
The ECB's role in the commitment to tackle the climate crisis: An Analysis of Monetary Policies Accounts

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“All the heat and fear purged itself. I felt surprisingly at peace. The bell jar hung, suspended, a few feet above my head. I was open to the circulating air.”

Sylvia Path, *The Bell Jar*

Abstract

The primary goal of this dissertation is to reflect upon the role of the European Central Bank (ECB) in mitigating the climate crisis. The growing debate regarding global warming and its consequences on the economy enhances the need for the ECB to be more proactive in implementing different frameworks that attempt to manage climate-related risks.

The chosen methodology involves a historical comparative analysis of the ECB's monetary policy accounts that focus on counting the frequency of climate-related terms across the years and their respective context classification. By using this method, it becomes clear that the ECB has been increasingly concerned with the climate crisis and is trying to deal with climate-related issues. Since 2021, with the implementation of the ECB Climate Action Plan, the frequency of climate-related discussions has noticeably increased.

The results also show that even though the ECB has been incorporating climate-related themes within their decision-making, the translation into action monetary policies is still limited. Some of the intentions for the future include adjusting the collateral and assets markets to favor greener investments and including risk assessments to consider more climate factors in their operations.

In conclusion, while the ECB recognizes the importance of integrating concrete climate-focused policies, it also faces a challenge in finding a balance between maintaining its primary objective of price stability and adjusting to its growing role in fighting the climate crisis. The ECB's evolving monetary policy must reflect a more significant commitment to achieving long-term economic and financial stability.

JEL codes: G51, Q54, Q56, Q58, P52

Keywords: Climate Crisis, European Central Bank, Climate-Related Risks, Green Policymaking

Resumo

A presente dissertação investiga o papel do Banco Central Europeu (BCE) na gestão de riscos relacionados com o clima no âmbito da sua política monetária. Dado o aumento das preocupações com as alterações climáticas e os seus impactos generalizados na economia a nível mundial, a participação proativa do BCE no combate à crise climática é oportuna e essencial. Esta dissertação analisa a integração das considerações climáticas nas políticas monetárias do BCE focando nos anos de 2015 a 2023, um período marcado por significativas mudanças ambientais, económicas e regulamentares.

A metodologia utilizada consiste numa análise comparativa com métricas qualitativas e quantitativas com base nas atas das reuniões de decisão da política monetária do BCE, focando-se na frequência e no contexto de um conjunto de palavras selecionado relacionados com o clima. Esta abordagem revela que o BCE tem reconhecido e, progressivamente, respondido às questões climáticas ao longo dos anos. Os resultados destacam ainda um aumento em 2021, que coincide com a implementação do Plano de Ação Climática do BCE, que marcou uma mudança substancial nas discussões e iniciativas relacionadas com a crise climática. Os resultados indicam ainda que, embora o BCE tenha incorporado mais as alterações climáticas nas suas considerações estratégicas, a integração prática nas políticas monetárias tem sido gradual.

Em conclusão, o BCE reconhece a importância de abordar os temas relacionados com as implicações da crise climática, no entanto, enfrenta desafios em equilibrar o seu objetivo principal da estabilidade de preços com o seu papel no combate às alterações climáticas. A abordagem política em constante alteração do BCE deve refletir um compromisso ainda mais crescente com as finanças sustentáveis, crucial para a estabilidade económica e sustentabilidade ambiental de longo prazo.

JEL codes: G51, Q54, Q56, Q58, P52

Palavras-Chave: Crise Climática, Banco Central Europeu, Riscos Climáticos, Políticas verdes

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1. Introduction

Considering the growing urgency of fighting the climate crisis, institutions around the globe have been forced to reassess their responsibilities and commitment within the context of sustainable development. Central banks, bound to their mandates focused on monetary policy, become pivotal players between economic policy and the climate crisis. The European Central Bank (ECB), responsible for the euro area, has positioned itself regarding this matter, stating, "We are not the main actors in the shift to a greener economy. Governments and parliaments are in the lead, but we are committed to playing our part in the fight against climate change within our mandate." (2022). The present dissertation focuses on studying the ECB's engagement with the climate crisis within their monetary policy framework using monetary policy accounts dating from 2015 to 2023. This period is crucial since it encompasses essential events such as the Paris Agreement and the Climate Pact.

The primary motivation for this dissertation is to analyze to what extent the ECB has integrated climate crisis considerations into monetary policy decisions by introducing quantitative and qualitative metrics throughout the years. Moreover, the topic of this dissertation also aligns with some of the Sustainable Development Goals (SDGs) since it characterizes the ECB's efforts to adapt monetary policies within SDG 13 (Climate Action), SDG 11 (Sustainable Cities and Communities), and SDG 17 (Partnership for the Goals).

This alignment shows the relevance of financial institutions in achieving more sustainable objectives beyond their mandates. In the case of the ECB, the integration of SDG objectives enhances its commitment to mitigating climate change and also supports the European Union's broader sustainability agenda.

Furthermore, this dissertation brings several contributions. It provides an empirical analysis detailing the ECB's monetary policy accounts and delves into the frequency and context of climate-related conversations in policymaking. It also discusses the effectiveness of the ECB's attempts to integrate climate-related risks, showcasing a critical assessment of the development observed in the past years and providing some insights for future considerations.

The document is divided into different chapters, starting with a Literature Review, which outlines the context of the topic and primary objectives. The Data and Methodology chapter describes the comparative analysis adopted in the study, which uses quantitative and qualitative metrics to analyze the ECB's monetary policy accounts and its approach to climate-related discussions. Right after, the Results and Discussions chapter presents all the findings from applying the described methodology by giving a general overview and an annual interpretation of

the results. A Critical Analysis chapter was also included to reflect upon the commitment of the ECB to the climate crisis over the years and discuss future steps. To finalize, the Conclusion summarizes all the critical information and main findings of the dissertation and suggests research for the future.

In sum, this research dissertation explores the ECB's role in climate-related discussions and the mitigation of the climate crisis. It also aims to feed the critical debate about central banks' responsibilities within the scope of the global climate crisis and its challenges.

2. Literature Review

This dissertation relates to different themes within the scope of the climate crisis, which will be discussed in this section, such as the impacts of the climate crisis on the economy and population and the progress made by international institutions over the past decades (United Nations, European Central Bank, European Commission, etc.). As this dissertation focuses on the European Central Bank, 2 parts of the literature review analyzes the importance of this institution, why it is worried about the climate crisis, and how it has been tackling the climate challenge.

2.1 Climate Crisis: Main consequences for the economy and population

In 1896, Svante Arrhenius introduced what we now call modern research on climate change by describing the possible consequences of CO₂ and greenhouse gas emissions. He concluded that a 50% increase in atmospheric CO₂ levels could lead to a rise in global temperature. He also identified human industrial activity as the primary source of new CO₂ emissions (Arrhenius, 1896).

Today, the climate crisis is often described as a dark age for human beings (Chew, 2006), and its dimensions are varied and observed across the globe. Two examples of the consequences of the climate crisis are (1) the rising temperatures of the surface, which lead to more frequent and intense heatwaves contributing to the melting of glaciers in the Arctic and Antarctic regions, and (2) the increased frequency and intensity of extreme weather events such as hurricanes, droughts, floods, and wildfires. These natural disasters are leading to struggles within the ecosystems and biodiversity, including problems of food insecurity arising from damaged crops and fragile agricultural infrastructures.

The State of the Global Climate report of the World Meteorological Organization (WMO) from 2023 shows that the last eight years were the warmest ever recorded, and the sea level rise and ocean warming hit new highs (Figure A.1). WMO Secretary-General Professor Petteri Taalas stated that populations continue to be seriously impacted by extreme weather and climate events, which drove food insecurity, boosted mass migration, and cost billions of dollars in loss and damage (United Nations News, 2023). The same report from WMO also points out that the Antarctic Sea ice fell to its lowest extent on record and that the sea level rise has been fueled not only by melting glaciers and ice caps in Greenland and Antarctica but also by the expansion of the volume of the oceans, which poses a threat to the existence of coastal communities.

Many socio-economic impacts caused by extreme weather have deadly consequences for the lives of the populations, especially the most vulnerable. A clear example takes place in Pakistan, where extensive flooding caused by severe rainfall in July and August of 2022 killed over 1,700 people and affected around 33 million, summing up to around 30 billion dollars in total damage and economic losses (European Environment Agency, 2022). In Europe, the number of weather and climate-related events per decade increased from 392 between 1981 and 1990 to 1,220 between 2011 and 2020. More recently, the summer of 2022 was registered as the hottest in history, where the extreme heat caused 20,000 deaths and crop devastation. As the temperatures continue to rise, hospital visits will increase, and there will be less agriculture yields and more damaged infrastructures (European Environment Agency, 2022). In addition, extreme heat can cause water restrictions and property impact; for example, in Portugal, 43 cities increased water prices and suspended street cleaning, and in Belgium, 19 municipalities limited water consumption. Also, due to dry conditions and extreme drought, hydropower generation diminished by 20% in 2022 across Europe, and nuclear power plants cut output due to reduced cooling capacity, which reflects an increasingly strained energy supply (Milliman, 2022).

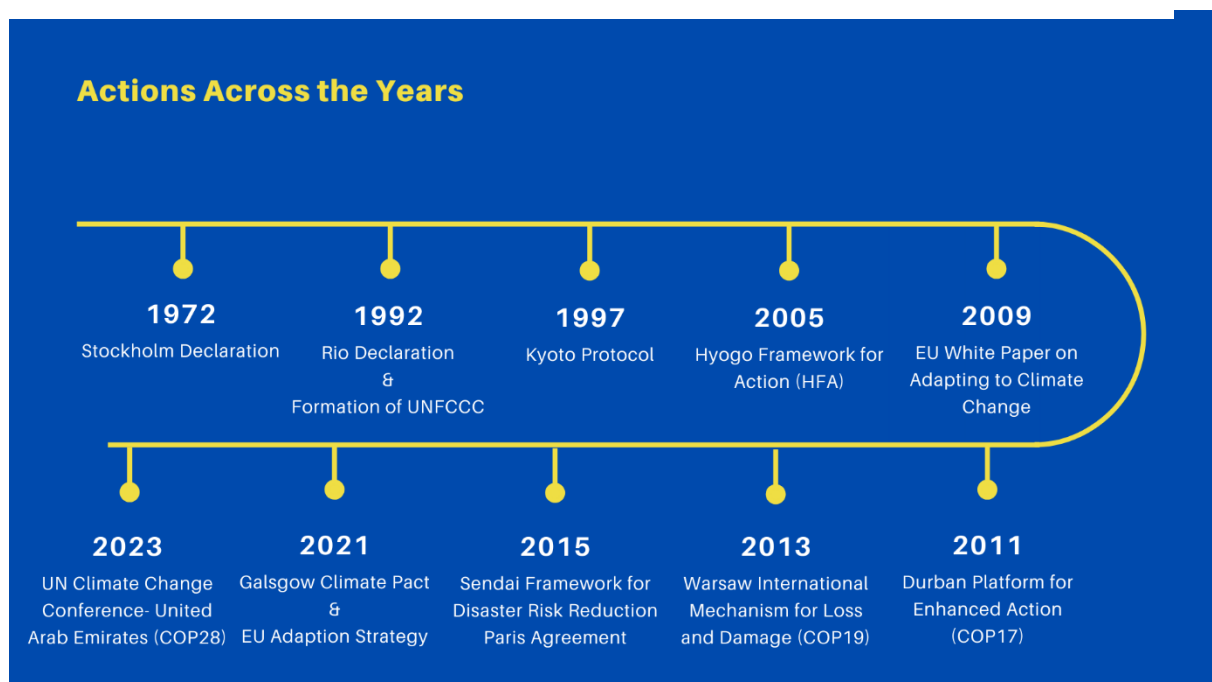
In a more global perspective, from 1970 to 2021, extreme weather events caused about 2 million deaths and 4.3 trillion dollars in economic losses (World Meteorological Organization, 2021). Moreover, developing countries are consistently the most affected in terms of economic losses, primarily due to their limited public financing, deteriorating infrastructure, capacity constraints, and the absence of effective operating models. According to the World Meteorological Organization (2021), national governments and international development institutions are responsible for providing services alongside financial resources to close critical gaps not only in developing countries but across the globe.

