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CENTRAL BANKING AND ENVIRONMENTAL SUSTAINABILITY: HOW MONETARY POLICY STRATEGIES HAVE BEEN SHAPED TOWARDS GREEN OBJECTIVES

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Abstract

Climate change and the political pressure for urgent policy responses have stirred an intense debate over whether central banks should adjust their monetary policy frameworks to support the green transition. Despite the seriousness of environmental issues and the seeming availability of monetary policy tools to address them, many argue that monetary authorities cannot be responsible for making policies that act upon the source of these issues. Among other reasons, the adoption of green monetary policy measures can conflict with the primary monetary policy goals, compromise the political independence of central banks, and raise questions about the legitimacy and increased power of some of these banks. Yet, evidence shows that a number of monetary authorities have already implemented specific measures and proposals that incorporate environmental criteria into their monetary policymaking, resulting in an expansion of monetary policy toolkits and areas of responsibility. In light of these developments, the central research question of this study is: *Under what institutional conditions can the development of green monetary policy measures be best explained?* To respond to this question, this study undertakes a comparative analysis of the legal mandates and environmental strategies of 20 central banks from the largest economies, between January 2010 and January 2024, followed by a detailed examination of three specific case studies: the Bank of Japan, the Swedish Riksbank, and the Federal Reserve System. The research findings contribute to the growing political science and political economy literature on the evolutionary process of central banks related to their support for environmental objectives.

Keywords

central bank mandates; climate change; comparative process tracing; green central banking; historical institutionalism; sociological institutionalism; sustainable finance; unconventional monetary policy

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List of Selected Abbreviations and Acronyms

APRA	Australian Prudential Regulation Authority
ASEAN	Association of Southeast Asian Nations
Banxico	*Banco de México*
BCB	Central Bank of Brazil
BCBS	Basel Committee on Banking Supervision
BI	Bank Indonesia
BIS	Bank for International Settlements
BoC	Bank of Canada
BoE	Bank of England
BOJ	Bank of Japan
BOK	Bank of Korea
BOT	Bank of Thailand
CBPS	Corporate Bond Purchase Scheme of the Bank of England
CBR	Central Bank of the Russian Federation/Bank of Russia
CBRT	Central Bank of the Republic of Turkey
Climate Response Financing Operations	Funds-Supplying Operations to Support Financing for Climate Change Responses of the Bank of Japan
COP26	2021 United Nations Climate Change Conference
COVID-19	Coronavirus disease 2019
CRFRs	Climate-related financial risks
e.g.	for example
EBA	European Banking Authority
EBRD	European Bank for Reconstruction and Development

ECB	European Central Bank
EMEAP	Executives' Meeting of East Asia-Pacific Central Banks
EMU	Economic and Monetary Union of the European Union
ESCB	European System of Central Banks
ESG	Environmental, Social, and Governance
ESRB	European Systemic Risk Board
EGD	European Green Deal
Fed	Federal Reserve System
Finansinspektionen	Swedish Financial Supervisory Authority
Federal Reserve Board	Board of Governors of the Federal Reserve System
FSA	Japanese Financial Services Agency
FSB	Financial Stability Board
FSOC	US Financial Stability Oversight Council
G20	Group of Twenty
G20SFWG	G20 Sustainable Finance Working Group
G7	Group of Seven
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GMP	Green Monetary Policy
GPFG	Government Pension Fund Global managed by Norges Bank
Growth-Supporting Funding Facility	Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth of the Bank of Japan
HI	Historical Institutionalism
IMF	International Monetary Fund

IPCC	Intergovernmental Panel on Climate Change
MPC	Monetary Policy Committee of the Bank of England
NBP	National Bank of Poland
NGFS	Network for Greening the Financial System
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
PBC	The People's Bank of China
RBA	Reserve Bank of Australia
RBI	Reserve Bank of India
Riksbank	Sveriges Riksbank
SAMA	Saudi Arabian Monetary Agency
SDGs	Sustainable Development Goals
SI	Sociological Institutionalism
SMEs	Small and Medium Enterprises
SNB	Swiss National Bank
TCFD	Financial Stability Board's Task Force on Climate-Related Financial Disclosures
TCFR	Financial Stability Board's Task Force on Climate-related Financial Risks
UK	United Kingdom
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
WWF	World Wildlife Fund

Introduction

1.1 Central Banking and Environmental Sustainability

Climate change and environmental degradation are among the most concerning global threats of our time, both in terms of potential mass suffering and severe economic dislocation (Rosling et al., 2018).[1] While governments are the primary actors in matters related to economic and social welfare, the increasing severity of environmental issues and the slow implementation of climate commitments have led citizens, policymakers, and leaders of international and non-governmental organisations (NGOs) to call for an urgent and broader range of policy responses.

Two main arguments have been raised in support of collective action towards environmental goals: First, the inability of individual governments to cope with the complexity and far-reaching magnitude of climate change on their own (Breeden, 2023; Elderson, 2021g; Kalinowski, 2018; Lagarde, 2023b; NGFS, 2019a; Oman & Krogstrup, 2019; Ostrom, 2009; Schnabel, 2020b, 2021d). Second, the outsized investments needed to align the economy with the Paris Agreement goals, in a context where financial markets do not adequately price the negative externalities of environmental damage, thereby preventing the financing of green investments (Bräunig, 2021; Furukawa et al., 2020; Georgieva & Adrian, 2022; IPCC, 2019; International Energy Agency, 2023; Panetta, 2021a).[2]

According to the International Monetary Fund (IMF), the investments needed to address climate change range from three trillion to six trillion dollars annually until 2050 (Georgieva & Adrian, 2022). Yet, the amount invested in 2021 stood at about 630 billion

[1] The terms climate change and environmental issues are used interchangeably throughout this thesis. However, the latter is a much broader concept that encompasses nature-related issues beyond climate change and global warming, such as pollution and biodiversity loss (United Nations Environment Programme, 2023).

[2] The notion of externality can be described as damages provoked by one party to another, where the former is not punished for the damages or costs incurred by the latter. This term has been extensively used in the context of climate change, where pollutants do not pay the price for the global warming caused by their activities.

dollars, of which a very small portion was allocated to developing countries. Against this background, there has been an intensifying debate as to the role of central banks in the green transition, given their prominent position and powerful tools to influence economic activity.[3] The topic has received heightened attention in international forums, as well as among economists and central bank officials. However, it continues to be surrounded by many questions about the extent to which monetary authorities should promote the greening of the economy and the financial system.

Leveraging the ability of central banks to mobilise funds across the various sectors of the economy—especially after expanding their monetary policy toolkits in response to the 2007-2008 Global Financial Crisis (GFC) and the COVID-19 pandemic—a number of academics, researchers, state and non-state bodies claim that central banks should make another substantive contribution, this time in the fight against climate change.[4] By factoring environmental aspects into monetary policy decisions, central banks encourage the market to take the net-zero transition seriously and expand green investments (Bank of England, 2022e; Interviews 1-3, 5-11; Van Doorslaer & Vermeiren, 2022; Volz, 2017). From this perspective, there seems to be a 'quasi-moral responsibility' to align central bank operations with the new sustainability values and practices, as with other public sector institutions (Șimandan & Păun, 2021, p. 1; see also Howarth, 2009).[5]

From a monetary policy standpoint, studies show that physical and transition risks pose challenges to macroeconomic stability and, consequently, to the conduct of monetary policy

[3] The expressions green transition, green shift, green turn, green changeover, green transformation, and the like are frequently used in the literature to describe the process whereby carbon-intensive practices and technologies are replaced by low-carbon alternatives (Aghion et al., 2022).

[4] Through the setting of interest rates and monetary policy operations, central banks affect the borrowing costs of economic agents, the demand for money and, consequently, the price of goods and services in the economy.

[5] Among other reasons that have been proposed in support of a swift and proactive action from central banks in the green transformation, Draijer and Vries (2021, p. 18) argued that banks' 'economic knowledge' and networks can positively contribute to the transition process.

(NGFS, 2020a).[6] Specifically, the increased frequency of natural hazards, along with the uncertain social and public policy responses to them, will demand significant monetary policy action and complicate inflation forecasts for policy decisions (e.g., Dollman et al., 2020; NGFS, 2020a). On the financial stability front, there is widespread acceptance that 'climate-related risks are a source of financial risk', negatively impacting the stability of the financial system and the financial position of central banks (NGFS, 2018a, p. 3). 'It is therefore within the mandates of Central Banks and Supervisors to ensure the financial system is resilient to these risks', as stated in the 2018 *First Progress Report* of the Network for Greening the Financial System (NGFS, 2018a, p. 3, n.d.).[7] Such climate financial risks are said to be on the rise due to the higher incidence of climate events—some of which have irreversible and amplifying effects—and the national efforts to achieve the Paris Agreement goals (Breman, 2020a).

Related to this, a parallel body of work has brought to light that financial firms are not only affected by climate risks but also exacerbate those risks by substantially funding high-emitting firms (Bank of England, 2022d; Schnabel, 2021g). The European Banking Authority (EBA) deployed the terms 'outside-in' and 'inside-out' to describe two possible ways through which financial institutions can address climate change risks. These two approaches have often been reflected in the more commonly used concepts of single and double materiality (EBA, 2021, p. 32; see also Stiroh, 2022). Whereas the former entails a more passive stance whereby

[6] The extant literature classifies climate change into two main risk types: physical risks and transition risks. Physical risks refer to climate and other nature-related events, the occurrence of which may result in significant financial losses for firms and households. Transition risks arise from the necessary adjustments in economic and social practices towards low-carbon ones. Specific examples include changes in environmental policies—such as the penalisation of carbon-intensive sectors through taxes—the development of new green technologies, and shifts in consumer preferences towards greener options (BIS, 2021). Originally used in the insurance literature, the term 'liability risks' has also been employed to describe the risks of rising compensation claims from those affected by climate events (Prudential Regulation Authority, 2015).

[7] The Network for Greening the Financial System (NGFS) is a voluntary group of central banks and financial supervisory authorities formed in December 2017 by eight countries, notably the monetary authorities of China, France, Germany, Mexico, the Netherlands, Singapore, and the UK, as well as the supervisory authorities of France and Sweden (NGFS, 2017). The network develops research and guidelines for its members and the public at large on how to manage climate change risks and steer funds to a greener economy, thereby enhancing the green finance debate and strategic solutions. The group has expanded considerably since its inception. As of March 2025, it had 145 members and 23 observers (NGFS, 2025b).

financial institutions identify, measure, and manage the impact of climate change risks on banks' profitability, the latter is a two-way approach that further considers the negative externalities of the banks' activities on the environment.

Despite the growing agreement about the risks posed by climate change on the economy and financial system, the implementation of central bank climate strategies has not been consensual due to data gaps, insufficient knowledge on how to manage those risks, and a lack of legal clarification as to whether central bank mandates can accommodate green objectives. The absence of trustworthy data and methodologies is argued to render any green policy measures inefficient and damage the credibility of central banks (NGFS, 2021a). As noted by Bo Li, IMF Deputy Managing Director, 'effective climate policy action must be grounded in accurate and reliable indicators. . . . If you don't measure it, you can't manage it' (Li, 2021).

In response to these issues, the proponents of green central banking hold that an early intervention with imperfect information is less costly than a late intervention with precise methods and guidance. According to Diluiso et al. (2021), delays in policy implementation will require stronger answers and technological breakthroughs at a later stage, resulting in increased transition costs and challenges for monetary policy. This is also the view held by some central bank officials. In the eyes of the governor of the Bank of Japan (BOJ):

> Waiting until specific guidelines and ideas are fixed will only delay our response to the urgent global issue of climate change. . . . it will be important to adopt a learning-by-doing approach: implement the crucial measures first, then make adjustments when necessary. (Kuroda, 2021b)

Related to this, the vice chair of the Single Supervisory Mechanism of the European Central Bank (ECB) went so far as to say that 'the risk of doing too little too late is significantly larger than the risk of central banks and supervisors overstepping their mandate' (Elderson, 2021d).

In support of this thinking, research has shown that monetary policy can help minimise 'climate-induced financial instability' and curb 'global warming' via the deployment of nonstandard tools, such as green quantitative easing and green collateral (Dafermos et al., 2018, p. 2019; see also C. Chen et al., 2021; Chenet & Kalinowski, 2021; Couppey-Soubeyran, 2021; Schoenmaker, 2021).[8] In a similar vein, Ferrari and Nispi Landi (2022), as much as Abiry et al. (2022), estimated a significant reduction in pollution levels should green quantitative easing be implemented early in the transition phase or if fiscal authorities fail to introduce an effective carbon tax. However, the latest trends at the time of writing indicate a shift towards a more restrictive monetary policy, exposing the limited impact of central banks on climate change through quantitative easing.

Notwithstanding the pressing need to deal with the environmental emergency and the seeming availability of monetary policy tools to support that goal, concerns have also been raised as to whether central banks should prioritise green investments. After all, monetary policy carries important socioeconomic and distributional effects. Therefore, it is crucial to clearly understand the implications of any green measures adopted and keep their scope within boundaries. The difficulties begin with the lack of a clear definition or consensus on what is recurrently referred to as 'green monetary policy', even though a significant number of monetary authorities have already embedded environmental considerations in their monetary policy operations.

[8] Unconventional, nonstandard, or unorthodox monetary policies refer to monetary policy instruments beyond the conventional or standard interest rate change. These may include forward guidance, negative interest rates, bespoke asset purchase programmes, and funding facilities, among other market operations of exceptional nature (e.g., Reserve Bank of Australia, n.d.-c).

While green quantitative easing involves a large purchase of securities from issuers that comply with environmental requirements, green collateral implies that the assets accepted as a counterpart for loans meet environmental standards. In the context of the green transition, the otherwise deployment of the conventional interest rate change is argued to create a 'dilemma between the welfare and the climate objectives' (C. Chen et al., 2021, p. 10).

While definitions of ‘green’, or assessing the extent to which an activity or investment is environmentally beneficial or damaging, is still difficult—given that taxonomies are being developed differently across jurisdictions and, is come cases, are even inexistent—‘green investments’ have been broadly described as the financing of projects ‘aimed at energy efficiency, renewable energy development, sustainable water management, clean transport systems’ development, sustainable agriculture, pollution prevention, and climate change adaptation’ (D’Orazio & Popoyan, 2019, p. 28; Centre for Climate Engagement, 2024). Conversely, brown investments are associated with the allocation of financial resources to activities or assets that harm the environment.

As for the term ‘green monetary policy’, the absence of a common understanding of the meaning of the term is reflected in the diversity of views provided by the interviewed policy experts when attempting to define the phenomenon. Interviewee 5, a former member of the Monetary Policy Committee (MPC) of the Bank of England, shed light on the complexities of adding the term ‘green’ in front of monetary policy:

> I do not think there is any such thing as green monetary policy. Monetary policy is monetary policy. It is about setting the price and all the quantity of money in relation to some particular target, which could be an inflation target, monetary target, exchange rate target or something else. The setting of interest rates and the quantity of money do not have any green or non-green characteristics. I think the confusion comes because when implementing monetary policy, there are operations you need to do . . . where there are degrees of freedom. . . . You may be lending to the banking system, purchasing assets outright, or taking collateral. . . . So, what people call green monetary policy. . . . It is monetary operations. . . . The purpose is still to set the required monetary policy, but you can slant your operations more in one way or another. . . . to help your green objective. (Interview 5)

For Interviewee 6, who was also a former central bank official, ‘green monetary policy’ is all about central banks facilitating the transition through their ‘monetary policy operations’, such as ‘asset purchases, lending facilities, and foreign exchange investments’ (Interview 6). However, this can be done in a more ‘activist’ fashion, where central banks use their monetary policy tools ‘to try to advance . . . [a green] agenda’ (Interview 4, see also Interview 8), or in a more cautious or ‘risk-based’ manner, whereby central banks account for the climate risks and the green transition in their monetary policy operations and forecasting models (Interview 7; see also Interview 3; Interview 4).

Given the multiple readings of the term ‘green monetary policy’, which tend to have several meanings depending on the ‘different actors who answer . . . [the] question’ *what is green monetary policy* (Interview 8; see also Interview 2), I propose the concept of ‘green monetary policy measures’, which is employed in this and subsequent chapters and often interchangeably with GMP. It describes central bank policy decisions aimed at embedding environmental considerations in monetary policy operations, for instance, by establishing new monetary policy instruments or reforming existing ones in ways that mitigate climate change-related risks and/or provide financial incentives towards investments in firms, projects, or sectors that contribute to the overall quality of the environment.

Regardless of the ambiguities underlying the GMP concept, one line of criticism argues that ‘there can be no such thing as a green monetary policy’—as in Interview 5 previously quoted—as it implies bringing into mandates areas that fall outside them (Issing, 2021, p. 188). Redirecting central banks towards environmental objectives constitutes another example where central banks are empowered on matters that ‘only indirectly concern monetary policy’(Marcussen, 2006, p. 181). There is also the ‘bizarre’ idea of why central banks should signal the importance of environmental issues through their operations, rather than governments (Interview 4). Unless the government expressly mandates the central bank to

signal it as well. In this case, central bank monetary policies must be 'tied' to the 'government's decisions', challenging their independence from the political agenda (Interview 4).[9]

Another strand of research holds that central banks can help mitigate environmental risks as part of their secondary mandates (Honohan, 2019). However, they cannot lead or be responsible for driving structural changes in what is produced and how (Campiglio et al., 2018; see also C. Chen et al., 2021; Cochrane, 2021; Dikau & Volz, 2021; Hansen, 2022; Honohan, 2019; Interview 4; Ozili, 2021; Parajon Skinner, 2021; Șimandan & Păun, 2021). Some of the risks associated with central banks taking an active role in environmental matters can be summarised as follows:

(i) the market neutrality principle, according to which central banks should not favour specific firms or sectors in the course of their investment operations, can be undermined if central banks favour green investments;[10] (ii) the limited expertise of central banks on climate change may lead to ineffective policies, damaging their credibility; (iii) the successful implementation of green monetary policies can result in central banks being requested to intervene in other political and socioeconomic pressing areas;[11] (iv) the stretching of central banks' mission without a formal mandate can render their actions illegitimate and compromise their independence, since the prioritisation of multiple policy goals will likely lie in the remit

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[9] Central bank independence is generally understood as the central bank's ability to pursue monetary policy operations without interference from external actors. A typical example is when politicians attempt to influence central bank policy decisions to boost short-term economic performance for electoral purposes (Burkovskaya, 2019). An independent central bank thus brings greater economic stability.

The word 'remit' can be defined as the sphere of action or responsibility of elected officials. In essence, it defines what constitutes the government's policy. In the context of monetary policy, the term 'remit' points to how monetary policy can be defined or what it incorporates (e.g., HM Treasury, 2023).

[10] As I shall describe in more detail throughout this thesis, the market neutrality principle is based upon the assumption that central banks' instruments and operations aim for macro-objectives only. Therefore, central banks' investment strategies must be conducted in a way that keeps firms' cost of capital relatively the same. Granting financial benefits to some but not all economic sectors, industries, or firms can be accused of being a type of 'state aid' or part of industrial policies, which are a task of governments (Büthe, 2016, p. 54).

Industrial policies typically refer to political decisions involving taxes and targeted subsidies for specific (manufacturing) companies or sectors. They entail distributive or differentiated consequences, thereby running counter to central bank neutrality principles (Diessner & Petit, 2024).

[11] Areas that pursue political, social, and economic goals.

of elected officials; (v) the potential expansion of legal mandates can overburden central banks with conflicting objectives and policy tools, turning monetary policy into a complex and incoherent policy area.[12]

By and large, the engagement of central banks in environmental causes appears inconsistent with the notion that 'central banks must be competent, trusted, narrow, [and] independent' (Cochrane, 2021, p. 83). Yet, evidence shows that a number of central banks have already incorporated green considerations into their monetary policy operations. This is particularly so in emerging market and developing economies (EMDE), due to their higher exposure to environmental problems and broader mandates, many of which include 'development in their remit' (Interview 5; see also Baer et al., 2021; Campiglio et al., 2018; Dikau & Volz, 2021; D'Orazio & Popoyan, 2019).

Regarding the advanced economies (AE), a change of paradigm seems to be underway (Mackintosh, 2019). After the former governor of the Bank of England (BoE) emphasised the financial risks of climate change in his 2015 speech on 'Breaking the Tragedy of the Horizon' (Carney, 2015),[13] several multilateral organisations and pressure groups were established to enhance the sustainable finance debate and draw solutions to integrate climate risks into businesses and policy processes.[14] In parallel, a number of AE central banks rolled out strategies with detailed instructions on how they are embedding or intend to embed environmental criteria in their monetary policy activities (see Appendix A, p. 375). As

[12] For example, employing nonconventional tools to promote renewable energies may trigger new types of inflation, such as 'climateflation', 'fossilflation', and 'greenflation' (Schnabel, 2022a). To address conflicting monetary policy objectives, additional policy tools may be needed. This idea is the basis of Tinbergen's principle from economic theory, which states that each policy goal requires at least one policy tool.

[13] The speech 'Breaking the tragedy of the horizon – climate change and financial stability' (Carney, 2015) highlighted the threats climate change poses to financial stability and central banks.

[14] For example, the Task Force for Climate-related Financial Disclosures established in 2015, the G20 Sustainable Finance Working Group in 2016, the Network for Greening the Financial System in 2017, the BIS Green Bond Fund for Central Banks in 2019, the BIS Innovation Hub in 2021 and its work on green finance, the Task Force on Nature-related Financial Disclosure in 2021, the Central Banks and Supervisors' Climate Training Alliance in 2021, the Glasgow Financial Alliance for Net Zero in 2021, and the International Sustainability Standards Board, also in 2021.

discussed in the empirical chapter, some of the most prominent central banks, including the BoE, the BOJ, the ECB, and the Sveriges Riksbank (Riksbank), have already adjusted existing tools or established new ones to nurture green investments.

Moreover, on the occasion of the United Nations (UN) Climate Change Conference held in Glasgow in 2021 (also known as COP26), the NGFS members endorsed the Glasgow Declaration, whereby they committed to 'deepen, expand and strengthen their collective efforts towards greening the financial system' (NGFS, 2021c). This included, inter alia, investigating how to integrate climate change considerations into monetary policy decisions (NGFS, 2021b). At the time of the UN event, 17 out of the 20 central banks in this study were members of the network.[15] Since then, the number of central bank pledges on climate change has expanded, and all monetary authorities in the present analysis appointed representatives to the NGFS during the period of research, except for the National Bank of Poland (NGFS, 2021b).

Given these developments at the start of this PhD research, a more intensified engagement of central banks in the green transition was expected. This could reflect a change of paradigm from a more neoliberal approach focused on price stability to a more reformist perspective that entails environmental targets (Dziwok & Jäger, 2021). Such a 'new job' would bring to the fore earlier debates about the increased power of some central banks (Moynihan, 2021, p. 31; see also Högenauer & Howarth, 2019; Langley & Morris, 2020; Șimandan & Păun, 2021; Diessner, 2022). As anticipated by Șimandan and Păun (2021), 'the envisaged green central banking policy turn' may provide the opportunity to investigate an 'upcoming central bank legitimacy crisis' (p. 22).

There is no denying that even a modest engagement of central banks in the fight against climate change requires either an adaptation or expansion of existing monetary policy toolkits

[15] The central banks of Turkey and Saudi Arabia joined the NGFS in December 2021 and by the end of 2022, respectively (Central Bank of the Republic of Turkey, 2022; NGFS, 2023b). As of July 2025, the National Bank of Poland was not yet a member of the network, although the Polish Financial Supervision Authority was (NGFS, 2025b).

and goals, which, in some cases, may not be fully supported by existing mandates and even work in contradiction with the overall terms of monetary policy. It remains to be seen whether central banks will embrace a more proactive or vigilant approach to green policies, if the selected options will require significant and enduring changes in monetary policy frameworks, and whether central bank mandates or their interpretation will be revised to include considerations of environmental protection. In the latter case, divergent readings and ambiguities will likely prevail, making it difficult to hold central banks accountable for their decision-making in this new policy area.

1.2 Theoretical Frameworks, Research Question, Hypotheses, and Methodology

The main theoretical expectation of this study, and the basis for what follows, is the observation that legal mandates shape central bank actions and commitments in line with a path-dependent logic. The notion of path dependency derives from one of the core concepts of Historical Institutionalism (HI), which emphasises the influence of founding institutions on subsequent policymaking. Yet, considering the previous discussion, the formal objectives of central banks are often vague and difficult to interpret. In an effort to overcome the indeterminacy problem of legal mandates, the existing scholarly and policy expert literature has resorted to the concepts of ‘narrow’, ‘broad’, ‘primary’, ‘secondary’, and ‘dual’ mandates, even though such conceptualisation is not explicit in central bank Acts (Interview 11).

Building on the previous terminology, which is explained in more detail in subsequent chapters, one could envisage limits to a central banking approach to environmental policy as follows: the most narrow mandates centred on price and financial stability would deprioritise GMP measures, whereas the broader mandates, which include the explicit support for economic variables, such as employment, production, or government policies—often as secondary objectives—would benefit from increased policy space to adopt measures that contribute to green economic growth. This premise is based on empirical research that

emphasises the macroeconomic implications of climate change on production, employment, and GDP (Gross Domestic Product) growth, as discussed in the Literature Review (p. 28) and in Subsection 4.3.2 on Reading Central Bank Mandates (p. 128). In this line of reasoning, more vigorous actions would be expected from central banks whose mandates encompass coequal monetary and economic objectives, the so-called dual mandates. However, given the climate pledges announced by a number of central banks, the mandates of which do not explicitly instruct them to promote the real economy, the evidence reveals some unexpected findings.

Against this background, the central research question of this study is: *Under what institutional conditions can the development of GMP measures be best explained?* To assess the pattern that best describes the inception and evolution of GMP measures and to answer the research question, three main hypotheses will be tested. These are drawn from the main theoretical elements of the historical institutionalist analytical framework: (H1) Central bank mandates create a path dependency, which significantly shapes the development of GMP measures; (H2) Critical junctures—notably, the experience of environmental disasters or other event(s) of systemic relevance—result in the development of GMP measures; (H3) Most GMP measures can be explained in terms of incremental change.

Originally focused on American and comparative politics, the concepts of HI have progressively contributed to the study of policy innovation in the financial sector, as demonstrated in earlier academic work cited in this thesis. In answering the above research question and testing the three hypotheses, this study seeks to track the progress of central banks in their adoption of monetary policy mechanisms to support the green transition, understand the source and form of change in monetary policy frameworks, and provide a review of how central banks address political and other historical pressures related to environmental concerns, which although vital to society and the planet, may create challenges to conventional goals, the guiding principles of their operations, and mandates.

It is important to note that since the severity of climate change incidents and transition policies are expected to increase, and central bank responses to environmental issues will likely evolve, this study does not aim to entirely reject any of the different explanations (path dependency, critical junctures, and incremental change). Instead, it seeks to assess the relative explanatory power of the three hypotheses during the period of investigation (Yin, 2018). Accordingly, evidence will be collected that both confirms and falsifies each of the three hypotheses. By inferring which of them explains best the observed mode of policy change, the study overcomes the confirmatory biases that may exist when selecting a single approach.

While formal institutions are the principal focus of this study, the evidence shows that one cannot easily read the origins and nature of GMP measures by simply examining central bank legal mandates and established principles, as central banks with similar mandates have responded differently to environmental issues. In line with the premise that the 'founding moment' of new institutions echoes the ideas and concerns of a certain period, the study complements the insights from HI with elements from Sociological Institutionalism (SI) to examine the ideational context within which central bank institutional change towards new environmental goals occurs (Helleiner, 2017, p. 225; see also; Farrel & Finnemore, 2017, cited in Fioretos, 2017; Bernstein & van der Ven, 2017). SI proved to be particularly helpful in understanding central banks that developed a climate strategy despite their narrow mandates. As it turns out, central banks' green shift is linked to a gradual replacement of ideas and practices influenced by the emergence of new environmental norms and political priorities, notwithstanding the constraints of their institutional settings (Farrell & Finnemore, 2016).

To anticipate the research methodology, which is explained in greater detail in Chapter 4 (p. 105), the study adopts a combination of quantitative and qualitative methods, namely descriptive statistics and in-depth case study analysis. The statistical description of the GMP strategies in 20 central banks from the world's largest economies—10 from AE and 10 from

EMDE—aims to identify large-scale patterns and compare the adopted strategies over time, across countries, and the two major world economic groups. The starting year of the research period, January 2010, was chosen based on the first identified monetary policy tool to support environmental businesses, specifically, the Bank of Japan's Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth (Growth-Supporting Funding Facility). It consisted of a favourable credit line for investments in areas with growth potential, including 'environment and energy business' and 'business for securing and developing natural resources' (Bank of Japan, 2010e, p. 26). The cut-off date, January 2024, was decided upon more practical grounds related to the duration of the PhD programme.

The analysis draws on a detailed examination of central bank mandates and official publications on environmental matters, existing secondary literature, news reports, information issued by other relevant national and international organisations, and 11 semi-structured interviews with monetary policy experts, including current and former central bank officials, academics, NGOs, and policy entrepreneurs. Subsequently, the study outlines the consistency of the green arrangements adopted by each of these 20 central banks with the breadth of their mandates (narrow/broad) using a typical and deviant case study selection approach. It argues that a typical or 'expected' case is one that confirms a stable and predictable relationship between the scope of central bank mandates and GMP outcomes (Rohlfing, 2012, p. 114). A deviant or 'anomalous' case does not hold such an anticipated relationship, suggesting that mandates do not clearly explain the adoption of or resistance to specific climate strategies (Rohlfing, 2012, p. 114).

In support of the analysis, the study offers a new dataset on central bank GMP responses (see Appendix A, p. 375) and develops a novel Green Monetary Policy Index (GMPI) for a more detailed picture of the degree of involvement of each central bank in environmental matters through their monetary policy operations. The typical and deviant classification, along

with the index scores, will assist in identifying a small group of three ‘deviant’ central banks, the mandates of which do not appear to support the GMP strategy adopted, or lack thereof. The conclusions drawn from the multiple-case analysis will be enhanced by a more thorough investigation of these three unexpected cases, specifically, the Bank of Japan, the Sveriges Riksbank, and the Federal Reserve System (Fed).

As elaborated in Subsections 4.1 (p. 105) and 5.3 (p. 246) on the case study selection, the proposed three units of analysis offer a diverse subset of central banks that help to explain the varying responses to environmental pressures. While the BOJ-Riksbank comparison provides real-world examples of how monetary policy frameworks have supported the green transition, the Fed is a theoretically surprising case of non-adoption of GMP measures despite its conceptually broader mandate, which equally emphasises elements from both the financial and the real economy.

This study does not prioritise the selection of central banks with broader mandates that have developed GMP measures, as these typically offer a more favourable legal setting to direct central bank policy tools towards environmental goals. While typical cases confirm the predicted patterns, deviant cases weaken the anticipated assumption between the scope of central bank mandates and the GMP measures adopted. Therefore, deviant cases allow us to delve into surprising findings and use this new knowledge to improve existing theories and our understanding of the events. This is why deviant cases are considered ‘instrument[s] of discovery’ (George Molnar, 1967, as cited in Steinlin & Trampusch, 2012, p. 256) and are claimed to hold greater theoretical and analytical value (see also Lijphart, 1971; Rohlfing, 2012; Seale et al., 2004; Gerring & Cojocaru, 2016).

The historical analysis of the BOJ and the Riksbank will be further advanced with the application of a mid-range comparative process tracing to explore a causal mechanism between the environmental emergency and GMP outcomes. Throughout this process, emphasis will be

placed on the main actors and events that were central to the process of greening monetary policy, as well as on the institutional and structural conditions under which central bank policy change occurred. The findings of this comparative exercise are hoped to serve as a basis for predicting GMP developments in other AE central banks with narrow mandates. The Fed will be subject to a separate examination as it represents a theoretically unexpected case of disregard for environmental considerations in the central bank's policymaking.

1.3 Scope of the Research and Contribution to Existing Literature and Broader Society

Green central banking as a research field has expanded significantly in recent years, ranging from banking supervision to monetary policy, non-monetary policy portfolios, financial regulation, corporate and social activities. A great deal of this work has been undertaken by academics, researchers, international organisations, central banks, and non-profit groups, primarily in mainstream economics and finance. Therefore, these studies tend to neglect historical explanations of the inception and long-term effects of the GMP event (Akomea-Frimpong et al., 2022; Rixen & Viola, 2016). Or else, they do so implicitly, and certainly without a detailed reference to the mechanisms of HI and SI schools of thought.

This research seeks to contribute to the emerging and rapidly growing literature in political science and political economy on green central banking and unconventional monetary policies, with a historical examination of the role of central banks and their legal mandates in environmental governance—a situation where environmental policy is distributed across several bodies holding different positions in the governance hierarchy (Smedby, 2020). In doing so, it helps to address a void in existing research by offering a comparative political science analysis of a subject that has mostly been studied in economic and financial terms (Akomea-Frimpong et al., 2022; McKibbin et al., 2020). Particular attention will be paid to the causes and institutional consequences of this phenomenon, which constitutes one of the latest shifts in central bank monetary policy related to its support for the green transition.

The focus on monetary policymaking stems from it being the core and common activity across the observed 20 central banks subject to a previously established mandate. While some central banks are not tasked with banking supervision or financial regulation, non-monetary portfolios, such as own funds and pension funds, are not normally contingent on a formal mandate. Moreover, changes to central banks' monetary policy frameworks can bring significant political, legal, and socioeconomic impacts. Nonetheless, monetary policy was largely overlooked or only briefly discussed in scholarly work on climate change at the beginning of this study, in December 2021. This was likely due to the implicit and prevailing assumptions that central banks are independent and expert-driven organisations in monetary and financial matters (D. Bailey & Jackson, 2024).

By and large, the contributions of this study to academic knowledge and broader society are many and substantial. First and foremost, the study highlights two important questions with a temporal scope, namely the role of central bank monetary policy in facilitating the transition to a low-carbon economy and the rise of GMP measures. It does so in a context where there seems to be an inadequate legal basis to legitimise the active involvement of a number of central banks in greening the economy. In this respect, the study builds upon the recent body of literature on monetary policy approaches to environmental objectives and enhances the increasing debate on the role of central bank mandates in light of topics that fall outside their conventional goals.

From the perspective of theory development, the study starts by providing an empirically-informed conceptualisation of what constitutes GMP and, drawing on this conceptualisation, advances the historical institutionalist framework by deploying its analytical concepts, methods, and ways of thinking to address a recent and evolving topic where further research is needed (e.g., Abdelli & Augoyard, 2021; Boneva et al., 2021; Campiglio et al., 2018; Dollman et al., 2020; Honohan, 2019; Interview 5; Interview 7; Interview 8; NGFS,

2020a; Șimandan & Păun, 2021). Specifically, it identifies and assesses the pattern(s) of institutional change in central bank policymaking driven by environmental pressures, notably, whether they are likely to be associated with punctuated or gradual forms of policy change. The study then strengthens the theoretical lessons from HI with components from SI, which considers the explanatory merit of constructed ideas and policy learning on institutional creation and change in path-dependent organisations.

In addition, the study makes two crucial methodological contributions: First, it sets out a novel index that captures the varying strategies of 20 leading central banks in tackling climate and other environmental concerns. Second, it discloses a causal process that accounts for monetary policy shifts towards new environmental goals using a mid-range comparative process tracing approach. In doing so, it illustrates the complexities of greening central bank monetary policy and develops a theoretical justification for cases of 'no-change' (Rixen & Viola, 2016, p. 18). To the best of my knowledge, this is the first causal mechanism of its kind, which can travel and be tested in other similar contexts. Taken together, this study provides novel evidence and a renewed framework to think through the evolutionary process of central banks related to their support for environmental goals.

It is worthwhile mentioning that this research does not primarily aim to make assertions about the appropriateness of monetary policy in addressing climate change, nor does it take a stance on the benefits of transitioning to a greener economy. However, both topics surface regularly throughout the analysis—given their linkages with the research question—thereby contributing to and facilitating these theoretical discussions. Moreover, while the independence of central banks in making monetary policy detached from political preferences is certainly significant and discussed in different parts of this study, the present research does not intend to provide a thorough examination of the relationship between the level of central bank independence and GMP outcomes, which is left for future research. In any event, the findings

suggest that while some level of independence appears crucial to keep inflation close to the target, it is not a critical requirement for adjusting central bank operations towards new environmental goals (Interview 6; Schellhorn, 2020).

Finally, provided that the fight against climate change is a long-term endeavour, some questions might not be fully addressed within the time frame of this study. For instance, the long-term legacies of the GMP decisions adopted up to January 2024, as well as other mechanisms or contingent events that may occur beyond the term of this research project, which can either undermine or reinforce the consolidation of GMP measures. Nonetheless, this study is believed to provide a solid foundation for further research into institutional developments and paradigm changes in the field of central banking.

1.4 Expected Outcomes and Summary of the Empirical Findings

At the beginning of this research project, the debate as to whether central banks should take a more reactive or proactive approach to climate and other nature-related problems surged amid an already unstable juncture featured by inflationary pressures and ‘overlapping crises’ (Eames & Barmes, 2022, p. 6; Best et al., 2025), such as the COVID-19 pandemic and geopolitical conflicts. However, the environmental crisis was expected to differ from other economic and financial disruptions in that the process of greening the economy is a long-term challenge, the solutions of which will likely demand a wholly different and enduring approach across most sectors of society.

With regard to central banking, the environmental emergency could provide an additional impulse to make new or existing nonstandard policy instruments part of the central bank’s ordinary policy toolkit. This potential outcome animated the present study on the conditions under which institutional developments in monetary policy activities associated with environmental pressures are made possible. An evidence-based case study was believed to provide a detailed and integrated perspective of how monetary policy frameworks effectively

have, could or will support the green transition, why central banks privileged certain policies, and whether their options reflect a longstanding shift in the operations and objectives of central bank monetary policy, the scope of which is becoming increasingly complex. To assist the reader in going through this thesis, the remaining part of this subsection provides a summary of the research findings, which are elaborated in more detail in the concluding chapter.

Drawing on the examination of 20 central bank legal mandates and monetary policy strategies between January 2010 and January 2024, the empirical results suggest that the greening of monetary policy is a highly challenging process whose future is uncertain. On the one hand, national and international pressures may instigate a growing number of central banks to act on climate change. As the multiple-case analysis demonstrated, monetary authorities have gradually implemented monetary policy measures that support a low-carbon economy, even if the strength of the measures adopted in terms of their ability to promote green investments has varied. On the other hand, the aggregated results highlight the following expected and counterintuitive findings.

First, as expected, the most climate-responsive central banks appear to have a secondary mandate that supports unconventional GMP measures. However, second, the greening of monetary policy operations has also occurred in contexts where institutional conditions appear at odds with such developments, in the so-called narrow mandates. Most strikingly, third, central banks with dual mandates have not undertaken such reforms, despite their institutional frameworks being more supportive of incorporating environmental provisions into monetary policymaking. Given the differentiated and even surprising responses of some central banks to a seemingly systemic environmental shock, it is reasonable to conclude that formal objectives have not been particularly strong in explaining GMP outcomes. This is relevant evidence suggesting that HI explains GMP developments to a certain degree, but not entirely.

In order to gain a better understanding of the findings of the medium-N research, the study proceeds with an examination of unexpected outcomes. The choice was made to compare three 'deviant' central banks that do not conform to the hypothesised relationship between the scope of the legal mandate and the strategy pursued. Specifically, two AE central banks that provide significant evidence that the green policy turn was possible notwithstanding their originally narrow mandates, the BOJ and the Riksbank, and one central bank that did not undertake any green reforms, despite its dual mandate, the Fed.[16]

Spurred by a growing concern with climate risks and the imperative need to accelerate the green transition, the BOJ and the Riksbank have set in motion new investment and policy strategies that offer incentives towards a Paris-aligned economy—whether central banks should be tasked with providing this incentive in the first place remains a matter of debate. However, despite expanding their monetary policy toolkits with green elements, the environmental emergency has not fundamentally changed the banks' mission and aims. Quite the contrary, the BOJ and the Riksbank's empirical narratives show that past institutional choices have left important legacies that help explain the GMP options adopted by these two central banks. Specifically, both banks devised environmental solutions using existing policy tools implemented in previous contexts for distinct purposes. Consequently, while pre-existing nonstandard monetary policy tools and expertise created strategic opportunities that both banks exploited to pursue environmental goals, GMP measures were less innovative than the instruments that supported them, notwithstanding introducing new environmental elements.

Remarkably, green considerations could not be entirely sustained due to continued pressures to safeguard the banks' overarching goals, which remain subject to keeping 'long-term inflation expectations . . . firmly anchored around the inflation target' (Sveriges Riksbank,

[16] The Riksbank has held a broader mandate that explicitly accounts for production and employment as secondary objectives since January 2023. However, the Riksbank's sustainability strategy was implemented in 2021, prior to the newly expanded mandate.

2023e, p. 30). As a result, environmental criteria can be ‘delayered’ and the climate-targeted instruments suspended whenever monetary and environmental ends are not compatible. This evidence is crucial in the analysis, suggesting that central banks’ extant organisational structures, in terms of established policy goals and tools, proved instrumental in shaping institutional developments in the environmental field.

The findings further reveal the importance of both incremental reforms and path-dependent dynamics in understanding monetary policy change towards new green segments. Legal, legitimate, and technical considerations account for the piecemeal changes in monetary policy toolkits, namely layering and displacement forms of change, as conceptualised by the historical institutionalist theorists. For the proponents of green central banking, the end result of attempting to green monetary policy turns out to be ‘disappointing’ in effectively enhancing investments in environmental sectors (Interview 10).

