p. 12) fossil-fuel companies are mainly financed by debt. Capasso, Gianfrate, and Spinelli (2020, p.25) argue that companies with a high amount of CO2 emissions are more likely to default. However, many banks have not started yet to take climate risks into account during their credit assessment process (see Colas et al., 2019, p. 16). As a result, an abrupt change can cause credit losses and a repricing of debt, which can ultimately affect financial stability (see Williams & Case, 2016, p. 3-6). Credit risk refers to the risk of a financial loss in case a borrower can not repay their debt to the lender (see Monnin, 2018, p. 3). Consequently, climate risks can be considered a source of credit risk (see Monnin, 2018, p. 2; see Solana, 2019, p. 572). If the ECB now would decide to exclude carbon-intensive companies in its CSPP, or to introduce Green Quantitative Easing (GQE), the cost of financing for carbon-intensive companies would increase (see Solana, 2019, p. 571). Together with possible emerging regulatory burdens like for example a CO2 tax or the general challenge to become sustainable in their operations, the long-term viability of such companies would be endangered (see Solana, 2019, p. 572). Ultimately, the risk of credit loss for commercial banks would emerge since those companies might not be able to repay their debt. This in turn could lead to a risk to financial stability.

4.3. The ECB mandate and conflicting objectives

In the last years, public awareness of climate change increased and a debate on the role of the ECB and central banks

emerged (see Batten et al., 2016, p. 3; see Dhomps, 2019, p. 29). A broad consensus argues that central banks in general can not ignore climate change (see NGFS, 2019b, p. 2, see United Nations Environment Programme, 2016, p. 53). However, there is no exact definition on the extent to which the ECB should consider climate change risks in their frameworks, or what role the ECB should hold in promoting sustainable finance. Researchers started to analyse the ability of the European Union to support environmental objectives as well as the mandate of the ECB with regards to a green monetary policy (see Solana, 2019, p. 575, see Fischer, 2018, p. 1-16). However, the integration of environmental objectives in the ECB's mandate faces criticism. Benoît Cœuré, Member of the Executive Board of the ECB, argues that the second objective of the ECB, to support general economic objectives, can be questioned regarding their orientation. He illustrates the example with the question "(...) why the ECB should not promote industries that promise the strongest employment growth, irrespective of their ecological footprint." (Cœuré, 2018, p. 1). Thereby he outlines the potentially conflicting objectives of the ECB, apart from their main objectives (see Dikau et al. 2019: 7). In general, Cœuré states that the ECB can occupy a promoting and supporting role in decreasing the risks from climate change within their mandate (see Cœuré, 2018, p. 1). On the contrary, the president of the Deutsche Bundesbank, Jens Weidmann, comments critically on possible instruments like GQE (see Weidmann, 2019, p. 3). He points out that the responsibility for a transition towards a low carbon economy can be supported by central banks but remains in the responsibility of politicians (see Weidmann, 2019, p. 4). As a result, the ECB may face restrictions regarding their competences that are in scope of their mandate. For instance, in 2020 the German Federal Constitutional Court (GFCC) judged that the Public Sector Purchase Program (PSPP) of the ECB is not in line with their mandate. They argued that the mandate is strictly limited to conducting monetary policy; and that economic or social policy decisions are not in scope of their mandate, even if they implement monetary policy instruments for this purpose (see Bundesverfassungsgericht, 2020, p. 70). Consequently, one could argue that a similar judgement could take place if the ECB decides to pursue climate policy with monetary policy instruments. Thus, the question arises whether the ECB's mandate should be extended, or if even a separate mandate should be introduced to permit the ECB to pursue climate change and sustainability objectives.

In addition to that, Volz (2017, p. 18) argues that adding environmental objectives to the ECB's tasks, could result in an overburdening. He states that the ECB would have to pursue "(...) to many objectives and have too few tools (...)" and that the ECB would need to introduce productive instruments to pursue environmental goals without affecting other objectives (Volz, 2017, p. 18). One of the ECB's core principles is anchored in Article 127 TFEU: market neutrality (see European Union, 2012, p. 50; 56, see Weidmann, 2019, p. 3). This means that the ECB may not preferentially buy bonds from certain companies or states (see Mersch, 2018, p. 1). In its purchase programs, the ECB needs to purchase the cross-section of the market, to avoid that the program does distort the market (see European Central Bank, 2020c, p. 1). If the ECB would now focus on sustainable "green" bonds, this would no longer be the case. Consequently, a separate mandate for the prosecution of climate would be necessary in terms of legal authorization.