Lately, a critical point for the discussion is that the different exposures to climate risk each country faces can accentuate inequality and climate injustice since the nations that are more affected by the consequences of the climate crisis are not necessarily the ones that pollute the most. The United Nations Development Program (2023) suggests that those countries and industries that have become wealthy from emitting greenhouse gases have the responsibility for those most affected by its consequences, especially vulnerable countries and communities. It also describes some facets of climate justice, such as structural, socioeconomic, and intergenerational inequality. For instance, evidence shows that between 2010 and 2020, human mortality from natural hazards was fifteen times higher in vulnerable regions compared to regions with low vulnerability (United Nations Development Program , 2023).

2.2 Main outcomes and progress made by international agents over the years

As the climate crisis advanced quickly, the need for action across the globe started to become mandatory, and international agents started advocating for countries' cooperation in different areas. To provide context for this dissertation's research question, this section of the literature review will provide a chronological analysis of some of the most critical events in the past three decades and what they represent regarding efforts to fight the climate crisis. Different international bodies will be mentioned throughout this section, such as the United Nations Office for Disaster Risk Reduction, the United Nations Framework Convention on Climate Change, the Annual Conference of Parties (COP), the European Union (EU), and the European Commission. To make it easier to follow the line of thinking, Figure 1 summarizes all the major events described throughout this section.

Figure 1: Relevant events throughout the years



Source: Developed by the author

In 1972, the General Assembly of the United Nations decided to hold, in Stockholm, the first global conference on Environment and Development to provide guidelines to protect and improve the human environment. As a result, the Declaration of the United Nations Conference on the Human Environment implemented 26 initial principles (Handl, 2012). Twenty years later, in 1992, at the second conference, the Rio Declaration on Environment and Development sought to reaffirm the previous declaration and establish new and equitable global partnerships by creating new levels of cooperation between States. The Rio Declaration also aimed toward international

agreements that included the interests of all and protected the integrity of the global environment and development system (United Nations , 1992). While none of these declarations are legally binding, they mark the first steps toward environmental protection across States.

In 1992, countries joined an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC), to tackle climate change's consequences more effectively. The ultimate goals were to slow down climate change by limiting average global temperature increases and to cope with the already inevitable impacts (United Nations , s.d.). The Convention set a basic legal framework and principles for international climate change cooperation to stabilize atmospheric concentrations of greenhouse gases (GHGs) and prevent dangerous human interference with the climate system.

At first, when the Convention was still in its primordial days, the objective was to pressure more developed and industrialized countries, which were the source of most greenhouse gas emissions, to do their best to cut emissions in their homeland. Most of these countries belonged to the Organization for Economic Cooperation and Development (OECD). Consequently, by 1995, an extensive series of negotiations to strengthen the global response to climate change started. Among them was the First Conference of Parties (COP1) held by the UNFCCC in Berlin that year. It would set the beginning of a series of annual Conferences of Parties (COP) to limit human interference with the climate system. Two years later, in 1997, the UNFCCC landed a significant formal agreement, the Kyoto Protocol, at the Third Conference of Parties (COP3), which legally binds 37 industrialized countries, economies in transition, and the EU to individual emission reduction targets (United Nations Framework Convention on Climate Change , 1997). These targets amounted to an average 5 percent emission reduction compared to 1990 levels over the first commitment period (2008-2012).

Furthermore, one of the essential elements of the Kyoto Protocol was the implementation of flexible market mechanisms, which included the trade of emissions permits, allowing countries to meet their targets through national measures and market-based mechanisms such as International Emissions Trading. These instruments also have collateral benefits since they encourage green investment, especially in developing countries, and include the private sector in the effort to cut and hold GHG emissions at a safer level. The Kyoto Protocol also implemented innovative monitorization instruments such as registry systems to track and record transactions made by Parties under the mechanisms and a compliance system to ensure Parties are meeting their targets. An Adaptation Fund, financed by the Clean Development Mechanism (CDM) and

the International Emissions Trading, was also created to finance projects and programs to support developing countries in adapting to the adverse consequences of climate change (United Nations, 2020).

Years later, the global blueprint for disaster risk reduction efforts was drawn. The Hyogo Framework for Action (HFA) was adopted in January 2005 by 168 Member States of the United Nations at the World Conference on Disaster Reduction, which marked a milestone in strengthening international cooperation by implementing regional strategies, plans, and policies. The goal was to substantially reduce disaster losses by 2015, not only in lives but also in communities' and countries' social, economic, and environmental assets. The HFA highlighted five priorities for action: (1) to ensure that disaster risk reduction becomes a national and local priority with a strong institutional basis for implementation; (2) to identify, assess, and monitor disaster risks and enhance early warning; (3) to use knowledge, innovation, and education to build a culture of safety; (4) to reduce the underlying risk factors; and (5) to strengthen disaster preparedness for effective response (United Nations, 2007).

It is crucial to notice that other institutions have also started committing to the battle against climate change alongside the United Nations. From a European perspective, the EU also recognized the need to reduce greenhouse gas emissions and take adaptation action to deal with the unavoidable impacts of the climate crisis. In 2009, the European Commission released the White Paper, which sets out a framework for reducing the European Union's vulnerability to the impact of climate change with an "attempt to expand efforts that identify actions to be taken in the short term and complement individual actions from the Member States" (European Union, 2009).

Some previously mentioned COP of the United Nations represent critical decisions in the pathway to a green transition and should also be highlighted. As an example, the Durban Platforms for Enhanced Action, accepted during the COP17 in 2011, is considered a turning point in climate change negotiations since, during the Conference, governments recognized the need for a new universal, legal agreement to deal with the climate change on the long run where all parts will use their best ability to be able to reap the benefits of success together. All Parties committed to a comprehensive plan that, over time, would achieve the ultimate goal of stabilizing greenhouse gas emissions at a level that would prevent dangerous interference with the climate system. Four main areas of coordination and action were designed and agreed on: (1) the continuation of the international legal system of the Kyoto Protocol, where the developed countries committed to

greenhouse cuts; (2) the launch of a platform of negotiations that included finding ways to raise existing level of national and international action; (3) the conclusion by 2012 of existing broad-based stream of negotiations; and (4) to scope out and conduct a new global review of the emerging climate challenge using updated science and data (United Nations, 2011) .

After 2012, at COP18, a second commitment period of the previously mentioned Kyoto Protocol was adopted. The Doha Amendment would last until 2020 and included (1) new targets for the 147 Parties, such as reducing emissions by 18 percent below the 1990 levels, (2) a revised list of GHGs to be reported by countries, and (3) several amendments to articles of the initial Kyoto Protocol (United Nations, 2012).

Furthermore, in 2013, at COP19, the Warsaw International Mechanism for Loss and Damage was established to address loss and damage associated with impacts of climate change, such as extreme events and slow onset events in developing countries that are more vulnerable to the adverse effects of climate change (United Nations , 2013). The Mechanism integrated three main functions, including (1) enhancing knowledge of comprehensive risk management approaches to address loss and damage associated with the adverse effects of climate change, (2) strengthening dialogue, coordination, and coherence among stakeholders, and (3) support actions related to the adverse effects of climate change. (United Nations, 2013)

Moreover, from 2012 to 2015, intense negotiations took place under the Durban Platform for Enhanced Action. From this period emerged the Paris Agreement, an international treaty aimed solely at addressing climate change, adopted in 2015 at the 21st Conference of the Parties (COP 21) of UNFCCC. Considered by many as a landmark achievement in the global effort to mitigate climate change, the agreement represents a cooperative and inclusive approach involving all parties (United Nations, 2015). It is focused on limiting temperature increase to 1.5° Celsius. Each participating country had to submit a voluntary climate action plan (the Nationally Determined Contributions (NDC)) outlining individual efforts to reduce greenhouse gas emissions. In addition, more developed countries were committed to providing financial aid to developing nations to assist them in adapting to climate change. Lastly, the agreement sought to accelerate the actions and investment needed for a sustainable, low-carbon future. It recognized the need for transparency of action and support through a robust framework.

Ten years after the Hyogo Framework for Action (2005), most countries' progress in mitigating underlying disaster risks remained limited because institutional, legislative, and policy frameworks resisted integrating disaster risk considerations in their development decisions.

Disasters continued to take a heavy toll on people, communities, and countries. Over 700 thousand people lost their lives between 2008 and 2012, and another 1.4 million were injured. Additionally, 144 million people were displaced by these natural disasters. Total economic loss accumulates to more than US\$ 1.3 trillion, requiring enhanced work to reduce exposure and vulnerability, preventing new disasters, and a more robust international, regional, subregional, and transboundary cooperation (World Meteorological Organization, 2021).

By 2015, extreme events exposure across countries was still increasing faster than the protection against those risks, which made the Member States recognize that the efforts did not lead to the expected reduction of physical and economic losses against the climate crisis and that the following steps should be focusing on creating resilience against external shocks to protect the social and economic conditions (United Nations Office for Disaster Risk Reduction , 2013). There was a call for better guidance on the governance of disaster risk reduction alongside effective results-driven accountability measures such as goals and targets at the global, national, and local levels.

Overall, implementing the Hyogo Framework for Action 2005-2015 highlighted several gaps in addressing the underlying disaster risk factors, formulating common goals and priorities of action, and the need to foster resilience at all levels.

The outcomes and reflections from the previous Hyogo Framework for Action of 2005-2015 were the basis for developing the Sendai Framework for Disaster Risk Reduction 2015-2030, adopted in 2015 at the Third UN World Conference on Disaster Risk Reduction in Japan. The framework outlined four priorities for action to prevent new and reduce existing disaster risks, which include “understanding disaster risk,” “strengthening disaster risk governance to manage disaster risk,” “investing in disaster reduction for resilience,” and “enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation, and reconstruction.”

For the assessment of the progress to reach the goals of the Sendai Framework, seven global targets were agreed, some of them are (1) the substantial reduction of global disaster mortality by 2023, (2) the reduction of direct disaster economic loss to global gross domestic product (GDP) by 2030, (3) the increase in the number of countries with national and local disaster risk reduction strategies, and (4) the enhancement of international cooperation to developing countries through adequate and sustainable support. Furthermore, a set of guiding principles was designed to complement the targets based on the previous Hyogo Framework for Action. Among them, the fact that “disaster risk reduction requires that responsibilities be shared by Central Governments

and relevant national authorities, sectors and stakeholders” or that “the development, strengthening and implementation of relevant policies, plans, practices, and mechanisms need to aim at coherence, as appropriate, across sustainable development and growth.” (United Nations, 2015)

Since 2016, even though most of the goals of the Paris Agreement have yet to be achieved, the number of countries, regions, cities, and companies establishing carbon neutrality targets has increased. Furthermore, zero-carbon solutions already represent 25% of emissions in the power and transport sectors (United Nations, 2023).