Two additional factors significantly influenced GMP reforms in the Japanese and Swedish cases, as discussed throughout this thesis. First, the green shift is also a narrative about policy learning and acceptance of new sustainable finance ideas promoted by a wide range of state and non-state organisations, especially the NGFS, as a complementary solution to the climate change problem. Yet, central bankers often attempt to justify their GMP decisions in more functionalist terms, notably by emphasising their potential to promote price stability, and thus, in line with central bank mandates. While these functional benefits certainly exist, they do not fully explain why some central banks have been more receptive to greening their monetary policy operations than others. As evidenced, there has been significant variation in central banks’ willingness to incorporate environmental considerations into their monetary policymaking, as well as in the policy options adopted, regardless of the scope of mandates.

Second, despite the historical period of growing environmental concern and the influential role of the NGFS in proposing monetary policy reforms, institutional factors—

notably, legacies related to central bank pre-existing operating procedures and primary policy goals—have limited what both central banks can implement and do for the environment. Building on this observation, it is plausible to conclude that extant monetary policy frameworks appear to be an inadequate tool to promote sustainable sources of economic growth.

The detailed analysis of the BOJ and the Riksbank's experiences with GMP measures further enabled theorising a mid-range causal process of how and why national and international pressures to fight climate change influence monetary policy activities. This comparative exercise revealed some of the specific circumstances under which the mechanism of monetary policy change towards new environmental goals is more likely to operate, specifically, in jurisdictions with clearer and more determined climate targets. For its part, the successful implementation of national climate frameworks appears to be closely linked to public support and political consensus on climate action, as illustrated by the case of the Fed.

Following this study's theoretical proposition based on mandates, we would expect the Fed to be more proactive in the green transition, given its dual mandate. However, the Fed has lacked a crucial factor present in both the Japanese and Swedish contexts that allowed the two banks to pursue their green reforms exempt from reputational and political risks: a critical mass of public and political support. Countries where governments and society at large are deeply polarised on the issue of climate change make it difficult for central banks to incorporate environmental criteria into their decision-making processes. Indeed, examining how the perspectives of the American business sector have interacted with public opinion and the two main parties in the political system sheds light on the Fed's challenges in achieving an environmental compromise.

In essence, the influence of the mighty carbon industry, coupled with cleavages between the Democratic and Republican parties—the two main parties in the United States (US) political system, representing opposing left-right ideologies—has created confusion

among American citizens and stalled meaningful responses to climate change. Consequently, any green measures proposed by the Fed would have likely encountered backlash from a divided public opinion and supporters of a conservative ideology. The Fed's passive approach to GMP measures thus mirrors the public and political deadlock surrounding climate change policies in the US.

This is convincing evidence that factors beyond mandates continue to influence central bank monetary policy decisions. In particular, the extension of domestic environmental norms and regulations that allow countries to transition to a low-carbon economy emerges as a strong predictor of GMP developments across these three case studies. While these findings could be somewhat anticipated from existing scholarly and expert literature on public opinion and political support for climate policies, it remains important to show that partisan dynamics and socioeconomic preferences are dimensions that influence central banks' appetite to adopt GMP measures. Such a finding is an important corollary of this study, as it lends support to the political nature of greening central bank monetary policy operations, regardless of the scope of legal mandates, their interpretation, and the financial risks posed by climate change.

1.5 Structure of the Thesis

The format of the thesis combines the standard 'linear-analytic' layout with a 'comparative structure'(Yin, 2018, pp. 229–230). The former entails the typical sequencing for compiling research reports, notably the introduction, literature review, methodology, data analysis, discussion of the findings, and conclusions. The comparative structure adds an aggregated overview of the 20 central banks, plus an in-depth analysis of the selected subset of three case study central banks. Consequently, the research results are divided into two levels: cross and within-case levels of analysis.

At the aggregate or cross-case level, the study focuses on global trends, notably central bank mandates and broad climate strategies based on a comparison of 20 central banks from

different jurisdictions. At a deeper or within-case level, the study centres the analysis on describing the process and factors that have the largest impact on the greening of monetary policy—or lack thereof—in three specific units of analysis. This last level offers a greater understanding of the central bank decision-making process in the environmental field, which can serve as a reference for comprehending central bank action on climate change in other contexts. As a result of the successive analogies conducted at both cross- and within-case levels, some repetition of the theoretical propositions, the data, and interpretations is encountered across the different chapters, sections, and subsections.

From this introduction, the remainder of this thesis is structured as follows. Chapter 2 begins with a critical review of relevant political science and political economy literature on environmental public policy and green public and private finance. It then examines existing academic and expert research that seeks to explain the opportunities and challenges of greening monetary policy. Subsequently, the chapter relates this study to a selected number of academic contributions that apply HI and SI to examine the financial system, systemic crises, and green central banking. Some of the key empirical findings from this work will be highlighted. The final subsection of Chapter 2 reviews other theories used to investigate environmental issues.

Chapter 3 elaborates on the analytical frameworks employed in this study to explore the formation and evolution of central bank GMP measures. It discusses more extensively how a historical institutionalist perspective can provide valuable insights to examine this event across three central banks and sets out the key principles of the historical institutionalist approach—path dependence, critical junctures, and incremental change—that are valuable to determine the source and pattern of policy change. The chapter then contemplates the tenets of SI and reviews the conceptual connection between HI and SI. As demonstrated, the comprehension of central bank green monetary policies requires additional tools that engage more systematically with the global context and sociological processes. Borrowing from Yin

(2018), ‘contextual conditions . . . can lead to an entirely new understanding of a case’ (p. 263). Accordingly, this study considers the role of constructed ideas and policy learning, and how they shaped the development of green monetary policies.

Chapter 4 outlines the research methodology and empirical material through which the environmental strategies adopted by each of the 20 central banks will be examined. As already anticipated, the research methodology proceeds in two main steps. This first step entails summary statistics and the development of a multidimensional GMP index to depict trends and map out how far these 20 central banks have gone in greening their monetary policy operations. The second step comprises a deeper case study analysis, which involves a mid-range comparative process tracing through which the key entities, activities, and decisions that produced green reforms at the BOJ and the Riksbank will be identified.

Chapter 5 presents and discusses the empirical findings, specifically the results of the cross-case comparison. It shows the variations in mandates, as well as in the number and strength of the GMP measures adopted across different countries and economic groups. Chapter 5 also reviews the environmental stance of each of the 20 central banks and reconciles the number and strength of the green measures adopted with the breadth of their mandate, using a typical and deviant case study selection approach. The chapter concludes with a justification for the three identified deviant central banks that merit further investigation.

Chapter 6 focuses on the cases of Japan and Sweden and examines the three alternative hypotheses that apply each one of the main elements of the historical institutionalist analysis: 1) the relevance of path dependency and the relationship between mandates and the development of specific GMP strategies, 2) the consolidation of central bank GMP strategies as a response or not to specific critical junctures, and 3) the formation of central bank GMP measures in terms of the four forms of incremental change, namely layering, displacement, conversion, and drift. Subsequently, Chapter 6 builds on concepts from SI to offer a

mechanism-based account of how national and international pressures to fight climate change, combined with the learning of new green finance ideas, prompted monetary policy reforms in two central banks whose climate strategies were unlikely given their narrow mandates, the BOJ and the Riksbank.

Chapter 7 explores the case of the US, which represents an 'anomalous' instance of non-adoption of GMP measures, and provides an explanation for the constraints on greening the Fed's monetary policy activities. The chapter ends with a discussion of the results from the within-case analysis of the BoJ, the Riksbank, and the Fed and, most notably, the lessons that can be drawn from the application of HI and SI to understand green monetary policy reforms. Chapter 8 presents the findings in light of the previously formulated research question and hypotheses, which expands the growing body of literature on green central banking and unconventional monetary policies with a renewed perspective that combines institutional and ideational scholarship. Chapter 8 concludes with final reflections related to current policy debates and highlights new issues that require further consideration. Avenues for future research will be proposed.

Literature Review: Concepts, Debates, and Contributions from Previous Work

This chapter undertakes an 'integrative or critical review' of scholarly and policy expert literature on environmental policy, green public and private finance, and how developments in these areas have contributed to ongoing discussions on greening monetary policy (Snyder, 2019, p. 335). Subsequently, the chapter spells out how the analysis of GMP through a combination of historical and sociological theories fits into and adds to the broader discipline. It first presents a selection of HI and SI studies that have assisted in understanding the evolution of the financial system, systemic crises, and green central banking. The review then highlights the application of these two frameworks to other environmental issues and points out additional theoretical approaches that have been deployed.

The documentary sources selected for this chapter are primarily, but not only, journal articles. Academic articles provide peer-reviewed research and are, therefore, viewed as the most reliable sources of information (J. Hall, 2025). The searches were conducted using the search engine of the National Library of Luxembourg and other public publishers of scientific research. Given the different disciplines that have contributed to the body of literature on green finance, particularly in the fields of economics and finance, it was challenging to provide a systematic review of the various research methods used in every documentary source (Snyder, 2019). Therefore, the current literature review process does not intend to offer an exhaustive or cross-disciplinary assessment of each piece related to the topic. Instead, it synthesises a selection of scholarly works.

While emphasis has been placed on results in the subject of political science, some documentary sources linked to economics, financial, and sociological theories that contribute to elucidating the research topic were also identified. At the start of the research project in 2021, most of the publications examined consisted of economic commentaries, policy reviews,

and prescriptive studies. These often included econometric analysis aimed at forecasting policy impacts and recommending policy solutions (Cote, 2021).

Over the research period, and especially from 2024, research on the association between central banks and climate change has garnered increased attention, including in the field of political science. In terms of the timescale of this research project, this was after I completed the multiple-case analysis of 20 central banks and selected the three case studies for more detailed research. Hence, in addition to the wide range of material explored at the beginning of the research project and throughout the years of study, a final round of searches was conducted between 14 and 17 May 2025. This last cycle involved using a specific set of keywords related to the main research question and methodology employed in this study to identify newly published material on the subject.[17] No specific time frame was set for the documentary searches, given the relatively newness of GMP and scant research on it. Moreover, the searches were conducted exclusively in English, which may have excluded potentially relevant studies published in other languages. Therefore, the reviewed articles should be read with these constraints in mind.

The most investigated AE central banks in the nascent literature are the ECB and the BoE (Aguila & Wullweber, 2025; Cerdeira & Rimkutė, 2024; Deyris, 2023; Helleiner, 2025; Jackson et al., 2025; Jackson & Bailey, 2024; Șimandan & Păun, 2021), followed by the Fed (Blondeel et al., 2024; Jabko & Kupzok, 2024b, 2024b; Kedward et al., 2024), which is also one of the three specific case studies in the present analysis. While there is a rich and growing academic literature attempting to elaborate on the origins of green central banking, none of the reviewed studies explicitly adopted HI to explain the development of GMP, nor did they test theoretical hypotheses or causal mechanisms that lead to the greening of monetary policy

[17] Research keywords: historical institutionalism AND environmental policy; historical institutionalism AND green finance; environmental policy AND green finance; sociological institutionalism AND environmental policy; sociological institutionalism AND green finance; green central bank; green central banking; green monetary policy.

frameworks. Furthermore, there was no mention of the sustainability strategies of Nordic central banks, such as the Riksbank, and little attention was given to the BOJ (Gabor & Braun, 2025; Gupta et al., 2023; Kedward et al., 2024; Larsen, 2023). Although this scholarly work emerged later in the research process, I deemed it important to highlight it in order to compare research designs and results. The reviewed studies are presented in a combination of thematic and chronological order. A variety of supplementary works is cited throughout this thesis to substantiate the underlying claims.

2.1 Green Public Finance and Green Private Finance

At the heart of the green agenda lies a transformation in consumption and production models towards eco-friendly ones. This implies incorporating environmental considerations into economic and social policies. The new green 'policy paradigm'—in Hall's terms (1993), a set of ideas associated with specific problems that inform policy goals and the instruments to address them—was initially reflected in the first largest UN Conference on the Human Environment in 1972, and in the subsequent intergovernmental report *World Conservation Strategy: Living Resource Conservation for Sustainable Development* (Bernstein & van der Ven, 2017; International Union for Conservation of Nature and Natural Resources et al., 1980; United Nations, n.d.). The report, jointly produced by the International Union for Conservation of Nature and Natural Resources, the United Nations Environment Programme, and the World Wildlife Fund (WWF) in 1980, outlined the fundamentals of sustainable development.

In 1987, the former UN World Commission on Environment and Development introduced the iconic definition of sustainable development as 'a new era of economic growth', which 'meets the needs of the present without compromising the ability of future generations to meet their own' (United Nations World Commission on Environment and Development, 1987). This notion of sustainable development has remained one of the main legacies of this early work.

The subsequent emergence of climate change as a global environmental issue laid the grounds for the creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988 and the Kyoto Protocol in 1997. Whereas the former provided member governments with expertise and scientific data for designing and implementing climate policies, the latter bound several countries with specific measures to reduce greenhouse gas (GHG) emissions (IPCC, n.d.; United Nations Framework Convention on Climate Change [UNFCCC], n.d.-b). However, the first studies denouncing greenhouse effects and a warming climate were identified as far back as the 18th and 19th centuries, in the works of French mathematician Joseph Fourier (1768-1830) and the American scientist Eunice Foote (1819-1888) (Joosse, 2023; Lynch, 2019). Several other studies followed, revealing that concerns with the climate change issue are not new but gained international visibility in the 1980s (see also Smil, 2022).

Developments in national and international climate policies were boosted with the Paris Agreement, an international treaty signed by 196 parties in December 2015 to restrict global warming below 2 degrees Celsius—ideally up to 1.5 degrees—against pre-industrial levels (UNFCCC, n.d.-a). To achieve internationally defined targets, governments can adopt various climate mitigation and adaptation measures and attract private capital to finance them. Among the chief public policy instruments 'to internalise the climate change externality' stand enforceable restrictions and taxes on carbon emissions, also referred to as a carbon price (Batten, 2018, p. 28). A robust carbon pricing is believed to correct the market failure of not accounting for the social and economic damages of destroying the environment (Dikau & Volz, 2018). If environmental costs are not embedded in asset prices, money will not flow to activities protective of the environment, as they are viewed as unprofitable (Newell & Bray, 2025).

Additional examples of public green regulations and policies include a system to market carbon emission allowances, minimum requirements for clean energy, subsidies for low-carbon production processes, green infrastructures, research, innovative technologies, and the

provision of carbon-neutral goods (e.g., Batten, 2018; Bräunig, 2021; Draijer & Vries, 2021; McKibbin et al., 2020; Pereira da Silva, 2021). The European Green Deal (EGD) and the US Green New Deal are two concrete examples of government programmes aimed to facilitate and speed up the changeover to a less fossil-based economy (European Commission, n.d.-d, 2021; Text - H.Res.109 - 116th Congress (2019-2020), 2019; Text - S.J.Res.8 - 116th Congress (2019-2020), 2019). They both comprise a mix of environmental, fiscal, and industrial interventions to promote the transition to a more sustainable economy (Bloomfield & Steward, 2020). For instance, the European Union (EU) taxonomy, which has been recognised as one of the most developed taxonomies worldwide, defines criteria for categorising economic activities based on their environmental impact (Brühl, 2021). The EU taxonomy and the EU Emissions Trading System mechanism are vivid instances of climate change mitigation initiatives (European Commission, n.d.-c, n.d.-b). Both the EGD and the US Green New Deal emerged in 2019, a year marked by intense pro-climate activism, which significantly increased the salience of the topic in the mass media (Jabko & Kupzok, 2024b).

Multilateral development banks have also incentivised green economic activities, notably via ‘promotional loans’ to energy-efficient structures and the development of green financial products, such as green bonds (Bräunig, 2021, p. 6; Goulard, 2021). The innovative capacity of multilateral banks in the face of new challenges is not new. Having investigated the responses of the New Development Bank and the Asian Infrastructure Investment Bank to COVID-19, Barrowclough (2025) asserted that both banks reinterpreted their mandates and quickly shifted their operations in order to support member governments in their response to the pandemic. For the first time, both development banks implemented counter-cyclical lending for new sectors and borrowers at a time when commercial banks were refraining from doing so. The reorientation of the banks’ purpose was possible because the two banks received strong support from their members and held the necessary resources to make counter-cyclical lending.

In conclusion, the purpose and priorities of the New Development Bank and the Asian Infrastructure Investment Bank changed in response to contextual conditions.

Barrowclough's (2025) findings may serve as a reference for thinking about the GMP event. At a time when elected officials have shown themselves to be unable or unwilling to govern the green transition, they may count on central banks to help them meet sustainability goals. Yet, Newell and Bray (2025) reminded us that environmental action by development banks—which can also apply to central banks—is restricted by the political setting where they perform their activities. The significant presence of polluting industries in the national economy can undermine the government's legitimacy to steer funds away from these work-intensive and lucrative industries. 'Once the legitimacy of government action is established, the involvement of central banks [as public institutions] can be advocated in terms of contributing their fair share to promoting the public interest' (Șimandan & Păun, 2021, p. 2).

However, in a context of high debt, growing interest rates, as well as 'political and social resistance' to carbon taxes, the support of fiscal measures with effect in mitigating, adapting or compensating for environmental problems has been overall limited (D'Orazio & Popoyan, 2019, p. 26; Baer et al., 2021; Dabla-Norris et al., 2023; Ferdinandusse et al., 2023). According to Gaspar et al. (2022), the COVID-19 pandemic raised the debt-to-GDP ratios of many countries to unprecedented levels, preventing the necessary reforms and investments required for transitioning to a low-carbon economy.

It follows that, despite some initial steps towards a more environmentally sustainable economy, the ability to address the climate emergency appears to rest on the capacity and willingness of political authorities to implement public policies and regulations that align with environmental goals.[18] Moreover, a standard classification of what is 'green' or assessing the

[18] The term political authorities stands for the public institutions, such as 'parliaments, government, [and] ministries', which represent the interests of the majority of the population that elected their officials (Baer et al., 2021, p. 189). These are the bodies typically tasked with defining and establishing social and economic development plans, including in the environmental field.

extent to which an asset is environmentally damaging or beneficial remains difficult and outside most institutions' expertise (Parajon Skinner, 2021). Therefore, strengthening the capacity of fiscal institutions in setting standards and establishing other means of funding investments in climate protection and mitigation appear decisive to close the existing 'green finance gap'—the difference between the required investments to achieve the green shift and their current low levels (Hafner et al., 2020, p. 26).

Against this background, 'green finance has emerged as a commonly used strategy for dealing with environmental problems' (Dziwok & Jäger, 2021, p. 1). Using the broad definition of Dziwok and Jäger (2021), green finance denotes 'financial stocks and flows that aim to achieve environment-related sustainable development goals' (p.3). It involves internalising the costs of environmental damage into asset prices and adjusting the risk profile of investments in ways that enhance the flow of funds to green investments or environmentally friendly activities. D'Orazio & Popoyan (2019) define 'a green asset' as 'one related to the financing of a green investment' (p. 28). Brown investments are linked to financing activities that damage the environment.

Alongside the efforts to define and distinguish green from brown assets and investments, one also has to account for the different nuances of green since the transformation to a net-zero economy requires funding projects with some degree of carbon emissions (Carney, 2019b; Debelle, 2021). Promptly stopping the operation of brown activities before implementing alternative and viable green solutions is deemed economically and socially impractical. Moreover, assuming that brown investments are riskier does not mean that green investments are safer (Brühl, 2021; Parajon Skinner, 2021). Green investments, such as those in renewable energies, come with significant risks associated with high upfront costs, long time horizons of both the financing needs and the expected returns, and high-return demands from the small group of investors that finance these projects (Georgieva & Adrian, 2022; Hafner et

al., 2020).[19] Consequently, there has been widespread recognition that changing the green finance incentives implies 'blending public and private sector finance . . . to de-risk these investments' and supplement the insufficient public finance to achieve environmental targets (Georgieva & Adrian, 2022; Acosta-Smith et al., 2023).

Accordingly, several authors and experts support the view of a 'new policy mix' that brings together fiscal, monetary, regulatory, and prudential instruments to attract private capital for green investments and catalyse fiscal policy through other green finance solutions (Goulard, 2021, p. 183; Lamperti et al., 2021). In particular, global and regional bodies, such as the UN, the World Bank, the IMF, the EU, the G20, and society groups, have urged reforms in banking policies to boost government efforts in financing a net-zero future and minimise the uncertain effects of a changing climate—also known as climate change risks (Akomea-Frimpong et al., 2022; Campiglio et al., 2018; D. B. Chen, 2018; Dikau & Volz, 2021; Missbach, 2004).

Drawing on insights from the literature on macrofinancial regimes, Gabor and Braun (2025) proposed four possible modes of a policy mix in the context of the green transition, which combine measures of fiscal, monetary, and financial nature—what the authors referred to as 'green macrofinancial regimes'. Each of the four regimes entails different speeds and degrees of decarbonisation: weak derisking, 'robust derisking, carbon shock therapy, and the big green state' (Gabor & Braun, 2025, p. 2). The difference between weak and robust derisking depends on whether decarbonisation is left to market forces and the individual strategies of firms, or if it further includes government subsidies to incentivise sustainable investments. In both cases, there is no direct control over the flow of credit for green sectors, which is left for investors to decide. The central bank plays a role in the 'robust derisking' ideal type, notably by containing inflationary pressures.

[19] Renewable energy refers to the energy produced from unlimited natural sources, such as sunlight, wind, geothermal reservoirs, moving water, seawater waves and currents, or biomass (including wood, charcoal, and dung). This information is available online at the UN website: https://www.un.org/en/climatechange/what-is-renewable-energy.

The most illustrative example of carbon shock therapy is the implementation of a carbon tax or an emissions trading scheme, aimed at more directly internationalising the costs of environmental degradation. The big green state entails substantial public expenditure on environmentally friendly activities, as well as directing credit towards projects and industries that adhere to environmental principles. A stringent environmental policy and regulatory framework, such as that of China, along with central banks' investment strategies that favour green assets, as followed by the ECB, are some of the examples suggested by the authors under the big green state regime.

Extant green finance literature has identified several factors that drive consumers' and investors' preferences for green financial options. These include cultural factors like environmental awareness, the voluntary alignment of business practices with environmental standards due to public reputation, the growing evidence of climate change risks, as well as the robustness of environmental policies and regulations—especially, banking regulations—developed by national competent authorities. Emphasis has gradually shifted towards the economic and financial opportunities arising from the green transition (e.g., Z. Chen et al., 2022; Mengze & Wei, 2015; Yun & Hu, 2024). In addition, Clapp and Helleiner (2025) stressed the importance of future research that considers how interest groups representing opposing green and brown economic interests can delay Environmental, Social, and Governance (ESG) initiatives, particularly in the US, as well as the role of international networks, especially the NGFS, in advancing and proliferating green finance discussions, ideas, and practices.

Sharma and Babic (2025) pointed to the value of understanding how the rise of right-wing narratives against ESG standards can impede green finance solutions. As the authors contended, 'green finance is not just a type or an instrument within global finance, but . . . is embedded in a wider landscape of regulation, ideologies, politics, and power relations that govern green finance supply and its targets' (S. E. Sharma & Babic, 2025, p. 6; see also Clapp

& Helleiner, 2025; Newell & Bray, 2025). This thesis investigates and critically reflects on these topics. Most notably, since previous analyses did not produce a theory but rather a collection of factors that may influence central banks' sustainability strategies, the present work tests for causation between the perceived environmental crisis and monetary policy decisions.

As a result of the increasing discussions on how to transition the economies, the growing public and private initiatives taken in that direction, and the work carried out by national and international organisations devoted to boosting green finance awareness and practices, the number of publications on the topic has expanded significantly (e.g., Akomea-Frimpong et al., 2022; Gabor & Braun, 2025; S. Sharma, 2024). Akomea-Frimpong et al. (2022) issued a groundbreaking article that identifies and summarises 46 pieces on green finance in the banking industry between 1990 and 2019. The authors noted that while green finance is embedded in the overarching concept of sustainable finance, which entails environmental, social, and ethical dimensions (see also Yun & Hu, 2024), climate finance is a specific segment of green finance (see also Brühl, 2021). According to the authors, the earliest scholarly work on green finance appeared in 1990—that is, two years after the IPCC was established, in 1988.

Despite the overall limited literature on the topic and the absence of guidance for future research, the authors described an increase in the number of publications from 2017 to 2019. This timeframe coincided with the launch of the NGFS, national commitments to achieve the Paris Agreement goals, and a period of increased salience and acceptance of sustainable development and environmental protection. The authors reported that the main countries contributing to green finance studies were China, the EU, and the UK. This finding aligns with the progress made by these three jurisdictions in greening their monetary policy frameworks, as illustrated in this thesis.

Yun and Hu (2024) followed up on the topic of publications addressing green finance. The authors identified similar trends in the growing number of releases as of 2017, as well as in the geographical distribution of research production, led by China. Yet, the study's figures were substantially larger than those from the previous article since it involved an extended spectrum of green finance segments, including FinTech. China's leadership in research was largely attributed to the green finance policies rolled out in the country, which surpassed those of other major countries and attracted significant research interest (Gabor & Braun, 2025). For instance, and related to this study's research topic, Dikau and Volz (2023) studied the role of window guidance conducted by the People's Bank of China (PBC) and the China Banking Regulatory Commission, between 2001 and 2020.

Window guidance was described by Dikau and Volz (2023) as an unofficial monetary policy tool consisting of informally advising commercial banks to steer their lending to specific sectors of the economy. The Chinese government identified the targeted sectors, which included sustainable development. The authors concluded that, despite the intermittent use of the tool by the PBC between 2010 and 2019, window guidance could become an important incentive to redirect the flow of money from brown to green industries, provided it was adopted within a green finance framework. In China, such a framework included not only guidelines but also environmental policies, regulations, and subsidies for renewable energies.

It should be noted that the PBC's window guidance was not counted as a GMP tool in this thesis for two main reasons. First, the tool did not assume a central and consistent role in the empirical data of the present research. Out of 20 banks, window guidance linked to clean industries was observed only briefly in the PBC's annual reports of 2010, 2012, and 2020. Second, it did not garner significant attention in the reviewed literature on green central banking nor in the climate strategies of the central banks under examination. This is plausible because window guidance has been defined as an instrument of direct control, and therefore,

avoided by modern central banks that adhere to the principles of central bank independence—which can be understood as the autonomy of central bank operations from the government's strategy—and market neutrality. Due to its evident distributive features, window guidance was deployed by only a limited number of central banks, especially the PBC (see also Best et al., 2025). Even if window guidance had been factored into the GMPI developed in this study, this measure of voluntary nature would not significantly alter the positioning of the PBC, which is ranked among the three central banks with the highest index scores.

In terms of other financial policy tools aimed at preventing and mitigating climate change and other environmental risks, Baer et al. (2021) classified them into three broad categories: 1) 'informational policies', aimed at expanding publicly available data on climate change and the environment; examples of such policies include the mandatory disclosure of climate-related information by firms, as well as the development of research, new methodologies, and guidelines to identify and measure climate risks; 2) 'incentive-based policies', targeted at giving preferential treatment to assets compatible with the environment and the transition, for instance, by factoring the cost of environmental damages into asset prices and investments; 3) 'quantity-based policies', designed to shape the market towards green segments in a more targeted manner, for example, by imposing minimum credit caps for specific green activities. Based on the European case, the authors argued that the available financial policy tools were not being utilised sufficiently to achieve environmental goals, except for informational policy tools. While informational policy tools are politically more consensual, they are less effective in advancing environmental objectives. Therefore, the authors claimed that Europe faces a green 'promotional gap' (Baer et al., 2021, p. 190).

In 2023, Gupta et al. (2023) developed an index to measure the intensity or strength of the green financial policies adopted by a set of 19 emerging and developed economies between 1996 and 2018. The authors further conducted regression analyses to identify factors affecting

this intensity. The study focused on credit guidance, prudential, and supervisory policies and relied on secondary data available online through the Green Monetary and Financial Policies Tracker. This tracker is managed by the independent research organisation E-Axes Forum. The findings of this study raise interesting questions relevant to this thesis. The authors confirmed a positive association between countries' vulnerability to climate risks and the number of green financial policies adopted. The United Kingdom (UK) and China were at the forefront of these efforts. This result aligns with the present study, where both countries are ranked first in GMP within their respective economic groups: advanced and emerging market economies. The authors also concluded that the intensity of the green financial policies is positively related to a country's higher exposure to climate risks, GDP growth, and broader policy mandates. In contrast, the level of economic and financial market development and the degree of central bank independence appear to be negatively related to the intensity of green financial policies.

While the findings presented by Gupta et al. (2023) merit mention, it may be complex to predict the intensity of green financial policies in a specific country by combining all these variables. It should also be noted, as the authors acknowledged, that the proposed index does not consider the varying strengths of the individual financial policies adopted. In other words, each policy decision gets the same weight despite some having marginal implications while others may have substantial consequences. By way of example, publishing non-binding guidelines differs significantly from imposing the mandatory disclosure of climate-related financial risks (CRFRs) by firms. Accordingly, the signalling effect from the policies adopted is likely to vary, contrary to the authors' assumption.

Additionally, relying solely on secondary sources can lead to data gaps, which may impact the precision of the findings. This thesis contributes to this research area by examining the role of the central bank in mitigating climate change from a monetary policy perspective. It does so by drawing on primary data and developing a novel qualitative index that accounts

for the varying levels of strength of the GMP tools adopted. One promising research direction proposed by Gupta et al. (2023), which this thesis explores, is the investigation of a mechanism that connects climate change risks with central bank involvement in environmental issues.

Another recently launched index was the Green Central Bank Index produced by Koshel and Thanassoulis (2024). Using data from 2020, the authors intended to measure the involvement of 13 central banks from the largest economies represented in the Group of Seven (G7) and the Group of Twenty (G20) in the net-zero transition. Koshel and Thanassoulis (2024) assessed nine policy areas through which the central bank can mitigate climate risks and foster the transition, including monetary policy. The authors concluded that the PBC and the Bank of France were the green pioneers among the 13 central banks analysed, which is in line with the findings of most studies in the field. In contrast, the US, Russia, Japan, and India were the lowest-ranked countries in this index.

Moreover, according to Koshel and Thanassoulis' (2024) index, no GMP measures had been implemented by the central banks of Japan and the UK, despite being highly ranked in the GMPI introduced in this thesis. Clearly, Koshel and Thanassoulis' study does not reflect the GMP developments in Japan from 2021, nor does it account for the UK advances in this area. The GMPI developed in this thesis extends Koshel and Thanassoulis' analysis to January 2024, allowing for identifying and describing more recent trends in GMP, which were only timidly emerging in 2020. The construction of the Green Central Bank Index can also raise methodological questions regarding the classification used to assess whether and how much central banks have engaged with green monetary policies: yes, mostly, partially, and no. This assessment aggregates all possible measures, without differentiating their individual intensity in terms of their impact on promoting green investments. Such an impact can vary, as previously mentioned.

By and large, despite the new knowledge brought about by green finance studies, their analytical focus has been on mathematical methods, which accounted for more than half of the literature reviewed by Akomea-Frimpong et al. (2022). More recently, Yun and Hu (2024) also highlighted the centrality of economic and financial analyses in the field of green finance. Notwithstanding their several achievements, quantitative studies may be too narrow for those seeking a more detailed understanding of institutions and their decision-making processes. This thesis demonstrates the importance of considering the historical context, the institutional setting, and the multiple stakeholders involved in the decision-making process to understand the various green finance trajectories adopted by monetary authorities. HI and SI, which are discussed more extensively in the last two Subsections 2.3 and 2.4 of this chapter, are two analytical frameworks that have been underexplored in the literature on green finance and account for these elements.

2.2 Debate Over Greening Monetary Policy

Arguing that central banks are important and hold a central position in the economy is not new. A central bank, also called a reserve bank or monetary authority, is a financial institution tasked with setting the appropriate monetary and financial conditions conducive to economic growth in a country or group of countries (e.g., Bank of England, 2020d). For this reason, central banks are considered core financial institutions in driving global economic growth. Seen as highly credible institutions, especially after doing whatever it took to avoid another great depression in the aftermath of the 2007-2008 GFC, many wanted them to make another substantive contribution, this time in the fight against climate change (Issing, 2021). In order to look into how central banks have responded to environmental pressures via their monetary policy frameworks, one needs to understand the workings of monetary policy.

Broadley described, monetary policy refers to the operations carried out by central banks to achieve their primary goal of keeping inflation low and stable over time, typically in

line with an inflation target.[20] To that end, central banks use a set of conventional and unconventional monetary policy tools to adjust the cost of credit and the subsequent amount of money in circulation. With regard to unconventional or nonstandard monetary policies, these measures extend beyond the standard or conventional interest rate change. Research in the field of unconventional monetary policies is relatively recent and is embedded in some uncertainties about their applicability and effects (Lubys & Panda, 2021).

Before the GFC, monetary policy was mainly concerned with setting a general interest rate that maximised output. The consequences of the GFC, the subsequent shocks—notably the 2012 Eurozone debt crisis and the COVID-19 pandemic—as well as the cycle of low interest rates that persisted in most advanced economies up to the beginning of 2021, provided the grounds for a list of nonconventional monetary policy proposals since the narrow policy rate proved to be insufficient to stimulate economic growth. These included forward guidance, negative interest rates, bespoke asset purchase programmes, tailored funding facilities, among other market operations of an exceptional nature (Honohan, 2019; Lagarde, 2020g; Lubys & Panda, 2021; Reserve Bank of Australia, n.d.-c). Unconventional monetary policies are not meant to replace standard measures. They aim to be temporary until the stability of the financial market is restored following an economic or financial shock (Cour-Thimann & Winkler, 2013).

In the context of the environmental crisis, Langley and Morris (2020) raised the important question as to whether central banks could act as ‘climate governors of last resort’, drawing an analogy with their role as lenders of last resort. The absence of an independent organisation with the authority to enforce and coordinate global climate action, coupled with the limits and political unpopularity of fiscal policies, has led to claims that ‘delegated authorities’ within the financial system should at least neither amplify climate risks nor

[20] It is widely documented that price stability is the cornerstone of financial stability, employment, and economic growth. More information can be found on the websites of central banks and international agencies like the IMF (IMF, 2023).

undermine the effects of the green public policies adopted (Baer et al., 2021, p. 190; NGFS, 2022c). For many, central banks should even compensate for political inaction and actively contribute to shaping the market according to green standards, much like interventionist policies. Indeed, several central banks have engaged in climate governance since Langley and Morris (2020) published their commentary, some of which went far beyond their financial stability mandates, as the present study demonstrates.

From a financial perspective, 'green finance and green monetary policy' are intertwined and 'should not be discussed separately', as both contribute to understanding the role of finance and money in global environmental welfare (Dziwok & Jäger, 2021, p. 11). Green finance implies that monetary policy tools are directed towards bolstering the flow of financial funds for green investments. Yet, the extent of this intervention can be more or less 'reformist' (Dziwok & Jäger, 2021, p. 6). In the limit, central banks finance private and public green sector activities, notwithstanding the potential for inflationary risks. Dziwok and Jäger (2021) presented a top-down analytical framework to classify three distinct strategies of green finance and monetary policy: neoliberal, reformist, and progressive. While the former relies on market-based strategies to finance sustainable development, the reformist and progressivist approaches doubt the effectiveness of purely market approaches. Instead, they place greater emphasis on monetary policy tools to stimulate green investments, including via the direct funding of environmental policies through an international mechanism that favours the poorest countries.

In a similar vein, Kedward et al. (2024) mobilised insights from macro-financial literature to distinguish between two types of green central banking: one focused on the management of environmental risks and another that allocates credit to the green sectors of the economy. In other words, 'risk-based approach vs allocative green credit policy' (p. 1594). Whereas the former is viewed as politically acceptable in that it delegates decarbonisation to market forces, the latter places central banks in the role of 'climate policymakers' (Kedward et

al., 2024, p. 1593). Although significant for facilitating the low-carbon transition, the shift to climate policymaker may pose challenges to central banks' established principles, notably those of operational neutrality, as well as to their primary goals driven by an inflation target. Furthermore, it involves coordinating central bank activities with other fiscal and industrial agencies to redirect credit flows to certain sectors and impose penalties on others.

Looking into real-case studies, Kedward et al. (2024) demonstrated that the ECB's most striking measures, which involved tilting the purchase of assets towards low-carbon assets, had explicit distributional effects. However, these measures did not last long. As inflation picked up, the tilting of asset purchases was discontinued due to the risk of deprioritising the inflation target over other government economic goals. The BoE's experience with GMP is another emblematic case. Jackson and Bailey (2024) surveyed the perceptions of the British state concerning the BoE's new policy remit to facilitate the net-zero transition, using elite interviews and discourse analysis. The authors concluded that the climate strategy adopted by the BoE did not significantly transform the bank's operations, since the new mandate conflicted with preexisting practices and goals. The prioritisation of the monetary and financial systems over environmental objectives became increasingly prominent when other economic and inflationary crises related to the war in Ukraine and the subsequent energy crisis hit. A green central bank in the interest of people's well-being would require a more radical transformation that allowed for a quicker realignment of investments with environmental goals. Yet, such a move could raise legitimacy and operational questions.

For Șimandan and Păun (2021), the ECB's climate strategy could not have been introduced at a worse time, following a period of controversial nonstandard momentary policies, which further eroded the bank's legitimacy. This view stands in stark contrast to Jabko and Kupzok's (2024b) piece about the BoE and the ECB. The authors argued that both banks leveraged the ambitions of climate advocates to involve new actors in the fight against climate

change to redirect their previously controversial policies towards legitimate environmental goals. In light of this, the authors contended that the green turn in the BoE and the ECB resulted from the intersection of two seemingly independent events, which gained prominence in 2019, when climate change became more salient in the social and political spheres: the unconventional monetary policies adopted from the 2007-2008 GFC, and the climate activism following the 2015 Paris Agreement. It is worth mentioning that Jabko and Kupzok's (2024b) claim about the rise of green central banking as a way to lessen criticism directed at central banks' unorthodox tools is not evident in the documentary sources of the BOJ and Riksbank, nor in the interview material. Yet, it may have played a more significant role in other contexts.

In a separate piece, Jabko and Kupzok (2024a) compared the ECB's proactive approach to environmental issues to the Fed's aversion to engaging in green initiatives. The authors maintained that, although both central banks were exposed to new green finance ideas—facilitated by a community of central banks, notably through the NGFS—their differing positions were closely related to the political contexts in which they operated. On the one hand, the ECB benefited from the EU political and public support. Left-wing parties backed the ECB's effort to mitigate climate change risks, whereas parties from the right did not oppose them. Additionally, the EU rolled out a determined EGD and established climate laws within the EU legal framework. This context provided the ECB with leeway to reframe the interpretation of its mandate in a way that accounted for environmental considerations in its operations without compromising the bank's legitimacy. It has even enhanced it in a period when the bank's unconventional monetary policies faced strong criticism.

The Fed, for its part, was reluctant to undertake any significant actions to address environmental issues. This, the authors believed, was largely associated with the strong contestation from the fossil fuel industry and the conservative party, which has traditionally supported this business group, including during the Biden administration. As a result of these

political frictions, Jabko and Kupzok's (2024a) main claim was that the Fed sought 'to stay above the political fray' (p. 1027). The findings of this study generally align with some of the conclusions of the present research regarding the case of the Fed.

This thesis delves deeper into these and other aspects, notably how both polluting industries and a biased media have distorted the perception of the American public on climate change and sparked political divisions over the topic, notwithstanding the increasing scientific warnings about the dangers of a changing climate. It is also unclear whether the Fed aimed 'to stay above the political fray' or if its inaction echoes the US's overall lack of consensus and clear guidance on an ambitious climate strategy. Crucially, this thesis extends the research period and explores other central banks that have been overlooked by the existing literature, especially the BOJ and the Riksbank. It further develops a theory of a causal mechanism that outlines the actors, discussions, and decisions involved in the lead-up to the greening of monetary policy in the BOJ and the Riksbank, which Jabko and Kupzok (2024a) did not systematically capture in their analysis of the ECB.

Despite the difficulties in deploying nonstandard GMP tools, as illustrated in the previous studies, a number of scholars hold that central banks must pay more attention to environmental issues and rethink their monetary policy operations for various reasons (e.g., C. Chen et al., 2021; Dafermos et al., 2018; Dikau & Volz, 2021; Honohan, 2019; Mastromatteo & Rossi, 2024; McKibbin et al., 2020; Schoenmaker, 2021; Vestergaard, 2024). First and foremost, climate and other nature-related risks impact overall financial and macroeconomic stability, notably prices and economic growth, a major mandate of most central banks. For instance, a carbon tax is likely to increase prices and decrease output, the effect of which can be exacerbated if central banks raise interest rates to meet their inflation target without considering the source of the price increase. From this point of view, climate and monetary

policies are conceptually related and can lead to ‘superior outcomes’ if coordinated (McKibbin et al., 2020, p. 599).

Furthermore, central banks must pursue the objectives stated in their secondary mandates—also called ‘peripheral’, ‘vertical’ or ‘hierarchical’ mandates (Ramos Muñoz et al., 2022, pp. 14, 16; L. Meyer, 2001)—to the extent that secondary goals do not thwart the achievement of the core mandate. Hierarchical mandates generally entail matters beyond price stability, such as the promotion of specific economic variables or support for government policies. Hence, where applicable, central banks are encouraged to deploy their wide range of policy tools and find the best policy mix that balances monetary and environmental goals.