5. An evaluation of instruments – the PCT approach

In the following abstract, a possible approach for the evaluation of the presented instruments will be outlined. The objective of the valuation approach is to evaluate the instruments in a reasonable manner. As an evaluation of the instruments could not be sufficiently quantified, a qualitative evaluation approach is used below to identify the main characteristics. The approach is based on three criteria that will be applied to the respective instrument.

The criterion of proportionality examines the suitability of each instrument to achieve the objective of a more sustainable financial system. For instance, the unconditional pursuit of the objective of sustainability without regard to the main objectives of price stability and financial stability would disregard the principle of proportionality. The criterion is based on the Treaty of the European Union, that states: "(...) Under the principle of proportionality, the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties." (European Union, 2012, p. 6).

The second criterion, competency, investigates whether the ECB acts within its mandate or exceeds its competencies. As stated before, the primary mandate of the ECB is to maintain price stability and an inflation target of below but close to 2%. Without disregard to the objective of price stability, general economic policies in the Union should be supported (see Estella, 2018, p. 78).

The third criterion is the time horizon. Since climate change is a rapidly progressing process, it outlines how quickly the respective instrument could be introduced and could have an impact. A distinction is made here between a short time horizon (up to one year), a medium time horizon (3-5 years) and a long-time horizon (5-10 years). Based on the three criteria, the evaluation model is referred to in the following as the PCT (Proportionality-Competency-Time) approach. In the next abstract, two instruments that were outlined in more detail before will be evaluated with the approach and conclusively assessed.

5.1. An assessment of two instruments using the PCT approach

First, voluntary green finance guidelines and frameworks as described in chapter 3.3.1 will be evaluated. With the aim to promote green finance products like for example green loans, the instrument clearly pursues the objective of a sustainable financial system. Since it is optional and not compulsory, it is expected that no abrupt shifts in the market will occur, so that the objectives of price and financial stability

should not be compromised. Consequently, the criterion of proportionality is fulfilled.

The article 132 of the TFEU allows the ECB to publish recommendations and opinions to fulfil its tasks (see European Union, 2012, p. 58). Besides the main objectives, the ECB's tasks include the support of general economic policies. One could argue that the climate target as stated in the Paris Agreement belongs to those (see Hercelin, 2019, p. 1). Under this assumption, the criterion of competence is also fulfilled. Given its voluntary nature, the introduction of voluntary guidelines should be possible in a short-term horizon as it costs less than binding regulations (see United Nations Environment Programme, 2017, p. 20). With the support of the classifications of the Taxonomy Regulation, the content creation of voluntary guidelines by the ECB should be possible in a short time horizon of approximately one year. All in all, despite the possibility of a quick introduction, it is difficult to estimate what impact voluntary guidelines could have. Further research, for example in the form of surveys to quantify the knowledge and willingness of investors to contribute towards green finance, is needed to assess the success of voluntary guidelines. However, the ECB holds a position as an EU institution to draw the attention of financial market participants to green products. Voluntary guidelines could simplify and accelerate this process.

The next instrument that will be analysed is the unconventional monetary policy instrument Green Quantitative Easing (GQE) as discussed in chapter 3.6.1. By directing the program towards green bonds, the main objective of the instrument would be the transition towards a more sustainable financial system rather than economic growth (see Dafermos et al., 2018, p. 2). However, the market of green bonds is still limited, and a discrimination of non-green bonds could endanger financial stability (see Deschryver & De Mariz, 2019, p. 1-4). Furthermore, the implementation of monetary policy instruments needs to be in accordance with the principle of market neutrality. An asset purchase program focused on green bonds would violate this principle as laid down in article 127 of the TFEU (see European Union, 2012, p. 56). Consequently, the criterium of proportionality is not fulfilled. The German Federal Constitutional Court (GFCC) clearly distinguishes monetary policy from economic policy due to the definition in the TFEU. It rejects actions that pursue economic policy objectives with monetary policy (see Rövekamp, Bälz, & Hilpert, 2015, p. 52-53). According to the GFCC, the responsibility for economic policies is in scope of the member states and not the European Union, the ECB is only allowed to support economic policy objectives, without pursuing its own economic policy (see Bundesverfassungsgericht, 2020, p. 70). Thus, the criterium of competency is not fulfilled.