In 2021, at COP26, the participating countries adopted the Glasgow Climate Pact, intending to transform the 2020s into a decade of climate action and intensified support. The Pact entails a set of decisions to enhance efforts to build resilience towards climate change and continue reducing greenhouse gas emissions while providing the necessary funding. The Nations also agreed to work on reducing the gap between existing emissions reduction plans and what is needed to achieve targets. Besides, for the first time in history, the United Nations started discussions to diminish incessant coal power and inefficient subsidies for fossil fuels. (United Nations, 2021)

In the same year, 2021, the European Commission took an important step by adopting its new EU strategy on adaption to climate change, where it draws how the European Union can adapt to the inevitable consequences of climate change and become more climate resilient by 2050. This new strategy aims to adopt more innovative actions based on robust data and risk assessment tools and requires quicker and more comprehensive action plans (Figure A.2). The Commission will support further development and implementation at all levels of governance, focusing on integrating adaptation into macro-fiscal policy, nature-based solutions for adaptation, and local adaptation action. Moreover, the EU will increase support by scaling up international finance and by more robust global engagement and exchanges. (European Commission, 2021)

Finally, in 2023, COP28 signaled the recognition of the need to transition away from fossil fuels and reviewed the commitment to increase financial support for developing countries by providing a total new amount of 100 billion dollars per year by 2025. It also established a new mechanism to assess the progress towards the goals of the Paris Agreement that works as a way to identify priority areas (United Nations, 2023). However, some challenges still need more commitment since the current climate targets need to be met, and more vulnerable countries still need extra support to deal with the impacts of climate change.

2.3 Importance of Central Banks for the green transition

From the last section, it becomes evident that international bodies have been trying to slow down the adverse effects of climate change. Furthermore, there has been an increasing need for a strategy that joins governments, international bodies, and Central Banks.

Central Banks are responsible for deciding and implementing monetary policy to keep the general level of prices and maintain stable economic growth. To achieve these, they set interest rates, control inflation, and manage the money supply (Stanley Fischer, 1993). Moreover, Central Banks are also responsible for monitoring and managing systemic risks to ensure the efficiency of the financial system as a whole. Regulation and supervision are another set of responsibilities taken by Central Banks as they oversee and regulate other financial institutions, enforcing rules and setting standards. Most commonly, these primary objectives are described as Central Bank's mandates, and for most Central Banks, they include maintaining price stability, ensuring the stability of the financial system, and supporting government economic policies such as sustainable growth, employment, and financial inclusion. Increasingly, Central Banks are also recognizing the impact of the climate crisis on financial stability and, consequently, are integrating green finance and sustainable activities into their mandates (Dikau & Volz, 2021). More specifically, a study from Dikau & Volz (2021) indicates that about 52% of the 135 Central Banks and monetary unions from the study have explicitly or implicitly indicated support of sustainability objectives on their mandates.

The financial sector and, consequently, the Central Banks face specific climate crisis threats since climate-related shocks can lead to supply price shocks, increasing volatility in financial and commodities markets, decreasing economic growth, and unexpected inflation movements (Schnabel, 2020). The assessment of climate risk differs from other sources of risk in the sense that climate risk is characterized as being deeply uncertain and non-linear, meaning that standard economic and financial risk metrics are inappropriate for dealing with its complexity (Monasterolo, 2020). Moreover, other sources of risk are usually evaluated using backward-looking benchmarks and historical information and knowledge, which, in the case of climate change, is inexistent.

In addition, Central Banks can work as a bridge between government regulation and maintaining financial stability. For instance, a transition to a low-carbon economy with new regulations or laws on carbon emissions can create a negative supply shock if announced suddenly, so monetary policy must be transparent and in line with new regulations to maintain financial stability while allowing a smoother transition to a low-carbon economy (Batten, Sowerbutts, & Tanaka, 2016).

Although the above examples show that Central Banks are essential players in the discussion and can be decisive on the path to a transitional society, literature shows that their actions still need to be revised. While they might take the matter seriously, central banks are limited by their mandate's responsibilities. In the case of the ECB, maintaining price stability is the ultimate goal.

For instance, the new monetary policy regimes at the ECB and Bank of England (BoE) from 2022 received much criticism because evidence showed that while Central Banks are more worried about the climate crisis, the priority is still monetary policy and the focus on interest rates to keep price stability, which is insufficient to face climate change's challenges (Cullen, 2023). Additionally, in the United States, a request from the government for the Federal Reserve System (Central Bank of the United States of America) to formulate policies to prevent further global warming resulted in targeting areas of the economy solely according to their level of "green" or "brown," without appropriate metrics, which caused much resistance within these sectors, highlighting FED's superficial mitigation of climate-related policies (Cullen, 2023).

Regardless of the challenges, even if Central Banks' mandates traditionally focus on price stability and financial stability, there is a growing recognition of the need to implement concrete sustainability objectives and find a balance between traditional objectives and the promotion of sustainable finance by developing frameworks for green finance, assessing climate-related risks, and boosting sustainable sectors (Dikau & Volz, 2021). One important step towards the calibration of macro-prudential policies is to start by identifying climate-related risks and the modeling of exposure that financial institutions and the system as a whole face (Bolton, Despres, Silva, Samama, & Svartzman, 2020). Nevertheless, while Central Banks cannot become fully responsible for fixing all environmental problems, they can use their regulatory channels to control money, credit, and overall financial system and support the development of sustainable finance approaches and a low-carbon transition. Many instruments are suggested by Dikau & Volz (2018), such as green macro-prudential regulation, which involves climate-related stress tests that assess the potential impact that natural disasters can have on the economy and subsequent incorporation of identified vulnerabilities into capital and risk weights in banking regulation.

Additionally, Central Banks can influence investment and allocation decisions by communicating guidelines that integrate green finance and using their regulatory powers to incentivize banks to increase green lending or sustainable projects (BIS, 2011).

2.4 The case of the European Central Bank and the European Union

The European Central Bank (ECB) manages the euro currency and implements the euro area monetary policy. According to their mandate, the main goal of the ECB is to keep prices stable by setting the interest rates at which it lends to commercial banks, therefore controlling money supply and inflation. Moreover, the ECB is also responsible for managing the euro area's foreign currency reserves and ensuring that national authorities supervise financial markets and institutions well. Overall, the ECB is the primary agent in maintaining the safety and soundness of the European banking system (European Union, 2016). The bank is composed of 3 decision-making bodies: the Governing Council, considered the main decision body; the Executive Board, which takes care of the daily activities of the bank; and the General Council which has a more advisory and coordination role (European Union, 2024).

The ECB is concerned about climate risk as extreme weather events can disrupt economic activity, damage infrastructure, lead to business and household losses, threaten the banking system's stability due to a rise in delinquencies, and break the normal functioning of financial markets. ECB also recognizes that climate change (not necessarily linked to extreme weather events) can pose a risk to price stability and monetary policy implementation since, for example, the rise of global temperatures can reflect higher energy costs and, as a consequence, pressure inflation causing disruptions on the prices of goods and services which would call for extra action from the European Central Bank side.

Additionally, on the 5th of September 2023, Isabel Schnabel, member of the Executive Board of the European Central Bank (ECB), reflected on the sheer size of climate-related and environmental risks and the special attention we should give them since they cause extensive impact on the macroeconomy (European Central Bank, 2023). This category of risks is not only restricted to physical climate risks derived from the increasing occurrence of extreme weather events such as floods and heatwaves or long-term changes like the sea level rise, but it also entails transition risks emanating from the changes made by governments, industries, and consumers across countries to accommodate climate change and achieve a greener world. Measuring and monitoring these risks is crucial to protect the soundness of the euro area banking sector, so the ECB is concerned with incorporating climate change considerations into the analysis and decision-making process, its macroeconomic models, projections, and risk management framework.

Bricongne, Caldeira & Meunier (2024) reflect that physical and transition risks can materialize existing financial risks, such as credit and operational, affecting different industries,

including agriculture, energy, and transportation. In the paper, the authors suggest that Central Banks could use text mining¹ more, which also implies that the European Central Bank should integrate climate-related risks into supervisory and stability frameworks, creating more resilience against climate change. One of the examples given throughout the paper regarding its practical implementation is how Central Banks have used text mining to measure compliance with ESG (Environmental, Social, and Governance) regulations by analyzing how much financial institutions comprehend climate-related disclosures. Generally, the results showed a lack of preparedness for those risks, revealing the need for more transparency and guidelines (Moreno Bernal & Caminero Garcia, 2022). Additionally, by using text mining, it is possible to understand better and study the impact of climate change on equity markets since previous textual analyses have identified transition shocks by joining financial returns with newspapers, showing that those shocks worsen credit conditions and affect industries like oil (which are more sensitive to climate) enhancing financial instability (Meinerding, Schuler, & Zhang, 2020). Also, text mining could allow the ECB to deal with large sets of unstructured data and turn them into useful insights to help supervisors understand and mitigate climate-related risks (Bricongne, Caldeira, & Meunier, 2024).

Even though the ECB is an independent entity, its actions still work in complementarity with the European Union (EU) decisions. For this reason, it is important to also reflect on their efforts. EU climate investment plans are still dominated by uncertainty, weak green regulations, and the reallocation of climate funds to other priorities, and they need a well-developed fiscal framework. As a result, significant economic and social consequences of the increasing global temperature are taking a toll on the euro area and climate change mitigation, and its adaptation requires coherent policies. The European Commission intends to fill investment needs with programs such as the Green Deal with a Net Zero emission target by 2050 and the Next Generation EU. However, those plans only cover less than half of the needs since only mitigation investments are highly financed. Mitigation policies implemented to prevent or decrease the release of GHG emissions that contribute to climate change, such as the replacement of fossil-fueled energy production with nuclear or solar energy plants. On the contrary, climate adaptation investments, which relate to creating resilience in the economy due to the effects of climate change, are still majorly neglected. In short, the EU-27 Member States and the European Commission need over 700 billion euros annually to achieve the Green Deal target by 2050 (European

¹ Text mining collects meaningful information from text data using computer techniques. It uses methodologies such as sentiment analysis, natural language processing (NLP), and machine learning to deal with large volumes of data from various sources. The main goal of text mining is to turn unstructured data into valuable insights that can be quantitatively analyzed. (Bricongne, Caldeira, & Meunier, 2024)

Environment Agency , 2024). Additionally, to describe and create awareness of the possible consequences of the climate crisis, the European Commission started segmenting the threats by territories, businesses, and social indicators (European Union, 2023)

Arguably, climate policies could be designed at the national level. However, Monasterolo, Pacelli, Pagano, and Russo (2024) pointed out in their recent paper that a national-level design can create inefficiencies such as carbon emission spillovers, with each country choosing lenient environmental targets and neighbors bearing the harm. Furthermore, firms can also reallocate to different jurisdictions to pollute across national borders in less stringent countries. In general, the incentive for each government to introduce ambitious climate policies and regulations is very low, so setting the standards and objectives of climate policies at a supra-national level based on their contribution to decarbonization and assigning the implementation to each member state could be a way to overcome those inefficiencies. The supra-national institutions monitor the projects by setting KPIs and ensuring compatibility with the scheme; non-compliant countries could be restricted from receiving further funding.

In sum, the ECB has strong incentives to address climate risks since they affect the stability of prices and the functioning of banks that the ECB supervises. For example, if a flood hits many firms at once, they might be unable to keep paying their loans. A sudden increase in loan defaults can be damaging if the banks under the ECB's supervision are unaware of their climate-related risks and do not have well-established policies to tackle the effects of a climate crisis (European Central Bank, 2022).