Moreover, ESG factors are drivers of financial risk, as are other risks already accounted for by most monetary and supervisory authorities, including credit, liquidity, market, and operational risks (Stiroh, 2022). Therefore, climate and other environmental issues are ‘exogenous’ risk factors that banks must manage, for instance, by limiting their exposure to carbon-intensive firms and assets. Additionally, central banks can themselves amplify climate-related risks by substantially funding high-emitting firms. In this case, climate change is considered ‘endogenous’ to the banks (Stiroh, 2022, p. 10). Related to this, Nguyen et al. (2022) found that monetary policy is a source of CO2 emissions. Through an econometric analysis of 14 emerging countries, the authors identified a long-term correlation between monetary policy regimes and environmental degradation. While an expansionary monetary policy leads to an increase in CO2 emissions by virtue of increased domestic spending and subsequent demand for fossil fuels, the opposite holds true in a higher interest rate environment.

The distinction between exogenous and endogenous risk factors has often been presented through the concepts of single and double materiality. The former entails a more passive approach whereby financial institutions identify, measure, and manage the impact of climate change risks on the profitability of banks. The latter is a two-way approach that further

considers the negative externalities of the banks' activities on the environment. Using the previous example, a bank that substantially funds high-emitting firms not only contributes to environmental damage but also to the growing physical and transition risks posed to other banks and the financial system at large. The case behind this example has been named 'financial sector externality' (Stiroh, 2022, p. 3). Therefore, some non-neutrality or an 'adjusted market neutrality' has been recommended, as proposed by the BoE (e.g., Hauser, 2021, p. 7). Otherwise, central banks will be locking in financing models that contribute to environmental degradation and, thus, to increasing economic and financial imbalances (D. Bailey & Jackson, 2024). The EBA has deployed the terms 'outside-in' and 'inside-out' approaches to climate change to describe the concepts of single and double materiality (EBA, 2021, p. 32).

Against this background and the urgency to act on the environmental crisis, several scholars and civil society have urged the financial system and central banks in particular to compensate for the scarce or inadequate policy action from 'political authorities' (Baer et al., 2021, p. 190). However, the prospect of unconventional GMP tools soon prompted questions from the more sceptical, who claim that central banks can assist in the transition to a low-carbon economy but cannot take a leading position in climate change governance (Dikau & Volz, 2021; Draijer & Vries, 2021; Goulard, 2021; Heath, 2021; Langley & Morris, 2020; Ozili, 2021; Șimandan & Păun, 2021). Notwithstanding the major goal towards saving the planet and the significant monetary policy action that is likely to be required during the shift to a fossil-free economy—say, to offset the drag of a carbon tax on output growth and inflation (Dollman et al., 2020)—these authors stress the trade-offs of central banks going green, as also emphasised by some interviewees (e.g., Interview 1; Interview 3; Interview 5; Interview 9).

First, it is difficult to distinguish between a 'green' and a 'brown' financial asset or investment despite advances in this area. Second, green investments are still embedded in high levels of uncertainty regarding financial returns and the effective mitigation of climate change.

Third, the incomplete and inaccurate climate data, coupled with the absence of risk management practices and models compatible with the long-term horizons of climate effects. While the manifestation of climate disruptions is becoming more evident, the prospect of how, when, and with what consequences they will occur remains largely unpredictable.

One should also account for differing monetary policy dynamics and priorities between the AE and EMDE. While green finance activities and regulations appear to be more pronounced in the EMDE due to their more ample mandates and higher levels of political oversight over central bank activities (e.g., Baer et al., 2021), financial markets and data indicators are less advanced in EMDE than in AE (Li, 2021). At present, the largest European banks are the ones providing the most detailed climate reporting (Debelle, 2021; Reserve Bank of Australia, 2022b). Furthermore, taxonomies to define environmentally sustainable activities and risks are being developed differently across the globe (Debelle, 2021; Reserve Bank of Australia, 2022b). The absence of a commonly defined taxonomy and framework for disclosing environmental risks in the EMDE limits the efficiency of any GMP measures adopted in these countries. The EMDE may also face increased challenges in acquiring the skills and knowledge necessary to incorporate green provisions into monetary policy operations.

Therefore, collaboration across economic groups is considered critical (Mminele, 2021). Otherwise, the varying approaches to addressing the environmental problem will raise significant concerns regarding the development of green projects and technologies, which will be limited to countries where the policy environment is conducive to that purpose. From this perspective, international policy coordination involving national political authorities reveals crucial, or else, polluting industries and financial investments in considered brown sectors will likely relocate to regions that ‘free ride’—that is, to zones with less stringent or no green policies—reducing the overall net benefit of the green project (Ostrom, 2009, p. 30).

Most fundamentally, only a fraction of central banks worldwide explicitly state the promotion of sustainability in their mandates. In this respect, Dikau and Volz's (2021) seminal work on green finance and central bank mandates offered a first evaluation of 135 mandates and formal objectives (Dikau & Volz, 2021). Interestingly, this article was a paper previously submitted to an NGFS conference jointly organised with the Deutsche Bundesbank and the Council on Economic Policies on Scaling up Green Finance: The Role of Central Banks, in November 2018 (Dikau & Volz, 2018). This study concluded that 52% of the examined central banks hold a mandate that can either directly support sustainability policies or, indirectly, via secondary mandates to support government policies. It should be noted that the authors' reading of central bank mandates differs slightly from the interpretation provided in this thesis, notably that of the central banks of Australia, Canada, Norway, Indonesia, Russia, and Switzerland. Moreover, Dikau and Volz's (2021) article did not reflect the changes in Norges Bank's monetary policy framework, introduced in March 2018, which emphasises employment alongside price stability. This missing data can potentially result from gaps in the IMF's Central Bank Legislation Database, upon which Dikau and Volz's (2021) study is built.

As for the remaining 48% of central banks examined, which do not have an explicit environmental goal, more encompassing political steps would be needed to stretch their mandates and accommodate an environmental dimension through legislation. Using a principal-agent theoretical framework, political authorities as principals would have to delegate not only monetary and financial goals to central banks as agents, but also a new environmental objective. The extent of this delegation may differ across jurisdictions as a function of local environmental ambitions.

The authors further compared central banks' sustainability practices with their mandates at the time of the study, having found no clear connection between the two. Moreover, most of the measures adopted aimed to manage climate and other environmental

risks, rather than promoting long-term sustainability goals. According to Dikau and Volz (2021), accounting for environmental risks is part of every central bank's job, independently of the objectives set in their mandates, as these risks impact central banks' operations and goals. This thesis follows up on these results by extending the research period to January 2024. It also draws on central bank mandates as published on the websites of central banks and justice laws, thereby overcoming the shortcomings associated with using secondary sources.

Regardless of whether central banks hold a mandate that can directly or indirectly support environmental goals, several scholars claim that enlarged mandates can overburden central banks with conflicting policy tools and objectives. Clashing objectives undermine their efficacy, potentially destabilising the whole economy. Moreover, when faced with multiple objectives, central banks may need to seek political guidance, thereby running the risk of slipping into fiscal dominance. Following Șimandan & Păun (2021), GMP might be the latest example of 'mission creep', where central banks pursue goals that dilute their primary objectives and which are better accomplished by political actors. Central bank GMP may not only divert the central bank's focus away from its core mandate and market neutrality principle, but also damage its independence and credibility.

The previous point is also one of the main findings of Jackson and Bailey's (2025) work on whether an expanded engagement of the BoE in climate change management undermines the bank's independence. Drawing on a thematic analysis of the bank's official publications and expert interviews, the authors concluded that the escalation of climate risks and pressures to tame them scales back the practice of market neutrality and renders the 'depoliticisation' of central banks very difficult to sustain. These observations raise several important questions that warrant elucidation, as follows.

The achievement of an environmentally friendly economy implies an unequal distribution of income and wealth, the task of which typically lies with fiscal authorities (Dikau

& Volz, 2021). Studies have shown that deploying GMP instruments—such as offering favourable funding schemes for low-carbon projects, tilting central bank asset purchases towards green assets, and favouring low-carbon assets as collateral—can boost the funds available for green-supporting investments, and thus help to speed up the transition. For instance, by making firms with a high carbon footprint ineligible for central bank portfolios, their yield increases, reducing the liquidity available for environmentally harmful activities (e.g., C. Chen et al., 2021; Schoenmaker, 2021). The simple prospect of introducing a green indicator in monetary policy operations is believed to have a significant signalling effect on financial market participants. As Interviewee 3 noted, 'as soon as the central bank starts including sustainability topics in its mission, such as the protection of climate, nature, and the transition, we can be sure that the whole financial market will follow' (Interview 3).

Indeed, according to Eliet-Doillet and Maino (2022), following the ECB's announcement of its commitment and action plan towards climate change in 2021, the yields of ECB-eligible green bonds decreased, and the amount of green bonds issued in the Eurozone increased considerably. Yet, even if some of these effects were unintended and socially accepted, they can become legally problematic as central banks use their delegated powers to pursue goals for which they have no clear mandate. Furthermore, central banks must refrain from employing tools that discriminate between green and non-green industries, since environmental problems are considered 'microeconomic policy goals' (Dziwok & Jäger, 2021, p. 6). This is, besides, against the market neutrality principle that has been widely followed by a large number of central banks, including the BoE, the BOJ, the ECB, the Riksbank, and the Swiss National Bank (Andersson & Stenström, 2021; Bank of England, 2021c; Dikau & Volz, 2021; Kuroda, 2021b; Schnabel, 2021a, 2021d; Swiss National Bank, 2022a).

The market neutrality principle supports the view that central banks should not favour any firms or sectors in the course of their investment operations. In practical terms, central

banks should buy more bonds from firms that issue more bonds, thereby minimising the impact of their purchases on the market price of individual assets. Neutrality is often argued to be a necessary condition to ensure that the central bank's investment strategy remains independent of political demands and is solely subordinated to the fulfilment of the central bank's policy goals (Maechler & Moser, 2019; Parajon Skinner, 2021). Paradoxically, in the context of the transition to a low-carbon economy, central banks have allocated their asset purchases and redirected their lending towards activities that promote the greening of the economy.

To alleviate these critics, some scholars and central bank officials hold that the green transition does not mean that banks should 'abandon' existing carbon-intensive customers (e.g., Dombret, 2021, p. 14). Instead, central banks should provide firms with incentives to 'develop credible transition plans' and 'become green', for instance, by requiring the disclosure of the carbon footprint of their asset portfolios (Moynihan, 2021, p. 31). In doing so, central banks help identify risks and price assets, thereby facilitating the direction of capital to environmentally friendly investments (Apel, 2022; Frykström, 2022b). Furthermore, while a green-targeted direction may raise questions about the modus operandi of central banks (Moynihan, 2021), it is often argued that the market neutrality principle has never been followed (e.g., Honohan, 2019; Papoutsi et al., 2021; Schnabel, 2021a; Schoenmaker, 2021).

Firstly, not all firms issue bonds. Research has shown that while carbon-based industries—such as those in the gas, oil, cement, and steel sectors—dominate the capital markets by issuing more bonds than clean industries, the renewable energy sector is mainly funded by equity and loans. Secondly, central banks tend to purchase bonds of investment grade due to risk management factors, most of which are held by the largest and carbon-intensive companies. It follows from this that central bank bond purchase programmes have systematically favoured brown sectors by virtue of the market neutrality formula. This has resulted in increased liquidity and a lower cost of capital for polluting firms over cleaner ones

(e.g., Papoutsi et al., 2021). Against this background, monetary policy has always had asymmetric effects. For their part, cleaner firms have had less capacity to fund themselves, despite being more desirable from an environmental perspective.

Whatever the way forward—whether going brown or green—central banks will likely face tensions resulting from the inevitable distributional consequences of either the adopted or non-adopted GMP measures. Arguably, the higher number of investments in polluting industries is likely not due to the market-neutral stance typically adopted by central banks, but echoes a market imperfection resulting from years of inaction by governments and industries on climate change (Șimandan & Păun, 2021). The quest is whether and how best to commit central banks to this perceived systemic crisis, which largely stems from governments' failure to regulate industries that harm the environment and disrupt the market structure.

2.3 Contributions of Historical Institutionalism and Sociological Institutionalism to the Study of the Financial System, Systemic Crises, and Green Central Banking

Early historical institutionalist work identified incremental change as the most common type of institutional change in the financial system. Gradual institutional change has often been the preferred or viable option for institutional change, given the constraints posed by the institutional environment on decision-making. This usually takes the form of layering of new institutions on existing ones or replacement of old institutions by new ones, also referred to as displacement (Deeg & Posner, 2016; Moschella & Tsingou, 2013). Moschella and Tsingou (2013) offered a theoretical and empirical analysis of the evolution of the global financial regulation using HI alongside more sociological and constructivist traditions to garner the preferences and roles of change agents in the changing process.

In their book, *Great Expectations, Slow Transformations* (2013), Moschella and Tsingou introduced various case studies from other contributing authors that underlined the

strategic actions of veto players,[21] policy entrepreneurs, international networks, and national regimes. One of the authors' main conclusions regarded the importance of new international financial regulations not opposing or significantly disrupting the dominant national practices in order to be adopted. This, the authors maintained, restricted the scope and depth of institutional change. The drift mode of gradual change was also observed in the European financial system, where new financial products such as derivatives were introduced without corresponding changes in regulation (Deeg & Posner, 2016). However, Deeg and Posner (2016) drew attention to the significant, yet insufficient, application of historical institutionalist theories to European finance.

Steinlin and Trampusch (2012) augmented the typology of incremental patterns of institutional change first theorised by Streeck and Thelen (2005), specifically layering, conversion, displacement, and drift. Using theory-testing process tracing to examine the new legal framework to combat money laundering in the Swiss financial system, the authors concluded that previously established rules regarding the secrecy of the banks' clients were purposefully 'curtailed' in scope (Steinlin & Trampusch, 2012, p. 249). The authors termed this new mode of institutional change as 'institutional shrinkage'.

In essence, some of the Swiss banking secrecy rules and practices were deliberately eradicated with no intention of being replaced by new ones, as predicted by the proponents of displacement. In cases of suspicion of money laundering, banks could no longer maintain the confidentiality of their clients. Instead, they were obliged to report clients' information, which does not represent a situation of layering. This new type of incremental change stemmed from outside pressures that constrained the willingness of veto players to either block change or allow for the explicit addition of new rules. In consequence, the decision was made to

[21] Veto players can be defined as 'individual or collective actors whose agreement is necessary for a change in the status quo' (Tsebelis, 2002, as cited in Lockwood et al., 2017, p. 4).

relinquish some of the banking secrecy provisions. This result challenged the authors' initial assumption that layering was the prevailing mode of change in Swiss banking secrecy, given strong veto possibilities and a low level of discretion in banking regulation.

Steinlin and Trampusch's (2012) alternative approach to Streeck and Thelen's typology of incremental change is both interesting and helpful in elucidating the evolving nature of institutional change theories. However, the present thesis does not enhance the validity of Steinlin and Trampusch's (2012) results. Neither the BOJ nor the Riksbank appears to support a case of institutional shrinkage in the adoption of GMP measures, since older monetary policy practices were not entirely abandoned. While the BOJ suggests a case of displacement, all other measures implemented by the two banks have not led to the complete eradication of investments linked to the fossil fuel industry during the research period.

In the domain of systemic crises, Salines et al. (2012) studied the patterns of change in the designing principles and structure of the European Monetary Union (EMU) following the GFC. The study focused on three specific case studies concerning EMU governance, the ECB, the Stability and Growth Pact, and three crisis management mechanisms: the European Financial Stability Facility, the European Financial Stabilisation Mechanism, and the European Stability Mechanism. To understand the best pattern of institutional change that characterised the EMU, Salines et al. (2012) also considered the theoretical elements proposed by Streeck and Thelen (2005): layering, displacement, conversions, drift, and exhaustion of existing institutions. The authors emphasised that despite the sense of urgency brought about by the GFC, the EMU evolved only gradually between 2007 and 2011, through layering and conversion of new and existing institutions for new purposes.

Concerning the ECB's monetary policy, the authors observed an expansion of the monetary policy toolkit, which was redirected to new objectives while preserving the ECB's overarching aim of safeguarding price stability—arguably, at a deeper level of analysis, one

could argue that the creation of new unconventional monetary policy tools could represent a case of layering of new instruments and policy goals on top of the existing interest rate change. Conversion or redirection was also observed in the bank's consultative function, which took on a greater emphasis on financial stability and macroeconomic surveillance.

Yet, notwithstanding the system-wide disruptions caused by the crisis, these changes did not amount to profound reforms in the functioning and objectives of the ECB. The authors held that this was probably the result of both the legal restrictions stipulated in the Treaty and political constraints. The latter stemmed from the difficulties in coordinating the interests of 16 countries without a prior agreement or plan to address the crisis. From this perspective, the lack of preparation or a contingency plan to deal with financial assistance may have impeded the EMU from undergoing a more radical change in response to the GFC. Indeed, the authors observed some rigidity in the EMU's response to the crisis.

It is worth noting that 'exhaustion' as a type of incremental change in the form of a gradual decline of durable institutions due to decreasing returns of existing practices, has received less consideration in the academic literature (Fioretos et al., 2016; Streeck & Thelen, 2005). Likewise, I did not consider this type of institutional change in the present research, since unconventional monetary policy tools are predominantly temporary, as pointed out by Salines et al. (2012). Therefore, one expects an erosion of these tools sooner rather than later. However, the environmental emergency may turn such sporadic tools into more permanent ones, for example, by introducing new and more durable policy elements that support the long-term climate transition.

In a related EU study, Verdun (2015) proposed an advanced version of Streeck and Thelen's (2005) model of incremental change after examining a set of EU instruments created in response to the euro area sovereign debt crisis. Through the theoretical elements of HI, particularly the concepts of critical junctures and incremental change, the author argued that

while the euro area financial crisis constituted a ‘good candidate’ for punctuated change, path dependencies proved crucial in understanding the euro area’s response to the crisis (Verdun, 2015, p. 222). Specifically, the newly created institutions, namely the European Financial Stability Facility and the Fiscal Compact, could be better described as a ‘coping’ mode of institutional change, as they mirrored previously established institutions.

Put differently, lessons from the format and function of former arrangements facilitated a prompt response to the crisis without the need for lengthy changes to the Treaty and associated political disputes. These findings align with those of Salines et al. (2012), who argued that the new EU institutions established in response to the GFC stuck to the EU framework established in the Maastricht Treaty. Given the similarities with previous institutions, Verdun (2015) expected that the newly created tools were likely to become embedded within the EU’s institutional setting.

Complementary to Salines et al.’s (2012) study mentioned above, Braun (2015) offered a compelling contribution to the scholarship on critical junctures with his study focused on the euro area during the GFC and the ensuing sovereign debt crisis. The author argued that to understand the impact of economic crises on established policy paradigms, one must consider the degree of preparedness for the crisis prior to its occurrence. However, contrary to Salines et al.’s (2012) argument, Braun (2015) maintained that the greater the preparedness for a crisis scenario, the more resistant the existing policy paradigm is to new economic disruptions. Previously experienced crises or their planning lessens the impact of an upcoming crisis more than if the said crisis had never been encountered or anticipated. Hence, the robustness of overarching goals hinges on this preparedness. The article further showed that the lack of EMU preparedness for a possible sovereign debt default compelled the ECB to assume a critical role and position within the EMU architecture, due to its established responsibilities as a provider of money and lender of last resort.

Braun's (2015) remarks provide valuable insights for comprehending the development of GMP instruments. In the context of the perceived environmental crisis, one might expect it not to substantially impact central bank overarching goals and operational principles, as previously developed crisis management tools may assist central banks in designing a climate strategy and prepare them to address economic and financial disruptions arising from climate risks. From this perspective, contingency plans can transform what might be an outlier event into a less critical one that is unlikely to disrupt existing policy paradigms.

Still in the context of the EU and the critical junctures framework, Dupont et al. (2020) investigated the potential for the COVID-19 crisis to form a critical juncture for enhancing EU climate policy and the driving factors behind this shift. At the time of writing, both the COVID-19 recovery and the EGD were still unfolding. Therefore, the authors could not firmly conclude whether the pandemic led to transformational changes that either advanced or shrank the EGD programme. However, the authors noted that the potential for a critical juncture towards boosting the implementation of EU climate policy existed. The Commission's entrepreneurship, coupled with the politicisation of the climate issue from 2019—notably, the growing public activism for climate action, the emergence of green parties in national politics, as well as in the EU parliament—helped create momentum to prioritise environmental considerations in the COVID-19 recovery package.

While an extended timeframe was needed to effectively evaluate the long-term effects of COVID-19 on the EU's climate trajectory, an early assessment indicated that the pandemic had strengthened the EU's efforts against climate change, unlike past economic crises that had marginalised environmental concerns. The present thesis builds on this theme by investigating whether this momentum constituted a window of opportunity for central banks to explore a new role for monetary policy in climate governance.

In a similar vein, Johnstone (2021) drew on HI to assess whether the COVID-19 pandemic represented a critical juncture or a critical wound for the G20. The author introduced the notion of 'critical wound' to describe a situation where failure to implement the 'building back better' programme undermines the G20 organisation and purpose—as a forum of cooperation among the world's largest economies to enhance the resilience of the global economy to shocks. The 'building back better' programme entailed innovative measures in the environmental and digital areas. Although the pandemic crisis was still evolving at the time of the analysis, the author concluded that the pandemic had a far greater macroeconomic impact than the GFC, thereby requiring more transformative responses from the G20.

Yet, political divisions within the G20 concerning how to address climate change were likely to undermine the economic recovery in line with the 'building back better' initiative. At one extreme were nations such as the EU, the UK, and the US, which showed some willingness to support a green economic recovery. At the other extreme were countries like Russia and Australia, which demonstrated resistance to pursuing recovery measures consistent with environmental principles. One of the main hypotheses this thesis explores is whether the opportunity created by the COVID-19 pandemic to rebuild economies in a greener way influenced central banks' monetary policy decisions, particularly in countries that were showing signs of adopting more revolutionary climate strategies.

According to Best et al.'s (2025) the context of intersecting crises—notably, the legacies of COVID-19, spikes in energy prices, and the war in Ukraine—provided central banks with the opportunity to engage with the topic of climate change, which some central banks explored while others did not. Although the concept of critical juncture deployed by the authors did not explicitly address the concepts of permissive and productive conditions that generate and lock in the new institutional path created by the juncture, the article offers valuable insights into a number of aspects related to this thesis. According to the authors, the outcome

of this uncertain period, where central banks could choose to either reinforce their climate commitments or reverse them, largely depended on the degree of central bank independence, the scope of the mandate, as well as the social and political support for climate action.

While public and political support are topics that this thesis addresses and elaborates on further, the results of Best et al. (2025) appear inconsistent with the observation that the most independent central bank, the ECB, nevertheless rolled out a new monetary policy strategy in 2021 that emphasised environmental considerations. The ECB was also one of the most vocal and active central banks on climate change, as the present thesis illustrates. Furthermore, the authors asserted that the ECB's mandate is rather narrow, which contradicts prior work and interpretations of the ECB's mandate, often classified as broad by virtue of its secondary objectives to support the economic policies of the EU. Best et al. (2025) proposed interesting avenues for future research, which this thesis explores. In particular, the authors suggested further inquiry on the anticipated critical juncture, notably whether climate-related inflation, central banks' growing expertise on climate change issues, and central bank epistemic communities motivate or disincentivise further environmental action from central banks.

Moving to more sociological theories, Hogan and Doyle (2007) argued that ideational change is the key factor that distinguishes critical junctures from less dramatic changes. By examining three prospective macroeconomic crises, one in the US and two in Sweden, the authors proposed a framework that helps scholars anticipate a critical juncture in terms of radical policy changes following a crisis. This framework can be applied to various types of crises and policy areas, including environmental policy. According to this framework, a critical juncture consists of three main phases: the crisis itself, the shift in ideas, and transformational policy change. Crucially, it implies that change agents agree on a set of new ideas and practices that break with established ones. These newly accepted ideas subsequently guide policy goals and the instruments to pursue them.

This sort of policy change proposed by Hogan and Doyle (2007) is akin to what Hall (1993) describes as 'third order policy change' or 'paradigmatic shift' (Hogan & Doyle, 2007, p. 905). In the formulation and promotion of these new ideas stand policy entrepreneurs, including politicians, social groups, pressure groups, scholars, scientists, and policy experts. From this perspective, while crises or their perception are necessary to produce radical policy change, they are not sufficient in themselves. The consolidation of new ideas becomes the driving force behind a paradigm shift during a critical juncture. The length of the changing process is expected to be relatively short. Otherwise, it could indicate a scenario of gradual change. If previous ideas largely prevail, the policy instruments and context may still change, but the overarching objectives remain unchanged. In this case, no paradigm shift occurs.

Bell (2017) examined the behaviour of bankers in the US and UK in the run-up to the GFC. The author argued that stickiness to mainstream institutions ultimately dictated the clash of failing banks. The author challenged existing theoretical frameworks of institutional stasis and change, suggesting that the success of banks that weathered the crisis can be best understood through an account that combines agency, cognitive, and ideational factors.[22] In 2019, Bell and Feng (2021) proposed an enhanced approach to the critical junctures theory popularised by Capoccia (Capoccia, 2015) consisting of 'short phases of fluidity and change alternating with longer periods of stability' (p. 147). The authors argued that this conceptualisation did not adequately explain the developments in the Chinese banking system following the GFC critical juncture. According to the authors, the emergence of a more liberal financial system and the rapid growth of shadow banking were characterised by a period of incremental changes both before and after this critical juncture. This implied an expanded role for agency beyond the period of the critical juncture, contrary to Capoccia's critical juncture

[22] The term 'agency' can be described as the actors' 'planned and strategic persuasion' towards specific objectives or interests, following an 'assessment of available means and institutional opportunities' (Emmenegger, 2021, p. 610; Thelen & Conran, 2016).

trajectory, consisting of a long period of institutional stability, followed by rapid and profound institutional transformations, and subsequent return to a stable path.

However, the research period examined by Bell and Feng (2021) can be too brief to ascertain whether the incremental changes pointed out by the authors occurred after the critical juncture or if they were still part of it. Although the authors did not explicitly reveal the research period, one could argue that these gradual changes may be part of a more extended period of less institutional constraints on agency and significant transformations that could only be accurately traced using longer time spans. Nevertheless, I agree with the authors' suggestion that historical institutionalist theories should not be treated in isolation. In this light, the present thesis aims to explore developments in GMP through the three alternative frameworks proposed by historical institutionalist theorists: path dependency, critical junctures, and incremental change. By doing so, it intends to consider the various dynamics that may have shaped the development of GMP measures, thus avoiding the confirmatory biases that may arise from selecting a single analytical approach.

Mobilising the theoretical principles of norm diffusion and isomorphism advanced by DiMaggio & Powell (1983) and Meyer and Bromley (2013), Larsen (2022) identified China and the EU as the global leaders in green financial policies. The author further described one way by which green financial policies have been initiated, adjusted, and propagated across countries. Through fieldwork and qualitative interviews, Larsen (2022) concluded that China established its first green financial policies in 2014-2015, thanks to its state-centralised approach and a non-independent central bank, which enabled it to speed up the formulation and implementation of mandatory green financial standards.

For its part, the EU leveraged the new green finance ideas and tools introduced by China to refine its content through lengthier, though more democratic, policy processes involving the participation of market participants. Due to the more legitimate nature of EU standards, these

served as role models for other states and even influenced subsequent adjustments in China's green financial policies. Despite the opposing political and economic approaches to governance that characterise China and the EU—'top-down' versus 'bottom-up'—Larsen (2022) conceded that they complement one another in the global proliferation of green financial policies. The author provided various examples of this proliferation mechanism, such as how the EU taxonomy influenced financial disclosures and green bond standards worldwide.

Larsen's (2022) theoretical lens, based upon more sociological assumptions of norm diffusion and policy learning, opens up new avenues to understand how GMP measures may emerge and potentially converge across the world. This optic stands in contrast to a more rationalist approach, which might view GMP measures as a means for countries to gain power and economic advantages. While materialist explanations offer some important insights, they do not fully explain institutional change in independent and neutral central banks. Therefore, this study accounts for both institutional constraints and the ideational orientations of the agents involved in the changing process to help explain the shift towards a green central bank.

Building on the previous study, Larsen (2023) combined elements from diffusion theory and comparative political economy to shed further light on where the most ambitious green finance policies emerged and how they were spread and adapted by receiving countries. According to the author, policy diffusion theory has traditionally been used to examine the diffusion of liberal policy ideas and norms from countries in the Global North to those in the Global South. Larsen (2023) leveraged this theoretical framework to show once again how the political and financial structures of China and the EU contributed to the rise and dissemination of green finance policies worldwide, particularly in the areas of environmental disclosures, green taxonomies, and green central banking. The results of this study are overall aligned with Larsen's (2022) previous article mentioned above (Larsen, 2022).

With regard to central banking, Larsen (2023) argued that the political independence of the ECB limits its ability to be as innovative as the PBC. Unlike the ECB, the PBC's alignment with the government's priorities enabled it to be more ambitious and test new policy tools. The author proposed an interesting research programme, which this thesis advances in the context of monetary policy. This included examining the role of state and non-state actors in the development and promotion of green finance policies, as well as the process through which homologous institutions across different political and economic contexts have shaped green finance instruments and their content.

Quaglia and Verdun (2023) adopted a policy learning framework to examine the ECB's response to the COVID-19 crisis. The authors borrowed the concept of 'policy learning' from Dunlop and Radaelli (2013), involving the 'updating of beliefs or policies based on lived or witnessed experiences, analysis or social interaction' (Quaglia & Verdun, 2023, p. 637). The findings of this work may provide useful clues into today's GMP measures. Although the pandemic and the environmental crisis are two distinct crises, each is characterised by a sense of emergency that may influence how central banks react. The authors concluded that in responding to COVID-19, the ECB primarily drew on its experience from previous emergencies concerning goals and tools, as well as the recognition that swift action was critical. The authors used the terms 'double loop' learning and 'single loop' learning to denote, respectively, the objectives and instruments adopted during the sovereign debt crisis, which fed into the response to the pandemic (Quaglia & Verdun, 2023, p. 636). Specifically, the bank's role as lender of last resort, along with instruments such as asset purchase programmes and long-term refinancing operations.

Quaglia and Verdun (2023) further explored the concepts of inter-crisis learning, where lessons are drawn from past crises, and intra-crisis learning, in which new tools are developed or existing ones are adjusted to address the particularities of a specific crisis. These notions

may be relevant to understanding central bank responses to the current climate crisis. As Quaglia and Verdun (2023) argued, some previously nonstandard instruments became standard practices during the pandemic. Likewise, central banks may learn from past junctures and adapt their existing tools to meet new environmental goals. This study examines whether inter-crisis policy learning enabled a swift response to environmental pressures and if central banks relied on their established toolkits or developed new ones, given the long-term nature and microeconomic implications of the climate transition.

Deyris (2023) deployed an ideational framework set forth by Schulz (2017) to demonstrate the paradigm change within the ECB associated with its support for the green transition. Using text analysis and feedback from 21 interview participants, the author argued that the ECB's climate strategy shifted from dissenting views on the role of the central bank and the interpretation of its mandate starting in 2018, to a consensus achieved in 2021 with the launch of the climate strategy. This evolution was influenced by a combination of external and internal pressures. The former entailed the 'persuasion' from social activism—particularly from NGOs and advocacy groups, which urged the bank to engage in climate action—the EU political agenda, as well as peer pressures from other central banks, notably via the NGFS. The latter comprised the 'appointment' of new members of the Executive Board, as well as changes in the ECB's 'leadership'. The new members—specifically, Executive Board Members Isabel Schnabel and Frank Elderson, and President Christine Lagarde—brought a less traditional view of central banking to the bank. Some had prior experience in climate and green finance issues, as well as a more political background. While this article presented an interesting account of green central banking with an emphasis on agency, it did not provide an institutional analysis of how policies within the ECB evolved.

Bailey and Jackson (2024) proposed three areas for future research that delve into how central banks can support the green state, which this thesis builds upon. The authors called for

comparative studies on a global scale, particularly involving central banks beyond those of the Organisation for Economic Co-operation and Development (OECD), to examine trends regarding central banks' institutional approaches to environmental goals. Emphasis should be placed on their differences and similarities, as well as the political, economic, social, and environmental conditions that facilitated or deterred a new green path.

The authors also proposed detailed analyses of the principles and operations that create a genuine green central bank, one that systematically embeds environmental norms and values. Importantly, from the perspective of this thesis, Bailey and Jackson (2024) suggested investigating the potential for 'layering' environmental goals within central bank operating systems and goals, as well as the institutional limits of this approach. This sort of analysis explicitly calls for a historical institutionalist examination. For instance, the authors highlighted the notion of central bank independence and how it could impose institutional constraints on aligning central bank operations with environmental targets. In this respect, this thesis suggests that traditional accounts on the separation between monetary and political interactions do not appear to play a major role in explaining developments in the GMP field.

2.4 Additional Theoretical Frameworks Applied to the Study of Environmental Issues

Moving beyond the study of the financial system, earlier analyses on the politics of the climate transition have usefully combined insights from HI with other theoretical strands. One noteworthy example is the study by Munck af Rosenschöld et al. (2014) on the gap between scientific calls for urgent climate action and the insufficient public policy responses. The authors leveraged five main mechanisms derived from the core concepts of 'new institutionalism' to elucidate institutional resistance to swift and effective policy responses to climate change:

1) the costs of policy implementation and collaboration among the various stakeholders involved in climate governance; 2) the uncertainty surrounding the evolution of climate change

and the consequences of any enacted policies; 3) path dependencies linked to the influence of decisions taken in the past, such as prior investments in fossil fuel infrastructures; 4) power struggles within the international political setting, as well as disputes between right- and left-wing parties over policy priorities, which hinder or delay consensuses on climate change commitments; 5) the legitimacy of climate policies in a political and socioeconomic environment that favours rapid returns on investments.

As an analytical framework, new institutionalism has been applied in the environmental policy field to examine institutions and the relationship between these and behaviour, drawing on elements from economics, political science, and sociology. The three main strands of new institutionalism are rational choice, HI, and SI. Following Munck af Rosenschöld et al. (2014), while rational choice views institutions as prescriptions aimed at maximising gains for individuals and places great emphasis on institutions, HI underscores the influence of established organisational principles on policy preferences, shaping new institutions alongside previously established structures and policy choices. However, several factors can disrupt continuity with past trajectories, for instance, through the efforts of policy entrepreneurs and transnational groups, which exploit moments of uncertainty to advocate for policy change in specific directions. Therefore, Munck af Rosenschöld et al. (2014) encouraged scholars to account for the role of agency to understand institutional change and inertia towards environmental ends. SI considers institutions as values and norms that determine whether specific behaviours are appropriate and emphasises the role of socialisation processes in the creation of new institutions.

This thesis proceeds with the application of HI to illuminate the climate strategies of independent central banks, which are legally constrained in their capacity to spur policy change and adopt innovative policies. In those central banks where mandates appear to play a minor role in explaining central banks' climate strategies, the objective is to highlight other

considerations that may have influenced the stance of central banks on climate change issues. These include pressures from government and non-governmental agencies, peer central banks, epistemic communities, as well as interest groups. This multi-perspective approach is hoped to render the present thesis analytically interesting.

Related to the previous study, Rosenbloom et al. (2019) concluded that the reluctance towards climate policies was closely linked to the vested interests of economic groups and the short-sighted ambitions of political parties. This was compounded by the lack of a global response to the problem, the distributional effects of climate policies, and the uncertainties surrounding climate change and how to tackle it. Based on the notions of 'path dependence, policy feedback, and transition pathways' (Rosenbloom et al., 2019, p. 168), the authors proposed four mutually reinforcing strategies to overcome the ongoing dependencies from carbon trajectories and accelerate the green transition: (1) institutionalising the transition within the broader economic and social system—that is, across multiple policy areas, (2) seeking public legitimacy for climate-related policies, (3) emphasising the material benefits of a low-carbon development through discourse, and (4) involving a broad range of state and non-state organisations in the transformation process.

What Rosenbloom et al. (2019) did not account for was the negative feedback stemming from the overlapping and sometimes incompatible remits of the various actors involved in climate governance. Such tensions can potentially scale back the newly adopted measures and send contradictory signals to the public, thereby offsetting the effects of any climate efforts. This thesis aims to shed light on the trade-offs arising from assigning environmental authority to independent centres of decision, using central banks as an empirical case study.

In the area of regulatory authorities, Dunlop and Russell (2012) investigated why the UK regulators adopted sustainable development goals (SDGs) differently in their operations. Using the concepts of rational choice and SI, the authors highlighted the importance of

interests—the regulator's formal objectives—and prevailing values in the sustainability strategies of the local government, education, and healthcare sectors. While the object of analysis exceeds the scope of the current thesis, understanding how these three regulatory bodies with specific responsibilities responded to the environmental emergency can generate important insights for studying monetary authorities.

Dunlop and Russell (2012) argued that the UK was falling short in integrating sustainability actions across public institutions, despite the increasing attention to environmental topics and the progressive formulation of laws and regulations aimed at protecting the environment. The authors noted that the public sector plays a crucial role in influencing social and economic behaviour, given its visibility and power (e.g., purchasing power and, I add, monetary power). However, public services encountered barriers in adopting a more supportive role towards achieving environmental goals. On the one hand, the government was sending ambiguous messages to the market regarding the pathway to achieve environmental targets. This was partly due to the uncertainty surrounding climate change and the perceived risks of implementing political measures that could ultimately prove unsuccessful. Echoing this uncertainty, the central government made successive amendments to established climate frameworks. The lack of a clear strategy for the public sector, coupled with the absence of a scheme of incentives and penalties, led regulators to refrain from taking significant strides. Furthermore, regulatory authorities often have a significant degree of independence, which requires them to duly justify any actions beyond their remit that may conflict with their primary purposes.

Among the three examined UK regulators—local government, education, and health sectors—the local government was the most progressive on the sustainability front due to its broader remit. Dunlop and Russell (2012) recommended that public authorities provide clear guidance and set sustainability targets for regulators, outlining what they can do and achieve

within their areas of intervention. Although this analysis offers valuable clues, incorporating additional theories that consider institutions in more detail could add further depth to the study. For example, examining more explicitly how existing institutions influence the regulator's behaviour could reveal other factors that can either encourage or hinder regulatory authorities' engagement with topics outside established mandates, notably when the linkage between the two is not immediately clear. Additionally, considering the timing and context is important. The authors relied on three case studies from a specific temporal and national context, meaning that some of the dynamics at work may be less relevant in other contexts. A comparative historical analysis across different national settings, as the one carried out in the present thesis, can provide further insights into these aspects.

In another UK study, Lockwood et al. (2017) complemented HI with a socio-technical systems framework to capture the political dimension of the transition to sustainable energy. According to the authors, the transition process is markedly political. It involves political decisions and social priorities, aspects that socio-technical systems often fail to capture. Lockwood et al. (2017) noted that countries with electoral systems based on proportional representation tend to adopt more stringent environmental policies than those with majoritarian systems. In proportional systems, a diverse range of parties participates in decision-making, some of which place the environment high on the political agenda. In contrast, majoritarian systems may experience rapid shifts in policy priorities with changes in the governing party.

Moreover, environmental activism is more pronounced in contexts where independent and regulatory agencies hold mandates that encourage innovation. Drawing on Streeck and Thelen (2005) and Mahonen and Thelen's (2009) model of incremental change, Lockwood et al. (2017) suggested that layering is the likely pattern of change towards sustainability in the energy sector. This is so given the difficulties of displacing existing institutions—particularly when veto possibilities exist—the central role of the energy sector in the economy, and the low

flexibility in interpreting and applying energy regulations, which makes the drift and conversion of existing institutions less likely to happen.

Rosamond and Dupont (2021) explored how intergovernmental EU institutions, namely the European Council and the Council of the European Union, address climate governance amid frictions between their members through the lenses of intergovernmentalism, HI, and discursive institutionalism. The authors maintained that the EGD represents a significant turning point in EU climate action and may constitute a critical juncture for EU policymaking. Specifically, the EGD sets ambitious collective targets aimed at making Europe climate-neutral by 2050. These targets are prescribed in the European climate law, making them mandatory across all policy areas. Furthermore, the transition process is designed to benefit all EU citizens. According to Rosamond and Dupont (2021), this outcome was supported by the emergence of new ideas relating to climate neutrality and a fair transition, which facilitated a consensus around climate action despite the turbulent period impacted by the COVID-19 crisis.

From an institutional perspective, this thesis elaborates on this theme. It investigates whether this potential critical juncture for EU policymaking, driven by the EGD, potentially affected monetary policymaking in the euro area. Given the ongoing degradation of the environment and the binding nature of the EU's climate law on all EU actions, one could reasonably expect that monetary policy decisions would evolve in support of environmental objectives. HI offers an analytical framework for analysing this issue, including the institutional barriers that may impede this advancement.

Schrage and Haarstad (2024) examined how climate action plans become 'politically feasible' at the city level. Using the logics of appropriateness and consequence borrowed from SI, the authors maintained that the likelihood of implementing promising climate strategies rests on the agency of bureaucrats. The preparation of climate action plans involved various stakeholders, including business groups, NGOs, scholars, and citizens, with a view to building

legitimacy around the plan. This collaborative approach aimed to create a climate strategy that was viewed as appropriate for the community, with clear targets and guidelines for all. The plan was subsequently promoted at multiple public events to gain acceptance from the broader public, thereby making it implementable.