In March 2020, immediately after the outbreak of the Covid-19 pandemic in Europe, the ECB announced a Pandemic Emergency Purchase Program (PEPP) to counteract risks from the global pandemic (see Deutsche Bundesbank, 2020, p. 1). In addition to that, a quantitative easing program was already implemented by the ECB in 2014, therefore a GQE would be no unfamiliar instrument in general, which could limit the time needed for implementation. Hence a GQE may would be introduced within a short-time horizon of one year, and its duration could vary depending on its measured results. However, the impact of GQE is not significant with regards to the climate target of the Paris Agreement (see Dafermos et al., 2018, p. 4-5). Subsequently one could argue whether the ECB should really introduce such a controversial measure and accept various risks, for relatively small effects.

6. Conclusion

To pursue a sustainable financial system, it will be essential to involve the financial sector, as well as its participants and authorities. This thesis discussed the role the European Central Bank could play in a transition towards a sustainable financial system. It outlined how climate-related risks can spread to the financial system and why central banks are concerned of them. While introducing possible instruments for a proactive role of the ECB in different policy areas, the thesis also pointed out the restrictions and risks of the ECB to engage. Next to the possible endangering of their institutional independence, the mandate of the ECB was investigated. To the extent that the ECB pursues financial stability, including climate change risks into stress-tests and frameworks already belongs to their mandate. However, incorporating climate risks into existing frameworks is a challenging task, since traditional frameworks rely on historical data, and climate change is characterized with deep uncertainty. All in all, it is to question whether macroeconomic models can serve sufficient data and information in this case. Further, detailed research is necessary at this point. However, ignoring the risks from climate change can not be considered an option.

Whether central banks in general should promote green finance is a political issue that is controversial and needs to be examined very carefully. At this point, complex political questions should not be converted into moral certainties. According to TFEU, it is not the task of the ECB to finance green projects or to even implement a GQE: the ECB is not allowed to define its mandate and adapt it to, for example, a European Green Deal. By implementing such controversial measures, the ECB would distort the market. Moreover, a "green" monetary policy could threaten democracy in the EU.

However, the ECB is only one institution among public institutions that can influence the transition towards a sustainable financial system, other relevant institutions are environment ministries, the finance ministry and development banks like the "Credit Institute for Reconstruction" (KfW), who hold an environmental mandate and pursue sustainability objectives. By reviewing financial and macroeconomic instruments and policies, it is important to keep in mind that there are many other types of policies and institutions that could be involved, for instance regulatory emission standards could serve as implicit carbon prices (see Krogstrup & Oman, 2019, p. 33).

Next to the restrictions of the ECB, the thesis presented an evaluation approach for the introduced instruments based

on the criteria of proportionality, competency and time. The aim of the approach was to evaluate the respective instrument in a plausible way bearing in mind the objectives and mandate of the ECB as well as the speed of climate change. Facing these legal and technical challenges, a key role of the ECB to support the transition towards a sustainable financial system could be to provide an appropriate frame of the climate change debate by providing information about the financial risks from climate change. Moreover, the ECB could lead by example by the disclosure of their own carbon impact and by promoting the discussion about climate change as outlined in chapter 3.3. Here, the ECB seems to approach the topic, since May 2020 they are working on the "guide on climate-related and environmental risks", which aims to provide transparency of the ECB's understanding of an appropriate management of climate-related risks (see European Central Bank, 2020g, p. 1-9).

The key points to consider as an answer to the approached research question "What role can the ECB fulfil in a sustainable financial system?" are the following:

- the ECB should not fulfil a proactive role, it should not use controversial instruments to promote a sustainable financial system, it should rather create the framework for the transition by providing information, education and awareness;
- the financing of concepts such as the European Green Deal is within the responsibility of politicians, not the ECB;
- to the extent possible within their mandate, the ECB should manage the risks from climate change on financial stability.

Limiting global warming to below 2°C as determined in the Paris Agreement requires a structural transformation in the economy, and therefore a transition in the areas on which the economy relies. Consequently, the transition will not only require a huge shift towards green, sustainable investments but also shifts in the prices of energy and productive capacity (see Krogstrup & Oman, 2019, p. 39). To conclude the "(...) climate crisis is probably the biggest challenge of our times and it will be faced only if it becomes a priority. Therefore, sustainable finance is only one piece of the green growth puzzle and all economic sectors should now start integrating into their policy environmental considerations and objectives." (Dhomps, 2019, p. 39).

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