2.5 The ECB's actions to tackle the climate crisis

The ECB has incorporated climate-related risks into its supervisory and monetary policy frameworks. It has also researched the impact of climate change on the economy and financial markets and provided guidelines for banks and other financial institutions to assess and manage climate-related risks.

In July 2021, the ECB announced a climate action plan to increase its contribution to addressing climate change by supporting the green transition of the economy while keeping in line with its primary obligation of maintaining price stability. The plan incorporates measures incentivizing firms and financial institutions to reduce carbon emissions and become more transparent about their environmental concerns and actions. Furthermore, to gradually decarbonize its corporate bond holdings, the Eurosystem will dispose of these holdings to issuers

with lower greenhouse gas emissions and ambitious carbon reduction targets. Also, the shares of assets issued by entities with high carbon footprints will be limited². By 2026, the ECB plans to only accept marketable assets and credit claims from debtors that comply with the Corporate Sustainability Reporting Directive (CSRD). To improve the risk assessment tools, the ECB urged rating agencies to be more transparent about how they incorporate climate risks into ratings and the requirements on climate risks (European Central Bank, 2021).

The Governing Council also compromises on regularly reviewing all the measures mentioned in the action plan to ensure continuous support of the decarbonization path to reach the targets of the Paris Agreement and the EU neutrality objectives and to tackle environmental challenges within their price stability mandate (European Central Bank, 2022).

In July 2022, a climate agenda with six priority areas was also released, such as assessing the macroeconomic impact of climate change and mitigation policies on inflation and the real economy, contributing to policy discussions to scale up green finance, increasing transparency, and promoting best practices to reduce the environmental impact (European Central Bank, 2022).

In addition to this action plan, the ECB and the European Systemic Risk Board (ESRB) frequently release reports on mitigating climate risks. In December 2023, they presented a report on macroprudential frameworks for different subjects, such as surveillance and monitoring or strategy and operationalization. Moreover, the report also presents broader financial stability risks derived from the climate crisis to relate climate risks and financial stability and create a common macroprudential strategy with both a corrective and preventive branch. The surveillance framework (Figure A.3) monitors financial stability risks arising from climate change hazards. Even though economic and financial exposures to those risks are heterogeneous, some are common, especially in banks' corporate and mortgage lending portfolios. More than 60% of the bank's interest income derives from companies operating in carbon-intensive sectors, and high-emitting households represent around 60-80% of the total mortgage borrowers in the euro area. This framework will be updated as challenges and gaps are surpassed; data availability and differences in reporting standards are obstacles to effective surveillance.

The second framework regarding the macroprudential policy and the provision of preliminary operational design based on the existing tools aims to use a broader set of prudential policies to support a common EU approach (Figure A.4). Macroprudential policy focuses on

² First, marketable debt instruments assets issued by companies outside the financial sector can be pledged as collateral by individuals, and other asset classes will be limited.

reducing risk build-up, creating more resilience, and lessening the materialization of tail events. Within this framework, one of the key challenges is managing the risks banks face by using systemic risk armor with different policy options, such as differentiated lending limits and including climate risk features in calibration models. The report also mentions a third framework, which dives into nature-related risks (Figure A.5) caused by degradation and how they can affect the economy through direct transmission channels, with preliminary estimates that 75% of corporate loans in euro area banks and 31% of investments in corporate bonds and equity are in sectors whose products and services are reliant on nature, or indirect channels that can boost direct effects via value chains as is the case of the retail sector (European Central Bank , 2023).

For 2024 and 2025, the ECB will focus on the implications of the green transition and on what can be done to support it within its mandate. It will also understand the physical impact of climate change on the economy and explore the risks that natural loss and degradation pose to the economy by assessing the implications of natural degradation for financial stability (European Central Bank , 2024).

3. Data and Methodology

This section will discuss the data collected and the methodology used to answer the research question regarding the ECB's commitment to tackle the climate crisis.

The European Central Bank meets, on average, every six weeks, eight times a year, and after every gathering, the discussions and policy decisions are made available to the public. For this study, 73 documents, all denominated as "Policy Monetary Accounts" from 2015 to 2023, representing the meeting minutes, were selected from the official ECB website.

The accounts cover monetary policy decisions of the Governing Council and include financial, economic, and monetary updates and a summary of the meeting's discussions. The documents have been available since 2015 (the first year of publication). Up to February 2020, the ECB published the minutes as "Account of the monetary policy meeting." From March 2020 onwards, the minutes were published as "Meeting of 11-12 March 2020", "Meeting of 20-21 July 2022," etc.

The methodology used in this dissertation is a comparative analysis, which emphasizes relationships and patterns between two or more phenomena and provides a better understanding of the differences and similarities between variables. This methodology can generally assume four typologies: individualizing, universalizing, variation-finding, and encompassing (Adiyia & Ashton, 2017). Given the nature of my research question, an encompassing comparison is more fitting.

The research was divided into two phases. Based on the data collected, the first phase was to define a set of keywords related to the climate crisis: climate, decarbonization, environment, energy, transition, green, brown, planet, and the respective family of the words. From 2015 to 2023, each word was counted to understand the growing relevance of the climate crisis in the ECB's meetings.

The second phase was classifying each occurrence according to its intrinsic objective and implementation. As for their intrinsic objective, the selected words can appear associated with a mitigation policy (Mitigation), an adaptation policy (Adaptation), or other (Other_Objective). A mitigation policy relates to policies that aim at diminishing Green House Gas emissions, such as the replacement of fossil-fueled energy production with nuclear or solar energy plants. An adaptation policy has in view the implementation of policies to create more resilience to the consequences of climate change, such as protecting coastal areas against sea-level rise. In terms of implementation, the selected words can be associated with policies that are intended to be

implemented in the future (Intention), policies that are already in progress (Action), or other (Other_Implementation).

Given the above two types of classifications, each word occurrence can be characterized with one of the following combinations: Mitigation/Intention; Mitigation/Action; Mitigation/Other; Adaptation/Intention; Adaptation/Action; Adaptation/Other; Other/Intention; Other/Action; Other/Other.

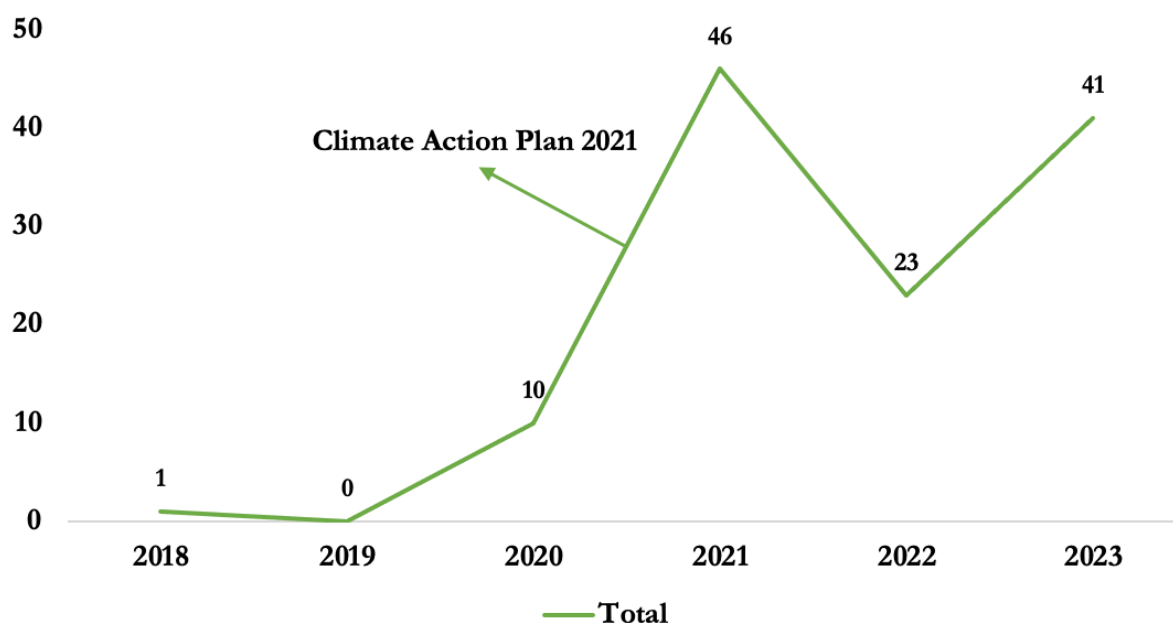
4. Results and Discussions

The following section shows the results obtained after applying the text analysis methodology previously described to the ECB's monetary policy accounts from 2015 to 2023. The first part shows the general results for the sample period. The second part presents a detailed analysis of yearly differences in keyword occurrences and respective classifications.

4.1 General Overview

As a starting point, Graph 1 depicts the evolution of the keywords' occurrence in the sample period. The plot starts in 2018 because it was the first year that the defined keywords appeared in the documents.

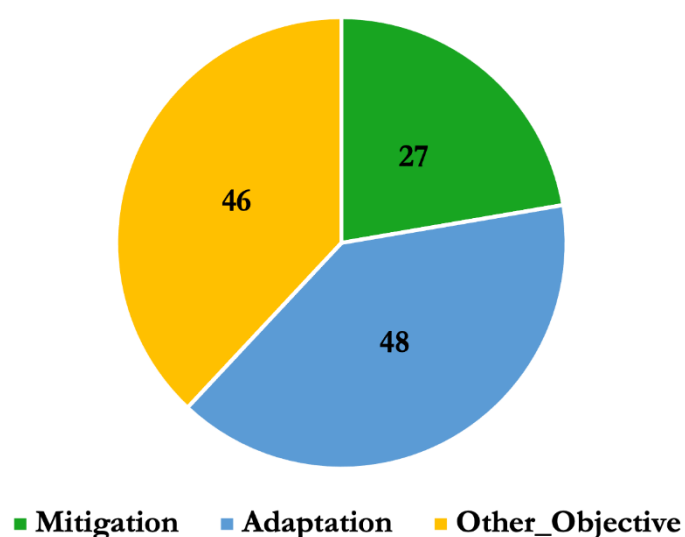
Graph 1: Historical occurrence of keywords from 2015 to 2023



Source: Own calculations based on European Central Bank Monetary Policy Accounts

In recent years, there has been an increasing trend in the recurrence of keywords related to the climate crisis. Between 2020 and 2021, the keywords became more frequent in the documents, reaching a peak in 2021. This result can be explained by the approval of the ECB Climate Action Plan in that same year, where the ECB committed to becoming more active in the fight against the climate crisis by integrating climate-related risks into its monetary strategy. After a short decline, the word count increased again in 2023 given the broader conversations regarding green credit supply associated with the decarbonization of the Eurosystem.