Taken together, organisational practices related to market consultations and the transparency of the plan's design and targets proved crucial in generating trust among the broader community. Yet, the authors suggested combining innovative climate solutions with a notion of consequence, where new ideas must align with the organisation's competencies and tasks. In other words, the importance of ensuring that what is desired is also feasible within the organisation's framework. This point can help elucidate how new ideas and practices, viewed as outside the traditional scope of central banks, can be legitimised in the eyes of the public. To promote this new field of competence, central banks might increase in-house research and expertise on climate change, enhance communication on the subject, conduct market consultations, and convene conferences and other public events. At the same time, they are likely to ensure that any climate-related policies are consistent with the primary goal of monetary policy, which is to maintain price stability.

The role of nonprofit organisations mentioned in the previous study is illustrated by Zou and Wang (2021). The authors built on the principal-agent theory and SI to advance the idea that NGOs became increasingly independent and powerful players in global climate governance. Zou and Wang (2021) argued that such an increased power results from the NGOs' dual source of authority: (1) the authority delegated by states in areas where they face challenges to respond effectively; this authority can be delegated directly or indirectly, via intergovernmental organisations such as the UN; (2) the authority inherent to NGOs stemming from their globally prized values, the principles they pursue, and their expert knowledge in specific domains.

The authors define global governance as an ongoing process in which multiple international actors work together to achieve specific collective goals. This collaboration can take place through more formal or informal structures. Given the increasingly global nature of several challenges, NGOs have gained respect and relevance within the international community, including those in the environmental sector. They provide states with the latest data and research on specific topics, leverage their expertise to inform and influence decision-making, and support and follow policy implementation. Additionally, they play a constructive role in mediating disputes. This thesis takes note of various actors, including non-profit groups and networks of experts, and their influence on central banks' climate roadmaps.

Mandelli (2023) combined four frameworks from institutional theories to develop testable hypotheses for the rise of eco-social policies (policies that embed social and environmental aims): functionalism, HI, interest-based and ideas-based approaches. In particular, the author elaborated on the institutional and political conditions that can either facilitate or hamper the adoption of eco-social policies. From a functionalist optic, eco-social policies are linked to the risks that social and ecological issues pose to societal well-being. These risks mainly arise from factors outside the political sphere. They can also stem from government actions taken to address said issues. However, the existence of new social and environmental risks may not be the sole reason why countries implement eco-social policies, given the varying national responses to seemingly common risks.

From a historical institutionalist perspective, Mandelli (2023) suggested that strong welfare states are better equipped to manage new risks. The adoption of eco-social policies tends to be more incremental and less disruptive in strong welfare states than in weaker welfare systems. In the latter, addressing new risks requires more innovative and transformative instruments. Consequently, the author contended that only accounts grounded in actors can provide a more meaningful explanation for eco-social policies. Drawing a parallel with central

banks, it could be theorised that central banks operating with nonstandard monetary policies might more easily accommodate unconventional green monetary policies than central banks that exclusively rely on the primary interest rate change. In this case, novel policy instruments would be necessary to achieve environmental goals. Hence, while institutions play a role in constraining and facilitating policy change, it also falls to the actors involved in decision-making to explore and select policy options based on their interests and incentives.

Mandelli (2023) turned from theories based on structural factors to those centred on actors, which place greater emphasis on agency and politics. Interest-based accounts explain policy preferences primarily through party ideologies and interests. In this situation, green and left-wing parties, as well as related interest groups, tend to push for environmental reforms. Ideas-based scholarship views policy preferences as the result of the learning of new policy solutions through multiple actors. These actors, whether individuals or groups, use discourse to propagate new social and environmental goals, alongside strategies to achieve them. However, evidence shows that many central banks do not adopt the promoted green finance ideas despite ideational pressures. This suggests that policy options are likely influenced by a combination of interests and ideas. The author held that eco-social policies are more likely to emerge in contexts featured by solid welfare policies and where key social and political actors are committed to pursuing social and environmental objectives.

Mandelli's (2023) study offers valuable insights for the present research, which draws inspiration from and expands this theoretical work by examining case study central banks where two of the political theories proposed by Mandelli can help elucidate the emergence of GMP measures: HI and ideational traditions. This mixed approach can be particularly elucidative in the current multiple-case research, especially since central banks do not typically have an explicit mandate to pursue environmental goals. Therefore, other causal drivers may have contributed to the development of a GMP strategy.

Related to the adoption of green monetary policies and the importance of discourse referred to in Mandelli's (2023) study, Cerdeira and Rimkutė (2024) maintained that the ECB successfully upheld the bank's legitimacy regarding its new climate strategy through a communication plan that linked new climate-related risks and targets to the bank's core objectives. Using text analysis of ECB communications between January 2022 and May 2023, along with a bureaucratic reputation analytical framework, the authors observed that by consistently articulating both new and old objectives, the ECB created a 'strategic ambiguity' in its discourse. This ambiguity enabled the ECB to satisfy the interests of both promotional and prudential audiences, thus preserving its reputation while taking on new areas of responsibility. Although the timeframe of the analysis could have been extended to cater for the discourse dynamics leading up to the 2021 climate strategy, the study deserves credit and provides valuable reflections for the present PhD research.

Connected to the previous study, Aguila and Wullweber (2025) found that the ECB legitimised climate action through three main evolving justifications: from a discourse focused on the financial risks from climate change and the resources needed to close the green finance gap in 2018, to one that emphasised the effects of climate change risks on price stability in 2021 and 2022. The authors drew their analysis on the notion of 'layered social structures' initially developed by Laclau in 1990. In this line of reasoning, the authors described the ECB as a three-part structure consisting of goals, institutional features, and policies.

At the lowest or deepest level of each part stands the core elements of the bank, respectively, the market liberal ideas of price stability, central bank independence, and interest rate change as the bank's primary monetary policy tool. This deepest level, the authors argued, is the most protected from changes. Similar to the concepts of incremental change and critical juncture employed by historical institutionalists and applied in this thesis, changes at the deepest level can still occur, mainly due to socioeconomic transformations or upheavals.

Aguila and Wullweber (2025) argued that the ECB's explanations for its climate strategy based on the price stability mandate provided the bank with the opportunity to adopt more comprehensive GMP measures. Yet, 'the new narrative has not been matched with new policy proposals', suggesting that the bank remains largely influenced by market liberal ideas (Aguila & Wullweber, 2025, p. 667).

As in Cerdeira and Rimkutė's (2024) study, Blondeel et al. (2024) also built on the bureaucratic reputation literature to explain the timing and varying degrees of the BoE, the ECB, and the Fed in addressing climate issues. The authors held that a 'broad social-political consensus' allowed both the BoE and the ECB to reinterpret their mandates and take more decisive actions to mitigate climate change risks, while maintaining their 'socio-political' and 'performative reputation' (Blondeel et al., 2024, p. 919). In the US, on the contrary, the partisan divide surrounding the climate change issue obstructed any advances towards a green central bank. The authors emphasised that the role of conservative political parties is a key factor in influencing the adoption of green practices by central banks. While conservatives in the UK and EU were generally more permissive or at least did not oppose a central bank climate strategy, party divisions in the US posed significant challenges to the Fed.

The timid steps thus far undertaken by the Fed in the supervisory domain were explained by Blondeel et al. (2024) through a reputational lens. As the recognition of climate change risks grew within the central bank community—particularly through the NGFS and the Basel Committee on Banking Supervision (BCBS)—the Fed became concerned about losing its 'technical reputation', as the leading institution in the world financial system (Blondeel et al., 2024, p. 919). Consequently, the Fed intensified its research on climate risks and advised US firms to account for these risks in their operations, albeit voluntarily, to avoid backlash from a divided Congress regarding climate change action. The Reserve Bank took its first strides on the climate front and joined the NGFS only after Democratic candidate Joe Biden

won the presidential elections against then-President Donald Trump in November 2020. The political account proves to be a relevant dimension in explaining the 'unexpected' results of the Fed in this thesis. The present research expands the analysis of the Fed by reflecting on the roles of interest groups and the media in shaping the US public opinion against climate action and sparking political divisions. It also covers other central banks that have been overlooked in the recent literature, notably the BOJ and the Riksbank.

The preceding literature review outlines some of the relevant political science theories applied to the study of climate transitions. Combined, they offer a multifaceted perspective of the processes of institutional change towards a greener future. One of the main conclusions of this literature review is that policy decisions are situational. Institutional, structural, and ideational factors affect and are affected by the decisions taken at a given point in time. Recognising that this research cannot account for all possible theoretical perspectives on policy change, and that each one has its own merits and limitations, this thesis identifies a fruitful combination of HI with SI to understand developments in central banks' monetary policy motivated by new environmental needs.

The fusion of HI and SI enables us to interpret why, in terms of institutional incentives, and how, in terms of the tools deployed, GMP was initiated (Bernstein & van der Ven, 2017). When functionalist arguments do not provide a reasonable explanation, the study examines how the interplay between new green finance ideas and interests formed in a specific historical context influenced and interacted with old central bank structures. Given the dynamic nature of the economies, as well as the long-term implications of environmental issues and required solutions, this interplay will likely remain a lively topic in the years to come. The following Chapter 3 delves deeper into the theoretical elements of HI and SI, which assisted in collecting and evaluating the empirical data.

Theoretical Frameworks: Applying Historical Institutionalism and Sociological Institutionalism to Understand Green Monetary Policy Measures

HI is a well-known and developed analytical framework. It has been used to theorise the processes by which institutions are devised, changed, and sustained over time and across different settings. Its conceptual elements have been deployed in a wide range of subjects, including public policies, party systems, labour movements, interest groups, professional networks, and financial systems (P. A. Hall & Taylor, 1996; Thelen & Steinmo, 1992). The historical institutionalist approach draws particular attention to the impact of past events in explaining present structural configurations—in terms of institutional constraints, incentives, and opportunities—the influence of critical junctures in initiating new path-dependent trajectories or reinforcing existing ones, and the value of studying long-time horizons to identify slow and more subtle institutional changes (e.g., Capoccia, 2015; Capoccia & Kelemen, 2007; Fioretos, 2011; Fioretos et al., 2016; P. A. Hall & Taylor, 1996; Krasner, 1984; Pierson, 2000; Sewell, 2005).

In the present study, HI is deployed to evaluate i) whether legal mandates have created a path-dependent structure that has fundamentally impacted the adoption or non-adoption of a GMP strategy, ii) if specific events, or a 'sequence of events' (Fioretos, 2011, p. 371), has prompted the quick consolidation of new GMP incentives within central banks' structures, or iii) whether changes in central bank policymaking towards environmental goals have been gradually institutionalised.

The scholarly literature offers various definitions of institutions. Broadly speaking, institutions are viewed as a set of formal and solid prescriptions, often with legal character, to enforce compliance and provide stability and predictability in structured situations. Scholars have also emphasised the cultural or normative aspects of institutions, which shape actors' interests and their choices (Heywood, 2015; Ostrom, 2005; Peters, 2019). Borrowing from the

sociologist Scott (2014), ‘institutions comprise regulative, normative, and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life’ (as cited in Emmenegger, 2021, p. 612). From this perspective, institutions are embedded in a complex mix of formal rules on the one hand and informal guidelines, norms, and values on the other. Policy change can thus be viewed as a type of institutional change.

Historical institutionalist theorists initially emphasised the stability of institutions. Meanwhile, scholars working within the three institutionalisms—rational, historical, and sociological—have increasingly drawn attention to the inherent tendency of institutions towards change (Emmenegger, 2021). Krasner’s (Krasner, 1984) definition of ‘punctuated equilibrium’ illustrates one way by which institutions may evolve over time. According to the author, institutions remain in equilibrium—or ‘institutional stasis’—over long periods, being periodically punctuated by ‘environmental pressures’ that spur rapid ‘institutional creation’ (Krasner, 1984, p. 240). The newly endured path is then reinforced, giving rise to long periods of institutional continuity. In this context, the merit of institutions to constrain and determine the course of action is circumscribed to times of ‘institutional stability’ (Pierson, 2011, p. 135). In the face of exceptional or contingent occurrences, such as economic crises, political upheavals or wars, contextual variables may intersect with institutional forces, producing unexpected outcomes (e.g., Farrell & Finnemore, 2016; Fioretos, 2017).

Further to ‘radical change’, other forms of small, incremental, and endogenous transformations have gained traction in the academic literature (Pempel, 1998, as cited in Streeck & Thelen, 2005, p. 7). Contrary to the claims about the enduring character of institutions, which are punctually disrupted by critical junctures, incremental change points to more successive, though gradual, institutional change. Rixen and Viola (2016) developed a framework that identifies three components of change in an attempt to measure and compare different change processes: speed (duration of the change), scope (quantity of institutional

elements affected by change), and depth (whether an institution is poorly or strongly institutionalised, and thus, more or less vulnerable to shocks).

In addition to the mode of institutional change, whether it is dominated by punctuations or incremental types of change, many argue that the institutional analysis is better equipped when accounting for the broader context within which organisations operate (Blyth, 2007; Fioretos et al., 2016; Weir, 1992; Widmaier et al., 2007). Certain external events may impact how individuals and organisations perceive the problems and the solutions to address them. This assumption goes along with the notion of 'institutional dynamism' (Thelen & Steinmo, 1992, p. 16), whereby policy decisions may result not only from 'logics of consequence' (Fioretos, 2017, p. 10)—that is, sticky rules and path-dependent procedures—but also in response to new circumstances, ideas, and interests formed in the wider context (Blyth, 2003).

The analytical focus turns to institutions as carriers of ideas and beliefs, which, according to Alexander Wendt, are a 'sociological construction' (Wendt, 1999, as cited in Blyth, 2003, p. 700). In this line of reasoning, although pre-established institutional arrangements condition choice and influence what individuals consider to be in their interest, they do not entirely eliminate agency. Institutions operate and change in response to the intervention of actors, whether individual or collective. These actors hold perceptions of how the world works or should work and engage in agency according to their beliefs and conceptions of what is appropriate.

A combination of institutional and sociological factors in the analysis of institutional change is thus believed to produce new explanations that cannot be easily anticipated using a single approach. This may be especially so in organisations highly exposed to national and international contexts, such as central banks. Therefore, the remainder of this chapter seeks to reconcile the key tenets of HI wielded to describe how policy change occurs or does not occur with a more constructivist approach to explaining the drivers of greening monetary policy.

Sociological factors bring new insights into the relationship between political and socioeconomic interests, the learning of new green finance ideas, and central bank environmental strategies.

3.1 Path Dependency and Central Bank Legal Mandates

The concept of path dependency posits that once a decision is made in a particular direction, that course of action tends to be perpetuated over time due to 'increasing returns' and 'positive feedback', even if the chosen trajectory becomes inefficient (Fioretos, 2011, p. 377; see also Mahoney, 2000; Pierson, 2000). In a path-dependent logic, actors balance 'the costs and benefits of adapting to new circumstances with the costs and benefits of maintaining or losing their investments in past arrangements' (Fioretos, 2011, p. 373). In general, previously established structures tend to prevail and shape actors' preferences over other solutions due to the increasing gains, benefits, or privileges derived from past decisions. The awareness of path-dependent processes illuminates why institutions remain stable over an extended period of time and why policy action is directed along specific paths, making it difficult for competing arrangements to supplant existing ones.

Central banks exhibit features of path dependency while being embedded in an institutional environment that restrains their actions, policy choices, and capacity for change. Notably, central banks are bound by an overarching and limited set of powers delegated by governments to them. Those powers are stated in treaties and other legal documents, typically referred to as mandates. With a view to ensuring the stability and predictability of institutions, formal mandates remain generally constant over time and are normally designed in ways that impose tight restrictions on their redrafting (Fioretos, 2017; Șimandan & Păun, 2021).

Legal mandates vary across jurisdictions. While some mandates are limited to price and often focus on financial stability, others allow for a broader interpretation of the central bank's mission by including support for other macroeconomic variables or government policies,

generally as a secondary objective. In either case, central bank policy decisions and commitments must be clearly justified on the grounds of their previously set objectives, which legally constrain them. This 'lock-in' effect or institutional 'stickiness' in the context of central banks aims to safeguard central bank powers and control their objectives (Pierson, 2000, p. 253; Thelen & Steinmo, 1992, p. 15). Specifically, it enables central banks to carry out their functions independently of political preferences and other external influences, while preventing them from interfering in matters that are under the responsibility of elected officials.

Notwithstanding the limited and enduring nature of legal mandates, we have witnessed an expanded role of some central banks through the adoption of unconventional monetary policies, notably following the 2007-2008 GFC and the COVID-19 pandemic. These are two instances where policy choices appear to have overcome institutional constraints. For Langley and Morris (2020), both crises demonstrated a variety of techniques that enabled central banks to move from 'lender of last resort' to 'investor of last resort' (Langley & Morris, 2020, p. 1472). According to Adam Tooze, 'what central banks do is becoming more complex, more diverse and multipolar' (Tooze, 2020). It involves successive market interventions and endless credit, significantly expanding the scope and ambiguity of central banks' purpose. In a similar vein, previous studies argued that the ECB adopted a number of monetary policy decisions where neither the primary objective of price stability nor the intended effect was its main goal (e.g., Högenauer & Howarth, 2019). The bank was also claimed to have spread its influence into other EU domains and national policymaking (Howarth & Loedel, 2005).

Taking advantage of the power of central banks to steer economic activity and their expanded monetary policy toolkits, a group of scholars, practitioners, and interest groups holds that the fight against climate change should benefit from the array of central bank standard and nonstandard instruments already in place (Chenet & Kalinowski, 2021; Couppey-Soubeyran, 2021). After all, secondary mandates draw central banks' attention to systemic topics, so

climate change should not be neglected (Honohan, 2019). Theoretically, there are several monetary policy operations available to achieve environmental targets. While some could be based on existing tools, others would imply innovative policy instruments and goals (Lonergan et al., 2022; NGFS, 2021a).

Although nonstandard instruments are not new and have been in use, climate change might differ from past crises in that it can last many years or even decades (Hansen, 2022). As mentioned by Frank Elderson (2021), executive board member of the ECB, the climate emergency is an 'international and intergenerational issue' (Elderson, 2021g). Provided that unconventional monetary policy tools are normally targeted, flexible, and temporary until economic conditions are stabilised (Cour-Thimann & Winkler, 2013), the green turn may demand new and enduring changes in central bank operations. Yet, such a scenario might be controversial, as it grants central banks competencies in a policy area that most mandates do not support.

For Volz (2017) and Ramos Muñoz et al. (2022), as long as the evidence indicates that climate change and environmental degradation severely affect price fluctuations and economic growth, which is 'exactly what monetary policy cares about' (C. Chen et al., 2021, p. 2), environmental targets may fit within the 'core mandate' of price stability (Ramos Muñoz et al., 2022, p. 49). In that case, GMP is the outcome of a 'path-dependent reform' as it aligns with central bank-delegated powers (Hanrieder, 2015, p. 229). Regarding mandates formulated more broadly, where price stability coexists with other wider economic policies, there would be no objection to greening monetary policy provided that environmental issues disturb macroeconomic variables. From this perspective, 'the less determinate an institution is, the more legitimacy it is likely to have' (Peters, 2019, p. 158). The challenge arises when promotional objectives conflict with the overarching goal of price stability (see also Campiglio et al., 2018).

In sum, following a path-dependent logic, one could envisage limits to a central banking approach to environmental policy as follows: the most narrowed mandates centred on price and financial stability would deprioritise green monetary policies, whereas the broader mandates, which include the explicit support for economic variables—such as employment and production—or government policies would offer greater leeway to establish green-based instruments. This second premise is based on empirical research that emphasises the implications of climate disruptions and policies on production, employment, and growth, as it has been widely documented in the macroeconomic literature on climate change (e.g., Batten, 2018; Kahn et al., 2019; Kruse et al., 2017; McKibbin et al., 2020; NGFS, 2020a). In this line of reasoning, more vigorous actions would be expected from central banks whose mandates assign equal weighting to different macroeconomic goals, often labelled as dual mandates. Should mandates fail to clearly explain the development of GMP strategies, the debate about the robustness of central bank frameworks and the role of legal mandates will likely receive renewed attention.

3.2 The Critical Junctures Approach to Monetary Policy Change

An extensive line of research on HI understands 'crisis-induced change' through the notion of critical junctures or punctuated change (Rehm, 2022, p. 1). Although there is no common view on the precise duration of a critical juncture (Sikkink, 2017), these junctures are typically defined as short moments of 'institutional fluidity', during which change agents encounter an increased array of possible choices, with punctuated or significant change being one of the likely outcomes (Capoccia, 2015, p. 166; Mahoney, n.d., p. 25; Capoccia & Kelemen, 2007). It is important to note that not all shocks or cleavages, even if extreme, prompt institutional breakthroughs (D. Collier & Munck, 2017). However, because institutional constraints on agency are loosened during these 'short bursts' of 'heightened contingency' (Capoccia & Kelemen, 2007, p. 352), the probability of institutional creation or significant

modification increases during these concentrated periods (Capoccia & Kelemen, 2007, p. 352; Capoccia, 2015; Mahoney et al., 2016). Therefore, the consequences of agency are believed to be more impactful under contingent conditions than during normal times.

Contingent conditions can stem from small or large events. In either case, radical change occurs when those events rapidly and significantly disrupt the mechanisms that were perpetuating a certain path, redirecting institutions towards a new trajectory. The long stretches of time before and after these relatively short breakdown moments are typically characterised by less obvious changes (Capoccia, 2015; Capoccia & Kelemen, 2007; R. B. Collier & Collier, 1991; Krasner, 1984; Mahoney, 2000; Pierson, 2000). Swift institutional changes have often been attributed to the need for urgent and sometimes atypical responses to supposed serious problems (B. Braun, 2015).

Grossman (2019), who studied the policy process of the US government during and after the 2007 energy crisis, concluded that when the perception of urgent action persists, policymakers believe they must take prompt action, even if the best policy response remains uncertain. External perturbations or their perception can thus create the 'permissive conditions' for punctuated change (Soifer, 2012, p. 1573). Permissive conditions can be defined as factors that weaken the structural constraints on agency, thereby creating opportunities for institutional reforms. Yet, although permissive conditions are essential for institutional change, they are not sufficient on their own. While permissive conditions relax restrictions on agents, 'productive conditions' refer to the processes through which agency results in effective institutional change within the timeframe of permissive conditions (Soifer, 2012, p. 1573; see also Fioretos et al., 2016). Once permissive conditions cease, the production of significant change is no longer possible, indicating the end of the critical juncture.

In addition to the notions of permissive and productive conditions, scholars have emphasised two other elements in the critical juncture theory, which Soifer (2012) noted in his

article on critical junctures. These are the 'antecedent conditions' and the 'mechanisms of reproduction' (Soifer, 2012, pp. 1573, 1577). Antecedent conditions can be described as the institutional setting surrounding a specific unit of analysis before permissive conditions unfold. While existing separately from critical junctures, antecedent conditions may have an important causal effect on the outcome of a critical juncture. Different antecedent conditions may explain why the same critical juncture may play out differently across various contexts, including why productive conditions operate in some contexts and not in others. The mechanisms of reproduction are often emphasised in the historical institutionalist literature on path-dependency. They refer to the structures and processes that sustain the newly established path once the critical juncture is over. In other words, the factors that preserve the institutional changes resulting from the critical juncture.

This study seeks to investigate whether the growing climate change and environmental risks can represent a critical juncture for central bank monetary policy using the conceptualisation of critical junctures. Notwithstanding the theoretical continuity of mandates, evidence shows that central banks have evolved over time in response to previous systemic punctuated crises, which shifted their focus towards new developments. For instance, junctures such as the GFC and the COVID-19 pandemic enabled new ways of making policy in both the AE and EMDE central banks on the grounds of keeping inflation low and stable. That is to say, these changes were tied to the central bank's main policy goals (Sever et al., 2020).

Likewise, some central banks have perceived the ongoing climate and environmental issues as a major threat to macroeconomic and financial stability. This has been linked to the increased materialisation of weather disasters and the widespread underestimation of environmental risks. Such risks can spur a swift repricing of assets, recessions, increased unemployment, and declining inflation (Breman, 2020a). Consequently, we may again see monetary policy take unexpected or unconventional directions to support environmental

objectives, as well as central banks finding ways to make the implementation of such measures explicable. Yet, it is important to remember that climate change is a long-term challenge that implies durable efforts. The adoption of unconventional GMP measures may therefore require a shift away from central banks' principles to a much larger extent than responses to previous temporary crises.

Against this backdrop, the value of applying a critical juncture analysis to the perceived climate and environmental emergency arises from its potential to alter central banks' operational frameworks and policy goals towards new and enduring environmental objectives. To that end, this study qualitatively appraises whether central bank decisions in the environmental field have resulted in i) no policy change—meaning that no critical juncture with transformational change can be found, ii) policy adjustments towards new green targets in ways that significantly modify previously established operations and goals. If the latter, the study proceeds with an examination of how the critical juncture can be recognised, the factors that account for it, and when and how subsequent transformational change took place.

At the beginning of this research project, evidence suggested an increased commitment by central banks to align their operations with the Paris Agreement, as well as growing communication on the topic. Central banks' official speeches and reports drew on scientific evidence that highlighted the vivid consequences of a changing climate on social, economic, and financial stability. Research indicates that the salience of an event, particularly when it is clearly linked to changes in welfare, may influence the choice of a set of solutions over others (Ostrom, 2005). Following Dupont et al. (2020), concerning the development of EU climate policy, 'the combination of a committed policy entrepreneur with a highly salient issue that had previously been politicised may drive critical junctures with transformational effects' (Dupont et al., 2020, p. 1099).

Taken together, while a window of opportunity appears to exist for advances towards a GMP, the degree of change, timing, and pace of central bank responses to the environmental emergency may vary across central banks. This can arise from specific antecedent conditions, such as different legal mandates and frameworks, as well as different meanings and interpretations of the crisis and the solutions required (D. Collier & Munck, 2017; Widmaier et al., 2007). That is to say, the speed of response to a perceived common shock, as well as the long-term consequences of the decisions taken, may vary significantly due to contextual factors. As Collier and Collier put it, 'a critical juncture may be defined as a period of significant change, which typically occurs in distinct ways in different countries (or other units of analysis) and which . . . produce distinct legacies' (R. B. Collier & Collier, 1991, p. 29).

Moreover, what is perceived as a critical juncture for one institution might not be for its counterparts, even if they are interconnected (Capoccia & Kelemen, 2007). This point may be particularly relevant in the present multiple case study analysis. Different institutional settings and structural factors can lead to various perceptions and degrees of mobilisation towards achieving climate goals. As Mminele (2021) noted in relation to the green transition:

> No two institutions are the same, and the ability of firms to support the transition is influenced by their macroeconomic environments, the structure and strength of their financial systems, capital markets developments, and also their political environments. (Mminele, 2021, p. 29)

The author contended that the otherwise implementation of standardised practices without factoring in the specificities of each country may put economies and financial sectors at risk.

In essence, no panaceas seem to exist for incorporating sustainability criteria into extant monetary policy activities. Central banks supporting the low-carbon transition are likely to consider local socioeconomic factors, the political landscape, and the structure of the financial system. In particular, differences in central bank approaches may arise between countries that

are heavily dependent on fossil fuels and require sizeable amounts of investment for decarbonisation, and others, such as Finland, which introduced a carbon tax in the 1990s and is already largely reliant on renewable sources of energy (Norges Bank, 2020c; Norwegian Petroleum, 2034). Arguably, countries that are more advanced on the regulatory and technological fronts exert less pressure on their national authorities to achieve green targets. In any event, only a thorough and evidence-based examination will enable us to ascertain whether the environmental crisis has the potential for a critical juncture in the policy frameworks of some central banks.

The analysis of critical junctures is often 'intertwined with other processes of change' (R. B. Collier & Collier, 1991, p. 27), notably path dependency and incremental change. On the one hand, decisions taken during contingent events can have major and long-lasting results towards specific arrangements. There is a 'dynamic of discontinuity, followed by continuity' (D. Collier & Munck, 2017, p. 2). On the other hand, a body of research shows that while a path-dependent process may result from sudden changes, adaptive transformation can still occur during periods of relative institutional stability, as the following subsection elucidates. Therefore, scholars have recognised the usefulness of combining the literature of critical junctures and incremental change (Mahoney, n.d.; Salines et al., 2012; Soifer, 2012; Verdun, 2015). By integrating insights from short-term trigger events and long-term institutional developments, one can better assess the causality, form, and long-term consequences of the changing process.

3.3 Explaining Incremental Change in Monetary Policy Frameworks

Incrementalism is a type of policy change emphasised in the historical institutionalist literature on gradual endogenous change. As Streeck and Thelen (2005) put it, it results from the impact of changing contexts: 'the world surrounding an institution evolves in ways that alter its scope, meaning, and function' (p. 25). Contrary to the institutional variation resulting

from rare episodes of change occurring over relatively short periods (D. Collier & Munck, 2017), as conceived by proponents of punctuated equilibrium and critical junctures, incremental change describes a situation of slow and piecemeal reforms held within institution-specific constraints. The accumulation of these small changes can nevertheless pave the way to significant and profound institutional transformations over time (Mahoney & Thelen, 2009).

Scholars working within the HI conceptualise incremental change through a typology involving four main forms of institutional evolution (e.g., Fioretos et al., 2016; Mahoney & Thelen, 2009; Streeck & Thelen, 2005; Thelen & Conran, 2016): (a) layering or the establishment of new rules atop or in tandem with existing ones, for instance, through amendments, revisions or additions; layering tends to occur when it is difficult to shift existing rules towards new targets or in the case of strong veto possibilities towards the adoption of new institutions; (b) displacement or outright replacement of existing rules by new ones; (c) conversion or adaptation of extant rules towards new objectives; pre-existing rules remain but are reinterpreted; (d) drift or the altered impact of established rules due to their deliberate non-adaptation to the evolving environment; drift implies that rules become dysfunctional, undermining the achievement of organisational goals.

By applying the main design principles of incremental change, this research seeks to identify gradual deviations in central bank monetary policymaking as they support the green transition. This approach can be particularly informative in the current environment, where there is considerable uncertainty about whether central bank mandates can effectively address green objectives (NGFS, 2021a). According to Mahoney and Thelen (2009), 'institutional change often occurs precisely when problems of rule interpretation and enforcement open up space for actors to implement existing rules in new ways' (p. 4). The preference for slow and small changes may result from central banks' need to control the change process and ensure that any green measures adopted are linked to their primary mandates and carefully tried out.

Central banks would thus avoid the unintended consequences of policy reversals should the new measures prove inefficacious during the experimental phase (Streek, 2005, as cited in P. A. Hall, 2009, p. 218). Moreover, in new or 'weakly institutionalised' areas, institutional change often occurs through the conversion of existing rules (Emmenegger, 2021, p. 623).

From the perspective of monetary policy, incremental change implies that policy decisions do not significantly deviate from past choices, such as existing practices and policy tools, but display some continuity with them. By way of example, the greening of asset purchases, whether via asset purchase programmes or foreign exchange investments, can potentially be associated with small and gradual reforms. According to the central banks involved in these operations, the introduction of green parameters as an eligibility requirement for purchasing assets complements other requirements used to assess conventional assets. Green considerations can even be waived should they compromise the risk and return profile of the banks' portfolios or the achievement of monetary policy goals, as discussed at greater length in the empirical chapters. Consequently, incorporating green criteria into asset purchases does not considerably alter the structure and reach of monetary policy frameworks.

Should incremental adaptation be the main outcome of this empirical study, this finding would align with earlier academic work, which suggested that the financial system appears more prone to evolve through gradual reforms rather than abrupt forms of change (e.g., Deeg & Posner, 2016; Fioretos, 2011; Helleiner, 2017; Moschella & Tsingou, 2013; Moschella & Vetterlein, 2016; Weaver & Moschella, 2017). Yet, one cannot rule out the possibility of contingent events that may occur beyond the term of this research, which can lead to new forms of institutional development.

The following subsection seeks to advance knowledge on why monetary policy change towards new environmental goals was initiated. To that end, this research explores insights more closely associated with SI, notably the role of newly created ideas and policy learning on

central banks' environmental strategies. As Interviewee 9 conceded, 'there is a symbolic move that central banks need to talk about climate. The sociology dimension of it is quite important' (Interview 9). Indeed, in a context where there is no firm evidence that greening monetary policy is legally valid or achieves the desired results, sociological factors may help explain why central banks added a new environmental goal to their strategic priorities and how they legitimised new GMP operations. The perspectives offered by HI and SI are, therefore, believed to contribute to a greater understanding of the origins and patterns of central bank institutional change.

3.4 The Role of Constructed Ideas and Policy Learning

In what follows, the term 'ideas' can be understood as concepts linked to 'values and moral principles' or methods (Weir, 1992, p. 207). The linkage between ideas, values, and norms stems from constructivist arguments, according to which created ideas perceived as appropriate feed into prevailing values and standards of behaviour through a learning mechanism (Schmidt, 2010). Values and methods tend to influence each other in that new ideas and values gain force when they are doable. For their part, new operations are more easily accepted and implemented when backed by existing values. Policy learning can be described as the assimilation of 'new information, including that based on past experience, and [its application] to subsequent actions' (P. A. Hall, 1993, p. 278).

Sociological factors provide new avenues for thinking about the global context and how socially constructed ideas and norms can serve as vehicles for policy change, even if they are not formally binding but rather spread as values and standards of behaviour. SI understands policy developments in terms of a 'logic of appropriateness', whereby the persistence and learning of new ideas and practices perceived as adequate in a particular context may lead organisations to reconsider their positioning on specific topics, opening opportunities for policy reforms (Schmidt, 2010, p. 2; see also March & Olsen, 1984). Building on the broader literature

on the ideas-oriented approach, specific ideas made available at specific moments may challenge a self-reinforcing path and offer opportunities for institutional reforms (e.g., Blyth, 2003, 2007; P. A. Hall, 1993; P. A. Hall & Taylor, 1996; Schmidt, 2008, 2010; Weir, 1992; Widmaier et al., 2007). As Weir (1992) put it, 'ideas and interests develop, and institutions and strategies adapt' (p. 192). From this perspective, organisations are carriers of meanings and norms and may evolve with them.

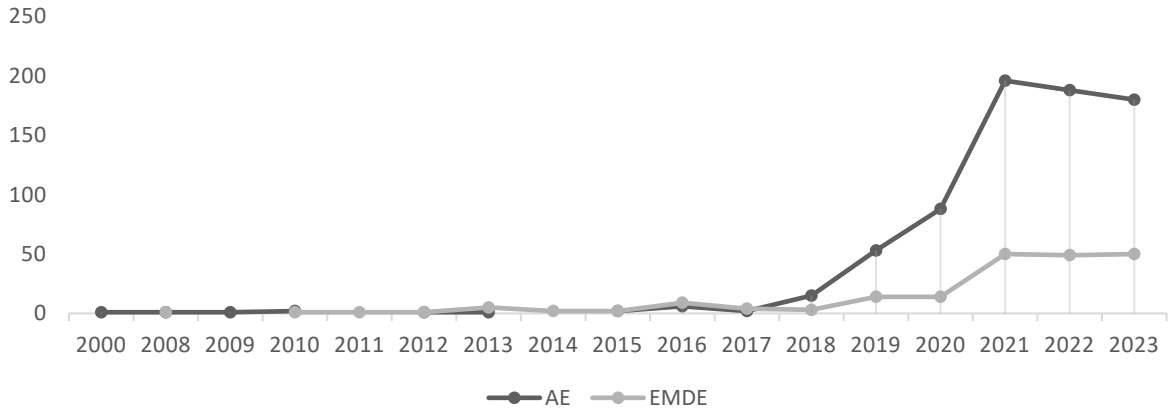
Blyth (2007), much like Widmaier et al. (2007), offered a constructivist analysis of economic crises as mechanisms of change. The authors conceded that crises are transformative not only because of their material effect but mainly due to changes in 'intersubjective understandings' (Widmaier et al., 2007, p. 757), that is, in the 'subjective consciousness of many individuals' (Harari, 2015a). The authors emphasised how the ideational construction of crises can transform social interests and legitimise the reconfiguration of existing institutions. This is especially the case when individuals face problems they have never encountered before. In such circumstances, typical of contingent episodes, what is wanted and needed is often unclear and more susceptible to external influences and new interpretations. It follows that, while evolving ideas and norms do not explain all change, they may create permissive conditions or opportunities for change in response to events outside the organisation.

The two precious studies from Blyth (2007) and Widmaier et al. (2007) illustrate how a constructed externality can bring about policy developments through changes in meaning. Similarly, the green finance movement may occur on a sufficiently substantial scale to change central bankers' understanding of what is appropriate and their positioning in the green transition. This can lead them to take responsibility for implementing policies targeting climate change and other environmental issues. Evidence shows that environmental topics have become increasingly prominent in the official publications of central banks. Less than a decade ago, only a few central banks discussed and published on environmental issues. As climate

change gained prominence on national and international political agendas, central bankers expressed greater concern about the prevailing brown-growth models. To elucidate this point, Figure 1 and Figure 2 (p. 97) present some empirical data from this research.[23]

In line with the search strategy applied in this study (see Subsection 4.3.2, p. 128), central bank communications on environmental matters expanded significantly from 2018, peaking in 2021 for AE central banks and in 2022 for EMDE central banks, as of December 2023 (see Figure 1). These results are consistent with the findings of Arseneau et al. (2022) on 'Central Bank Communication about Climate Change'. The empirical data further suggest that the volume of publications on green topics was higher in AE than in EMDE central banks. The intensifying debate on environmental topics among central banks echoes the growing scientific evidence of the economic and financial risks of climate change. It also resonates with the increased environmental regulation and standards developed in several jurisdictions to meet climate goals. Arguably, central bankers learned from international recommendations and practices and started investing in research and communication to explore whether and how they can address environmental issues.

Figure 1. *Evolution of Central Bank Publications on Environmental Matters in English by Year and Economic Group, as of Dec. 2023*

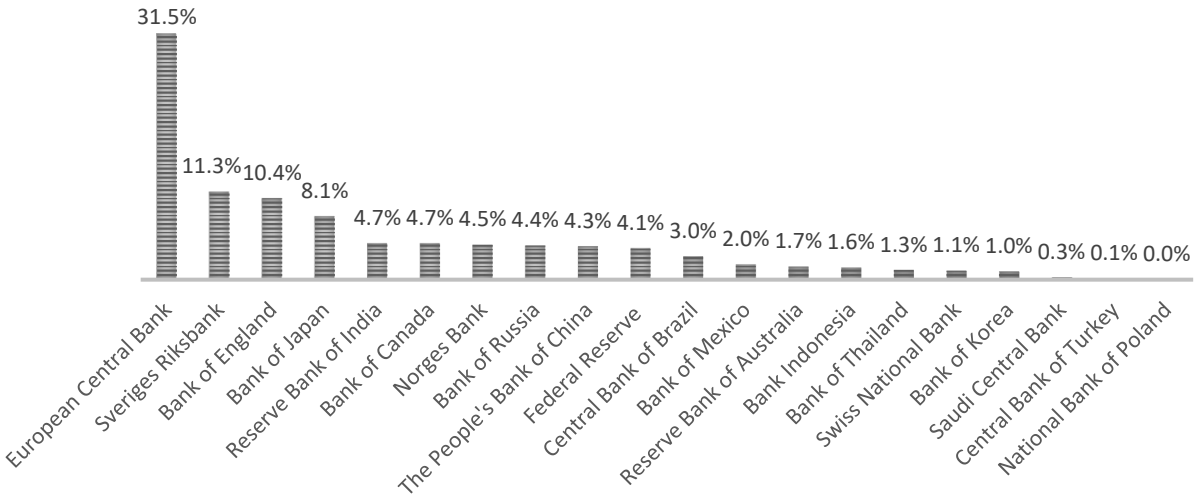


[23] The source of all tables and figures in this thesis is my work and calculations, based on the empirical data collected and the search strategy outlined in Section 4.3 on Empirical Data and Theoretical Propositions (p. 114), unless stated otherwise.

The ECB, the Riksbank, the BoE, and the BOJ were at the forefront of the publication efforts, being the AE central banks most actively engaged with the public through their communications (see Figure 2). As I shall demonstrate later, the larger number of publications from these four AE central banks lines up with their equally high number and strength of GMP measures adopted. This relationship between the larger number of environmental publications and the higher level of central bank responsiveness to environmental goals is possibly linked to two main reasons: First, it serves to explain the newly created green instruments and practices to the market participants. Second, it helps to gain public support to become a legitimate player in the fight against climate change. As the ECB president put it:

> [Policymakers] need to explain their analysis to the public in a way that reduces complexity and unites people around the case for action. . . . Trust in the ECB is found to hinge not just on our competence in delivering our mandate but also on whether we are perceived to care about citizens and act responsibly. So, communicating how responsible ECB policy benefits people's welfare can foster greater trust. (Lagarde, 2021b)

Figure 2. *Environmental Publications in English per Central Bank. Relative Weight of the Total Data Collected, as of Jan. 2024*



From the EMDE, the Reserve Bank of India, the Bank of Russia, and the PBC were the three central banks that communicated the most on environmental-related topics. While there appears to be some correlation between the volume of publications and the number of GMP measures in place in the AE central banks, this may not be entirely the case in the EMDE context. Despite ranking first and second in terms of EMDE publications, the Reserve Bank of India and the Bank of Russia were not actively engaged in greening their monetary policy activities (see Section 5, p. 143, on the empirical findings).

Arguably, peer pressures among central banks and the growing public demand to tackle environmental issues may have nudged some 'glossy green banks' to increase their corporate communication on environmental topics to signal their commitment to the cause, thereby compensating for their policy inaction (Giannetti et al., 2023). By way of example, the 2022-2023 annual report of the Reserve Bank of India draws attention to a renewed focus of the bank's communication strategy, moving from one aimed to inform about policy choices to one that also seeks to '[manage] public perception' vis-à-vis the wide range of topics handled by the central bank (Reserve Bank of India, 2023d, p. 207). Alternatively, as discussed in more detail in Subsection 5.2 (p. 152), these banks were involved in other sustainable finance initiatives, such as banking supervision, financial regulation, research, and corporate social activities, with no practical consequences for monetary policy operations. This could well be the case of India, which took the presidency of the G20 in 2023. Climate change action was one of the G20 priorities.

Concerning the topics covered by central banks in their communications, Table 1 (p. 99) provides a snapshot of the climate and other environmental-related issues that stood out from this study's research. Recognising the limitations of comparing and assessing a high volume of qualitative data, this list is not meant to include every single topic addressed by each

Table 1. *Some of the Most Debated Topics on Greening Central Bank Operations*

- The complexity and uncertainty embedded in the climate change problem.
- The adverse impact of climate change on the economy and financial stability.
- The challenges in measuring CRFRs.
- The existence of data and skill gaps, which hamper prompt and coordinated responses.
- The need to further research and understand climate risks and opportunities.
- The inclusion of climate change risks into macroeconomic assessments—for instance, via the development of climate change scenario analyses in line with the international guidelines, particularly those from the NGFS and the Task Force on Climate-related Financial Disclosures (TCFD).
- The inclusion of climate-related risks into banking supervision guidelines, notably concerning the management and disclosure of climate financial risks.
- The primary role of governments in driving the green transition.
- The importance of meeting the Paris Agreement goals and supporting the national targets to reduce carbon emissions.
- The role and interpretation of central bank mandates in promoting sustainable finance.
- The feasibility of deploying monetary policy tools to help attain climate-related objectives.
- The adoption of ESG considerations into central bank non-monetary policy portfolios, such as staff pension funds and other investments exempt from the mandate.
- The importance of going beyond climate change and considering other nature-related aspects in central bank operations and activities (e.g., biodiversity loss).

of the 20 central banks, nor does it follow a specific order of importance. Ultimately, the relevance assigned to each subject varies over time and across different banks. The objective of this exercise is to flesh out some of the most debated issues. Although the analysis aims to be as comprehensive as possible, it still demands a cautious interpretation of the results. As highlighted in the search strategy (Subsection 4.3.2, p. 128), even if English publications represent what central banks normally disclose to international investors and other stakeholders, limiting the search to English may still penalise those central banks which produce information in different national languages. In any event, this study hinges on the assumption that green central banks strive to publish their progress in English to share with the international community how they tackle climate change and other environmental issues.

It is also worth noting that central banks in charge of banking supervision are likely to display more publications than those in countries where an independent supervisory authority controls prudential supervision. This is so because the inclusion of climate-related risks in supervisory processes has been one of the banking areas widely documented and advanced. The Riksbank and the BOJ may be exceptions to this trend. Although the supervision of financial institutions falls under the remit of the Swedish Financial Supervisory Authority (*Finansinspektionen*) and the Japanese Financial Services Agency (FSA), the Riksbank and the BOJ displayed the second- and fourth-highest number of individual publications, respectively. As previously mentioned, this is probably due to the involvement of these central banks in climate policy through their monetary policy frameworks.

The Mediators of Green Finance Ideas. In connection with the emergence of new green finance ideas and their nexus to policy action lies the process through which ideas are communicated and exchanged. This calls for the mediators of institutional change and subsequent learning effects. Behind the promotion of new ideas stands a configuration of actors, including international agencies, politicians, social groups, reform coalitions, and networks of experts, among other alliances and communities. These actors or groups of actors use several means to make the implementation of these ideas feasible, opening up opportunities for policy change (Blyth, 2007; Haas, 1992; Hanrieder, 2014; Newman, 2016; Sabatier, 1998; Weir, 1992; Zito & Schout, 2009). In the course of their activities, they generate knowledge and propagate a 'particular moral' to bend institutions towards their preferences and to add legitimacy around specific values and practices (Scott, 2015, p. 449; Capoccia, 2015; Farrell & Finnemore, 2016).

By evoking and encouraging commonly accepted ideas on what is appropriate, these mediators of change exert 'outside-in' pressures over decision-making processes (Sabel, 1994,

as cited in Deeg & Posner, 2016, p. 441).[24] According to Blyth (2007) and Hogan and Doyle (2007), if 'change agents' are not able to persuade and consolidate a viable alternative idea, radical change does not occur (Hogan & Doyle, 2007, p. 891). For these authors, the presence of ideational transformation is the 'differentiating factor' that makes a critical juncture result in effective policy change (Hogan & Doyle, 2007, p. 894).

'Inside-out' originating change can also shape policy outcomes since individuals and organisations seek to learn and adjust their behaviour in line with what is expected from others, as well as the principles and practices that are widely valued in society—even if those practices are institutionally inefficient (Sabel, 1994, as cited in Deeg & Posner, 2016, p. 441; P. A. Hall & Taylor, 1996; Krasner, 1984; Pierson, 2000). Hence, despite the presence of boundaries imposed by the institutional landscape, there may be a range of additional reasons to act. As this study explores, prevailing green finance ideas driven by political and socioeconomic interests may induce change in settings that are theoretically deeply institutionalised. For their part, climate change deniers and the ideas they advocate can also exert pressure to keep the status quo, as we will see in the case of the Fed.[25]

Inherent to the activity performed by the sponsors of new ideas is the learning process. Solingen and Wan (2016), as well as Zito and Schout (2009), highlighted the importance of learning in the context of institutional change in path-dependent structures. In essence, the learning of new ideas motivated by new preferences and interests may originate new understandings about the problems, rendering new actions explicable (e.g., Blyth, 2007; Haas, 1992; Schmidt, 2008, 2010). Interdependent and internationally exposed organisations can be particularly susceptible to the learning of globally spread ideas, given the increased interactions and learning possibilities at the 'cross-border and transnational' level (Newman, 2016, p. 644).

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[24] Deeg and Posner (2016) deployed the labels 'outside-in' and 'inside-out' in their analysis of the institutional evolution in the financial systems. This terminology was first introduced by Sobel (1994).

[25] The term 'status quo' refers to the pre-established arrangements (Jupille et al., 2017, p. 121).

Frequent interactions may render some of those ideas viable and even encourage international coordination on a strategy (Haas, 1992; Sabatier, 1998). Roggero et al. (2018) held that the way environmental problems are framed influences the selection of possible choices and pushes individuals to act collectively in a specific ideational direction. The convergence of individuals towards specific ideas is believed to be intimately related to social learning. This learning effect can help elucidate why homologue organisations in different jurisdictions may adopt similar policy decisions and practices irrespective of their formal remits.

In light of the above, explaining the evolution of central banks' GMP strategies only on the basis of their mandates might be insufficient. As Schmidt (2008) observed, 'if everyone follows rules, once established, how do we explain institutional change?'(Schmidt, 2008, p. 314). In order to illuminate central banks' stance vis-à-vis GMP, one might need to go beyond the formal set of rules and consider the evolving national and international system to which central banks are exposed. In their daily activities, central banks liaise with multiple actors, including financial institutions, other central banks, national authorities, and multilateral organisations, in areas such as technical cooperation, information sharing, and project coordination. As previously highlighted, the higher the number of interactions with the surrounding context, the greater the access to new ideas, interests, and strategies that can be learned and possibly implemented. An extended focus on the new GMP ideas and how they are conveyed and pursued by central banks can elucidate the influence of the new green finance paradigm on central banks' policymaking.

The logic of appropriateness can provide further insights into the GMP event. The widespread view that financial resources should be invested in ways that consider the protection and improvement of the environment has gained increasing momentum. A growing number of international bodies, networks of experts, and interest groups have come into play to raise awareness about the seriousness, causes, and consequences of environmental issues.

Notably, several initiatives and organisations have been set up to increase the available information on how green finance can contribute to climate solutions. These organisations are often networks of professionals offering various resources to exchange new ideas and knowledge, with the intent of elevating the environmental ambition and influencing decision-making processes. 'Learning-driven instruments' include the organisation of meetings, conferences, public events, speeches, research publications and technical reports, among other initiatives aimed to propagate green finance ideas and interests (Zito & Schout, 2009, p. 1116).

The impact of new ideas on policy outcomes is believed to be especially effective in the face of uncertain and complex events or topics that fall outside policymakers' competencies (Blyth, 2007; Capoccia, 2015, 2016; Haas, 1992; Hogan & Doyle, 2007; Schmidt, 2008; Widmaier et al., 2007). When agents are unfamiliar with some problem or uncertain about their interests and strategies, they tend to seek external advice and be more prone to persuasion and the influence of new ideas. According to Emmeneger (2021), uncertain and not fully institutionalised areas open up more opportunities for agency. This is why specialised norms and practices promoted by 'change agents' can profoundly impact institutions, even if they only take the form of informal recommendations (Mahoney & Thelen, 2009, p. 22).

In this line of reasoning, it could be anticipated that the need to expand knowledge about the environmental crisis, coupled with political and social pressures to advance a green agenda, may drive central banks to seek technical advice from communities of specialists. Such interactions may help central banks make better sense of the crisis, their priorities, and the actions to be taken. Indeed, the Central Bank of Brazil (2021e) stated that 'it is difficult to talk nowadays about the role of central banks on the sustainability front without thinking about the NGFS' (p. 2). The bank acknowledged that the 'NGFS recommendations were great inspirations for its Sustainability Strategic Dimension' (Central Bank of Brazil, 2021e, p. 2).

The importance of the NGFS as a game changer for thinking about climate change risks and green finance was otherwise recognised by most central banks under analysis and the interview participants in this study. The NGFS was claimed to have 'bolstered a change in culture' inside and outside central banks, notably in the field of banking supervision, where its climate scenarios became a standard practice across financial institutions (Interview 9). Through conferences and other outreach activities it organised, the NGFS also gave 'visibility' to the green central bank frontrunners, who were usually invited to participate and speak at these events, thus enhancing the 'credibility' of the network and its objectives (Interview 9). In addition, the NGFS advocated for change in 'political forums', such as the G20 (Interview 3; NGFS, 2025a). As for this and other non-state organisations, Interviewee 11 conceded that Frank Elderson, from the ECB, publicly expressed 'the [significant] role of NGOs and think tanks in making the ECB policies' (Interview 11).

It follows that examining these communities of specialists, especially the ideas they promote, can shed more light on the origin and dissemination of GMP measures. A potential convergence of central banks around GMP practices—what could be called 'institutional isomorphism', borrowing the term from DiMaggio and Powell (DiMaggio & Powell, 1983, p. 149)—would suggest something normative directed by broader considerations of what is politically and economically appropriate, as well as socially legitimate. As observed by Interviewee 11, 'central bankers move in herds. They are looking for the safety of the herd, and the NGFS is their green herd. . . . [where they] share insights and develop new insights together' (Interview 11). However, isomorphic or homogenised GMP practices across central banks may be unlikely. Different stages of national economic development, environmental ambitions, and monetary policy toolkits may affect the extent to which environmental considerations are incorporated into central bank monetary policy decisions.

Research Methodology: A Controlled Comparative Case Study

4.1 Case Study Selection and Research Period

The present research draws on the controlled comparative case study method to examine the interlinkages between environmental goals, central bank mandates, and monetary policy decisions. Compared to other methods of inquiry, the research through case studies is argued to fit the analysis of how and why some contemporary phenomenon works (Small, 2009; Yin, 2018). The controlled comparative case study involves investigating a purposively selected number of central banks to gain a deeper understanding of their monetary policymaking, the findings of which can be cautiously transposed to a larger population of similar institutions (Gerring & Cojocaru, 2016). To this end, this study performs an analysis of a medium-N set of homologue institutions—that is, more than 10 units of analysis—selected according to certain criteria. This approach is known as 'purposive case selection' (Gerring & Cojocaru, 2016, p. 411).

Specifically, the multiple-case analysis considers the legal mandates and monetary policy strategies of the central banks from the 10 largest AE and 10 largest EMDE, between January 2010 and January 2024. The countries were selected based on the World Bank's GDP estimates for 2020 and 2021 (World Bank, n.d.-c),[26] whereas the world economic group (AE and EMDE) follows the IMF country classification (IMF, 2022). From the AE, the units of analysis are the monetary authorities of Australia, Canada, the euro area (EA), Japan, Norway, the Republic of Korea, Sweden, Switzerland, the UK, and the US.[27] From the EMDE, the examination includes the monetary authorities of Brazil, China, India, Indonesia, Mexico,

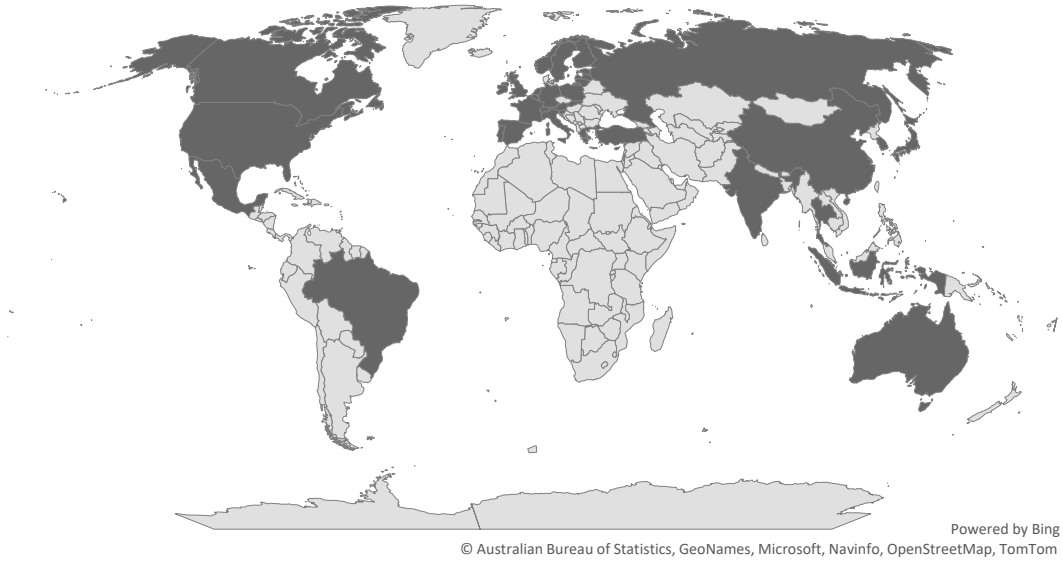
[26] This selection of 20 countries was based on World Bank data from 28 October 2021. As of 25 May 2023, the World Bank data indicated the same GDP ranking for these 20 central banks in 2022.

[27] As of August 2023, the EA comprised 20 of the 27 EU Member States that adopted the Euro (European Union, n.d.). The formulation of monetary policy in the EA is the exclusive responsibility of the Governing Council of the ECB (Consolidated Version of the Treaty on the Functioning of the European Union, 2020, Articles 3, 12, and 20). Therefore, the study considers the ECB as the sole unit of analysis for the EA.

Poland, Russia, Saudi Arabia, Thailand, and Turkey. The final sample comprises countries from Asia, Europe, North America, Oceania, and South America (see Figure 3 for a worldview of the studied countries, highlighted in dark grey).

As mentioned in the introductory chapter, the starting year of the research period, January 2010, was chosen based on the first identified monetary policy tool to support environmental businesses: the Bank of Japan's Growth-Supporting Funding Facility. It consisted of a credit line for investments in specific areas with growth potential, including 'environment and energy business' and 'business for securing and developing natural resources' (Bank of Japan, 2010e, p. 26). Following Bennett, the initial implementation of specific programmes is an evident moment to begin a 'historical explanation' (Bennett, 2022, p. 199). Accordingly, this study considers the first monetary policy decisions with an environmental scope as crucial moments to begin a historical investigation. This enables us to unveil the incentives that led a restricted group of central banks to account for environmental needs before the intensifying debate on climate change. Positive feedback from these first actions may have fed into how central banks have responded to the current climate crisis. The

Figure 3. *Worldview of the Research Sample Distribution by Country*



cut-off date of the cross-case examination, January 2024, was decided upon more practical grounds related to the duration of the research. After this date, the investigation focused on a subset of three units of analysis.

The decision to conduct medium-N research involving 20 systemically important economies from two leading economic groups was considered beneficial to the whole study and existing scholarly work. First, the international standing of these countries is not only economic but also political. While all seven members of the G7 are represented in the research sample, 15 out of the 20 central banks were G20 members at the beginning of this study (Council of the European Union, 2021; G20 Italy, 2021a). Countries that are part of these groups work together to reach a consensus on and implement solutions for global issues. Given that climate action and sustainable finance have been policy priorities for both groups, the strategies adopted by these dominant economies are likely to shape practices worldwide. As Rothstein observed (1992), citing Bianco and Bates (1990), in light of complex and uncertain events [such as climate change], leadership plays a key role 'in initiating collective action' (Rothstein, 1992, p. 51). Moreover, this group of 20 countries represents over 85% of the world's GDP, corresponding to the top emitters of GHG (Friedrich et al., 2023; World Bank, n.d.-c). From an environmental perspective, the GMP decisions taken by these central banks will possibly influence the magnitude and pace of the transition to a greener economy. In this respect, the proposed case selection also contributes to the study of global climate governance.

Second, a combination of AE and EMDE central banks can better portray the evolution of green monetary policies worldwide. As mentioned earlier, whereas the EMDE central banks have been originally more proactive in incorporating green objectives into their policy decisions, a growing number of AE central banks have rolled out specific measures and roadmaps to include green elements in their operations. The combination of AE and EMDE central banks thus renders this set of units more representative of the entire population of

central banks. Third, from the perspective of the external validity of the findings, the confidence in the results of a medium-N study is claimed to be greater than that of a single or a few case studies (Lieberson, 1991).[28] As noted by Slater and Ziblatt (2013, p. 134), the 'transferability' of an argument to other concrete situations is higher when explained in dozens of other cases. A larger sample offers diversity across a range of dimensions, such as the level of national economic development, institutional frameworks, and geographical scope, which maximises the number of possible variations and cases to which the insights can be generalised.

Taken together, the case study selection aimed to set a group of comparable institutions that share some similarities in relation to key background elements that characterise the economic strength and political influence of the jurisdictions in which they operate. In order to enhance the robustness of the findings, this study not only splits central banks according to the country's economic group but further restricts the 'scope conditions' or contextual factors by allocating the banks in line with the competencies entrenched in their mandates (Ragin, 2000, p. 61): i) narrow, if monetary policy objectives prioritise price and financial stability, in which case the adoption of GMP instruments may be conceptually more difficult to justify in light of the underlying mandates; ii) broader, should statutory objectives explicitly cover multiple policy goals, including the harmonisation of monetary and economic variables, such as employment and production or support for government policies.

[28] Internal and external validity relate to two types of inference strength. While internal validity refers to the robustness of inferences within the case(s) under investigation—that is, the consistency and depth of the data collected and how the described findings are explicitly based on that data—external validity concerns the confidence in generalising the findings from a sample to the entire population it represents or across a different set of cases. Internal and external validity are argued to be inversely correlated (e.g., Beach & Pedersen, 2018; Levi-Faur, 2006; Schimmelfennig, 2014; Slater & Ziblatt, 2013). For instance, while process tracing seeks to perform a deep analysis of a particular case(s) to maximise the internal validity of its conclusions, these conclusions may not be reproduced in other cases due to the lack of representativeness. In essence, the lower the number of cases being studied, the more robust the within-case inferences tend to be, and thus, the higher the internal validity of the study. Conversely, the higher the number of cases being studied, the more reliable the generalisations tend to be, and thus the higher the external validity. Hence, achieving greater external validity often comes at the cost of reduced internal validity due to the difficulty of conducting an in-depth analysis involving a large number of cases. Given the trade-offs between including more cases and increasing the internal validity of the results, it is often argued that studies should strive to find a balance between the two.

This distribution-based strategy seeks to form two groups of ‘closely matched cases’ to facilitate cross-case comparisons (Slater & Ziblatt, 2013, p. 1307). The typical or ‘expected cases’ of this study are the central banks whose green strategies or lack thereof fall into the previous two categories, i) and ii) (Rohlfing, 2012, p. 114). However, as previously stated, the evidence reveals some surprising findings. To elucidate this matter, the PhD proceeds with a detailed analysis of three deviant or ‘anomalous’ central banks (Rohlfing, 2012, p. 114), where the strategies adopted were unexpected in light of their legal mandates.

This hybrid design, combining typical and deviant case study types, is related to the objectives of the analysis, which involve a descriptive and a causal dimension, as elaborated in the following subsections. In short, the first part of the research seeks to describe an event, specifically how the monetary policy frameworks of 20 central banks have responded to the environmental emergency. Following Gerring and Cojocaru (2016), this sort of descriptive analysis generally entails ‘a typical or diverse approach to case selection’ (p. 396). The second part of the research aims to demonstrate a causal relationship between the environmental emergency and GMP outcomes, using a subset of three specific cases.

In order to offer a set of possible variations on how monetary policy frameworks have reacted to the green transition, thereby augmenting the external validity of the findings, the decision was made to select two central banks with narrow mandates that implemented policy decisions with the expressed objective to favour green-supporting investments, and one central bank with a broader mandate that did not undertake any green adjustments in its monetary policy toolkit. The subsequent examination seeks to produce a new explanation for the potential anomalous or deviant findings, where the predicted relationship between legal mandates and GMP developments does not hold. This mixed research design helps explain why GMP played out in some institutional contexts and not others.

It should be noted that the scholarly literature provides other possible case study selection techniques, the decision upon which lies significantly on the known variables, the ones that the research aims to explore, and the conceptual approach that best fits the research question the study seeks to address. Two of the most popular methods in qualitative research designs are the most-similar and the most-different case selection methods. The most-similar approach 'is based on the assumption that the more similar the cases being compared, the simpler it should be to isolate the intervening factors' (Przeworski & Teune, 1970, as cited in Levi-Faur, 2006, p. 57). It implies strong similarities in all background conditions but one dimension, which leads to divergent outcomes (Bennett & Checkel, 2014; Gerring & Cojocaru, 2016; Seawright & Gerring, 2008). The most-different technique requires variation in the background conditions and a shared outcome (Gerring & Cojocaru, 2016). In this case, the quest is to determine the one independent variable that is constant across the units of analysis. In this respect, QCA – Qualitative Comparative Analysis has proven to be a powerful tool for identifying potential conditions that may lead to a specific outcome.

Yet, the objective of the multiple case analysis in the first part of this research is not to identify all potential (in)dependent variables or conditions that are likely to account for monetary policy changes towards green objectives. Rather, the research aims to depict global trends involving one condition only, as theorised at the outset of this study: the scope of central bank mandates. The statistical analysis provided in the empirical section, along with the typical and deviant case study selection outlined in Table 5 (p. 150), offers a descriptive rather than causal examination. It illustrates how these 20 central banks have responded to environmental concerns through their monetary policy operations, compares the strategies adopted over time, across countries, and economic groups, and shows whether a strong relationship exists between the reach of central bank mandates and GMP reforms. Moreover, given the diversity of background conditions that characterise the present medium-N research, notably institutional,

political, social, and economic, it would be flawed to assume that these 20 central banks are 'similar in the values of all but one independent variable' (Bennett, 2022, p. 207; Levi-Faur, 2006; Seawright & Gerring, 2008). Similarly, the dependent variable or outcome is unlikely to be the same across the 20 central banks.

The second part of the study seeks to offer a deeper understanding of the medium-N analysis by investigating specific cases. Notably, it unpacks the key events, actors, and activities that paved the way for greening monetary policy in two central banks whose GMP strategies do not seem fully explained by the limited competencies entrenched in their mandates. This is achieved using a mid-range comparative process tracing, which differs from the probabilistic approaches that aim to indicate the likelihood of something occurring (Beach & Pedersen, 2018). Building on this analysis, an explanation is formulated for the 'green avoidance' in one central bank that opted for institutional stability despite holding a broader mandate (Blondeel et al., 2024, p. 918).

Again, the research design is not primarily directed at investigating the range of conditions that might have mattered in the greening of monetary policy activities, nor on the probability of it happening, although this analysis is of great interest and is proposed in the concluding chapter of this thesis as a differentiated research method for future investigation. Instead, the study shifts its analytical focus from evaluating the necessary or sufficient conditions that trigger specific outcomes to developing causal claims about the workings between the environmental emergency and GMP measures in central banks with narrowly defined mandates. Such an approach does not invalidate the presence of other causes that could also be relevant in the GMP event or other mechanisms that can also occur.

The purpose of the previous paragraphs is not to review the range of possible research methods that could be deployed in this study, nor to make claims on the most appropriate one. Ultimately, different methods seek to gain distinct insights into the topic being studied,

depending on the research question and hypotheses they aim to answer. Despite the merits of other case study selection techniques, the conceptualisation behind the typical and deviant case study approach was deemed appropriate for qualitatively illustrating whether a stable and predictable relationship exists between central bank formal objectives and GMP outcomes across the proposed set of 20 central banks.

4.2 The Structure of Comparison: Level of Analysis, Cross- and Within-Case Studies

The study entails a 'theory-centred' level of analysis (Rohlfing, 2012, p. 9). Evidence is collected to test the theoretical hypotheses drawn from the historical institutionalist framework at the start of the research, specifically, how central bank mandates shape the evolution of GMP strategies. The research further explores the ideational dimension as a source of institutional change. In doing so, it offers a causal inference analysis between constructed ideas—notably, the perceived environmental crisis and how green finance can contribute to the solution of this problem—and GMP reforms. All these concepts have been formulated in previous chapters before testing the research hypotheses.

The plurality of methods deployed in this study—also called 'mixed methods research' (Johnson et al., 2019), 'multimethod research' (e.g., Beach & Kaas, 2020), or 'nested analysis' (Lieberman, 2015)—stems from the specific research question and goals, which suggest a cross-case and within-case level of inquiry, as I shall explain next. The proposed mixed methods approach allows us to collect and converge information in such a triangulating way that would be difficult to achieve with one single method only (Yin, 2018).

4.2.1 *The Cross-Case Level to Compare Differences in the Adoption of Green Monetary Policy Measures*

As previously mentioned, the cross-case analysis 'aims for descriptive' and uses descriptive statistics to uncover patterns across the selected 20 units of analysis. The use of indicators and figures will also help to choose individual cases for in-depth investigation. In

the descriptive part, it is expected some 'variance-on-Y' analysis (Rohlfing, 2012, p. 65) or 'variance-based' design to 'assess the difference that a given cause . . . has on . . . the outcome, holding all other potential causes of difference constant' (Beach & Pedersen, 2018, p. 838). In practical terms, this study evaluates whether formal mandates have significantly influenced central bank actions and commitments in line with a path-dependent logic. As described in Section 4.1. (p. 105), while the most narrow mandates focused on price and financial stability are expected to downplay green policy, broader objectives—either primary or secondary—offer more leeway to adopt policy tools that contribute to green economic growth. These are the typical cases of this study. Typical cases are intended to show a stable and predictable relationship representative of the population (Seawright & Gerring, 2008), in this case, where the scope of legal mandates is linked to central bank monetary policy decisions.

If mandates do not clearly explain GMP developments, the deviant or anomalous cases, there should be an additional factor that accounts for the 'unexpected outcomes', as posited by the 'method of residues (MoR)' introduced by Mill (Steinlin & Trampusch, 2012, p. 256; Rohlfing, 2012, p. 116). Devian cases constitute good candidates for knowing more about the contextual conditions that lead to surprising outcomes (Bennett, 2022). Through within-case tracing (see Subsection 4.2.2, p. 115), this study tries to address this puzzle, having in mind that outcomes typically result from a mixture of factors and not a single one (Bennett, 2022).

Regarding the 'level of measurement aggregation', the cross-case examination envisages the deployment of both nominal and ordinary strategies (Rohlfing, 2012, p. 137). The nominal method involves comparisons at a high level of aggregation to facilitate the classification of typical and deviant cases. It entails a mutually exclusive binary measurement, as illustrated in Table 2 (p. 114): AE and EMDE, narrow and broad, typical and deviant. Nominal comparisons are argued to fit 'descriptive purposes' for 'deterministic understandings of causation', that is, when the presence of a given factor is expected to bring about a specific

Table 2. *Illustration of Cross-Case Comparison*

Unit of analysis (Central Bank)	Economic group (AE/EMDE)	Scope of the mandate [narrow/broad]	GMPI	Case study type [typical/deviant]

outcome (Mahoney, 2000, p. 389; Lieberson, 1991). The proposed cross-case comparisons will play a significant role in making claims about GMP trends and selecting appropriate cases where the condition and the outcome of interest are present.

The ordinal approach relates to the central question of how we can harmonise the varying GMP measures adopted by the different central banks to make them comparable. For instance, while some central banks may have a number of operations in place with low impact in terms of their ability to promote green investments, others may have implemented fewer, yet more targeted, arrangements with more significant effects to accelerate green growth. As a hypothetical example, one option is to accept green bonds as collateral, and another is to reformulate the collateral framework in a way that uniquely accepts green bonds as collateral. Even though the deployed instrument is theoretically the same, the sort of green adjustment significantly varies in its influence on stimulating green sectors. Therefore, although green collateral is a tool to be accounted for, other aspects of it ought to be considered.

A meaningful cross-central bank comparison thus requires elaborating a proper score or ranking that standardises the myriad ways through which green elements can be incorporated into monetary policy activities. An ordinal strategy will also assist in identifying central banks that have advanced the most and the least with GMP measures. In response to this challenge, this study sets out a qualitative index, the GMPI, to capture the varying degrees of central bank involvement in environmental decisions through their monetary policy operations. More

information can be found under Subsection 4.4 (p. 137) on the Development of a Green Monetary Policy Index.

4.2.2 *The Within-Case Level to Trace the Making of Green Monetary Policy Measures*

> In order to explain macro-level change, rigorous theorizing is needed that explicitly considers the micro-level mechanisms at work and the dynamic processes that they give rise to. (Hedström & Ylikoski, 2010, p. 64)

The within-case analysis seeks to improve the qualitative and quantitative interpretation of the multiple-case results by investigating a causal relationship between the environmental crisis—which will be defined as insufficient public policy responses to growing environmental risks—and green monetary policymaking in a small subset of central banks (Gerring & Cojocaru, 2016, p. 394; Lieberman, 2015). To that end, this study applies a mid-range comparative process tracing approach to produce a systematic explanation for how and why central banks have adopted an environmental approach in their monetary policy strategies, despite the limited scope of their mandates.

The analytical objective of this exercise is twofold: First, to comprehend how established objectives and operating procedures enabled and constrained the inception and institutional design of GMP measures. Emphasis is placed on the mode of institutional change, most notably whether institutional ruptures or adaptation prevailed. Second, to uncover the main drivers of GMP reforms. To this purpose, the study further builds on the broader literature that emphasises the impact of sociological factors in policy formation to produce a 'mechanism-based' explanation of how the interaction of political and socioeconomic interests, with the subsequent learning of new green finance ideas, contributed to central bank GMP reforms irrespective of the reach of legal mandates (Hedström & Ylikoski, 2010, p. 64). In hypothesis form, this could be outlined as follows: in the face of political and socioeconomic pressures to address environmental needs, the learning of new green finance ideas influences

GMP outcomes. The process-tracing research method undertaken in this study draws significantly on the book *Process-Tracing Methods: Foundations and Guidelines* and the working paper 'Going Beyond the Single Case: Comparative Process Tracing as a Tool to Enable Generalizations about Causal Processes' (Beach et al., 2022; Beach & Pedersen, 2019).

Process tracing can be defined as 'the effort to infer causality through the identification of causal mechanisms' (George & McKeown, 1985, cited in Mahoney, 2000). The concept of mechanism(s) has been used in numerous ways. More generally, as processes and events, but also as 'entities and activities' (Illari & Williamson, 2012, as cited in Johnson et al., 2019, p. 9), 'pathway' (Gerring & Cojocaru, 2016, p. 403), 'intermediate steps' (Bennett & Checkel, 2014, p. 6), 'intervening factors' (Hedström & Ylikoski, 2010, p. 54), and 'causal processes that are triggered by causes and that link them with outcomes in a productive relationship' (Beach & Pedersen, 2019, p. 1). As a research technique, process tracing is considered particularly suitable to test mechanisms hypothesised from existing theories or where there is 'an initial suspicion' that such mechanisms have been in place (Schimmelfennig, 2014, p. 104).

Previous studies provided several accounts of how process tracing can be a powerful tool for addressing institutional and ideational explanations (e.g., Beach et al., 2021; Beach & Smeets, 2022; Jacobs, 2014; Löblová, 2018; Schimmelfennig, 2014; Schmidt, 2008; Steinlin & Trampusch, 2012). However, claims on theorised causal mechanisms can 'include a great deal of evidence on contextual or background factors' (Bennett & Checkel, 2014, p. 8). This is especially so in the realm of ideas, where covariation with policy choices is sometimes difficult to observe. To overcome this challenge and increase the precision of the findings, the process tracing approach proposed in this study is primarily bottom-up. In essence, it builds on empirical material from two case study central banks that have developed a GMP strategy to formulate a theory of a causal mechanism that can potentially travel to other similar institutions. This inductive research design resulted from the initial lack of confidence in the mechanism

linking the environmental emergency to GMP. This uncertainty made it challenging to hypothesise a detailed causal process in advance. As a matter of fact, there was not even certainty as to whether such a mechanism existed. The theoretical and empirical literature on GMP at the beginning of the research was relatively recent and inconclusive regarding the background conditions required for adopting climate strategies. Therefore, it was difficult to map out the relevant actors and events with sufficient precision ex-ante.

However, the analysis also comprises elements from deductive process tracing. In moving from the narrative of the events to the design of an explanatory mechanism for how environmental pressures affected monetary policy frameworks, the analysis draws on a prior review of existing literature on institutional change and ideational-based traditions. This review provided clues for why and how things may have happened, the entities and activities involved, as well as the empirical traces that could be left. In other words, while there was an anticipation that outside pressures to fight climate change and the subsequent new green finance paradigm could have had a bearing on monetary policymaking, the confirmation of this assumption, the unfolding events, and the order of those events are based on the BOJ and Riksbank's observed results and not presumed. Therefore, we can infer with a considerable degree of confidence that the connection between the constituent parts of the causal mechanism is plausible and the hypothesised causal linkage between the cause and the outcome is highly possible, even if the sequencing of events across the two banks does not occur at exactly the same time when considered at the individual level, but in similar moments.

The multi-part mechanism or main episodes that tie the environmental emergency to GMP outcomes are described in Section 6.6 (p. 309). Typical of a mid-range causal process theory, the parts of the mechanism are presented in a sufficiently abstract way to allow for being found in other AE central banks with narrow mandates that implement GMP measures. Yet, although the main actors and activities proposed in the empirical-based mechanism can

be functionally equivalent in other concrete situations, the identified observables are case-specific, based on the BOJ and Riksbank's empirical records (Beach et al., 2022).

The scheme adopts a 'systems understanding' approach, where the actors and activities that operate between the trigger and the outcome are empirically identified, and their causal relationship is explained (Beach & Pedersen, 2019, p. 64). Accordingly, the illustration of the mechanism (see Figure 10, p. 313) is followed by a more detailed explanation of each causal part, including the marks left during or after the actors' execution of the identified activities, as well as a theoretically and empirically informed justification of what binds the operating parts together and how.

Each piece of found evidence seen as explanatory of the causal process or a part thereof is broadly examined in light of the historical and institutional context within which it was produced—to account for potential alternative explanations—and the trustworthiness of the sources. The evaluation of what the observable data is relevant evidence of, and whether we can trust it, is called the assessment of 'empirical uniqueness' (Beach & Pedersen, 2019, p. 201). The empirical material for this study stems from different sources and types of evidence (see Section 4.3 on Empirical Data, p. 121). These include an array of official documents that central banks and other relevant organisations have made available to the general public, extant literature, newspaper clippings, and 11 expert interviews.

To enhance the likelihood that a similar process tracing mechanism occurs, and thus the precision of the findings, the two selected case studies for process tracing analysis will be either from AE or EMDE. This decision is based on the assumption that, while organisations differ, the political and socioeconomic conditions within each group are likely to be more similar, allowing for more meaningful comparisons. For example, the level of central bank independence is claimed to be higher in AE than in EMDE, which may impact the way the causal mechanism is unpacked (Baer et al., 2021; Campiglio et al., 2018; Gupta et al., 2023).

Therefore, this study assumes that it may be analytically more consistent to compare central banks from the same economic group rather than across different groups. The case study selection also draws on more pragmatic factors, such as the amount of public information in English. If the findings of the comparative analysis point to processual heterogeneity, a new research agenda emerges to investigate the dynamics that may have impacted the two causal mechanisms differently.

The third case study will not be subject to in-depth process tracing since it represents a 'deviant consistency case'. In other words, a case of non-adoption of green reforms despite its theoretically broader mandate to promote environmentally friendly activities (Beach et al., 2022, p. 34; Beach & Pedersen, 2019, p. 98). Following Beach and Pederson (Beach & Pedersen, 2018, 2019), there is no analytical value in exploring a potential 'mechanism breakdown before we are more confident about the actual existence of a mechanism linking X and Y in one or more . . . cases' (p. 862; p. 274). Should a similar causal process be found in the first two cases, the examination will be extended to gauge whether this mechanism is also present in the deviant consistency case or where it breaks down. This exploratory analysis sheds light on the antecedent conditions that have to be in place for a specific mechanism to occur. Further investigation into the inhibiting factors that caused the absence or discontinuation of the process in the third case study will follow.

4.2.3 *Limitations of the Case Study Research Design*

The case study research design comes with some limitations, which are worth anticipating. Prominent among them are two widely documented issues linked to the internal and external validity of causal inferences (Beach & Pedersen, 2019; Rohlfing, 2012). The first relates to the indeterminacy problem concerning the causes—also known as the 'equifinality' problem, when various causes lead to the same result (Beach & Pedersen, 2019, p. 6; Rohlfing, 2012, p. 7)—and the mechanisms that explain an outcome. The indeterminacy problem

regarding the causes and the mechanisms can trigger multiple readings over the same event. The second issue, linked to the external validity of the findings, concerns the transposition of causal inferences from one or a reduced number of empirical studies to other cases that have not been examined.

Furthermore, existing literature warns that it may be challenging to observe and trace the activities or processes that effectively turn the influence of ideas into a plausible mechanism of policy change, as some of these activities can occur in contexts concealed from the public and, therefore, difficult to scrutinise empirically. As Jacob (2014) noted, many of these activities may 'operate at the level of social interaction. . . . (strategically) hidden' (p. 46). Central bank officials might not acknowledge having completely altered their priorities and objectives following informal or semi-formal interactions. Instead, they may frame their discourse directed to institutional justifications, rendering the identification of ideational influences challenging. As explained by Schmidt (2010), 'institutions and cultural frames affect the ways in which ideas are expressed and discourse conveyed' (p. 21). It can also be challenging to control for contextual conditions that may diversely affect the unfolding of these activities in each setting (Falleti & Lynch, 2009).

This study uses three main methodological strategies to address these issues and increase the accuracy of the findings: First, the analysis is initially centred on one main cause only, the perceived environmental crisis, which has been regarded as a global shock that affects all sectors of society, including central bank activities. By restricting the number of variables of interest or excluding 'those of only marginal importance', the indeterminacy problem is alleviated (Lijphart, 1971, p. 690). Moreover, it should be noted that the process tracing approach shifts the analytical focus from evaluating the necessary or sufficient conditions that trigger specific outcomes to developing causal arguments about the workings between an identified cause and an outcome. In other words, even if multiple causes may have affected

monetary policy frameworks towards a new environmental role, process tracing allows one to 'disentangle' them by tracking observable data that empirically confirms the presence of a mechanism for a given cause and outcome (Beach & Pedersen, 2019, p. 44). Hence, the method followed in this study does not invalidate the role of other causes and mechanisms that may be present in the development, or not, of GMP measures.

Second, this study's 'exploratory process tracing' is inspired by two well-developed theoretical frameworks (Rohlfing, 2012, p. 102), HI and SI, which help to organise the analysis of whether and how the trigger and the outcome relate to each other, thereby strengthening the internal validity of causal assumptions (see also Schimmelfennig, 2014). Third, the BOJ-Riksbank comparison offers a range of options for how monetary policy frameworks have effectively supported the green transition, as well as the possibility of surveying evidence cross-institutionally and over a relatively extended period of time (14 years).

This triangulated design, using direct and indirect forms of empirical evidence from various types of sources, together with a comprehensive assessment of the relevance and accuracy of the evidence, is believed to enhance generalisability claims about the key dynamics that produce GMP reforms in central banks from AE with narrow mandates (Gerring & Cojocaru, 2016; Seawright & Gerring, 2008). It is also hoped to facilitate the observation of periods where changes in expressed ideas and policy actions co-vary, regardless of other institutional or 'material incentives' (Jacobs, 2014, p. 47). Hence, despite the potential challenges inherent to any research method, comparative process tracing can bring new and complementary insights into the GMP event.