Graph 2: Objectives of the policies associated with the keywords



Source: Own calculations based on European Central Bank Monetary Policy Accounts

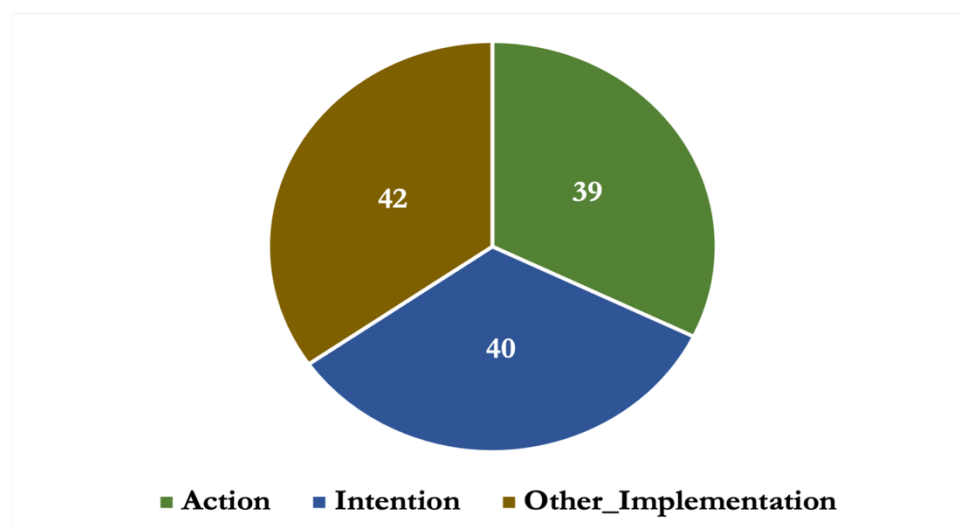
To better understand the ECB's underlying objective of mentioning each keyword, Graph 2 portrays the classification of each occurrence according to its policy objective. As shown above, forty-eight occurrences relate to adaptation policies (40%) associated with investments to increase resilience against climate change. For example, there are multiple references to the NextGenerationEU program, which was implemented to contribute to a more robust and uniform recovery across the euro area post-COVID-19. The program has key components, which include boosting investment in sustainable infrastructure, innovation, and digitalization alongside the emphasis on the EU's goals to achieve climate neutrality by 2025. There are also references to the importance of accelerating the green and digital transitions.

Occurrences related to mitigation policies represent 22%. The introduction of environmental sustainability requirements for eligibility for collateral and asset purchases or discussions regarding how the European Commission's Green Deal package should be implemented in the projection exercise are some examples of mitigation policies mentioned throughout the years.

Keywords unrelated to mitigation or adaptation policies are also frequent (46 occurrences representing 38%). These "Other_Objective" occurrences are still related to the climate crisis but cannot be classified as mitigation or adaptation policies. As an example, in 2023, the Governing

Council mentioned the need to monitor the composition of the Asset Purchase Programme³ (APP) portfolio to assess whether the composition remained compatible with both the intended monetary policy and the climate goals of the Paris Agreement.

Graph 3: Implementation of the policies associated with the keywords



Source: Own calculations based on European Central Bank Monetary Policy Accounts

Regarding the implementation of the policies, Graph 3 shows that the overall distribution between actions, intentions, or other types of implementation is evenly distributed, with actions representing 35%, intentions 33%, and other implementations 32% of the total occurrences.

Actions are usually related to planned climate-related initiatives that were implemented before or during the period studied (2015-2023), such as the Next Generation EU and the Green Deal package. Moreover, because of COVID-19 and the war between Russia and Ukraine, policies considered “actions” are also the ones implemented as a quick and direct response to these events. Even though these events are not explicitly related to the climate crisis, they had implicit impacts such as resource tightening and reallocation and the increase of energy prices, which have impacts on the green transition.

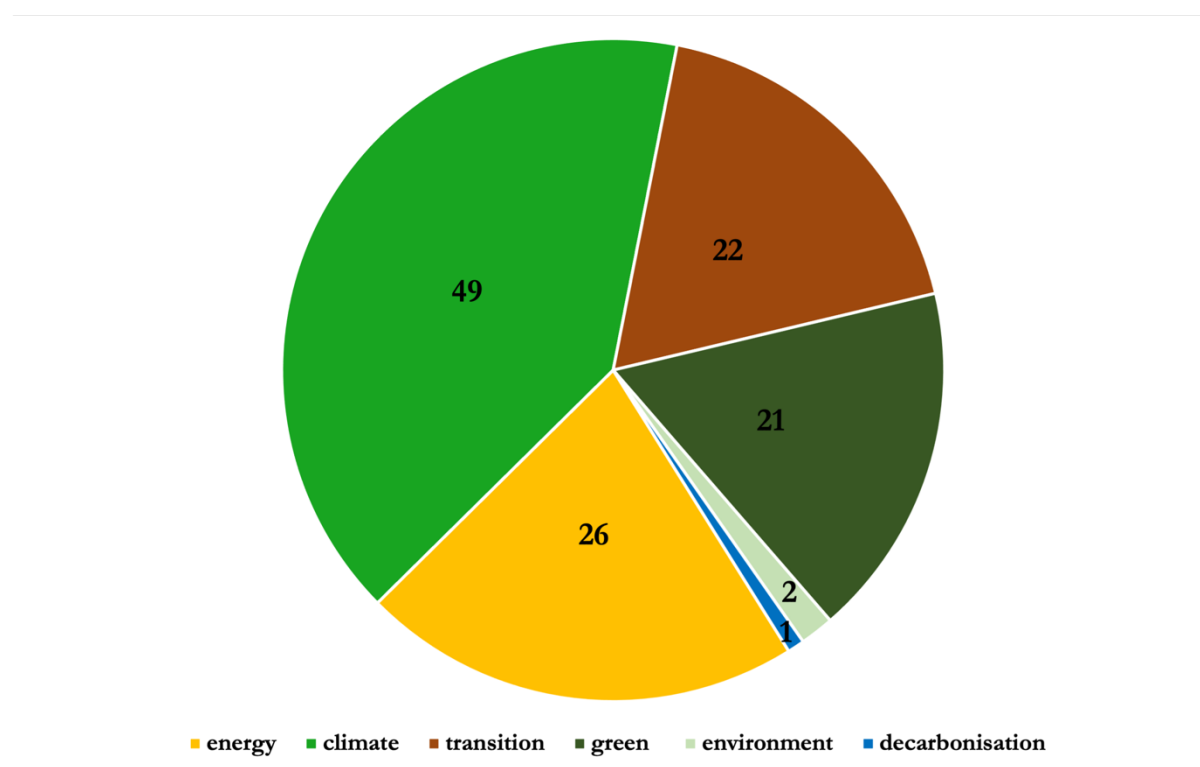
Intentional policies (33%) are those that the ECB states it intends to implement in the future without a proper timeframe. Some of the examples collected mention how the Governing Council will explicitly account for implications of climate change and carbon transition in its

³ ECB’s asset purchase programme (APP) is part of a package of non-standard monetary policy measures which include longer-term refinancing operations and was created in 2014 to support monetary policy transmission mechanism and ensure price stability (European Central Bank, 2023)

strategy or future boosts of fiscal spending by additional investments in the renewable energy sector and green energy transition.

Other implementation policies also have a big weight (32%), mostly due to mentions of policies where it is difficult to identify whether the policy discussed is an intention or an action. A common example relates to conversations regarding the loss of value in sectors such as retail and construction due to the impact of weather conditions and the policies to mitigate those effects.

Graph 4: Occurrences by keyword

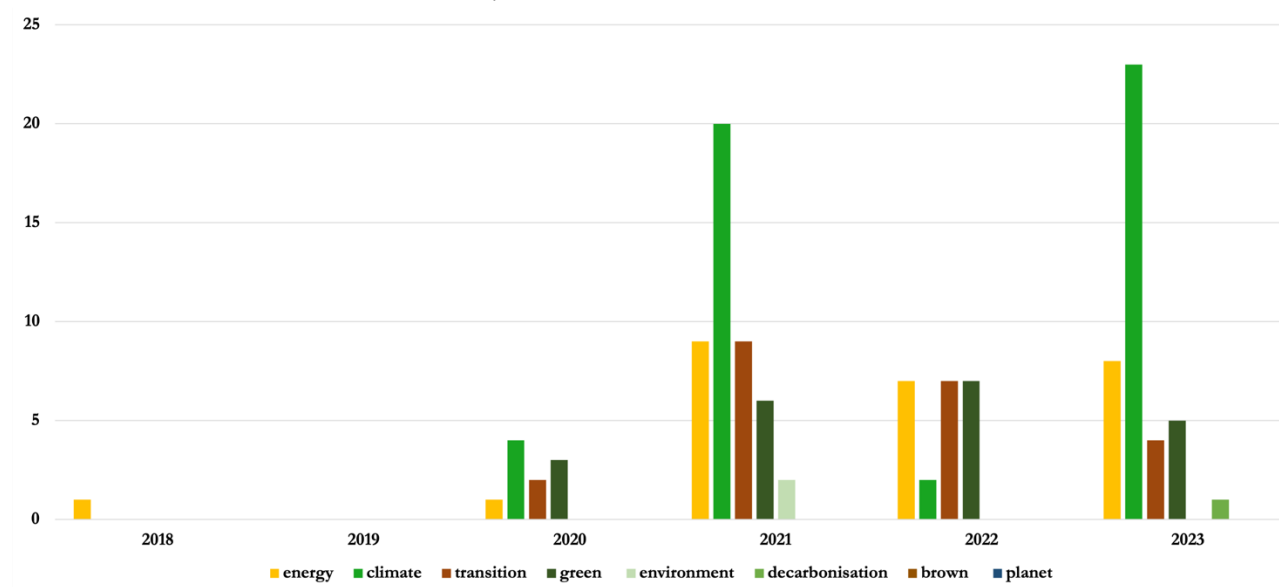


Source: Own calculations based on European Central Bank Monetary Policy Accounts

Looking at the total number of words, four of the defined keywords hold the most weight: “climate,” “energy,” “green,” and “transition.” Moreover, the word “climate” appears 49 times, representing 40% of the occurrences. Its frequency is mostly associated with broader topics of discussion, such as meeting climate change targets, mentions of climate-related packages such as the European Commission’s Green Deal, and the effects of climate policies. The same occurs with the words “green” and “transition,” representing 17% and 18%, respectively. Most of the time, these two words are linked with policies to accelerate the green and digital transition, for instance, structure reforms, replacement of fossil fuels, or positive effects of medium-term inflation.

The word “energy” also holds considerable weight (21%) as it can be associated not only with post-war breakout conversations regarding dependency on Russian energy sources but also with the green transition and the impacts on energy prices.

Graph 5: Historical occurrence of each keyword from 2015 to 2023



Source: Own calculations based on European Central Bank Monetary Policy Accounts

By showing each word occurrence on a yearly basis, Graph 5 reveals that the first word reported in 2018 was “energy.” This first mention of energy in the monetary policy account of May 2018 relates to possible gains in energy sectors derived from the impacts of weather conditions early that year, therefore not translating to either a mitigation or adaptation policy.

From 2020 onwards, it is possible to observe a more frequent diversification of keywords. Words like “climate,” “energy,” “transition,” and “green” appear the most and are usually associated with references to initiatives to foster the digital and green transition. Additionally, the words “climate” and “green” are likely to appear more since they involve broader discussions around the climate crisis and the role of the ECB towards green finance. In contrast, “energy” and “transition” have become more frequent since 2021 due to the geopolitical tensions and discussions surrounding green transition and changes in energy policies.