4.3 Empirical Data and Theoretical Propositions

The study draws on a comprehensive analysis of primary and secondary data, including central bank mandates and publications on environmental matters, existing literature, information issued by other relevant national and international organisations, news reports and

11 semi-structured interviews with monetary policy experts—including current and former senior central bank officials—some of whom had several years of experience in monetary policy and had been engaged in 'green' decision-making (the interview design and participants' profile is described in Subsection 4.3.3, p. 130). Central bank publications on environmental matters encompass news articles, research papers, working papers, staff memos, web reports, meeting minutes, letters, magazines, announcements of events, speeches and interviews in both written and video formats, as well as other material on the websites of central banks, such as podcasts and blog posts.

Provided the multiple data sources and substantial information needed to compare developments in 20 different central banks, this study introduces a new dataset on central bank GMP responses prepared to support the investigation of how these 20 units of analysis have supported the transition to a greener economy via their monetary policy frameworks. It contains an overview of the 20 central bank mandates, the GMP instruments created, adjusted or announced over the research period, the central bank publications on climate and other nature-related topics that have been surveyed for this study, as well as complementary information that was prepared in support of the analysis, including descriptive statistics.

The Excel file in Appendix A (p. 375), Central Bank Green Monetary Policy Responses, is a segment of the said dataset. It was inspired by a working paper produced by staff from the Bank for International Settlements (BIS) on 'Central Banks' Monetary Responses to Covid-19' (Cantú et al., 2021). The present study has a different purpose and, therefore, follows a tailored structure and criteria. Appendix A provides the following information for each of the 20 central banks: country, economic group (AE/EMDE), central bank name, legal mandate, monetary policy objectives according to the banks' website, positioning of the economic policies in the overall mandate of the bank—first, secondary or not mentioned (as explained next)—the title of the legal document, the document's version

date, link to the mandate, link to the monetary policy objectives as per the bank's website, implemented GMP measures, year of implementation, planned green monetary policy measures, instrument category (asset purchase programmes, collateral, credit operations, and foreign exchange investments), GMPI score per policy measure, and reference links.

The dataset distinguishes between central banks whose legal mandates include price stability alongside i) other economic variables as the first objective (first), ii) economic variables, support for government policies or other wider purposes as the secondary objective (secondary), iii) no explicit support for economic-related policies (not mentioned). When the text of the law does not clearly rank the positioning of economic variables or support for government policies vis-à-vis the central bank's primary goals, and should central banks emphasise price stability as the primary monetary policy objective on their websites, the support for the real economy is regarded as a secondary objective. In any event, either primary or secondary, such mandates fit into the 'broad' classification.

The date assigned to each implemented GMP measure corresponds to the year a bank publicly emphasised an environmental concern in the adopted decision. This means that, although a central bank may have already invested in green assets before a specific date, such operations were most likely guided by principles related to market neutrality and portfolio risk management. While the growing purchase of green bonds tends to decrease green bond yields and encourages their issuance by firms regardless of the underlying motive (De Santis et al., 2018; Lautenschläger, 2018), this study only considers investments that entail an explicit environmental purpose.

It is possible to find a handful of public databases and studies that combine central bank mandates and environmental strategies. Some are run by renowned international organisations, whereas others are managed by independent research institutes. For example, the IMF Central Bank Legislation Database (IMF, 2016), the Currency Area Overviews of the BIS (BIS, n.d.),

the Green Monetary and Financial Policies Tracker of the E-Axes Forum (E-Axes Forum, n.d.), and the Green Central Banking Scorecard from Green Central Banking and Positive Money (Green Central Banking & Positive Money, 2022). The objective of this new dataset based on primary sources, upon which the medium-N qualitative comparative analysis was conducted, was to avoid the shortcomings of using existing material, such as inaccurate information, outdated data, or the use of different indicators. For instance, in June 2023, the platform offered by the BIS had not yet incorporated the new Sveriges Riksbank Act, which came into force on 1 January 2023 (BIS, 2020; The Sveriges Riksbank Act, 2022). The Green Central Banking Scorecard of November 2022, jointly produced by Positive Money and Green Central Banking, included a number of monetary policy initiatives which, in this study, are classified as financial regulation—as in the Central Bank of Brazil (Green Central Banking & Positive Money, 2022).

The process of collecting central bank data proceeded in three main phases. The first phase consisted of collecting climate and other environmental-related information from the websites of the 20 central banks. The first round of data collection took place in September 2022. The second and most crucial round ran between December 2022 and May 2023. The last searches on central bank websites were held in February and March 2024, for information published until January 2024.

During the research period, a corpus of over one thousand documents was identified, downloaded and registered in an Excel file. Next, in phase two, all these documents were surveyed, and the parts linked to climate change and other environmental aspects were tracked down and thoroughly reviewed in phase three. The following subsection provides a description of the search strategy and each of these three phases. In addition, Section 5.2 (p. 152) presents an overview of the main highlights resulting from my analysis of the data collected.

4.3.1 *Search Strategy and Caveats*

Legal documents, including unofficial English translations of mandates, were obtained from central banks or Justice Laws websites. The policy objectives were further validated on the banks' web pages on monetary policy. In the event of conflicting information, the text of the law prevailed. It should be noted that when the validity of the link to the Sveriges Riksbank's Act was last verified on 10 October 2025, the Riksbank no longer provided the English translation of the central bank's Act, which was only available in Swedish on the Riksdag's (Sweden's parliament) website (The Sveriges Riksbank Act, 2022). The Riksbank confirmed that it cannot offer an English translation of the Act 'at the moment' (personal communication, 30 October 2025). However, this thesis includes references to official documents of the bank that offer English summaries of its legal functions, notably the *Monetary Policy Report* of February 2021 (Sveriges Riksbank, 2023d). The English version of the Act, retrieved from the central bank's website on 7 February 2023, can be accessed upon request.

As for the remaining empirical data, searches were conducted in English using a set of seven climate-related keywords on the search bar of central bank websites, also known as the 'dictionary approach' (Arseneau et al., 2022, p. 7): green OR climate OR sustainability OR environment OR weather OR ESG OR NGFS. The Boolean operator OR was expected to retrieve all results that include one, a few or all the mentioned keywords (University of Exeter, 2023). The selection of the word 'weather' derived from the observation that some central banks, notably those from the EMDE, conducted studies on weather events well before the intensification of the climate change debate (for example, the central banks of Brazil and India). My judgment was that these central banks could later adopt a more proactive approach towards climate change, given their countries' vulnerability to weather phenomena.

When the proposed dictionary displayed hundreds of results, the search was limited to the first 100 entries and, within these, to those containing at least one of the keywords in the

title to facilitate the collection process. Results that did not contain any of the keywords but were still related to the research topic were also considered, including ‘low-carbon transition’, ‘net-zero transition’, and ‘responsible investments’. Results with keywords used in different contexts, also known as ‘stop-phrases’ (Acosta-Smith et al., 2023, p. 25), such as ‘economic climate’, ‘regulatory environment’, ‘debt sustainability’, and ‘low-interest rate environment’, were discarded.

For the purpose of counting central banks’ publications on environmental issues, each publication corresponded to one entry, regardless of its length. It is worth noting that some central banks had fewer entries but more comprehensive publications, such as reports and research papers, whereas others displayed more entries but shorter ones, based on summaries and press releases. This was especially so in some EMDE central banks whose national language was not English. In the few publications where the publication date was not visible, the collection year was applied. Non-working links and publications from external entities were not considered, as these were not produced by the bank (though they may indirectly reflect the bank’s views). The next step involved parsing all documents, focusing on sections related to monetary policy, climate change, and the environment. These sections were copied into a Word file for analysis in light of the concepts and debates drawn from the literature review, having in mind that these publications may be inaccurate or biased, depending on the interests and audience of the institutions that produced them (Beach & Pedersen, 2019; Yin, 2009, 2018).

Despite the growing use of artificial intelligence tools in data collection and text analysis, especially when covering a large corpus of files, I started this work manually in 2022, when such tools were not so widely used in research as they were by the end of the PhD project. While I recognise that the manual collection and analysis of this study’s data implied several hours of reading and manual work, as well as subjective interpretation (Acosta-Smith et al., 2023), it enabled a more expanded and multifaceted analysis that would likely not be achieved

with automated analysis (V. Braun & Clarke, 2022). By way of example, some documents did not contain monetary policy-related information, in which case special attention was placed on the parts that could help elucidate the banks' stance towards GMP. For instance, if central banks emphasised their country's exposure to climate risks, whether and how they included sustainability aspects in their corporate activities, their involvement in climate supervisory expectations, and the disclosure of their own exposure to climate risks. Some documents pointed to additional publications of interest that were also surveyed. In essence, the manual collection of data enabled exploring additional themes, which allowed for a richer understanding of how and why GMP was initiated or not.

It is worth noting that while the collected information seeks to be as complete and comprehensive as possible, it is not exhaustive. Some links were not working, whereas others could not have been displayed using the search key. Furthermore, since the selection of keywords was subjectively determined based on the terms I considered relevant in this particular area, a different dictionary could have led to slightly different results. To address these limitations, the data search includes an intensive examination of central bank web pages dedicated to climate change and sustainability, as well as the banks' annual reports from 2010. Annual reports are generally published in English and represent what central banks aim to make accessible to international investors and other stakeholders regarding the banks' activities. Due to public accountability, most central banks are required by law to submit their annual reports to national parliaments every year.

The examination of annual reports using the search keys 'climate', 'green', 'environment', and 'sustainab'—which retrieved all words starting with 'sustainab', such as sustainability and sustainable—revealed supplementary information about the environmental work conducted by each central bank beyond monetary policy activities. They also provided a clearer view of the green initiatives deployed by those central banks with fewer publications.

Additional publications were also reviewed when further information was needed, in particular for the three specific case studies, as also explained in Chapters 6 and 7. These included financial stability reports, monetary policy reports, policy board meeting minutes, and accountability reports. This cross-referencing was believed to alleviate the shortcomings of the search strategy.

Moreover, although the examined central banks had English pages and published in English, the search strategy may have penalised the results of banks whose prevailing working language is not English by excluding documents produced in the local idiom. However, given that GMP is a relatively new and uncertain topic, this study hinges on the assumption that green central banks strive to publish their progress in English to share their environmental approach with the international community. This was the view of the BOJ when it translated its market functioning surveys on climate change into English. The objective was to 'globally explain about trends in Japanese financial markets in tackling climate change' (Bank of Japan, 2022h, p. 1). No disclosure suggests that central banks have not considered environmental risks, or something has prevented them from publishing this information. Either way, silent central banks do not exhibit an interest in being recognised as well-positioned in the green transition.

Finally, it should be noted that the data collection for publications issued until January 2024 ended in March 2024, after which the focus of the analysis shifted from the 20 to the three case study central banks. While this study examines recent data, the estimates presented here may not capture the evolving nature of the topic by the time the PhD thesis is submitted. Therefore, it is not entirely sure whether the same results will hold using the latest data.

4.3.2 *Reading Central Bank Mandates*

'For many central banks, the goals of the mandate are not clearly defined' (Vermeiren, 2025, p. 2). Given the vagueness of some central bank mandates, this study considers the following four propositions concerning key concepts and relationships to overcome the

indeterminacy problem involved in the interpretation of mandates and facilitate their classification according to the theoretical typology ‘narrow’ and ‘broad’. First, the terms ‘support’ or ‘promote’ are viewed as the central bank’s contribution to the achievement of macroeconomic goals beyond an inflation target, inter alia, output growth and employment. These concepts do not imply that central banks are primarily responsible for economic policies.

Second, it is recognised that natural hazards and the shift to a low-carbon economy affect output prospects, production, and employment, as highlighted in the macroeconomic literature on climate change and economic growth (e.g., Batten, 2018; Kahn et al., 2019; Kruse et al., 2017; McKibbin et al., 2020; NGFS, 2020a). Economic growth is typically defined as an increase in a country’s production and consumption of goods and services over a certain period. This is normally measured by the growth rate of GDP (Bank of England, 2020e; Reserve Bank of Australia, n.d.-a). Since earlier models of economic growth relied on the exploitation of limited natural resources, the idea of sustainable development gained ground on the account that environmental degradation threatens future economic growth (Batten, 2018; European Environment Agency, 2021; Harari, 2015b; United Nations World Commission on Environment and Development, 1987). Therefore, this study assumes that central banks whose main objectives include supporting economic growth, such as the Saudi Central Bank (Saudi Central Bank Law, 2020), benefit from greater leeway to support national policies that promote greener products and ways of production. This implies defining productivity growth in a broader sense that includes sustainability elements and accepting periods of ‘less productivity’ in favour of sustainable growth (Interview 4; see also Interview 5; Interview 6).

Climate change and the green transformation of the economy are also expected to affect employment (Interview 4; Parajon Skinner, 2021). On the one hand, extreme weather events can negatively impact a business’s productivity and revenues, thereby lowering the demand for labour. On the other hand, the greening of economic processes demands structural changes in

what is produced and how, which may lead to the elimination of physical assets and jobs linked to carbon-intensive industries, ultimately reducing employment in these industries. Although this decline in employment can be cancelled out with the creation of new green jobs over time, fluctuations in employment rates are anticipated. Hence, while central banks may not have direct control over productivity and employment, mandates that explicitly require them to support productivity and employment cannot be 'insensitive' to them (Interview 5). This group of central banks holds a sounder legal basis to assist governments in achieving 'development objectives', including higher productivity growth and job opportunities in green sectors, even if indirectly through financial markets (Baer et al., 2021, p. 190).

Third, it is assumed that wider objectives, such as the economic and financial welfare of the country, provide central banks with greater discretion to implement new policy tools or redirect existing ones towards green segments. While welfare typically entails dimensions such as environmental protection, economic welfare concerns consumption and the environmental resources that enable that consumption (Reinsdorf & Quiros-Romero, 2020). Fourth, economic growth as a result of price stability is not considered a central bank's primary objective per se, which remains to keep inflation low and constant with a view to fostering economic growth. For instance, the Reserve Bank of India Act states that 'the primary objective of the monetary policy is to maintain price stability while keeping in mind the objective of growth' (Reserve Bank of India Act 1934, 2022). In this and other similar cases, this study assumes that the central bank's main goal is to maintain stable prices, thereby helping to 'create the conditions' for political authorities to implement policies that promote green growth (Interview 5).

4.3.3 *The Interview Design*

Qualitative interviews are one of the most common and relevant sources of evidence. By listening to those best positioned to help make sense of a topic, the interviews can reveal insightful explanations about the 'hows' and 'whys' of particular policy processes and events

(Lareau, 2021). The objective of the interview method in this study is threefold: (1) to explore additional sources of information that corroborate the documentary analysis, thereby strengthening the validity and reliability of the findings, (2) to access potential new knowledge, (3) to gain a richer understanding of the main motives and strategies behind central bank GMP arrangements, or lack thereof.

In particular, the qualitative interviews seek to examine what experts say about how the broader context may have influenced the adoption or non-adoption of a GMP strategy, following the tenets of the 'extended case method' (Small, 2009, p. 19). The focus is on tracing processes and uncovering linkages between prevailing political and socioeconomic priorities, green finance ideas, and central bank institutional reforms. The extended case method is argued to be especially valuable in the analysis of deviant cases, as it offers new insights into atypical developments, thereby contributing to the refinement of existing theories (Small, 2009).

Regarding the number of interviews, 'saturation' is often considered 'the prevailing concept strategy for sample size in qualitative studies' (Malterud et al., 2016, p. 1753). According to this approach, the number of interviews conducted depends on the quality of the collected data or until subsequent interviews provide no or little new meanings on the studied topic (V. Braun & Clarke, 2022). Moreover, the larger the 'information power' held by the sample of participants, the lower the number of individual interviews required (Malterud et al., 2016, p. 1759). Saturation also emphasises that the stronger the theoretical background with the key concepts and the relationships between the variables of interest, the smaller the sample size needed to ensure sufficient information power (Malterud et al., 2016).

Given that the foreseen interviews targeted a group of purposively selected experts and that the interview guide was inspired by existing and comprehensive theories, a relatively low number of qualitative interviews was expected. In any event, in line with the aforementioned premises, the number of interviews was not predetermined but was decided later during the

research (e.g., V. Braun & Clarke, 2022; Malterud et al., 2016; Small, 2009). As for the recruitment process, initial contacts were established directly with the three specific case study central banks examined in the second part of this study, as well as with relevant research institutes and NGOs. Within these organisations, I approached Policy Boards, monetary policy experts, research and media relations departments. Some interview participants were suggested by previous interviewees, an approach known as 'snowballing' (Small, 2009, p. 14).

The general structure of the interview questionnaire drew on the practical guidelines provided by Yin (2018), Lareau (2021), and the 'Item-Writing for Surveys and Interviews' course attended at the University of Luxembourg in October 2022. The interview script sought to address the following four main areas: inception and structure of the GMP strategy, evolution of the GMP tools, relationships with government(s), international agencies, networks, and social groups, outcomes and implications of the adopted GMP measures.

At the beginning of the interview, respondents were asked to define GMP. Afterwards, a broad set of questions was used, given that the terminology and procedures in monetary policy are well-known to experts in the field. Even so, the script was slightly modified as the interviews progressed to account for the specificities of each interviewee/institution, clarify any word or interpretation issues related to the questionnaire, or incorporate topics that were brought about in earlier interviews and were worth exploring in subsequent ones. Some of the interview questions were similar but phrased differently to double-check the accuracy of the answers. Appendix B (p. 407) offers the templates of the two interview scripts used, one case-specific and one generic.

Out of 58 interview requests, 11 semi-structured individual interviews were effectively conducted. The participants included monetary policy experts from both typical and deviant

AE central banks,[29] former central bank officials, academics, NGOs, policy entrepreneurs, and parliament members, all of whom held extensive information on monetary issues. Specifically, interviews were conducted with:

(1) a Japanese monetary policy expert with many years of experience in monetary policy, including in 'green' decision-making and discussions with international bodies, (2) a senior advisor to the executive board of Sveriges Riksbank involved in the bank's sustainability strategy and 'green' deliberations with external organisations—I recall that the central banks of Japan and Sweden are two of the three deviant case studies selected for in-depth investigation—(3) a lead at the WWF Greening Financial Regulation Initiative and former monetary policy expert in a green-leading central bank, (4) an academic and former vice-governor of a deviant AE central bank classified with a broad mandate, (5) an academic and former member of the MPC at the BoE, who was involved in the design of the bank's climate strategy, (6) an academic and former central bank official at a typical AE central bank classified with a narrow mandate, (7) a researcher from the international organisation Positive Money EU, (8) a central banks campaigner from the NGO Reclaim Finance, (9) a researcher and policy entrepreneur in macroeconomics and finance, (10) a policy advisor from the Greens/EFA Group at the European Parliament, (11) a member of the Sustainable Finance Lab.

Except for the interview with the Japanese expert, all interviews were held online via MS Teams between April and September 2024. The interview script was shared with the interviewees by email ahead of the interview date to allow respondents to prepare and provide as much information as possible on the asked questions. Following the introductions, each discussion lasted approximately 45 minutes and was audio-recorded with the interviewees' consent. At the start of each interview, all respondents received information about the research

[29] As the interviews were undertaken after selecting the three AE central banks for detailed investigation, preference was given to interlocutors related to AE central banks.

project and the three specific case studies under analysis. The interviews were automatically transcribed using MAXQDA for the first interview and MS Teams for the remaining.

The list of participants is available in Appendix E (p. 417). Due to the sensitivity of some interview material, the clean verbatim transcriptions of each interview are available in a separate file and shared only with the members of the Thesis Committee. The decision to provide clean or edited transcriptions aimed to enhance the readability of the interview material by eliminating filler words, repetitions, unnecessary sentences, and correcting some grammatical mistakes, although the transcripts seek to be as close as possible to the interviewees' actual words (Terra Translations, 2021). As agreed with the participant from Japan, the interviewee's answers were paraphrased to guarantee anonymity. Each interview transcript was examined in light of the specific research question and the supporting theoretical frameworks. The main ideas and messages are cited and interpreted throughout this thesis.

The interviews provided clear benefits to the study. Notably, they allowed for delving into views and meanings that were difficult to reach through the central bank publications. They also offered insights that, although beyond the scope of this study, open new opportunities for future research. However, like any other research method, interviews carry some challenges worth anticipating and minimising. First, a significant number of central bank officials chose not to participate in this study, despite being familiar with the process of doing and publishing research, as well as being used to dealing with queries from the mass media and the wider public. The sensitivity surrounding the GMP topic appeared to be the main reason behind the high number of unanswered or rejected interview requests, particularly from the Fed, as discussed in Chapter 7 (p. 326) on the Fed's case.

Second, the quality of the interview material depends on the level of openness and knowledge of the interviewees (Beach & Pedersen, 2019; Yin, 2009, 2018). To overcome this issue, a detailed explanation of the relevance and goals of this study was shared in advance to

increase the commitment of the contacted organisations in appointing respondents who could answer the questions knowledgeably. This was also intended to augment the willingness of the assigned respondent to collaborate with this study.

Interestingly, the youngest respondents in the group of interviewees proved to be highly informative as they led the technical work and closely followed the topics without the political or reputational concerns that may make those in higher positions less open to sharing information with outsiders. Reputational concerns can also have led some interviewees to justify central bank actions on the grounds of institutional objectives, which may not be the fundamental motives of these actions. Third, one should account for issues related to tepid recaps and biased answers (Beach & Pedersen, 2019; Yin, 2009, 2018), as well as the possibility that some respondents unwittingly mix their views with those of the institutions they represent. To address these challenges, the study mobilises and combines various sources and types of evidence.

Note on ethical considerations. Qualitative research involves two main ethical dimensions: 'procedural ethics' and 'ethics in practice' (Guillemin & Gillam, 2004, p. 263). Procedural ethics refers to the formal arrangements for seeking approval from an ethics committee before conducting research activities involving human participants. In this regard, this research follows the University of Luxembourg's procedures and laws on ethics and research integrity, according to which any potential risks to research participants or the organisations they represent must be minimised (University of Luxembourg, 2010). Hence, before undertaking the interviews, I sought approval from the Office of the Ethics Review Panel at the University of Luxembourg in November 2022. It was concluded that since the study comprised interviews with officials in their professional capacity, no formal approval was required from the Ethics Review Panel. Nonetheless, the research project was registered

in the University's Record of Processing Activities, as instructed by the University's data protection guidelines.

Regarding the collection, management, and storage of data, all interviews were voice-recorded, transcribed, and stored in a password-protected folder on the University's networked space, except for the interview with the Japanese expert, following the interviewee's preference. In addition, an information sheet and consent form were prepared in accordance with the University's templates and approved by the Data Protection Office before submitting them to the interviewees. Since this research identifies the three deviant central banks, it would be helpful to link the interviewees' arguments to the central bank they represent, thereby facilitating the interpretation of the cases. However, interview participants were free to choose the option that best fit their preferences. When the participant's final decision was in line with full anonymity, precautions were taken to ensure that their name, institution, and job position remained confidential, and the answers were reported in an aggregated or paraphrased way. A copy of the information sheet and consent form is available in Appendix C (p. 409).

Ethics in practice draws on the notion of 'reflexivity' during 'ethically important moments' (Guillemin & Gillam, 2004, p. 262). These moments are characterised by unexpected and often challenging situations that may unfold during research activities. Reflexivity concerns critical thinking when making decisions that involve ethical concerns. In order to reflect on ethical principles and develop reflexivity skills, I attended two courses on ethics. The first course was primarily focused on the University of Luxembourg's ethics guidelines. Among other topics of interest, both courses covered instances where the research activity may impact its participants, ethical responses to unpredictable situations, the limits of probing, and potential 'ethical dilemmas'(Fujii, 2012, p. 101; Guillemin & Gillam, 2004).[30]

[30] Examples of such unforeseen situations may include participants' discomfort with the interview questions, emotional distress, and inappropriate attitude.

4.4 Development of a Green Monetary Policy Index (GMPI)

Drawing on the GMP arrangements implemented or announced up to January 2024, each central bank policy decision was identified and classified according to one of the following four monetary policy instruments: asset purchase programmes, collateral, credit operations, and foreign exchange investments. Asset purchase programmes stand for the outright purchase of assets under different programmes, standard or temporary, with a monetary policy purpose. The greening of these programmes involves excluding assets from firms with a higher carbon footprint or tilting asset purchases towards entities with better environmental performance. The greening of collateral implies altering the eligibility criteria of the assets that central banks accept as counterparts to loans. These assets must either comply with environmental principles or be subject to higher value reductions, also known as haircuts. Credit operations refer to lending solutions that offer favourable conditions for projects linked to environmental targets, such as lower interest rates or extended credit limits vis-à-vis conventional loans. Foreign exchange investments include incorporating green elements into the selection of assets or counterparties in operations that involve foreign currencies.[31]

The classification outlined above shows the varying ways through which central banks approached environmental issues via their monetary policy tools. Provided that this research aims to explain the rationale behind the policy decisions adopted, the analysis leaves aside technical details related to how central banks conducted their operations. Even so, evidence shows that each instrument can be adjusted with different green parameters, resulting in varying effects to promote green investments. As noted earlier, one option is to accept green bonds as collateral, while another is to reformulate the collateral framework to only accept green bonds as collateral. Although the instrument deployed is theoretically the same, the sort

[31] Foreign exchange reserves have often been used as a tool to achieve monetary policy goals (e.g., Chițu et al., 2019; Interview 6; Maechler & Moser, 2019; Norges Bank, 2023; Sveriges Riksbank, 2021e, 2021j; Vallence, 2012). They have been part of the climate strategies of several central banks (see Appendix A, p. 377).

of adjustment undertaken varies significantly in its ability to catalyse green investments. As an additional example, one thing is to discuss the prospect of adopting GMP tools, and another is to schedule a specific date for their implementation.

In order to harmonise the multiple ways in which the same policy instrument can be deployed to advance environmental goals, and to provide a clearer picture of each central bank's involvement in environmental matters, this study introduces a qualitative composite index (OECD et al., 2008; United Nations Economic Commission for Europe, 2025), the Green Monetary Policy Index (GMPI). The index scores aim to make the adopted policy measures more comparable. In doing so, one can more easily assess how far each central bank has gone in its intent to green monetary policy, identify the deviant cases, and their 'level of deviancy' (Doorenspleet & Kopecký, 2008, p. 698). The GMPI was inspired by the Green Macroprudential Index developed by D'Orazio and Popoyan (2019). However, the GMPI follows a distinct categorisation to fit the purpose of this research.

Under the GMPI framework, each monetary policy measure with an environmental component was qualitatively assessed and graded on a scale of 0 to 5, according to one of the following six categories (see also Table 3, p. 141):

1. Not observed: recognises central banks that did not publicly mention the possibility of adopting green criteria in their monetary policy frameworks. They were assigned an index equal to zero (GMPI = 0).
2. Under consideration: identifies GMP measures under discussion without a specific implementation date. They were assigned an index equal to one (GMPI = 1). Multiple measures stated in a single communication were scored individually.
3. On the agenda: includes GMP measures publicly announced, together with an approximate timeline for implementation. The exact implementation date often depends on the observation of specific preconditions. They were assigned an index equal to two (GMPI = 2).

4. Facultative: comprises flexible monetary policy arrangements that are decided upon, implemented, or have an implementation date within a short period from the policy decision (usually one to three months). They add new green criteria to existing instruments, but with no binding force or alongside other eligibility criteria that can lessen the weight of environmental factors. For instance, the voluntary purchase of green bonds, the acceptance of green bonds as collateral, and the incorporation of green elements into collateral assessments or in credit facilities designed for multiple purposes. Regarding the latter, even if such schemes offer favourable terms for green-supporting sectors or projects, they often encompass other business activities that can neutralise the effect of promoting green investments, such as non-green industries. Since these measures are not exclusive to environmental projects, they were assigned an index equal to three (GMPI = 3). This category also includes discontinued solutions, such as green credit lines, launched in response to temporary needs. Even if such commitments did not persist, they allow for understanding the logic behind their implementation and why they were not sustained. Accounting for discontinued operations also enables differentiating between central banks that joined efforts to pursue green objectives and those that did not undertake any action.

5. Risk control: encompasses mandatory environmental criteria that are decided upon, implemented, or have an implementation date within a short period from the policy decision (usually one to three months). Under this category, existing instruments are deliberately amended with enduring green parameters with a view to minimising environmental risks and protecting central bank assets and operations from these risks. These policy decisions are often based on the premise that lending to or purchasing from carbon-intensive firms increases the central bank's own financial risks. This may include ceasing to purchase assets from specific polluting activities or economic sectors, requiring asset issuers to disclose climate-related risks, and favouring asset issuers with better environmental performance. Compared to the previous 'facultative' category, green considerations are given substantial weight in relation to other risk metrics, thus implying a more explicit shift of funds from brown to green firms. Risk control measures were assigned an index equal to four (GMPI = 4). It should be noted that some of these measures can (temporarily) be discontinued due to economic developments and monetary policy needs. For example, the envelopes for asset purchase programmes are larger during periods of monetary policy expansion and can

be stopped due to monetary policy tightening (European Central Bank, 2024c; Sveriges Riksbank, 2020a). Although these measures can be suspended, they remain important for understanding the institutional conditions that led to the introduction and later withdrawal of environmental considerations. Also, these criteria are likely to be reintroduced in future asset purchases and can serve as an example of how to green an asset portfolio.

6. Targeted: corresponds to monetary policy instruments exclusively created to expand the flow of financial funds towards firms and investments that consider or improve the quality of the environment. Compared to the previous 'risk control' category, there is a change of narrative and approach from one focused on shielding central banks from environmental risks to another that significantly emphasises environmental targets and the promotion of green growth. Bespoke credit lines appear to be the most compelling exemplification of green-targeted monetary policy tools to date, as they can substantially lower the borrowing costs for green projects, enhancing their uptake. For their part, the purchase of (green) corporate bonds and foreign exchange investments is normally constrained by other eligibility criteria to protect the price stability goal and the financial situation of central banks. In addition, corporate bonds are usually a very small part of central bank asset purchases, which mainly comprise government bonds (see Bank of Canada, 2023b; Bank of England, 2023c; Flodén, 2019b; Norges Bank, 2021c; Schnabel, 2022a; Sveriges Riksbank, 2019e). Hence, the impact of purchasing green corporate bonds or engaging in green foreign exchange operations seems more limited than green lending facilities. Targeted monetary policy measures were assigned an index equal to five (GMPI = 5).

The GMPI for each central bank results from the sum of the scores given to each policy measure implemented or announced up to January 2024. The final individual scores attempt to reconcile the quantity with the strength of the measures adopted by each central bank. After assessing and assigning a score to each monetary policy decision that accounted for environmental aspects, it was concluded that central banks with a total score above 14 were the most actively engaged in greening their monetary policy frameworks. Central banks with scores between 7 and 13 revealed a moderate level of involvement in green policymaking,

Table 3. *The Six Categories for Measuring the Strength of Green Monetary Policy Decisions*

Category	Description	Score
1. **Not Observed**	Recognises central banks that did not publicly mention the possibility of adopting green criteria in their monetary policy frameworks.	**0**
2. **Under Consideration**	Identifies GMP measures under discussion without a specific implementation date.	**1**
3. **On the Agenda**	Includes GMP measures publicly announced, together with an approximate timeline for implementation.	**2**
4. **Facultative**	Comprises flexible monetary policy arrangements that are decided upon, implemented, or have an implementation date within a short period from the policy decision. They add new green criteria to existing instruments, but with no binding force or alongside other eligibility criteria that can lessen the weight of environmental factors.	**3**
5. **Risk Control**	Encompasses mandatory environmental criteria that are decided upon, implemented, or have an implementation date within a short period from the policy decision. Compared to the previous 'facultative' category, green considerations are given substantial weight in relation to other risk metrics.	**4**
6. **Targeted**	Corresponds to monetary policy instruments exclusively created to expand the flow of financial funds towards green firms and investments. Bespoke credit lines appear to be the most compelling exemplification of green-targeted monetary policy tools to date.	**5**

primarily driven by risk management concerns. Central banks with scores between 1 and 6 proved a superficial approach to environmental factors. Central banks with an index score of 0 did not publicly consider adopting environmental considerations in their monetary policy operations. Assuming that central banks seek to clearly and timely inform the market about how they intend to tackle new risks (Olsen & Vikøren, 2019), it can be inferred that the higher the index score, the greater the central bank's public commitment to participate and be recognised as a main player in the green transition.

It is important to emphasise that the GMPI scores are designed to offer a qualitative account of how far central banks contributed to a greener economy through their monetary policy frameworks. Therefore, three relevant clarifications are necessary: First, the GMPI

scores are not intended to measure the overall level of ‘greenness’ of each central bank. A low score does not necessarily mean that these banks have not advanced an environmental strategy in other business areas, such as banking supervision, financial regulation, non-monetary policy portfolios (own funds and pension funds), and corporate activities. The individual summaries provided in Subsection 5.2 (p. 152) offer a general examination of how each of the 20 central banks addressed environmental concerns in activities beyond monetary policy. Second, the GMPI scores do not aim to quantify the economic impacts of the measures adopted, to rank the best-implemented policies or the ones that lasted longer. Such an analysis would require a quantitative or econometric study, which exceeds the scope of this research.

Third, this study does not address the extent to which central banks put the announced measures into practice, nor the unlikely scenario where they implemented measures that were not communicated. Arguably, central banks may inflate the description of the measures adopted or the figures for green investments to maximise public impact. Central banks may also increase their corporate communication on environmental issues without any real effect on their monetary policy operations. The widespread belief that some sort of climate policy will be implemented influences market participants, who anticipate its effects and voluntarily reduce and disclose their carbon emissions (Fried et al., 2021).

While the possibility of ‘cheap talk’ is a relevant aspect that this study acknowledges, the present study is neither able nor intends to embrace all these dimensions. A more encompassing index that reweights the index scores considering all these variables would deserve an index-centred study. For now, the primary focus of the analysis is to understand why and how central banks started considering environmental factors in their decision-making, irrespective of their practical implementation. To that end, the GMPI provides an index score for each central bank based on the cumulative GMP measures announced at a specific point in time, January 2024, to facilitate the identification of three central banks for in-depth analysis.

Empirical Findings of the Cross-Case Analysis of 20 Central Banks

5.1 Legal Mandates and Green Monetary Policy Measures in Comparative Perspective

The empirical data pointed to the following results regarding the classification of central bank mandates and the evolution of GMP decisions between January 2010 and January 2024 (see Table 4 for a summary overview and Appendix A, p. 375, for detailed information per central bank). Concerning the AE, three of the 10 AE central banks were not explicitly instructed to support variables from the real economy or government policies (the BOJ, the Bank of Korea, and the Swiss National Bank). Two AE central banks presented features of dual mandates (the Reserve Bank of Australia and the Fed), whereas five AE central banks were directed to contribute to economic policies or promote economic welfare, at least as a secondary objective (the Bank of Canada, the BoE, the ECB, Norges Bank, and the Riksbank).

From the subset of 10 EMDE central banks, six entailed narrow policy mandates focused on price or currency stability (the PBC, the Reserve Bank of India, Bank Indonesia,

Table 4. *Central Bank Distribution by Scope of Mandate and Economic Group, as of Jan. 2024*

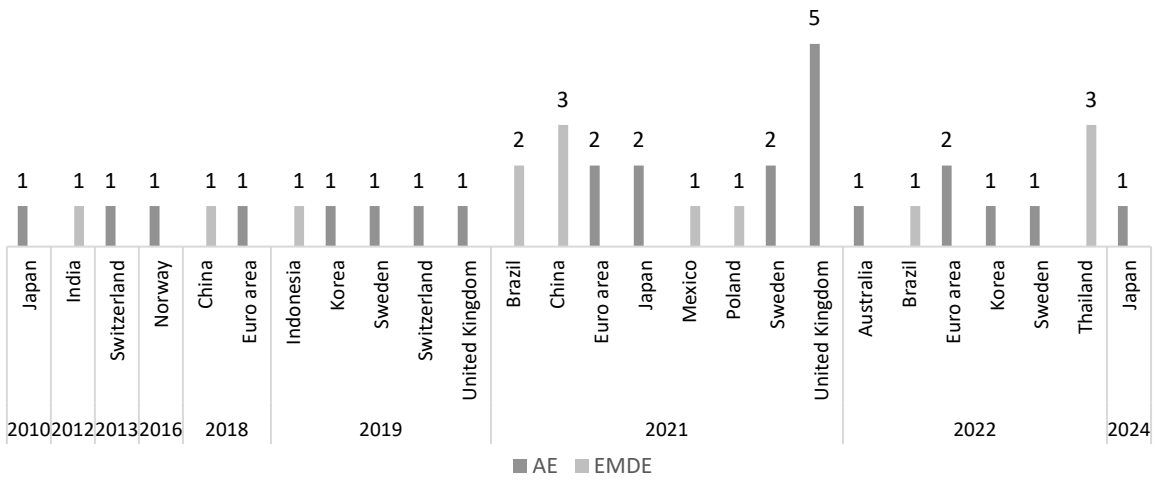
Scope of Mandate	AE	EMDE	Expected GMP
Narrow focused on price and financial stability	Japan Korea Switzerland	China India Indonesia Mexico Russia Thailand	No
Broader Include monetary objectives alongside economic goals or support for government policies	*Dual mandate:* Australia US	*Dual mandate:* Saudi Arabia	Yes
	Secondary goals: Canada Euro area Norway Sweden UK	*Secondary goals:* Brazil Poland Turkey	

the *Banco de México*, the Bank of Russia, and the Bank of Thailand). One EMDE central bank mandate comprised economic growth alongside price and financial stability (the Saudi Central Bank). Three EMDE central banks operated with hierarchical mandates (the Central Bank of Brazil, the National Bank of Poland, and the Central Bank of the Republic of Turkey). The last column of Table 4 further suggests that we would expect central banks with narrow mandates to refrain from developing GMP instruments, contrary to central banks with wider objectives.

As for the GMP measures adopted, the empirical evidence revealed that a number of monetary authorities across different jurisdictions had steadily incorporated an environmental dimension into their monetary policymaking. The data further hinted at important differences between AE and EMDE in terms of the strength of the measures adopted and how the two economic groups handled the matter. The durability of the implemented measures also fluctuated, as I shall demonstrate in the following (see also Appendix A, p. 375, for a more detailed description).

Figure 4 shows that we can split the period under review into two distinct phases. The period between 2010 and 2019 witnessed the first central bank monetary policy tools geared towards sectors that protect or augment the quality of the environment. Out of the 11 measures

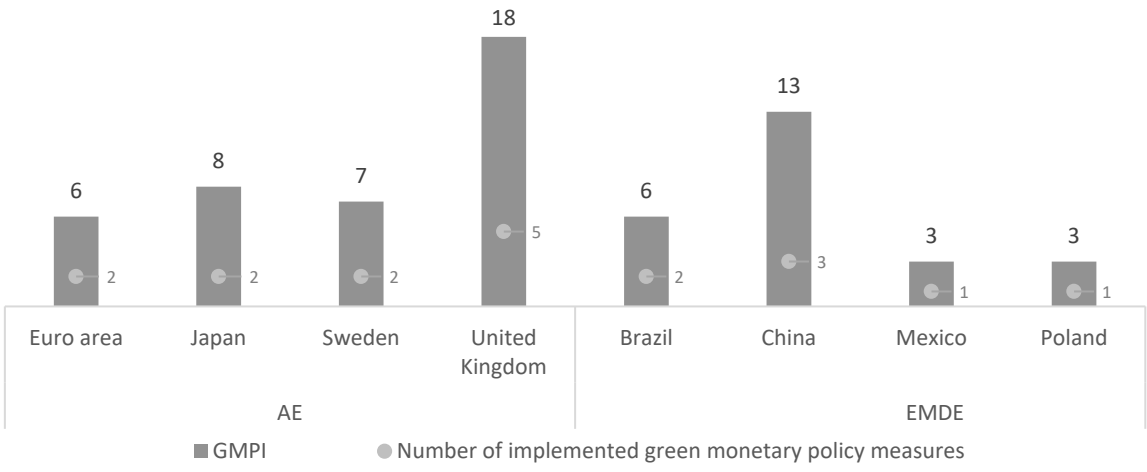
Figure 4. *Number of Implemented Green Monetary Policy Measures by Central Bank and Economic Group, as of Jan. 2024*



adopted during this time, eight were implemented in the AE (Japan, Switzerland—with two monetary policy measures—Norway, the EA, Korea, Sweden, and the UK) and three in the EMDE (India, China, and Indonesia). The year of policy adoption varied. The occasional and modest measures implemented between 2010 and 2019 contrasted with the increased number and reach of the decisions taken in 2021, which continued through 2022, albeit to a lesser extent. The collective engagement of central banks in green policymaking in 2021 warranted further investigation.