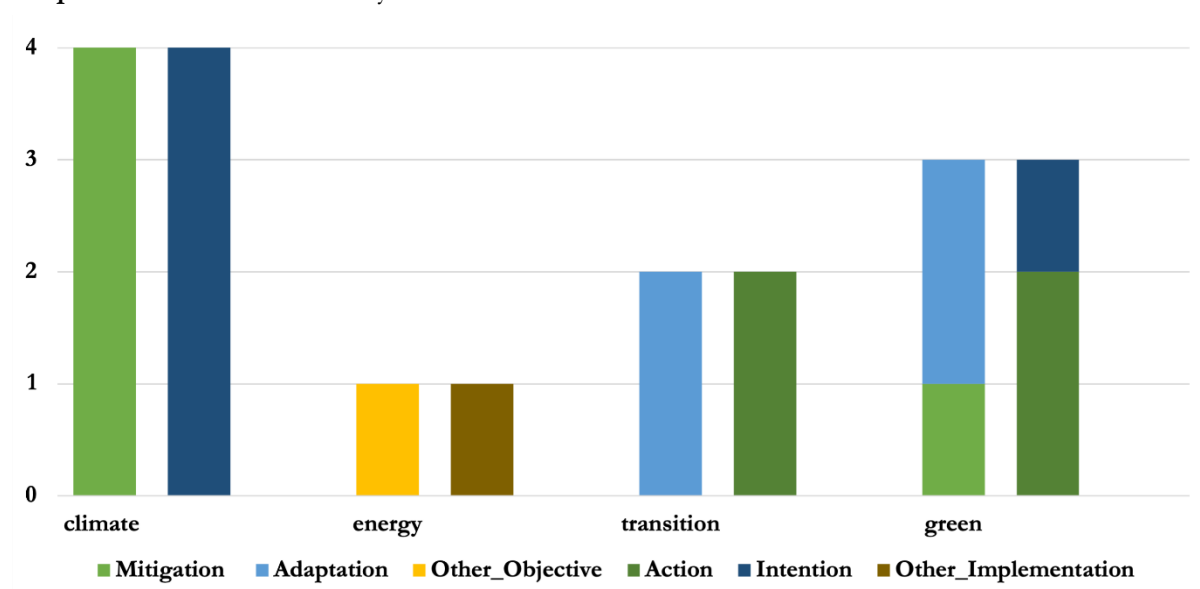
This marked increase in frequency and diversification since 2020, especially since 2021, suggests a shift in the ECB's strategy, probably due to the increasing public pressure on climate crisis issues.

4.2 Analysis per Year

A detailed analysis of the years with the most relevant results (2020, 2021, 2022, and 2023) can provide valuable insights regarding the European Central Bank's evolving strategy to tackle the climate crisis. It also allows for the underscore of patterns and trends across the years and possible coincidences with EU policy shifts and climate agreements.

In the following graphs, for each word displayed in the horizontal axis, the first column presents the distribution of counts according to its intrinsic objective (mitigation, adaptation, or other objective), and the second column presents the distribution of occurrences according to its implementation (action, intention, or other implementation).

Graph 6: Characterization of keyword occurrences in 2020



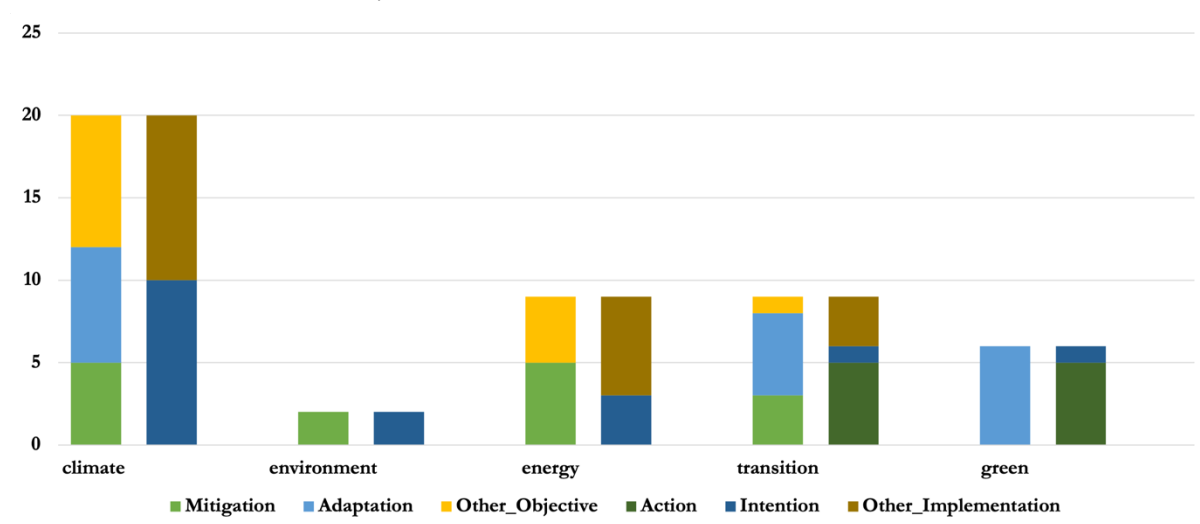
Source: Own calculations based on European Central Bank Monetary Policy Accounts

Graph 6, for 2020, reflects no visible pattern regarding the objective of policies discussed since mitigation, adaptation, and other policies are all mentioned. In terms of implementation, the same occurs, portraying results for actions, intentions, and others. However, it is noticeable that actions and intentions have more occurrences than other implementation types, which showcases strides in addressing the climate crisis. This represents a broader discussion on integrating climate-related risks into policy frameworks within the ECB.

However, a significant result to reflect on is that all mentions of the word “climate” throughout 2020, associated with mitigation policies described as diminishing greenhouse gas emissions, reveal an intention of implementation and never an action taking place. This result shows the ECB's tendency to have difficulty fully integrating climate crisis challenges into actual

monetary policies, giving space for vague guidelines for the future instead of an action for the foreseeable time.

Graph 7: Characterization of keyword occurrences in 2021

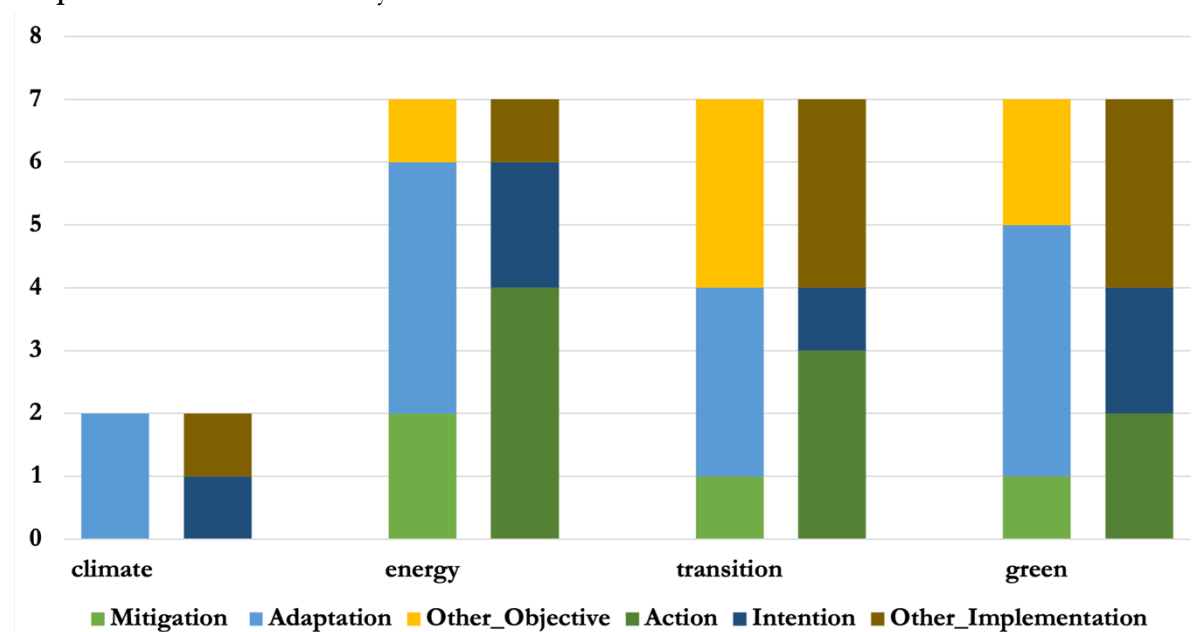


Source: Own calculations based on European Central Bank Monetary Policy Accounts

Graph 7, reflecting 2021, marks a significant increase in climate-related discussions, most likely as a direct consequence of implementing the ECB's Climate Action Plan (2021). This year portrays the highest number of times the word “climate” was mentioned, with an increase of around 16 mentions compared with the previous year, and, in contrast, including mitigation policies, adaptation, and other objective policies. The same year, the word “environment,” which had not been mentioned before, was also introduced, as it is related to an intentional mitigation policy to introduce environmental sustainability disclosure requirements for collateral and asset purchases.

Overall, as shown in Graph 7, most policies are associated with an intention or other type of implementation. Once again, even if we see a substantial shift in the ECB's strategic approach, policies related to the climate crisis still need to be implemented in the course of action, reflecting their difficulty in fully integrating new environmental policies into their operations.

Graph 8: Characterization of keyword occurrences in 2022

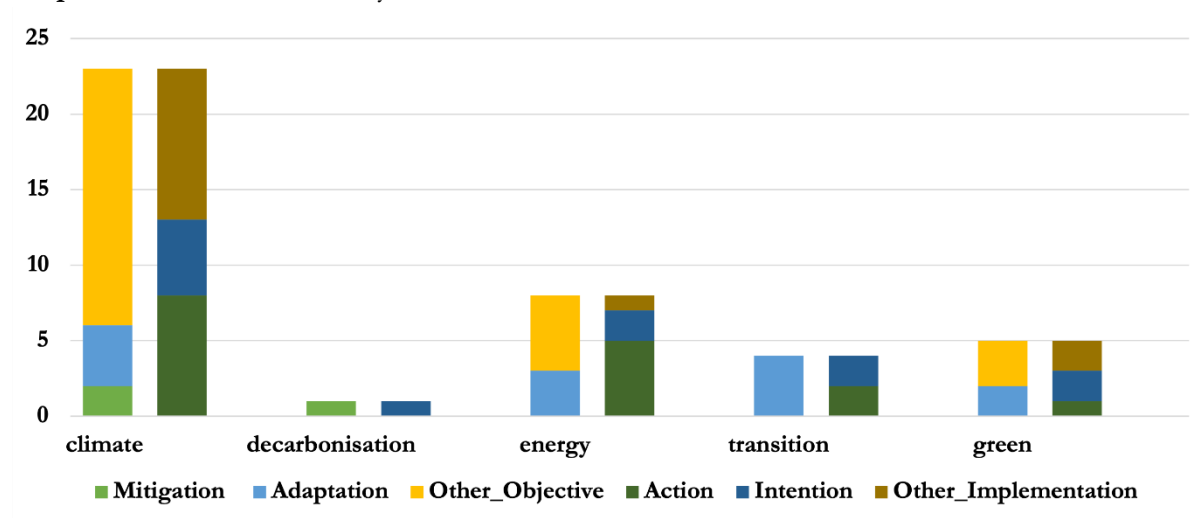


Source: Own calculations based on European Central Bank Monetary Policy Accounts

Graph 8 describes the general decrease in word occurrences in 2022. Most of the occurrences are related to adaptation policies associated with actions or other implementation types. It is essential to notice that even though it is a year with multiple references to adaptation investments, both mitigation and other investments also appear more than once.

This year, as opposed to the previous ones, showcased more policies in action, most likely related to the beginning of the implementation of the Climate Action Plan (2021). Moreover, 2022 also focused on adjusting to unpredictable external shocks, such as the energy crisis caused by the war between Russia and Ukraine, which reinforced the need for revising energy dependency and accelerating the transition to greener energy sources.

Graph 9: Characterization of keyword occurrences in 2023



Source: Own calculations based on European Central Bank Monetary Policy Accounts

Graph 9 portrays 2023 data, the last year within the scope of analysis. Most of the occurrences are neither linked with mitigation nor adaptation policies but are related to other types of policies, and the majority represent an action or other type of implementation.

This year, the word “decarbonization” appears for the first time and is associated with an intentional mitigation investment regarding a gradual decarbonization of the Euro system’s corporate bond holdings to increase support for the EU’s policies to achieve the climate goals of the Paris Agreement.

The ECB’s discussions in 2023 reveal a consolidation of previous efforts and much preparation for long-term sustainability. They are focusing on increasing the resilience of monetary policies to climate-related risks (adaptation) while developing new tools to integrate and measure those risks.

5. Critical Analysis

Given what has been presented up until now, it is possible to reflect more in-depth on the ECB's developments regarding the climate crisis and its commitment to tackling it. Keyword mentions can be further analyzed to understand their context, policy impacts, and strategic implementation.

Back in 2018, the only mention concerning the climate crisis was through the word “energy” and reflected the possible impact of weather conditions earlier that year and the consequent loss in value in some sectors of the economy, such as those related to energy. Moreover, this occurrence cannot be characterized as an intention or an action to implement mitigation or adaptation policies, revealing no further steps within the ECB to start including the climate crisis in their monetary policy decision. In the following year, 2019, no mentions of the selected keywords were made, indicating no commitment from the ECB. It is noteworthy to notice that, at this moment, governments and parliaments already have multiple climate actions in place. Within the European Union, the EE White Paper on Adapting to Climate Change aimed at reducing the European Union's vulnerability to the climate crisis's impact and diminishing greenhouse gas emissions (GHG). Furthermore, the COP held yearly by the United Nations Framework Convention on Climate Change, which, in 2019, took place in Madrid. Its primary objective was the expansion of the climate ambition by achieving carbon neutrality in 2050 and fulfilling the goals of the Paris Agreement.

Fast-forward to 2020, more occurrences of keywords started happening, and there was a noticeable concern of the European Central Bank with the climate crisis. That year, the intention to include climate-related policies in the projection exercises is mentioned. More specifically, “there was also some discussion about how climate-related policies, including the European Commission's Green Deal package, should be taken into account in the projection exercises” (European Central Bank , 2020) and how these structural policies could help accelerate the investment in areas such as the green and digital transitions, portraying an action related to adaptation policies focused on creating resilience against the climate crisis.

In 2021, the ECB's commitment to be an active player alongside other agents, such as governments and parliaments, became evident. It is referenced how climate change was now of strategic importance for the ECB, and environmental sustainability requirements would be implemented in different areas, such as when making collateral and asset purchases, favoring those with greener investments (European Central Bank , 2021). Moreover, it was also mentioned

multiple times throughout the year how the role of the Next Generation EU package was reaffirmed by calling out Member States to allocate funds productively in these structural policies because “Such structural policies were significant in improving economic structures and institutions and in accelerating the green and digital transitions.” (European Central Bank , 2021). Regarding the new pack with climate policies aiming at addressing climate change by boosting investments in the green transition while keeping price stability, it was also mentioned that this pack would most likely lead to pressure on energy prices and other price components. Moreover, this aligns with the increased carbon prices needed to meet the Paris Agreement's goals to reduce greenhouse gas emissions, as a substitution effect would be seen later on. As carbon prices increase, businesses and consumers are more likely to substitute high-carbon activities with lower-carbon activities incentivizing shifts towards greener investments (European Central Bank , 2021).

As a direct consequence of the Ukraine-Russia war outbreak in 2022, Russia's energy dependency became one of the primordial discussions, and how the disconnection from their resources could enhance and accelerate the green transition. Furthermore, it is mentioned that “there would be additional investments in the energy sector to reduce the dependency on Russian gas and oil, including investment in the green energy transition,” and over time, the EU would find alternative suppliers to become even less dependent on fossil fuels.

In that same year, another central key point within the conversation was how implementing the Next Generation EU plans, the “Fit for 55” package, and the REPowerEU plan would help the euro area become more resilient and grow more sustainably. By gradually decarbonizing the Eurosystem corporate bond holdings, the euro area could achieve the goals under the Paris Agreement.

However, most of the events in 2022 are characterized as intentions to implement adaptation, mitigation, or other policies, which could translate into minimal results when faced with the rapid advances of the climate crisis.

Lastly, in 2023, after the outbreak of the Ukraine-Russia war and the COVID-19 pandemic, the monetary policy accounts shifted to more actions regarding adaptation or mitigation policies to diminish greenhouse gas emissions and create more resilience against the consequences of the climate crisis.

It was underlined that the ECB's commitment to supporting the euro area in achieving the goals of the Paris Agreement could be felt by the reinvestments in the corporate sector purchase

program portfolio towards issues with a better climate performance and by gradual decarbonization of the corporate bond holdings (European Central Bank , 2023). Also, to diminish the pressure on the increasing energy prices mentioned before, the ECB suggests policies that could boost the euro area's supply capacity in the energy sector. Governments should swiftly shift their focus on their investments in plans under the Next Generations EU program.

Moreover, concerning the asset purchase program (APP) of the ECB, it was requested a disclosure of the portfolio composition to assess if it was aligned not only with the intended monetary policy stance but also with the climate goals of the Paris Agreement, showcasing a more active role in the implementation of mechanisms to tackle the climate crisis from the ECB side. Besides that, in order to meet the EU's 2030 climate objectives of reducing greenhouse gas emissions by at least 55%, achieving at least a 32% share of renewable energy in the EU's energy mix, strengthening the EU Emissions Trading Systems (ETS), among others, it was mentioned the need for extra investment especially in the household sector (European Central Bank , 2023).

Despite that, some challenges also arose during the meetings of 2023, which showcases that more progress and action are necessary since “adverse weather conditions, and the unfolding climate crisis more broadly, could push food prices up by more than expected” (European Central Bank , 2023). Considering the overall economic conditions of the euro area consumers, this quickly became a concern for the ECB, even if no concrete policies were designed or implemented. It was also pointed out how the consequences of the climate crisis could bring new adverse supply-side shocks resulting from extreme weather events, destroying harvests and agricultural land (European Central Bank , 2023).

Ultimately, combining the results exhibited before and the present critical analysis, it is clear that the ECB has been introducing the topic of the climate crisis and taking it seriously, focusing more on adaptation or mitigation policies and planning for further plans. Nevertheless, while public statements suggest a solid commitment to integrating climate-related risks, a deeper analysis reflects a slow pace and depth of integrating climate considerations into monetary policy frameworks. Once again, the difficulties the ECB faces when finding an interplay between maintaining price stability and addressing these new climate-related risks might be an essential reason behind this gap. For example, the implementation of measures like adjusting collateral and asset purchase frameworks to favor greener investments while at the same time accounting for the potential impacts on inflation and price stability. Moreover, the implementation of the Climate Action Plan, which marks an ambitious commitment, appears uneven across policy areas because

integrating all the considerations into the complex mechanism of monetary policy poses a challenge for the ECB.

For this reason, the ECB needs to start applying a more integrated, clear, and comprehensive approach that addresses the systemic implications of climate-related risks and demonstrates how greener investments contribute to measurable positive outcomes.

A way to accelerate newer approaches is to implement robust feedback mechanisms that measure the effectiveness of climate-related policies using metrics and benchmarks as mentioned in the Climate Action Plan. This would allow not only the assessment but also the monitoring of new policies in order to keep adjusting. Stress testing and scenario planning are also crucial to create a more resilient and adaptive framework to respond more effectively to climate-related risks' dynamic nature. As previously mentioned, Bricongne, Caldeira, and Meunier (2024) suggest text mining to transform unstructured data into valuable inputs. This would allow the ECB to, for instance, measure compliance and assess the impacts of green investments' measures regarding asset purchase and collateral frameworks to communicate its benefits better.

In conclusion, this critical analysis stresses the need for the ECB to expand its climate-related communications and close the mentioned gaps to solidify its commitment to tackling the climate crisis using monetary policy.

6. Conclusion

This dissertation has reflected upon the role of the ECB in its commitment to combat the climate crisis based on the monetary policy accounts from 2015 to 2023, demonstrating a definitive but gradual implementation of developments surrounding these concerns in its strategic operations.

The study shows that throughout the years, the ECB has recognized the dangers of climate-related risks and, since 2018, has gradually introduced mentions and discussions of climate-related topics in monetary policy meetings, especially after the release of its Climate Action Plan in 2021. This plan is considered a crucial development since it translated into more depth and frequency of climate-related considerations. The following years show the same trend, with 2023 emphasizing green investments and broader environmental goals.

Graphical analysis shows a predominance frequency of keywords associated with adaptation policies, highlighting their role in increasing resilience in climate change. This becomes more evident with the frequent references to initiatives such as the NextGenerationEU program, emphasizing recovery and structural reforms that support green and digital transitions.

Furthermore, the analysis from 2020 to 2023 provides valuable insights into the ECB's evolving focus. In 2020, the discussions encompass mitigation, adaptation, and other objectives, mentioning intentions to incorporate climate policies. The following year, 2021, is marked by a significant increase in climate-related discussions, focusing on environmental sustainability requirements for financial instruments. Despite a decrease in overall mentions in 2022, the emphasis on adaptation investments persisted, reflecting the ECB's response to the Ukraine-Russia conflict and its implications for the energy sector. In 2023, a shift towards actionable climate policies was more evident.

Although there has been noticeable progress, from a more critical point of view, integrating climate risk considerations has been challenging for the ECB. Initiatives such as adjusting collateral frameworks and asset purchases to favor green investments demonstrate a commitment to fighting the climate crisis. However, the transition toward full integration of climate considerations into monetary policy is still a slow and ongoing process.

The critical analysis also highlights the challenges faced by the ECB in obtaining a balance between its primary priority of keeping price stability and its intention of being active players in mitigating the climate crisis. Even though the ECB has stated before that it does not consider itself

a frontline environmental player, a broader acknowledgment of its responsibilities and involvement has been noticeable, reflecting an awareness of the risks presented by climate change. This dissertation recognizes that this progress indicates a cautious but significant shift toward effectively mitigating climate risks.

This study contributes to a better understanding of the different approaches central banks, specifically the ECB, can take to align monetary policy with environmental goals. It also provides an empirical analysis based on the ECB's monetary policy accounts, joins monetary policy and climate risk management topics, and considers future policy adjustments.

Focusing on the future, it is likely that the ECB's approach to climate change will continue to change and be driven by new socio-economic developments and regulations. Furthermore, this dissertation suggests policy reevaluation as a crucial step in the ECB's strategic operations to continue contributing to broader climate-related objectives while keeping its primary focus on price stability.

Overall, this dissertation underlines the ECB's commitment to its role in addressing the climate crisis while reflecting on the need to redefine strategic operations to provide more precision and integration of climate-related risks, ensuring the transition to a greener and more sustainable economy.