Looking at Figure 5, the boldest moves from the AE came from the BoE, the BOJ, the Riksbank, and the ECB. All four central banks published climate roadmaps on the grounds that acting on climate change falls within their primary, secondary, or both mandates (Bank of England, 2023c; Bank of Japan, 2021f; European Central Bank, 2021d; Sveriges Riksbank, 2020k). From the EMDE, the PBC stood out. The high GMPI score for the PBC reflected changes in the bank's monetary policy remit towards promoting the greening of the Chinese economy and financial system, following instructions from the Central Committee of the Communist Party of China and the State Council (PBC, 2022a). In the same year, the PBC added green finance to its strategic goals and launched two green lending facilities: the Carbon Emission Reduction Facility and the Special Central Bank Lending Facility for Green and

Figure 5. *Green Monetary Policy Measures in 2021, Including GMPI Scores*



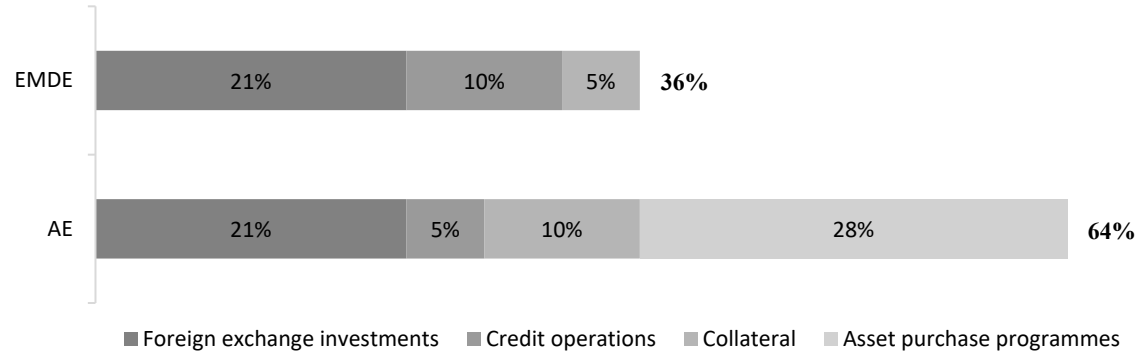
Efficient Use of Coal (Gang, 2021; Guiping, 2021; PBC, 2021g, 2021f). The third green credit line launched in 2021 came from the BOJ, specifically the Funds-Supplying Operations to Support Financing for Climate Change Responses, also known as the Climate Response Financing Operations (Bank of Japan, 2021i). Surprisingly, both central banks held what this study classifies as narrow mandates.

The year 2021 was marked by a number of historical events that contributed to an intensifying engagement of central banks in the environmental emergency, as highlighted in various central bank publications. Prominent among them was COP26, which brought together ministers of finance and senior officials from central banks to catalyse green finance (Bank of England, 2020c; UNFCCC, 2021b). On this occasion, 16 out of the 20 central banks included in this study published pledges or strategies on climate change and supported the NGFS Glasgow Declaration (NGFS, 2021c). The central banks of Indonesia, Poland, Saudi Arabia, and Turkey appear not to have joined the pledges. Out of these four central banks, only Bank Indonesia was a member of the NGFS at the time of the event. This finding lends support to the view that NGFS members show more resolve in contributing to environmental targets. As Cella (2021) noted, central banks that are members of organisations aimed at mitigating climate change tend to align their operations more closely with net-zero goals.

Furthermore, within the context of COP26, 146 out of the 192 signatories of the Paris Agreement presented new or revised plans to bring down GHG emissions by mid-century (UNFCCC, 2021a). The G7 and G20, for their part, simultaneously elevated climate change action to one of their top priorities (Bank of Canada, 2022a). These were some of the contextual conditions in 2021 that may have contributed to a turning point in the monetary policy strategies of some central banks, which could be indicative of a critical juncture.

Considering the monetary policy tools created or adjusted with green criteria (see Figure 6, p. 147), asset purchase programmes represented the main instrument of intervention

Figure 6. *Percentage of Implemented Green Monetary Policy Measures per Instrument and Economic Group, Out of the Total Number of Measures Adopted, as of Jan. 2024*



in the AE (28% of the total number of GMP measures adopted across AE and EMDE), followed by foreign exchange operations (21%). The analysis also suggested that no new green asset purchase programmes were deliberately created. Instead, central banks largely leaned on their previously established arrangements and added green elements to them, for example, by requiring the disclosure of CRFRs from asset issuers or tilting their asset purchases towards firms that account for environmental aspects.

The greening of asset purchase programmes and foreign exchange reserves was often justified as a means to protect the central banks' balance sheet from climate risks. As some central banks involved in these operations explained, the tilting of purchases towards greener issuers must comply with other eligibility criteria used to assess conventional assets (e.g., Bank of England, 2023c; Bank of Japan, 2021f; Lagarde, 2020a; Sveriges Riksbank, 2023c). While such a claim lowers the contentious debate over whether central banks should engage in green policymaking, it is plausible to assume that the strategic purchase of green assets by a powerful investor, such as a central bank, steers capital away from carbon-intensive firms towards greener ones, even if indirectly and on risk management grounds.

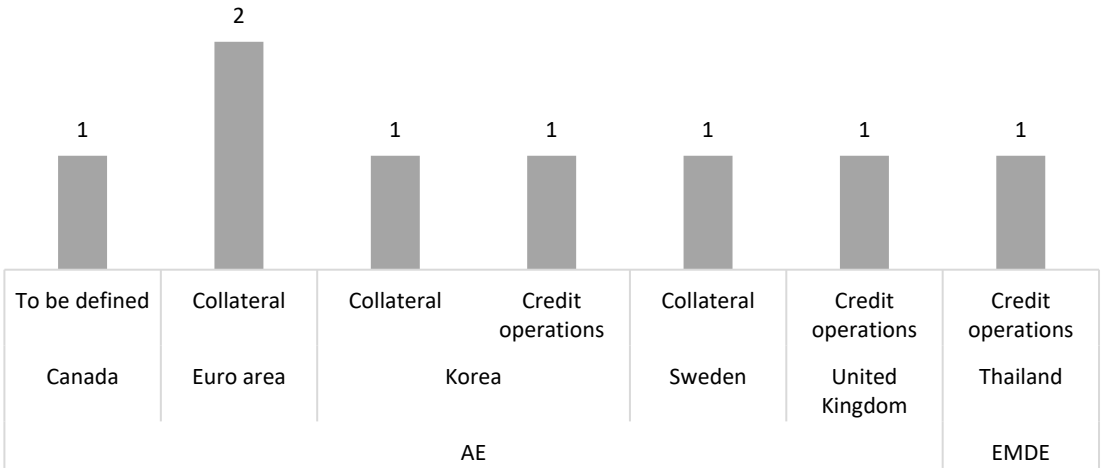
In the EMDE, green considerations typically resorted to the selection of investments or counterparties in foreign exchange investments (21%), followed by credit operations (10%). The central banks of China, Brazil, and Thailand were at the forefront of these efforts. The

incorporation of environmental considerations into asset purchase programmes was not explored in this study's EMDE central banks. One possible reason for this is the limited green bond market and the low level of central bank involvement in domestic asset purchases in the EMDE. As Interviewee 9 noted, the EMDE tend to experience higher inflation rates and, therefore, have less need for quantitative easing tools (Interview 9).

Regarding the forthcoming GMP measures (see Figure 7), six central banks declared the intention to undertake new or additional green adjustments. From the AE, the ECB, the Bank of Korea, and the Riksbank proposed fine-tuning their collateral frameworks towards greener segments. The Bank of Korea mentioned the prospect of adjusting the existing Financial Intermediated Lending Support Facility in favour of green investments, while the BoE was considering including climate risks in the assessment of counterparties for lending operations. The Bank of Canada—of which there were no records of previous GMP decisions—was examining options to incorporate climate elements into its market operations.

Although not included in Figure 7 due to its rather speculative nature, the ECB did not rule out the possibility of establishing green lending once data becomes more robust and monetary policy expansionary (Elderson, 2023d; Schnabel, 2023). From the EMDE, the Bank

Figure 7. *Planned Green Monetary Policy Measures by Country and Economic Group, as of Jan. 2024*



of Thailand announced a potential credit facility to support Small and Medium Enterprises (SMEs) through the green transition.

The GMPI scores offered additional insights into the GMP event. Regarding the geographical scope (see Table 5, p. 150), three out of the top five central banks most visibly engaged in environmental decision-making were located in Europe—the BoE (22), the ECB (20), and the Riksbank (15)—and two in Asia—the PBC (16) and the BOJ (14). Drawing a parallel with the findings from Doorenspleet and Kopecký (2008, p. 707) on the 'spatial clustering of democratic regimes', central banks surrounded by green central banks may more likely consolidate a green strategy by virtue of the increased exchange of information and resulting learning effect. This is what Solingen and Wan (2017) referred to as 'neighbourhood effects or network externalities' (p. 175).

As for the remaining central banks in this study, notably the 11 monetary authorities with scores below 7—Norway (4), Australia (3), India (3), Indonesia (3), Mexico (3), Poland (3), Canada (1), Russia (0), Saudi Arabia (0), Turkey (0), and the US (0)—there was a clear reluctance towards greening monetary policy despite i) the growing consensus and urgency over the promotion of sustainable finance, ii) their membership in the NGFS, 'a coalition of the committed' (Elderson, 2021d), and iii) the broader mandates of some of them, which are theoretically more conducive to green-supporting solutions. This reluctance held especially true for the central banks of Australia, Saudi Arabia, and the US, the mandates of which included coequal monetary and economic objectives.

Most strikingly, the multiple-case analysis showed no clear linkage between formal objectives and GMP outcomes, as suggested by the typical and deviant case study classification. For ease of interpretation, I recall the two main propositions of this study: the group's most typical or expected cases are those where i) narrow mandates cannot satisfactorily explain the development of measures aimed at catalysing the greening of the

economy, whereas ii) broader mandates hold more favourable institutional conditions to steer central bank policy instruments towards achieving environmental targets. A central bank is considered deviant or anomalous if it reveals a result that does not fit into either of the two previous relationships. Given the significant number of deviant cases outlined in Table 5 (nine out of the 20 units of analysis), it is reasonable to assume that the centrality of central bank mandates in explaining monetary policy decisions in the environmental field was not particularly strong.

Table 5. *Cross-Case Comparison Using a Typical and Deviant Case Study Selection Approach, as of Jan. 2024*

Unit of Analysis	Economic Group	Scope of Mandate	GMPI	Case Study Type
United Kingdom	AE	Broad (secondary)	22	Typical
Euro Area	AE	Broad (secondary)	20	Typical
China	EMDE	Narrow	16	Deviant
Sweden	AE	Broad (secondary)	15	Typical [Deviant before Jan. 2023]
Japan	AE	Narrow	14	Deviant
Thailand	EMDE	Narrow	11	Typical
Brazil	EMDE	Broad (secondary)	9	Typical
Korea	AE	Narrow	9	Typical
Switzerland	AE	Narrow	7	Typical
Norway	AE	Broad (secondary)	4	Deviant
Australia	AE	Broad (dual)	3	Deviant
India	EMDE	Narrow	3	Typical
Indonesia	EMDE	Narrow	3	Typical
Mexico	EMDE	Narrow	3	Typical
Poland	EMDE	Broad (secondary)	3	Deviant
Canada	AE	Broad (secondary)	1	Deviant
Russia	EMDE	Narrow	0	Typical
Saudi Arabia	EMDE	Broad (dual)	0	Deviant
Turkey	EMDE	Broad (secondary)	0	Deviant
United States	AE	Broad (dual)	0	Deviant

Due to limited time and resources, this research could not undertake a detailed cross-case analysis of what motivated central banks with narrow mandates to advance an environmental agenda and what held back central banks with broader objectives. Yet, drawing on the wide range of central bank publications surveyed for this study, the following subsection seeks to provide a brief overview of the thinking and positioning of each of the 20 central banks towards environmental issues. Specifically, it highlights the key arguments behind the adoption or non-adoption of GMP measures, as well as the main sustainable finance initiatives started by each central bank up to January 2024. The analysis also emphasises the broader national and international contexts underpinning central banks' climate strategies, as described in their publications, and assesses whether the degree of central bank involvement in green initiatives aligns with their mandates using the typical and deviant approach outlined before.

Although the elaboration of the next section was demanding in terms of the time and efforts involved in collecting and analysing such a large amount of data, it enhances the previous summary statistics by providing a greater understanding of how each central bank has reconciled growing environmental concerns with its statutory objectives. This extended examination further enabled the gathering of more credible evidence that supports the typical and deviant claims summarised in Table 5. It also helps select three central banks that can provide worthy insights into the main factors driving the greening of monetary policy. The added value of such a medium-N analysis could not be achieved in a small-N study or through an approach restricted to cases that only fitted one of the two patterns, typical or deviant.

It should be noted that the typical and deviant classification proposed for each central bank is likely to evolve as central banks' positioning towards green matters develops. Furthermore, while the individual summaries presented below seek to be as comprehensive as possible, they are not intended to be exhaustive. On the one hand, some central banks offer a more detailed and expanded overview than others. This variation stems from the differing

amounts of information disclosed by each central bank, as well as their varying degrees of involvement in sustainable finance activities. On the other hand, there may be other initiatives whose information I did not have access to or deemed less relevant to this study. A more thorough analysis would need to consider additional contextual factors beyond the scope of this study, notably the stage of each country's engagement in environmental legislation. While this study does not delve deeply into this topic, it concludes that the green-leading central banks are located in jurisdictions with well-established green public policies and institutions that facilitate the transition to a greener economy.

5.2 An Overview of the Various Central Banks' Stances on Greening Monetary Policy

5.2.1 *Australia – Reserve Bank of Australia*

The Reserve Bank of Australia (RBA) holds the commonly cited dual mandate. According to the Reserve Bank Act 1959, the central bank's monetary policy should be conducted in ways that 'best contribute to . . . the stability of the currency . . . full employment . . . [and] the economic prosperity and welfare of the people of Australia' (Reserve Bank Act 1959, 2020, Section 10). Notwithstanding the expanded mandate, which offers a framework more supportive of targeted policies, the RBA has held against a central bank mission driven by environmental considerations.

In line with the former RBA deputy governor (Debelle, 2019), climate change and the policy environment in response to it were but some of the 'forces' that could influence the variables of the bank's major mandate. Debelle argued that the bank's job was to manage outcomes, not to drive them: 'it's more responsive rather than changing behaviour' (Debelle, 2019). According to the former deputy governor, the bank lacked the tools to influence outcomes, which belonged to other parties. Debelle further explained that a chief difference between the RBA and the ECB in the fight against climate change was that the latter engaged

in ‘very large’ asset purchases, allowing the bank to have a more direct involvement in the economy. In contrast, the RBA neither held nor envisaged such instruments.

In September 2023, Michelle Bullock took office as the new governor of the RBA (Reserve Bank of Australia, n.d.-b). In a speech delivered a month before, in August 2023, Bullock (2023b) stressed the concerns and uncertainties surrounding climate change risks, their short- and long-term effects on output, employment, and prices, as well as the actions taken by a growing number of policymakers to curb carbon emissions. Regarding the contribution of monetary policy to climate change, the new governor stuck to the ‘traditional approach’ whereby it aims to keep interest rates, and thus inflation expectations, under control (Bullock, 2023a). Bullock argued that, in this way, the bank supported both public and private agents in navigating the transition without inflationary concerns.

The RBA announced it would continue investing in the Asian Bond Fund, which has been promoting investment in green bonds since 2022 (EMEAP, 2021; Reserve Bank of Australia & APRA, 2021). Arguably, the investment in the Asian Bond Fund can be perceived as a light measure when compared to more vigorous moves taken by other AE central banks, none of which have dual mandates. On the grounds of its limited policy toolkit and the bank’s role in dealing with the consequences of external forces rather than manipulating them, the RBA has opted to keep the continuity of its monetary policy framework. Considering the bank’s favourable context of a dual mandate, which could line up more naturally with climate goals, I classified the RBA as a deviant case.

The RBA’s thinking and work on environmental matters. The RBA’s efforts regarding environmental topics have focused on understanding and debating the risks arising from climate change, notably physical, transition, and reputational risks. Although the supervision of financial institutions is performed by the Australian Prudential Regulation Authority (APRA), the RBA has collaborated with APRA in the monitoring of climate risks as

part of its monetary policy assessment and financial stability goal (Reserve Bank of Australia, 2019). To ensure that the Australian financial system is well equipped to tackle CRFRs, the Council of Financial Regulators (CFR)—formed by the APRA, the Australian Securities and Investments Commission, the RBA, and the Australian Treasury—established the Climate Working Group in 2017. The group was tasked with undertaking a Climate Vulnerability Assessment of Australia's largest banks using NGFS scenarios, ensuring that firms disclose CRFRs in line with the TCFD recommendations, and developing Australia's taxonomy, which was viewed as the cornerstone of sustainable finance (Kearns, 2022).

The bank has paid particular attention to global transition risks (Debelle, 2021; Kearns, 2022; Kemp et al., 2021; Reserve Bank of Australia, 2019). For a country highly dependent on carbon-intensive exports like Australia, transition risks correspond to the losses that may occur due to the environmental policies and regulations implemented around the world. For the former RBA deputy governor, taxonomies and well-intended net-zero policies developed worldwide were inappropriate for the Australian situation (Debelle, 2021). Therefore, the country had to seek alternative transition solutions for its emission-intensive firms. However, as noted earlier and highlighted by Laeven and Popov (2022), country-specific taxonomies, like the one suggested by Debelle, hinder international efforts of standardisation and prevention of 'cross-border regulatory arbitrage' (p. 39).

The RBA joined the NGFS in July 2018, seven months after the network was created. The RBA participated in various workstreams of the network, including the one on monetary policy (Reserve Bank of Australia, 2020, 2023). The central bank's senior and expert staff reported the participation of the bank in various other high-level meetings and international working groups with a sustainable finance agenda, including the G20 Sustainable Finance Working Group (G20SFWG), the Financial Stability Board's (FSB) Climate Vulnerabilities and Data Group—which the RBA co-led—the IMF, the Executives' Meeting of East Asia-

Pacific Central Banks (EMEAP), the OECD's Committee on Financial Markets, the BIS Asia Climate Network—which discussed about incorporating climate considerations into monetary policy frameworks—and the BCBS (Reserve Bank of Australia, 2021, 2022a, 2023).

Despite the RBA's extended involvement in climate-related work, the central bank's approach to a greener economy has been circumscribed to research, capacity building, and guidance on managing climate risks (Reserve Bank of Australia, 2023). In 2021, along with the climate pledges from other central banks and supervisory authorities that were members of the NGFS, the RBA announced it would consider disclosing sustainability-related information about its activities (Reserve Bank of Australia & APRA, 2021). This topic was still under review at the time of writing, in February 2024 (Reserve Bank of Australia, 2023). Assuming that firms with clear transition plans exhibit higher reductions in carbon emissions than their peers with no such targets (Carbone et al., 2022), it could be argued that the RBA's non-disclosure of how 'brown' its balance sheet is may be an attempt to defer environmental commitments. As in other central banks, the RBA announced an environmental management plan to reduce the environmental impact of its facilities and day-to-day operations.

5.2.2 *Brazil – Central Bank of Brazil*

The primary objective of the Central Bank of Brazil (BCB) is to ensure price stability by keeping 'inflation low, stable and predictable' (Central Bank of Brazil, n.d.-b). According to the Complementary Law No. 179 of 24 February 2021, the primary mandate of the central bank adds a secondary objective consisting of 'fostering the stability and efficiency of the financial system, smoothing fluctuations in the level of economic activity, and promoting full employment' (BCB [Central Bank of Brazil] Complementary Law No. 179, 2021, Article 1). The BCB has undertaken a wide range of initiatives to address both social and environmental issues, as described in the bank's 2021, 2022, and 2023 annual reports on *Social,*

Environmental and Climate-related Risks and Opportunities (Central Bank of Brazil, 2021b, 2022b, 2023b). The sustainability topic has also been prominent on the central bank's website.

Regarding monetary policymaking, the bank has included sustainability elements in its collateral framework and international reserves. Regarding the collateral, the bank has accepted green and other sustainability-linked bonds as guarantees for its loans since 2020. However, it was only in the sustainability report of 2022 that the bank announced the strategic monitoring of sustainable bonds accepted as collateral. This occurred after the bank implemented the Sustainable Financial Liquidity Facility in November 2021 (Central Bank of Brazil, 2022b). Concerning its international reserves, the bank has intentionally increased the share of green bonds in its foreign exchange investments since 2021. However, green assets have been part of the bank's reserves since 2015, steered by risk management principles. In 2022, the BCB started deploying ESG criteria in the selection and ranking of counterparties for activities involving foreign currencies (Central Bank of Brazil, 2022b).

As a result of its sustainability approach in the management of international reserves, the BCB was distinguished 'Best Reserve Manager' by the Central Banking Awards 2023 (Central Bank of Brazil, 2023b; Central Banking, 2023). The bank has publicly expressed its commitment to climate change and other environmental issues, as well as its intention to deploy the bank's policy tools to address them. Although it does so in a moderate fashion, due to the lack of developed metrics and taxonomies to properly classify green assets (Central Bank of Brazil, 2022b), the BCB has strived to make its monetary policy operations more environmentally friendly. Given its broader secondary mandate, the BCB falls within the classification of a typical case study.

The BCB's thinking and work on environmental matters. Notwithstanding the unavailability of annual reports between 2013 and 2019, a detailed overview of the BCB socio-environmental actions and respective timelines is compiled in the previously mentioned 2021,

2022, and 2023 reports on *Social, Environmental and Climate-related Risks and Opportunities* (Central Bank of Brazil, 2021b, 2022b). The main highlights of these reports are summarised below. However, from the management reports for 2010, 2011, and 2012 (Central Bank of Brazil, 2010, 2011, 2012), one can already observe the bank's commitment towards understanding, disseminating, and monitoring social and environmental practices within the financial system in collaboration with government agencies and research institutes. In 2011, the Socio-environmental Responsibility Project (RSA) of the National Financial System (SFN) was set up aimed to provide guidelines on environmental responsibility. The 2012 management report, in turn, included a subsection devoted to this topic, which anticipated the mandatory inclusion and disclosure of environmental practices by financial firms.

The BCB's roadmap to achieve environmental goals was formalised in 2020 with the launch of the BC# Sustainability agenda (Central Bank of Brazil, n.d.-d, 2021a; Nechio, 2020). It comprised a set of measures to mainstream ESG factors into the central bank's primary functions, specifically in the areas of regulation, supervision, policies, and internal operations. The BC# Sustainability agenda was part of a broader programme set in 2016, called the Agenda BC#, which entailed four additional dimensions beyond environmental sustainability, namely inclusion, competitiveness, transparency, and education (Central Bank of Brazil, n.d.-a).

Countrywide, Brazil is rich in natural resources. The agricultural sector accounts for one-fifth of the country's GDP, which is one of the largest worldwide (Central Bank of Brazil, n.d.-c). In its various publications, the BCB systematically addresses the adverse effects of climate events on price stability and monetary policy, often pointing to the country's experience with drought. According to the Strategic Plan 2020-2023, the bank's end goal was 'to promote sustainable finance and contribute to the reduction of socio-environmental and climate risks in the economy and the financial system' (Central Bank of Brazil, 2021b, p. 23, 2023a, p. 20). This was otherwise aligned with the UN 2030 Agenda for Sustainable

Development and the Federal Multi-Year Plan, to which the bank sought to contribute. The BCB argued that failing to achieve this vision posed several risks to the bank and its activities, notably reputational risks and the subsequent distrust in the country. The Strategic Plan was based on what the BCB considered to be the best international practices in the field. The bank often expressed its support for the NGFS and the TCFD work, the latter of which informed the BCB supervisory guidelines for the disclosure of social, environmental, and climate-related data (Central Bank of Brazil, 2021a, 2022b). Alongside environmental topics, other themes related to social inclusion, financial education, diversity, and equality were commonly addressed in speeches by BCB's officials, as well as in the bank's written publications.

On the regulatory front, the BCB issued the first voluntary guidelines in response to environmental issues in 1995. Amid the BCB's numerous actions since then, the following stand out. In 2008, the bank established social and environmental recommendations for credit concession, especially for rural credit. In 2014, the bank launched the Socio-Environmental Responsibility Policy (PRSA), which required financial institutions to account for the social and environmental impact of their business activities. In 2021, the bank enhanced the PRSA to include climate risks—the Socio-Environmental and Climate Responsibility Policy (PRSAC)—and formulated regulations for the financial disclosure of ESG risks from 2022 (Central Bank of Brazil, 2021c, 2021d). In 2023, the bank established a Sustainable Rural Credit Bureau to improve the classification and data sharing of sustainable projects that can benefit from rural credit. Related to this, the BCB integrated a task force led by the Ministry of Finance to develop the national taxonomy (Central Bank of Brazil, 2023b).

In the supervisory arm, the bank enhanced the supervision guidelines in 2022 by introducing a new disclosure template, the *Social, Environmental and Climate Risk Document* (DRSAC). This document required financial institutions to report their exposure to counterparties whose products, services or processes were associated with the violation of

fundamental rights, environmental degradation, and climate risks (Central Bank of Brazil, 2022a). In the same year, the bank assessed the financial system's exposure to transition risks and conducted a scenario analysis of credit portfolios' exposure to the risk of extreme droughts. Stress testing and climate scenario analysis were ongoing (Central Bank of Brazil, 2023b).

Regarding its own business operations, the bank adopted a tailored version of the Socio-Environmental Responsibility Policy and set up the Organisational Socio-Environmental Committee to oversee the bank's policy implementation in 2017. In 2021, the bank created the Committee for Sustainable Economy, an advisory group tasked with monitoring all sustainability-related activities across the bank (Central Bank of Brazil, 2021a, 2022a, 2023b). In 2022, the bank further improved the carbon emission reduction strategy of its facilities, which had been in place since at least 2012 (Central Bank of Brazil, 2012, 2023a).

The BCB regularly advertises the bank's cooperation with various multilateral organisations involved in climate work, notably the BCBS, the FSB, the IMF, the G20, the Germany Agency for Cooperation under the Brazilian Sustainable Finance project, and the NGFS. The BCB joined the NGFS in March 2020, where it coordinated the *Progress Report on the Guide for Supervisors* in preparation for the COP26. The BCB was appointed to the NGFS Steering Committee for 2022-2024. Among other environmental initiatives, the bank signed a Memorandum of Understanding with the Climate Bonds Initiative in 2020. The BCB also hosted a wide range of outreach activities as part of its BC# Sustainability programme, such as promoting financial literacy in schools, as well as conducting research with universities and research institutes to estimate the impacts of climate change on the economy and financial system (Central Bank of Brazil, 2021a, 2021b, 2022a, 2022b, 2023b).

5.2.3 *Canada – Central Bank of Canada*

The Bank of Canada (BoC) Act instructs the central bank to 'promote the economic and financial welfare of Canada' (Bank of Canada Act 1985, 2023, Preamble). This primary

mandate encompasses all the central bank's core functions, including monetary policy. According to the information displayed on the BoC's website, the specific objective of monetary policy is 'to preserve the value of money by keeping inflation low, stable and predictable' (Bank of Canada, n.d.). In light of the growing scientific evidence pointing to the adverse implications of climate-related risks on the price level, output, and jobs, one could argue that the underlying 'economic and financial welfare' objective provides the central bank with relatively increased policy space to implement measures with an environmental scope. However, no monetary policy tools were adopted or adjusted in consideration of green objectives during the research period. Back in 2017, the former BoC deputy governor demarcated the frontier between monetary policy and climate change as follows:

> The bank needs to consider these [adverse climate change] effects as we deliver on our mandate to promote the economic and financial well-being of Canadians. . . . As a central bank, we can react to events as they occur. But we cannot build them into our economic forecasts or adjust our monetary policy in advance because each is unique and unpredictable. (T. Lane, 2017)

Meanwhile, the BoC's approach to climate change has evolved. Environmental risks were approached more systematically from 2019 and elevated to one of the bank's main risk categories (Bank of Canada, 2020a, 2021a). From a monetary policy perspective, the BoC was still in the early stage of assessing the possibility of adding climate risks and opportunities into its market operations (Bank of Canada, 2021c, 2022c, 2023a; McGuinness, 2023). Given the BoC's broader mandate and low resolve towards an environmental response, I have classified the BoC as a deviant case.

The BoC's thinking and work on environmental matters. Canada features an economy highly dependent on energy consumption and carbon emissions. The contributions of the automotive and aerospace industries to the country's GDP, the generous size of the country,

the climate conditions, and the high living standards of the population are some of the challenges Canada faces in navigating through the green changeover (Bank of Canada, 2023b; T. Lane, 2017; OECD, 2023). From the BoC's standpoint, measures to mitigate rising temperatures are beyond the central bank's responsibility (Ens & Johnston, 2020). As stated in the web report *Bank of Canada Disclosure of Climate-Related Risks 2022* (Bank of Canada, 2023b), trying to steer monetary policy towards achieving green objectives is impractical and can even prove counterproductive. First, the BoC may need to increase investments in carbon-intensive assets to respond to economic crises, as seen during the COVID-19 pandemic. Second, the asset purchase programmes held by the bank, specifically the Provincial Bond Purchase Program (PBPP) and the Corporate Bond Purchase Program (CBPP), were meant to be temporary and were, therefore, discontinued. The main assets maintained by the central bank are government securities, which limit the BoC's capacity to support other pressing areas.

The former deputy governor regarded carbon pricing as the leading measure to drive structural changes in the economy and the backbone for allocating funds into investments that can be classified as green (T. Lane, 2017). Moreover, the bank's resources to tackle climate change were viewed as very limited, since the BoC was not tasked with banking supervision and financial regulation, unlike other central banks. Against this background, the BoC's actions concerning climate change have been centred on researching and sharing knowledge about the implications of climate change risks (Bank of Canada, 2021a, 2021c; Macklem, 2020).

In March 2019, the BoC became a member of the NGFS. Since then, it has taken part in various NGFS publications, participated in its working groups, including on monetary policy, and sat on the Network's Steering Committee in 2020 and 2021 (Bank of Canada, 2020b, 2021a, 2021b, 2021c). The bank has also participated in climate-related activities of the G20SFWG—having contributed to the design of the G20 Sustainable Finance Roadmap—the G7, the FSB, and the IMF (Bank of Canada, 2020a, 2021a, 2021c, 2022a, 2022c). In 2020, the

BoC began designing a climate strategy covering the areas of research, risk management, governance, partnerships, and physical operations. During that year, the BoC ran a pilot project to assess and understand the impact of transition risks on the economy and financial system in collaboration with the Office of the Superintendent of Financial Institutions. The project involved six financial institutions and drew upon the climate scenarios developed by the NGFS (Bank of Canada, 2020c, 2021a, 2022b).

In 2021, the BoC established its Climate Change Steering Committee, tasked with monitoring the green activities performed by the various areas of the bank (Bank of Canada, 2023b). In the same year, the bank dedicated an entire section of its annual report to climate change (Bank of Canada, 2022a). Following the practice adopted by several major central banks, the BoC disclosed the climate-related risks of its operations in line with the TCFD guidelines in 2023 (Bank of Canada, 2022c, 2023b). On this occasion, the bank revealed that it had incorporated climate and transition risk considerations into its Pension Plan (Bank of Canada, 2023b). Similarly, the bank developed the Greening the Bank of Canada strategy to reduce the environmental footprint of its physical operations (Bank of Canada, 2023a, p. 58).

5.2.4 *China – The People's Bank of China*

> The People's Bank of China shall, under the leadership of the State Council, formulate and implement monetary policy, prevent and resolve financial risks, and maintain financial stability. . . . The objective of monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth. (Law of the People's Republic of China on The People's Bank of China 1995, 2003, Articles 2–3)

The PBC's formal objectives do not explicitly require the bank to support national economic policies. There is also no reference to specific elements of the real economy, such as production or employment. Therefore, the PBC can be seen as a central bank with a narrow

mandate, primarily focused on the currency value and financial stability.[32] Despite its limited policy aims, the PBC has consistently emphasised the leading role of central banks in earmarking funds towards achieving 'carbon neutrality goals' (PBC, 2021e, 2021f, 2021g). This claim gained momentum following the commitment of the Chinese president to peak national carbon emissions by 2030 and achieve carbon neutrality by 2060 at the UN General Assembly in September 2020—also known as the 30.60 goals (Guiping, 2021; PBC, 2021b).

According to the bank, since the Chinese government can only partly cover such an ambitious and large-scale transformation, 'the PBOC has resolutely prioritized the development of green finance' (Gang, 2023b). Consequently, the PBC's monetary policy assumed the dual role of adjusting 'aggregates and structure', following instructions from the Central Committee of the Communist Party of China and the State Council (PBC, 2022a, p. 22). In other words, the bank's monetary policy sought to ensure appropriate market liquidity while directly supporting the real economy (Guofeng, 2021). In addition, given China's 'tight schedules and heavy tasks in achieving carbon neutrality' (Guiping, 2021), the PBC elevated green finance to one of its top priorities in 2021 (Gang, 2021).

Prior to reformulating its monetary policy remit in 2021, the PBC was already accepting green loans and green bonds into its collateral framework since 2018, as part of the Chinese green finance reform started in 2016 (PBC, 2019d). In 2021, following the new government guidelines, the PBC increased the weight of green assets in the bank's foreign exchange reserves and launched two special lending facilities—also called 'structural monetary policy instruments' (PBC, 2021g, 2022b)—to provide 'targeted and direct support for green and low-carbon projects' (Gang, 2023b). Specifically, the Carbon Emission Reduction Facility and the Special Central Bank Lending Facility for Green and Efficient Use of Coal (PBC, 2021f). These measures signalled the bank's duty to assist China in delivering its neutrality

[32] The value of the currency can be defined as its price (Bank of Korea, n.d.).

commitments and demonstrated the 'flexible', 'targeted', and 'forward-looking' attributes of the PBC monetary policy framework (Guofeng, 2021; PBC, 2022a, 2022c).

The implementation of targeted monetary policy instruments was not a new territory for the PBC. According to the bank, the special programmes delivered during the COVID-19 pandemic proved that monetary policy had space to 'provide support to key areas' (Gang, 2021). It becomes evident that the PBC's monetary policy not only strives to maintain the stability of the currency's value, as stated in the central bank's law, but also supports the policy objectives of the Chinese government, as the central bank publicly conveys. Historically, the PBC has deployed various financial instruments and regulations to advance the policy objectives of the government, including the industrial policy (PBC, 2011, 2021a). The greening of the Chinese financial system and the implementation of precise GMP tools to address that goal are additional examples of how the PBC's policymaking moves in line with specific political goals (Interview 4; Larsen, 2023). In the words of Interviewee 5:

> China is a state-controlled system. . . . The People's Bank of China is not going to be completely independent the way the western central bank is. In quite a lot of emerging market economies, the central banks . . . can operate a bit more like a private bank at times. (Interview 5; see also Interview 2).

The participant in Interview 4 went so far as to say that:

> [The People's Bank of China is] doing a lot, but that is not an independent central bank. It is hand in hand with the government, and if [the government] wants to do it [green the economy] through the central bank or do it through some other tool, I completely understand. (Interview 4)

The joint arrangements between government agencies and the central bank to help the world's top emitter of GHG deliver its neutrality goals placed the PBC among the pioneering

central banks in establishing a template for GMP reforms. The limited fiscal space, vis-à-vis the substantial amount of capital needed for the green transformation, gave an essential impetus for these arrangements (Gang, 2021, 2023b; Joselow et al., 2022; PBC, 2015a, 2019b). Considering the bank's direct involvement in green policymaking and the seeming narrowness of its formal objectives, I classified the PBC as a deviant case.

The PBC's thinking and work on environmental matters. The PBC debate on climate finance can be found as early as 2008, during a seminar on Climate Change and Carbon Trading hosted by the bank (PBC, 2008). The seminar brought together delegates from various Chinese ministries, researchers, and practitioners to discuss the adverse and global effects of climate change, as well as the need to mobilise financial instruments to conserve natural resources. The central bank's commitment to supporting the development of a sustainable and low-carbon economy through financial services is underlined in the first annual report surveyed for this study, the 2010 annual report.

In the late 2000s, the bank was already engaged in credit policy to guide and stimulate financial institutions to steer their credit towards projects of environmental protection. The green credit policy under the principle of 'differentiated treatment for different industries' was strengthened over the years, especially following the 2014-2015 Action Plan for Low Carbon Development through Energy-Saving and Emission Reduction enacted by the State Council of China (PBC, 2012, p. 54; see also Asia Pacific Energy Portal, n.d.; PBC, 2015b). The concept of 'climate change financing' appears in the bank's 2011 annual report (PBC, 2012, p. 99).

In 2015, the PBC established the Green Finance Committee and issued a research report on *Building China's Green Financial System* (PBC, 2016a). Over the same year, the bank set out the regulatory framework for issuing green bonds to expand green credit. The framework was bolstered with updated standards and complemented with a national database that compiled and monitored green loan statistics (PBC, 2018c). In 2016, the PBC and government

agencies released the Guidelines for Establishing the Green Financial System as part of the national strategy for developing a sustainable economy and an 'ecological civilization' in China (PBC, 2016b). For the Chinese authorities, this was the first most comprehensive policy framework for green finance formulated by the 'world's largest green financial market' (PBC, 2019b, 2021b). According to the PBC, China's outstanding green loans and bonds rank among the top worldwide (Gang, 2021, 2023b; PBC, 2021a). In 2017, the bank issued the first annual report on *China's Green Finance Development* (PBC, 2019c).

The institutional arrangements to implement the decisions of the Central Committee of the Communist Party of China and the State Council towards a greener financial system were strengthened in 2018. In cooperation with the China Securities Regulatory Commission, the bank launched its Guidelines on Green Bond Certification to boost the green bond market (PBC, 2018a). In the same year, the Chinese Working Group on Green Finance Standards held its first meeting with the participation of the Central Committee, the PBC, representatives from government ministries, market and research institutions (PBC, 2018b). The group conducted the first Green Finance Assessment Program for Banking Institutions, the results of which fed into the PBC rating of financial institutions (Guofeng, 2021; PBC, 2022b).

In 2019, the central bank took further strides towards the 'green finance reform' by announcing the issuance of green finance instruments by pilot zones. This exercise was meant to be extended countrywide (Guofeng, 2021; PBC, 2019a). The bank also supported the creation of the Green Investment Principles for the Belt and Road region, a set of voluntary investment guidelines jointly formulated by the Green Finance Committee of the China Society for Finance and Banking and the City of London Green Finance Initiative (PBC, 2019b).

Following the Chinese government's commitment to peak carbon emissions in 2030 and to achieve carbon neutrality by 2060, the bank set forth various industry standards and regulations (PBC, 2021b, 2022b). Most importantly, the PBC, the National Development and

Reform Commission (NDRC), and the China Securities Regulatory Commission launched two editions of the *Green Bond Endorsed Projects Catalogue* in 2020 and 2021, respectively.[33] The catalogue aimed to better define and classify green projects to advance the 'structural adjustment and transformation' of the Chinese economy (PBC, 2021c). It is worth mentioning that the 2021 edition of the catalogue, combined with the EU Taxonomy Climate Delegated Act, fed into the Common Ground Taxonomy launched by the International Platform on Sustainable Finance in November 2021. This project, co-chaired by the EU and China, aimed to harmonise definitions and classifications to facilitate international flows of green capital. The launch of the Common Ground Taxonomy occurred in tandem with the COP26 in November 2021. As of 2022, 80% of this common taxonomy was aligned with European standards (Gang, 2023b; Guofeng, 2021; PBC, 2021d).

Among other regulations formulated by the PBC, the following two stand out: the Guidelines on Environmental Information Disclosure for Financial Institutions, developed in line with the TCFD recommendations, and the Environmental Equity Financing Tools (Guofeng, 2021). The PBC also participated in the creation of international standards for sustainable finance, such as the International Organisation for Standardisation (ISO) Technical Committee (TC) 322 on Sustainable Finance (ISO/TC322), and took part in relevant international organisations and working groups devoted to greening the global financial system, notably, the G20 Green Finance Study Group. This group was set up during the Chinese G20 presidency in 2016, when the green finance topic was first added to the G20 agenda (Gang, 2023b; PBC, 2017, 2022b).

In 2021, the study group issued two key reports, the *G20 Sustainable Finance Roadmap* and the *G20 Sustainable Finance Synthesis Report*. The G20 Finance Ministers and Central

[33] The National Development and Reform Commission is 'a ministerial-level department of the State Council' responsible for implementing the 'Central Committee's policies and decisions' (National Development and Reform Commission, n.d.).

Bank Governors endorsed both documents (Guofeng, 2021; PBC, 2022c). The group further announced the G20 Framework for Transition Finance in 2022 (Gang, 2023a). The IPFS Taxonomy Working Group was another crucial initiative co-led by the PBC and the European Commission in 2020 (PBC, 2021d). Importantly, China was a founding member of the NGFS, holds a permanent seat on the network's Steering Committee, and chaired the microprudential supervision workstream (Gang, 2021; NGFS, 2023a; PBC, 2020).

The PBC has set various bilateral agreements with countries regarded as green prime leaders, such as the UK and France. With the former, the PBC launched a pilot initiative to advance China-UK Climate and Environmental Information Disclosure for financial institutions (PBC, 2021b). The bank has extensively hosted and participated in meetings and conferences on green finance and ESG promotion with institutions such as the IMF, the World Bank, and the European Bank for Reconstruction and Development (EBRD) (PBC, 2020). From a supervisory standpoint, in addition to the financial regulation already mentioned, the PBC organised climate risk stress tests for financial institutions in 2021 and has progressively implemented mandatory environmental data disclosures to companies and financial firms (Gang, 2023b; PBC, 2021a).[34] Given the efforts dedicated by the bank to communicating the various green finance initiatives it has undertaken so far, the PBC is an example of a central bank which strives to be recognised as a key player in the green reform, even if by force of its commitment to the government's goals.

5.2.5 *Euro Area – European Central Bank*

According to the Treaty of the European Union, the ECB's primary goal is to preserve price stability by ensuring that the inflation rate—'the rate at which the prices for goods and services change over time—remains low, stable and predictable' (Lane, 2022). Without prejudice to its primary mandate, the treaty sets out as a secondary objective to 'support the

[34] Climate stress tests assess the resilience of financial firms to climate change hazards and policies.

general economic policies in the Union' (Consolidated Version of the Treaty on the Functioning of the European Union, 2020, Article 119).