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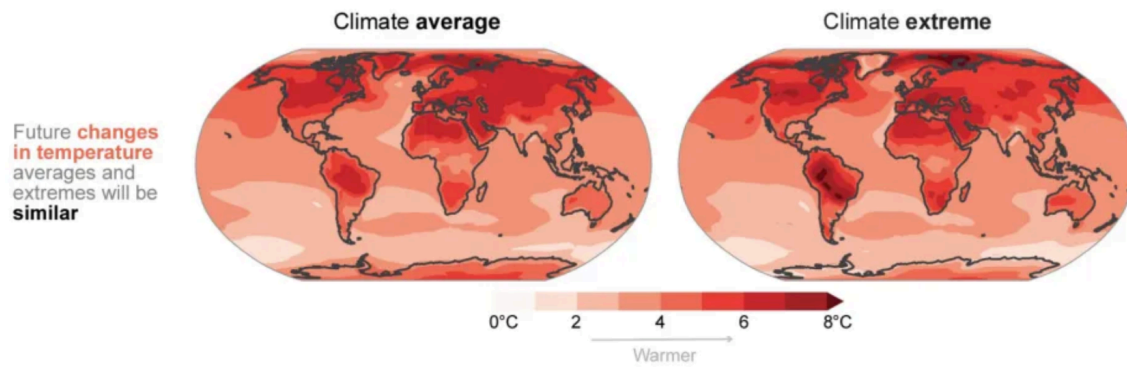
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Appendix

Appendix A

Figure A.1: Climate Average vs Climate Extreme around the globe



Warming is already occurring in all areas of the globe, but models of future temperatures show that the changes will not be distributed equally. Polar regions and land areas are expected to see the largest temperature changes.

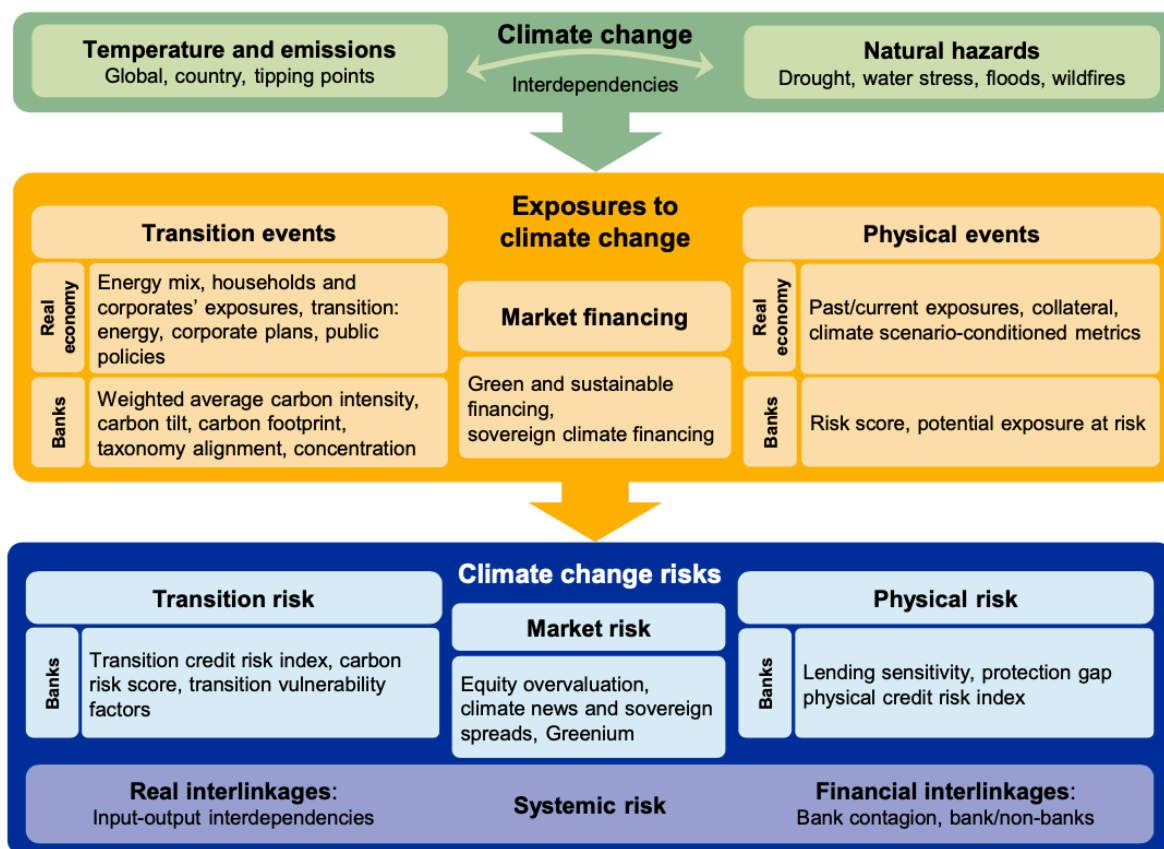
Source: IPCC Working Group I, 2021

Figure A.2: Climate change-related actions planned by the ECB from 2021 until 2024

		2021	2022	2023	2024
1.	Eurosystem/ECB staff macroeconomic projections	Introduce technical assumptions on carbon pricing for forecasting and regularly evaluate the impact of climate-related fiscal policies on the Eurosystem/ECB staff macroeconomic projections baseline.			
2.	Macroeconomic modelling and scenario analyses		Integrate climate risks into the ECB's workhorse models and assess their impact on potential growth. Conduct scenario analyses regarding transition policies. Model implications of climate change for the transmission of monetary policy.		
3.	Statistical data for climate change risk analyses	Develop indicators on green financial instruments.		Develop new statistical collections related to climate change.	
		Construct indicators on exposures of financial institutions to climate-related physical risks through their portfolios.			
		Derive indicators on the carbon footprint of portfolios of financial institutions.			
4.	Market neutrality and efficiency concepts in monetary policy operations	Assess potential biases in the market allocation amid market inefficiencies and the pros/cons of alternative allocations.	Make concrete proposals for alternative benchmarks, in particular for the Corporate Sector Purchase Programme (CSPP).		
5.	Disclosures in line with EU policies as an eligibility requirement in collateral framework and asset purchases	Proposal and adoption of EU disclosure regulation.		In force.	First regulatory disclosures covering 2023.
			Design adequate policies and conduct legal and operational preparations.	Adaptation period for issuers.	In force.
6.	Climate stress-testing of the Eurosystem balance sheet	Prepare data and methodology.	Conduct pilot stress test based on the 2021 ECB economy-wide climate stress test and 2022 supervisory climate stress test of individual banks.	Build upon the pilot stress test and introduce regular climate stress-testing.	
7.	Climate change risks in credit ratings for collateral and asset purchases	Assess rating agencies' disclosures and understand how they incorporate climate change risk in ratings.		Introduce requirements into the Eurosystem Credit Assessment Framework (ECAF) targeted to climate change risk, if warranted.	
		Develop minimum standards for internal credit ratings.			
		2021	2022	2023	2024
8.	Climate change risks in the collateral framework	Review collateral valuation and risk control framework to ensure that climate change risks are reflected. Assess financial innovation related to environmental sustainability.		Monitor the adequacy of the collateral valuation and risk control framework to ensure that climate change risks are properly reflected. Design and implement changes, if warranted.	
9.	Climate change risks in the CSPP	Conduct enhanced due diligence to incorporate climate change risks.			
		Prepare climate-related disclosures of the CSPP.			
		Develop proposals to adapt the CSPP framework to include climate change considerations.	Adapt CSPP framework.		

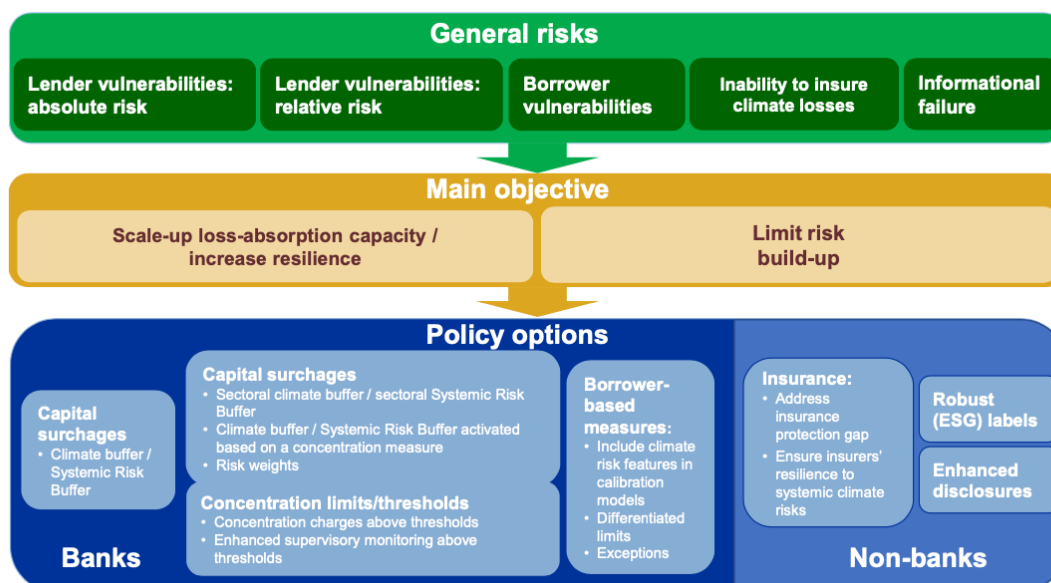
Figure A.3: Surveillance Framework for climate-related financial stability risks

Surveillance framework for climate-related financial stability risks



Source 1: Climate Report ECB/ESRB page 11

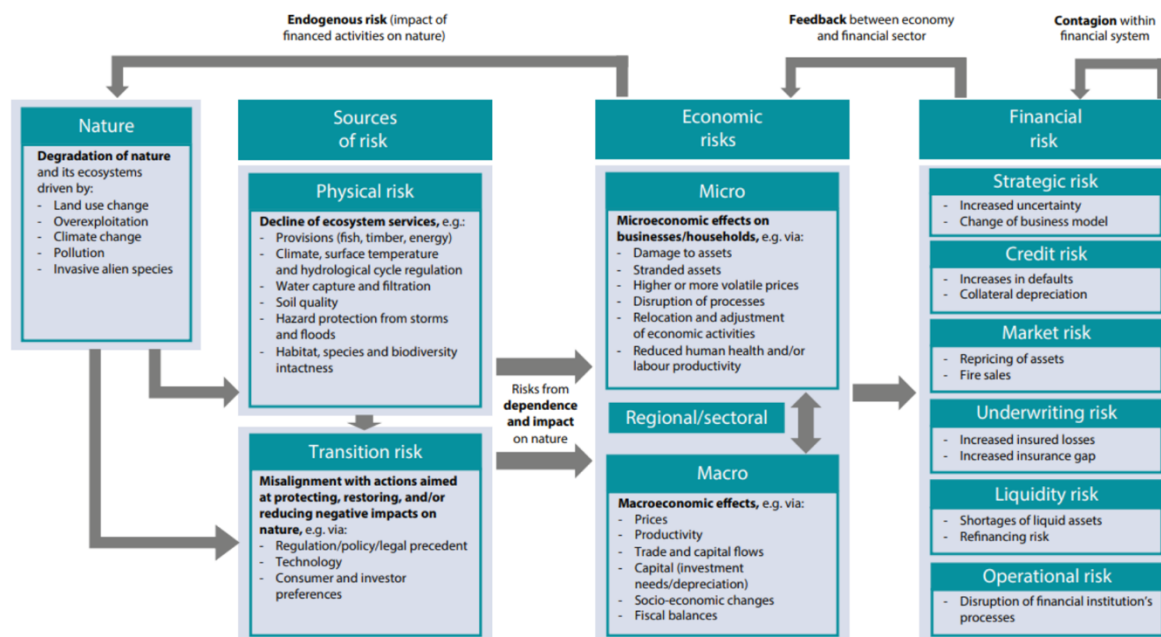
Figure A.4: General to specific macroprudential risks, tools and objectives



Source: Climate Report ECB/ESRB page 77

Figure A.5: Transmission channels of nature-related risks

Transmission channels of nature-related risks



Source: NGFS Conceptual Framework on Natural-related Financial Risk 2023