Provided the vast set of EU economic policies and increasing regulation aimed at making Europe climate-neutral by 2050, notably the European Climate Law and the EGD, the bank initially invoked its secondary mandate to justify the inclusion of climate considerations into its main monetary policy operations (Aguila & Wullweber, 2025; Elderson, 2022c, 2023c; European Commission, n.d.-a; Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 Establishing the Framework for Achieving Climate Neutrality and Amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'), 2021). In practical terms, when two policy options produce the same desired monetary policy goal, the ECB chooses the one that is more supportive of its secondary objective. In case the pursuit of environmental goals jeopardises the bank's attainment of its price stability objective, the latter prevails even if it implies neglecting environmental needs (de Guindos, 2022; Lagarde, 2021f, 2022h; Mersch, 2020; Schnabel, 2021a, 2021b, 2021d).

Following the growing scientific evidence and international consensus on the adverse macroeconomic effects of climate change, the ECB decided to become an active participant in addressing climate change in 2021. This decision was taken on the grounds that climate change impacted not only its secondary mandate, which required the ECB to support the EU's general policies, but also influenced how the bank kept prices stable, supervised banks, and monitored its own financial risks. The bank stressed the difficulties of achieving monetary policy goals in a market disrupted by climate change risks. Physical risks and unexpected structural changes resulting from climate transitions complicated inflation forecasts and, consequently, monetary policymaking. Moreover, the bank's balance sheet was claimed to be itself affected by climate-related risks, as climate change and related public policies could destroy, strand, or depreciate the assets purchased or accepted by the bank as collateral (European Central Bank, 2022c;

Lagarde, 2021c, 2021h). Gradually, the core mandate argument gained prominence. According to Frank Elderson, ECB executive board member and vice chair of the SSM, 'we are acting in the pursuit of, not in spite of, our mandates. This is our duty, not an option. . . . Our failure to do so would mean we would not deliver on our mandates' (Elderson, 2021g). Furthermore, the ECB recalled that the treaties demand that EU institutions consider environmental protection in all their activities and policies (Elderson, 2021b; Schnabel, 2021a).

Against this background, and after a lengthy 18-month monetary policy review (Lagarde, 2021i), 'the first one in 17 years' (Lagarde, 2021j), the ECB devised a comprehensive though flexible climate strategy covering its essential functions, specifically in the areas of banking supervision, non-monetary and monetary policy portfolios. According to the bank, the climate roadmap had two main purposes: First, to protect the bank's balance sheet from climate-related risks (European Central Bank, 2022b; Lagarde, 2022g). Second, to align the bank's operations with the Paris Agreement and EU environmental objectives. This second purpose was to be achieved by mobilising funds for green investments and encouraging bond issuers to disclose climate-related information and reduce their carbon footprint (Elderson & Schnabel, 2022; European Central Bank, 2022d; Lagarde, 2022c).

On the monetary policy front, the ECB has included green bonds in its asset purchase programmes since their inception—specifically, in the Public Sector Purchase Programme in 2014, and in the Corporate Sector Purchase Programme in 2016. Yet, these purchases were conducted without an explicit environmental goal and were directed by the market neutrality principle, according to which the amount of purchased assets echoes their share in the market to avoid price distortions. From 2018, a renewed emphasis has been placed on the purchase of green bonds. In the Economic Bulletin 7/2018, the ECB highlighted the decisive role of the Eurosystem's purchases in reducing green bond yields and promoting their issuance (De Santis et al., 2018; Lautenschläger, 2018). In 2021, sustainability-linked bonds were accepted as

collateral and included in the central bank's asset purchases for monetary policy purposes. Although these assets were managed on the same terms as conventional bonds, this move signalled the ECB's growing support for sustainable finance (European Central Bank, 2020a).

The ECB's climate roadmap, published in July 2021, marked a turning point in the bank's monetary policy framework. Further to embedding climate protection considerations in its analysis and forecasting of the economic outlook (Lagarde, 2022a), the bank decided to tilt the purchase of corporate bonds towards companies with better climate performance (Elderson et al., 2022; European Central Bank, 2022a, 2022d, 2023g). This performance was assessed using a climate score developed by the bank, which considered the firms' past carbon emissions, plans to curb those emissions, and the level of climate-related disclosures. Low-scored companies were subjected to more rigorous maturity limits on their securities. This measure entered into force in October 2022.

Following the decline in the purchase of corporate bonds due to monetary policy needs, the ECB Governing Council announced in February 2023 that it would strengthen the green tilting during reinvestments in line with the bank's decarbonisation plan for its portfolios (European Central, 2023). The net purchases of assets had been discontinued for the Pandemic Emergency Purchase Programme and the Corporate Sector Purchase Programme at the end of March and in July 2022, respectively. Reinvestments under the Corporate Sector Purchase Programme ceased in July 2023, while reinvestments under the Pandemic Emergency Purchase Programme were to remain until the end of 2024 (European Central Bank, 2024b, 2024c, 2024d). Concerning the collateral framework, climate risks were included in the estimation of haircuts in 2022. The bank further proposed limiting the collateral linked to carbon-intensive companies from 2024. Going forward, the ECB planned to only accept assets and credit claims from firms that conform to the EU Corporate Sustainability Reporting Directive. This measure was expected to be implemented in 2026 (Elderson, 2022a; Elderson et al., 2022).

Along with the uncertainty surrounding climate change, the climate strategy was intended to be adjustable to price stability requirements, the EU and Paris green targets, as well as new environmental data (Elderson, 2021f; European Central Bank, 2022d; Lagarde, 2022c). According to the ECB president, the bank was reviewing new ways to strengthen climate criteria in its monetary policy operations (Lagarde, 2023c, 2024). Therefore, there was the prospect of additional environmental measures through monetary policy operations. Aside from the debate as to why the ECB favours green ends over other economic policy priorities (Cœuré, 2018; Schnabel, 2022a), considering the ECB's secondary objective to support the EU policy—which includes 'preserving, protecting and improving the quality of the environment' (Consolidated Version of the Treaty on the Functioning of the European Union, 2020, Article 191)—the ECB falls within the typical case study typology.

The ECB's thinking and work on environmental matters. The ECB's positioning on the role of monetary policy in the green transition has changed considerably since 2018. As I shall explain, the initial phase featured contradictory views from the central bank's senior officials. The bank progressively aligned its stance and became particularly outspoken about climate change. During the period of investigation, the ECB was not only a leading central bank in research, speeches, and other public communications on climate change, but also in its efforts to reshape monetary policy in a particular green way. On 8 November 2018, the former ECB's Executive Board Member Benoît Cœuré (2018) contended that the ECB 'can—and should—actively support' the green transition. In line with Cœuré, supply-side shocks such as climate change events force central banks to rethink their policy framework. While demand shocks are easier to overcome using conventional monetary policy tools—given that inflation, output, and employment move along the same upward or downward trend—supply-side shocks pull macroeconomic variables in opposite directions, posing a problematic trade-off between inflation target and output. For Cœuré, the increasing frequency of climate hazards and the

uncertain social and policy responses to them complicate inflation forecasting and, thus, monetary policy decisions. Against this background, Cœuré held that the ECB had to reconsider its approach to climate change and act towards its mitigation.

Some days later, on 27 November 2018, another former Executive Board Member, Yves Mersch, conveyed a completely opposite view, providing well-grounded reasons that render the use of monetary policy for climate change action not only impractical but also illegitimate. Contrary to Cœuré's stance, Mersch placed climate change on the same level as other economic shocks, such as those resulting from wars and technological breakthroughs. Although the effects of such shocks must be accounted for when setting monetary policy, Mersch held that it was not within the ECB's remit to find or finance solutions for climate issues. According to the former executive board member, the growing scientific evidence on the adverse impacts of climate change was not enough to suddenly 'create a new mandate or objective for a central bank' (Mersch, 2018). Mersch went further to say that responses to climate change were to be determined by political choices concerning the instruments to be used, when to use them, and which groups would be most affected by the measures adopted. Entering such a political arena would pose a significant threat to a 'credible monetary policy, conducted by an independent central bank' (Mersch, 2018).

The former board member raised other questions, such as 'how should a central bank with a limited geographical remit respond to events affecting the planet as a whole?' Given the bank's strict mandate, monetary policy instruments had to be 'necessary, suitable and proportionate' to the overarching goal of safeguarding price stability (Mersch, 2018). Moreover, tools such as asset purchase programmes were transient and guided by the price stability objective, meaning that the bank could need to purchase a significant amount of assets from carbon-intensive sectors. As Mersch (2018) noted, 'the APP is a tool for macroeconomic

stabilisation, not for microeconomic reallocation [of resources]. . . . It is not up to the central bank but to elected governments to decide which industry is to be closed and when'.

Departing from divergent views, the ECB progressively elevated climate change to one of its top priorities. In April 2019, the bank identified climate risks as a key risk to be included in banking supervision assessments. Notwithstanding the need to develop further knowledge and methods to tackle climate risks, the former SSM Vice Chair, Sabine Lautenschläger, asserted that 'we cannot afford to wait until we have a perfect understanding of all these risks to take action. Climate change will not adapt to our research schedules (Lautenschläger, 2019).

With the new ECB President Christine Lagarde, climate change was given a heightened 'urgency' and 'focus' (Lagarde, 2020i). At Lagarde's first monetary policy meeting in December 2019, the new president committed to considering both climate change and support for the EGD in the bank's first review of its monetary policy strategy (Lagarde, 2019). Although 'unrelated to monetary policy' (Schnabel, 2020c), climate as well as the COVID-19 health issues, were alleged to severely affect the bank's core mandate of price stability. Therefore, the bank had to play its part in mitigating those risks (Lagarde, 2020e, 2020h; Schnabel, 2020a, 2021b). The ECB often invoked the pandemic experience to show its ability to develop solutions for new challenges, notably, climate change (Lagarde, 2021b, 2021m).

Following 18 months of deliberations, the bank unanimously decided to take up the fight against one of the largest systemic risks 'to our planet' (Lagarde, 2020f; Schnabel, 2021f). According to the ECB president, the monetary policy review was an effort to adapt the bank's strategy to new needs (Lagarde, 2021i). The 'market neutrality' principle that guided the bank's operations was reassessed and replaced by 'market efficiency' (Schnabel, 2021d). The notion of market neutrality is related to Article 119 of the EU Treaty, which states that economic and monetary policy shall be conducted in line 'with the principle of an open market economy with free competition' (Consolidated Version of the Treaty on the Functioning of the European

Union, 2020, Article 119; Schnabel, 2021d). Yet, according to President Lagarde, the market neutrality principle is ‘an operational tool, not a legal requirement’ (Lagarde, 2022h).

Moreover, the eligibility criteria applied in the purchase of assets implied that the corporate bonds held by the bank could not entirely reflect the market structure. Provided that carbon-intensive firms dominate the market composition due to the presence of ‘environmental externalities’ that have not been corrected with proper carbon pricing, the market neutrality principle was argued to contribute to an inefficient distribution of resources (Schnabel, 2021b, 2021g). This was against Article 2 of the Treaty, according to which the European System of Central Banks (ESCB) shall likewise favour ‘an efficient allocation of resources’ (Consolidated Version of the Treaty on the Functioning of the European Union, 2020, Article 2).

The ECB significantly invested in communication and research on environmental issues, especially from 2021, being the central bank of this study with the highest number of publications in the field. For the ECB president, an independent central bank bases its policy decisions on robust analysis to demonstrate that the measures adopted result from scientific evidence, rather than political interference (Lagarde, 2021b). However, it is worth mentioning that the bank’s research papers are produced by its staff. Therefore, the research topics and empirical findings are generally aligned with the bank’s policy decisions.

Looking into the bank’s climate-related speeches and official communications, it is possible to identify a number of factors beyond the ECB mandate that were repeatedly emphasised by the bank’s senior representatives regarding the ECB’s actions on climate change and the green transition (European Central Bank, 2020b, 2024a; Lagarde, 2020b, 2020c, 2021a). First, the uniqueness, urgency, and complexity of the climate change shock. The bank placed climate change at a higher severity level than the COVID-19 pandemic in terms of uncertainty, scope, and effects. According to the ECB president, ‘when threats are global,

cross-sectoral and complex, no institution can understand and tackle them alone' (Lagarde, 2021n). For Lagarde, all policymakers must get involved (Lagarde, 2021c, 2021o).

Second, the slow pace at which climate commitments were being implemented. The protracted climate action revealed the economic and social unpreparedness to deliver swift responses to the climate emergency (Lagarde, 2022b; Schnabel, 2022b, 2023). The bank argued that prices did not fully reflect the economic and social costs of environmental degradation and that carbon pricing alone was insufficient to warrant an urgent transition (Panetta, 2021a; Schnabel, 2021d). Moreover, deployed measures such as the EU's Emissions Trading System and the EU taxonomy were incomplete (Lagarde, 2021c; Schnabel, 2020a). The ECB advocated that acting without delay would reduce the costs of economic shocks and abrupt policies (Nerlich et al., 2022; Schnabel, 2021d, 2021g). As noted by the ECB Executive Board Member Frank Elderson, 'the risk of doing too little too late is significantly larger than the risk of central banks and supervisors overstepping their mandate' (Elderson, 2021d).

Third, the compliance with the EU Climate Law, according to which 'all relevant Union legislation and policies need to be consistent with, and contribute to, the fulfilment of the climate-neutrality objective' (European Climate Law in Elderson, 2022c). Fourth, the need for outsized public and private investments to meet climate-neutrality goals. Whereas the Next Generation EU programme somehow cushioned the former, the latter appeared to be constrained by an European green bond and equity market, which was still growing and fragmented, preventing the allocation of sufficient funds towards a carbon-free economy (de Guindos, 2021b; Lagarde, 2021e, 2021g; Panetta, 2021b, 2022; Schnabel, 2020a, 2021e, 2023). The ECB acknowledged that its engagement in specific markets, such as the green bond market, could increase the flow of investments to green firms and technologies (Lagarde, 2021c, 2022i). Finally, fifth, the risk of litigation and reputational damage if central banks

disregarded climate change in the pursuit of both their own operations and supervisory functions (Elderson, 2021d, 2021j; Setzer et al., 2021).

Taken together, all these factors may have compelled the ECB to consider environmental sustainability more thoroughly in its monetary policymaking. Although climate events and transition policies can be linked to price volatility—backing the bank's argument that climate change action is not mission creep—the direct support for other political and societal causes is also visible. As President Lagarde (2020d) put it, 'our mission . . . is to work to make our society a better place, so that it will take up the fight against climate change, protect biodiversity, ensure that future growth is both fairer and more efficient' (p. 2). This statement takes us to a renewed and enlarged central bank purpose. Arguably, it encompasses notions of sustainable development, such as environmental protection, justice, equality, and management of natural resources, the scope of which exceeds price stability.

Concerning the ECB's macro- and microprudential work, the bank set out a guide for supervised institutions built on the *NGFS Guide for Supervisors* about managing and disclosing climate and environmental risks in 2020 (Elderson, 2021c, 2021f; Lagarde, 2021d). In 2021, the bank performed the first 'economy-wide stress test' using NGFS scenarios (a second stress test of the sort was undertaken in 2023). The assessment involved circa four million companies and 1,600 banks over a 30-year period. This exercise evaluated the exposure of companies and euro area banks to climate risks. The findings highlighted the economic and financial benefits of early and steady climate policies (de Guindos, 2021a, 2021c, 2023; Lagarde, 2021k, 2021l).

The Eurosystem adopted ESG criteria in non-monetary portfolios in 2021 (European Central Bank, 2021b). The ECB pension funds adhere to the UN Principles for Responsible Investment, and the bank's own funds include green bonds (Cœuré, 2018; European Central Bank, 2021e; Lautenschläger, 2019; Mersch, 2020; Schnabel, 2020a). In 2022, climate and environmental risks were defined as one of the ECB's top supervisory priorities for 2022-2024

(Lagarde, 2022f). Consequently, the bank rolled out a Supervisory Review and Evaluation Process (SREP) methodology that embedded climate risks and conducted a 'supervisory climate stress test' to assess the banks' readiness to tackle these risks (Elderson, 2021e, 2021i; Lagarde, 2022d). The results suggested that banks' efforts to manage climate risks were still insufficient. Banks within the Eurosystem were expected to align with the ECB climate supervisory guidelines by the end of 2024 (Elderson, 2023a; Germann et al., 2023).

With a view to pushing climate disclosures and, consequently, the green transition, the ECB disclosed climate-related information about both its non-monetary and monetary portfolios in 2023, and committed to releasing this information on an annual basis (Elderson, 2021f; European Central Bank, 2022a, 2023g, 2023e; Schnabel, 2021g). The disclosures aimed to contribute to the EU and the Paris Agreement targets by increasing the amount and understanding of climate-related data (European Central Bank, 2023c, 2023b). As the ECB president noted, 'these disclosures are a further piece of the puzzle in our efforts to contribute to fighting climate change' (European Central Bank, 2023e). This is in line with the understanding that more reliable data on climate risks allows businesses and households to make more carbon-efficient investment decisions (Elderson & Schnabel, 2023). Accordingly, the bank published statistical indicators related to climate change and sustainable finance in January 2023 to support policymakers and broader society in the analysis and design of sustainability strategies (European Central Bank, 2023d, 2023f; Kanutin, 2023).

The bank has sought to participate in the international debate and definition of best practices, notably in the context of the Technical Expert Group on Sustainable Finance set by the European Commission,[35] the NGFS—which the ECB joined in May 2018—the G20, the Climate Training Alliance, the EBA, the BCBS, the FSB, and the IMF (Elderson, 2021c;

[35] The Technical Expert Group on Sustainable Finance was created to advance the EU 2018 Action Plan on sustainable finance and, in particular, the EU Taxonomy (de Guindos, 2019; European Central Bank, 2020b; Schnabel, 2020a).

Lagarde, 2021h, 2021o; P. Lane, 2022). The ECB established a climate change centre in 2021 and set emission reduction targets for its corporate activities in line with the Paris Agreement goals (European Central Bank, 2021a, 2023a; Lagarde, 2022a). The ECB was also involved in outreach activities in preparation for its monetary policy strategy review. By way of example, the bank convened a dedicated Academic Roundtable, an ECB forum, and launched the portal 'ECB Listens to people' to collect the public's concerns and their views on how the ECB can help. As expected, climate change was claimed to be a top priority (Schnabel, 2021b, 2021c).

In addition to climate change, the ECB has been outspoken on other pressing social issues. From 2021, following the appointment of Frank Elderson in February 2021 as ECB executive board member and vice chair of the SSM, the bank expanded its communication to other nature-related topics, such as biodiversity loss, water shortages, and gender diversity, based on the premise that nature and the economy are interrelated.[36] Therefore, the policy design should take them both into account (Elderson, 2022b). As with the appointment of the ECB President, Christine Lagarde, the appointment of Frank Elderson suggests that climate and other nature-related ideas gained force following the arrival of new senior officials. Indeed, the role played by the profiles and views of those in power has been highlighted by both earlier studies, as discussed in the Literature Review, and by some interview participants, as one of the contributing factors to the greening of the ECB's operations (e.g., Interview 5; Interview 6; Interview 9; Interview 10).

The bank has produced and published growing research (Elderson, 2023b), including a pioneering study on the relationships between nature loss and euro area firms, which pointed to the significant negative effects of nature loss and degradation on the economy and financial system (Ceglar et al., 2023). In January 2024, the bank announced its Climate and Nature Plan

[36] Frank Elderson also served as co-chair of the BCBS's TCFD and was the founding Chair of the NGFS from December 2017 to January 2022 (NGFS, 2022a; Single Resolution Board, 2025).

2024-2025, where nature-related risks became one of the guiding principles of the bank's activities (European Central Bank, 2024a). This latest information may anticipate new ECB actions towards environmental issues.

Regarding gender diversity, research undertaken by the bank's staff found a correlation between the gender composition of firms and carbon emissions. In essence, companies with a higher number of females at their management level show more significant contributions to climate change, given women's greater sensitivity to societal issues (Altunbas et al., 2022; Gambacorta et al., 2022). Both topics, nature and gender diversity, were embedded into the ECB's banking supervision guidelines (Elderson, 2021a, 2021c, 2021f, 2021h). Climate change and 'women's issues' were also two main societal objectives that the ECB President, Christine Lagarde, committed to when she was appointed in late 2021 (Lagarde, 2022e).

The evolving role of the ECB's purpose and tools in line with collective issues becomes clear in the following statement by the ECB's Executive Board Member, Isabel Schnabel:

> The challenges central banks are facing today are fundamentally different from the ones that were relevant when they gained broad political independence. Inflation is less of a concern to many people, in large part reflecting the achievements of central banks over time. As a result, expectations towards central banks have changed. Many call for central banks to have a more active role in tackling wider societal challenges, climate change in particular. (Schnabel, 2021b)

5.2.6 *India – Reserve Bank of India*

The Reserve Bank of India (RBI) is India's financial regulator, banking supervisor, and monetary authority (Reserve Bank of India, 2023c). According to the RBI's act, 'the primary objective of the monetary policy is to maintain price stability while keeping in mind the objective of growth' (Reserve Bank of India Act 1934, 2022, Preliminary). The interplay between economic growth and environmental sustainability was persistently addressed in the

bank's annual reports. Initial concerns were directed to the successive droughts faced by the country and their impact on the agriculture sector, which nudged the RBI to call for a 'green revolution' back in 2010 (Reserve Bank of India, 2010, p. 20). The bank drew attention to the vulnerability of the country to environmental hazards and, in particular, climate change (Dilip & Kundu, 2020; Ghosh, Kundu, et al., 2021; Prakash et al., 2020; Rao, 2022). This argument aligns with the Climate Risk Index 2025, published by Germanwatch (Adil et al., 2025), which ranks India as the sixth country most affected by climate change risks between 1993 and 2022 (see also Ghosh, Kundu, et al., 2021; Reserve Bank of India, 2023c).

The bank's argument for increasing green finance gained traction as of 2021 along with key events, most notably, the bank's membership at the NGFS in April 2021, India's commitment to reduce 45% of its carbon emissions by 2030 and achieve carbon neutrality by 2070 in November 2021, and the country's more recently announced ambition to become an advanced economy by 2047. According to the Reserve Bank, all these commitments pose a trade-off between environmental goals and economic targets (Reserve Bank of India, 2023c). However, the bank held that 'climate change has been appropriately assigned to the domain of fiscal policy' (Reserve Bank of India, 2023c, p. 23; Rao, 2023), despite its likely impact on the central bank's activities (Rao, 2023). The RBI's narrow mandate, combined with the reduced number of policy tools, forced it to focus on its core tasks. Climate change was not one of them.

The bank feared failing to achieve its primary mandate, losing its legal independence from the central government, and missing climate targets if it expanded its sphere of action. Furthermore, unlike other central banks such as the BoE and the ECB, the RBI claimed that it did not hold corporate bonds or other private securities in its portfolio, which would allow it a closer involvement with market participants. As for collateral, the RBI only accepted government securities as loan guarantees, which limited the bank's market operations. As a

result, the RBI's focus was on 'managing the outcomes from climate change' as these could impair inflation forecasts and the stability of the financial system (Rao, 2023).

Accordingly, the bank adopted a small number of green measures with low impact on its engagement with environmental policy. Concretely, the RBI added renewable energy projects to its Priority Sector Lending list in 2012. The objective was to raise households' liquidity for solar and other 'off-grid renewable energy solutions' (Rao, 2021). The facility was expanded to firms in the renewable energy sector in 2015. Additionally, the maximum amount of individual loans allocated to the energy sector increased from 15 crore in 2015 to 30 crore in 2020 (Ghosh, Nath, et al., 2021; Rao, 2022; Reserve Bank of India, 2016). No other green-targeted policies were envisaged in the monetary policy space, despite the intensifying environmental work in other areas of the bank. Given the RBI's mandate focused on price stability, the RBI represents a typical case.

The RBI's thinking and work on environmental matters. Recognising the impact of climate change events on inflation and the economic outlook, the RBI increased its efforts in capacity building, assessing climate change risks, raising awareness, providing guidance on best practices, and including climate change risks in the monitoring of financial stability (Ghosh, Nath, et al., 2021, pp. 2021–2022; Rao, 2021, 2022; Reserve Bank of India, 2022a; Sinha & Bhanvadia, 2024). The bank launched the first recommendations on Corporate Social Responsibility, Sustainable Development and Non-financial Reporting in 2007. These guidelines were complemented by government instructions to encourage companies to adjust their business strategies in line with the principles for responsible investment. Specifically, the Voluntary Guidelines on Corporate Social Responsibility issued in 2009, which were upgraded to the National Voluntary Guidelines on Environment, Social and Economic Responsibilities of Business in 2011, whose terms became mandatory in 2013 (Chakrabarty, 2013; Ghosh, Nath, et al., 2021; Reserve Bank of India, 2016, 2023c; Subramaniam, 2011).

The first RBI speech on environmental sustainability found in the research data dates back to 2013 and was delivered by the RBI's deputy governor (Chakrabarty, 2013; Reserve Bank of India, 2013). The speech highlighted some critical green finance topics currently discussed, notably the crucial role of 'green banking' in cushioning sustainable development (Chakrabarty, 2013, p. 13). While the former deputy governor assumed that environmental issues were not a central topic for the central bank, he also recognised that the RBI's operations were affected by them through inflationary prices, asset damages, and increased financial risks for regulated entities, especially credit, legal, and reputational risks.

The conception of double materiality, whereby financial activities are both affected by and contribute to environmental degradation, was underscored in the 2011-2012 annual report (Reserve Bank of India, 2012). In the same document, the RBI highlighted the crucial role of the financial sector in mitigating GHG emissions, notably by mobilising investments towards industries or sectors striving to become sustainable (see also Chakrabarty, 2013). As a result, the bank added the renewable energy sector to its Priority Sector Lending in 2012.

Subsequent annual reports, especially those from 2016, emphasised the need to raise private funds for green investments and embed ESG factors into the investment decisions of commercial banks. The RBI further underscored the Paris Agreement goals and the national efforts concerning the development of renewable energy (Reserve Bank of India, 2018). It is worth mentioning that India launched its first green bonds in 2015. Although the percentage of green bonds in India is relatively small, circa 0.7% of the total amount of domestic bonds as of 2021, India's issuance of green bonds was placed second among the EMDE, just behind China (Ghosh, Kundu, et al., 2021; Ghosh, Nath, et al., 2021; International Finance Corporation, 2022; Rao, 2021, 2022). The Bombay Stock Exchange and the National Stock Exchange are part of the UN Sustainable Stock Exchanges Initiative (Reserve Bank of India, 2020).

The RBI joined the NGFS in April 2021. On the occasion of COP26, and alongside the bank's support for the NGFS Glasgow Declaration, the RBI pledged to green India's financial system by conducting research, assessing and sharing information on CRFRs, and including those risks into the bank's risk management and monitoring of macroeconomic and financial stability (Dayal, 2021a, 2021b; Reserve Bank of India, 2022a, 2022b, 2023d). Most crucially, India's prime minister committed to reaching net-zero emissions by 2070 at COP26 (Climate Action Tracker, 2023b; Rao, 2022).[37] To ramp up green finance and accelerate the transition efforts, the government of India launched the first green sovereign bonds in January 2023, with the regulatory and technical support of the RBI as the government's debt manager (Dayal, 2023; Rao, 2022; Reserve Bank of India, 2022a).

In May 2021, the bank established the Sustainable Finance Group within the Department of Regulation (Reserve Bank of India, 2022a, 2022b). The group was tasked with coordinating the bank's efforts on sustainable finance and developing a framework to include climate and environmental-related risks in the activities of regulated banks. It represents the Reserve Bank in bilateral and multilateral settings that discuss and advise on sustainable finance, including the India-UK Sustainable Finance Forum set up in 2020, the International Platform on Sustainable Finance, the working groups of the FSB on climate risks and related disclosures, the BCBS's Task Force on Climate-related Financial Risks (TCFR), the BIS, and the IMF. Also, India held the presidency of the G20 between December 2022 and November 2023. One of the group's top priorities under the Finance Track was addressing climate change (Reserve Bank of India, 2023d). The RBI emphasised the green progress of other central banks, especially the BoE and the ECB (e.g., Reserve Bank of India, 2020, 2022a, 2023c).

[37] Net-zero emissions represent a situation where the amount of GHG released into the atmosphere is as close as possible to zero, either by reducing or absorbing remaining emissions using specific mechanisms (UN, n.d.). Contrary to carbon neutrality, net-zero emissions include gases other than carbon dioxide (EP, 2019).

Concerning the bank's supervisory function, the RBI was developing guidelines on disclosures, climate scenarios, and stress testing for financial institutions (Rao, 2023; Reserve Bank of India, 2023c, 2023d). In line with the practice adopted by other central banks, the RBI surveyed 34 banks in January 2022 to collect their views and practices on managing climate risks. In July 2022, the bank launched a discussion paper on the survey results. During October and November of that year, the RBI conducted a climate scenario analysis involving the country's 15 largest banks to assess the impact of climate change on the Indian financial system (Dayal, 2022; Rao, 2022; Reserve Bank of India, 2022b, 2023c, 2023d; Sinha & Bhanvadia, 2024). The findings pointed to well-known challenges related to data gaps, lack of knowledge, absence of adequate methodologies, as well as complex and costly reporting processes, which deterred firms from adequately measuring climate risks and complying with recommended practices (Rao, 2021; Reserve Bank of India, 2020, 2023c; Sinha & Bhanvadia, 2024).

In January 2023, the RBI set out a framework for green deposits, whereby the proceeds from customers' deposits were allocated to environmental projects (Reserve Bank of India, 2023a, 2023b). The bank has also published the results of a GDP scenario analysis for different levels of carbon intensity in India. The findings pointed to the need for bold and concerted actions at national and international levels, along with precise green definitions and an Indian taxonomy to enhance the green market (Rao, 2022; Reserve Bank of India, 2022a, 2023c).

The RBI has long expressed interest in the environmental impact of its facilities through its Green Initiatives plan, having received national awards for its energy and environmental efficiency strategy (Reserve Bank of India, 2011, 2012). The bank conducted a study on the environmental consequences of banknotes in 2011 and rolled out an action plan to monitor and reduce the GHG emissions of its corporate operations in 2012. Additionally, the Reserve Bank convened conferences on climate change and, like many other central banks that implemented

a climate strategy, announced the launch of a website to post bank-specific communications on climate and other environmental topics (Reserve Bank of India, 2023c, 2023d).

5.2.7 *Indonesia – Bank Indonesia*

'The objective of Bank Indonesia [BI] is to achieve rupiah stability, maintain Payment System stability, and participate in maintaining Financial System Stability to support sustainable economic growth' (Law of the Republic of Indonesia Number 23 of 1999 on Bank Indonesia, 2023, Article 7). Articles 1 and 7 of the bank's Act further explain the role of monetary policy: 'to reach and maintain rupiah stability', that is, 'low and stable inflation', as well as exchange rate stability. BI is also tasked with developing and implementing macro and microprudential policy,[38] as well as supervising financial institutions in collaboration with the Indonesian Financial Services Authority (Bank Indonesia, 2022c).

The search strategy deployed in this study retrieved a relatively low number of publications from the bank's website, which seemed partly due to technical issues with the search engine. Therefore, I proceeded with the examination of the bank's annual reports from 2011 onwards.[39] Climate change and green finance instruments were first addressed in the 2019 annual report (Bank Indonesia, 2020). In the same year, BI became a member of the NGFS and developed sustainable initiatives in the field of macroprudential policy, as explained below. During Indonesia's G20 presidency between December 2021 and November 2022, climate change and sustainability were given increased emphasis in the bank's communications (Bank Indonesia, 2022b, 2022c; Embassy of the Republic of Indonesia in Madrid, n.d.).

Throughout 2022, BI rolled out a green finance framework, the Bank Indonesia Green Institution Framework, the details of which are outlined in the following subsection. As far as

[38] Macroprudential policy concerns financial regulation aimed at minimising systemic risks, whereas microprudential policy refers to regulation focused on managing individual financial institutions (Bank Indonesia, 2022c, p. 168).

[39] The annual reports for 2010 and 2013 were not available.

monetary policy is concerned, the bank has included green and other sustainability-related bonds in its reserve portfolio since 2019, and is a public supporter of the BIS Green Asian Bond Fund (Bank Indonesia, 2023; Haryono, 2022a). No other GMP measures were identified within the researched period. Given the bank's mandate focused on maintaining the currency's value, BI fits within the typical case study typology.

BI's thinking and work on environmental matters. Concerns about climate change and elements of green banking have featured BI's publications since at least 2010 (Johansyah, 2010). At that time, the bank signed a memorandum of understanding with the Ministry of Environment to encourage environmental practices within the banking industry and support an environmentally sustainable economy. The agreement envisaged 'Green Banking' regulations issued by the central bank. The newly established framework valued green financing and alerted to credit, reputational, and legal risks if environmental considerations were overlooked (Bank Indonesia, 2013a)—recurrent topics in today's sustainable finance debate.

BI advanced its 'green macroprudential policy' in 2019 by lowering the bank loan requirements for financing green properties and vehicles (Bank Indonesia, 2021, p. 59, see also 2020). In 2020, BI added green finance to its Medium-Term Plan 2020-2025. Since then, the bank has intensified its English communications on climate change and sustainable finance (Bank Indonesia, 2021). This was especially so in 2022, by virtue of Indonesia's G20 presidency and the sustainable finance agenda under the Financial Track. The bank strengthened research on 'green economy' and sustainable finance (Bank Indonesia, 2022b, 2022c, 2023; Haryono, 2022b), having produced a number of topical working papers in 2022 (Anugrah et al., 2023; Rishanti et al., 2023; Rishanty et al., 2023; Zhanga et al., 2023).

BI has particularly emphasised two main publications: the *Green MSME* [Micro, Small, and Medium Enterprises] *Business Model Development Review*, with recommendations for green business strategies, and the *Green Institution Review* 'to explore good institutional

practices for green central banking' (Bank Indonesia, 2023, p. 44). The latter resulted in the Bank Indonesia Green Institutional Framework, which brings together the bank's activities in the environmental field. These included the *Integrated Commercial Bank Report*, which collects information on banks' carbon emissions, a Green Calculator to help firms measure their emissions, and a climate stress test involving Indonesian financial institutions conducted in collaboration with government agencies and the Indonesian supervisory authority. On the macroprudential front, BI further offered banks the opportunity to meet the Macroprudential Inclusive Financing Ratio by purchasing ESG securities or financing projects linked to the SDGs (Bank Indonesia, 2023). All these initiatives were documented in the year 2022.

Further to BI's membership in the NGFS in November 2019, BI has followed the green finance work advanced by multilateral organisations such as the IMF, the FSB, and the BIS, and has participated in sustainable finance discussions at the EMEAP, the Association of Southeast Asian Nations (ASEAN), and the G20, where the bank co-led the G20SFWG during the 2022 Indonesia's presidency (Anwar et al., 2020a; Bank Indonesia, 2019, 2020, 2022a, 2022c, 2023; Haryono, 2022a). BI has been pursuing a programme of social and environmental nature since 2012, the Bank Indonesia Green Institution Initiative (Bank Indonesia, 2023, p. 42), which entails awareness-raising initiatives and a resource management plan for its banknotes, corporate activities, and facilities (Bank Indonesia, 2013b, 2023).

5.2.8 *Japan – Bank of Japan*

The Bank of Japan Act mandates the national central bank 'to issue banknotes and to carry out currency and monetary control' with the aim of achieving 'price stability' (Bank of Japan Act, 1997, Articles 1–2). In addition, the bank shall contribute to financial stability by ensuring the 'smooth settlement of funds among banks and other financial institutions' (Bank of Japan Act, 1997, Article 1). Despite the limited mandate focused on price and financial stability, the BOJ has encouraged investments in environmental projects since 2010 through

the Growth-Supporting Funding Facility. This facility eased credit conditions to a range of sectors considered crucial for economic growth, including the environment. This measure was adopted to counteract a long period of deflation affecting the national economy, as I shall explain in more detail in the empirical analysis of the BOJ (p. 254). Disbursement of new loans under the Growth-Supporting Funding Facility ceased in June 2022, although existing loans could be rolled over for up to four years, until June 2026 (Bank of Japan, 2010h, 2021a).

In 2021, climate change emerged as a major challenge that demanded a decisive response from the central bank (Kuroda, 2021d). Amid the ongoing debate as to whether and how central banks should engage in fiscal matters (Wakatabe, 2021), the BOJ decided to step up its support for the decarbonisation of the economy. In July 2021, the bank published its Strategy on Climate Change, which announced, among other initiatives, a novel monetary policy tool specifically designed to assist financial institutions in raising funds for climate change mitigation: the Climate Response Financing Operations (Bank of Japan, 2021a, 2021f, 2022c, 2022e, 2023g; Nakamura, 2021). The new policy tool was planned to be in force until March 2031. The 2021 climate roadmap also announced the inclusion of green bonds in the bank's foreign exchange reserves, including investments in the EMEAP Asia Green Bond Fund established in March 2022 (EMEAP, 2021). In December 2023, the bank decided to include Japan Climate Transition Bonds in the bank's purchase and sale of government bonds (Bank of Japan, 2023l, 2023m).

The BOJ has demonstrated a willingness to address climate change and support sustainable development. Similar to the ECB's view, according to which the market neutrality principle does not hold in the presence of environmental externalities, the BOJ claimed that the market was biased towards brown assets. Therefore, measures were needed to make it more neutral (Amamiya, 2022; Kuroda, 2021b, 2022). Yet, the BOJ considered the operationalisation of the market neutrality concept important. According to the bank, its

operations had to be conducted in ways to minimise 'the microeconomic allocation of resources' to certain firms or industries (Amamiya, 2022), the task of which belongs to 'governments and legislative bodies' (Amamiya, 2021). Therefore, the BOJ maintained that it should refrain from discriminating between green and brown activities when offering preferential loans (see also Bank of Japan, 2021f, 2021g, 2022c, 2022e; Kuroda, 2021b).

To minimise the distributional effects resulting from the bank's activities, the BOJ left the decision regarding the investments or loans that best address climate change to the financial institutions. In turn, these institutions must disclose climate-related information on their investment decisions in line with the TCFD guidelines (Bank of Japan, 2021i, 2021j, 2022c, 2022e; Kuroda, 2021c). According to the bank's former deputy governor, 'the Bank's new measure . . . could be the world's first such attempt, in that it ensures flexibility while avoiding involvement in micro-level resource allocation as much as possible' (Amamiya, 2021). Arguably, by easing credit to firms that address climate change, the BOJ influences firms' decision-making concerning what and how they produce. Against the background of its narrow mandate, I classified the BOJ as a deviant case study.

The BOJ's thinking and work on environmental matters. Climate change has been addressed in the BOJ's publications since 2019, the year of the bank's membership in the NGFS (Bank of Japan, 2020e). The Climate Strategy, launched in 2021, marked a turning point in the bank's direction towards supporting the government and broader society in mitigating climate change. A set of measures spanning different functions of the central bank was rolled out, including GMP tools (Bank of Japan, 2022c, 2023h; Kuroda, 2021b). It was possible to identify a number of key factors behind the bank's decision to take prompt action on climate change, notably via bank loans. First, the bank argued, climate-related events were likely to 'exert an extremely large impact on developments in economic activity and prices as well as financial conditions' (Bank of Japan, 2022e, p. 33; Nakamura, 2021). By contributing to

ensuring a smooth transition, the central bank would help limit future price fluctuations and economic disruptions (Amamiya, 2022).

Second, the urgent and extensive investments needed to decarbonise the economy, which required a supportive and well-functioning financial system to secure funding (Amamiya, 2022; Kuroda, 2021d, 2021e; Wakatabe, 2021). Third, the absence of developed taxonomies, regulations, and a solid green bond market that encouraged climate change investments (Amamiya, 2021, 2022; Kuroda, 2021b; Nakamura, 2021). According to the bank's former deputy governor, Japan was still advancing taxonomies and corporate reporting processes, which prevented the bank from using other policy instruments, such as greening the corporate bond portfolio and collateral framework (Amamiya, 2022; Bank of Japan, 2021l, 2022g; Kuroda, 2021b; Wakatabe, 2021).

Fourth, besides these economic and financial accounts, the 'tragedy of the horizon' if no immediate action were taken (Wakatabe, 2021). There was as though an underlying 'force majeure' that required all institutions to take part in a response to climate change, no matter their statutory objectives or role in society. As the bank noted, 'there is widespread acceptance . . . that climate change in particular is a global challenge that could have a broad impact on society and economic activity . . . central banks are expected to address this issue', given their influential role in the economy and financial system (Bank of Japan, 2022e, p. 58; Kuroda, 2021a). This statement points to the role of external pressures and social legitimacy that encouraged the BOJ to address this novel issue. Politically, it should be noted that the Government of Japan committed to achieving net-zero carbon emissions by 2050 in October 2020, which required concerted and enhanced national efforts (Kuroda, 2021a, 2021b, 2021e).

The interplay between climate change, the economy, and the financial system became a central research topic in 2021 (Bank of Japan, n.d.-a). The bank carried out a scenario analysis on the impact of floods on the Japanese economy, which represented 70% of Japan's natural

disasters (Ashizawa et al., 2022; Bank of Japan, 2021c). This percentage was expected to increase due to climate change, affecting the economic stability and financial health of firms. The BOJ performed two market surveys to evaluate how the Japanese financial system handled climate-related issues and to consider possible improvement measures (Bank of Japan, 2021o, 2022f, 2023a, 2023h, 2023j). Interaction with the broader public on climate change was strengthened via thematic events and the launch of a webpage where the bank publishes institutional communications on the subject (Bank of Japan, n.d.-a, 2020e, 2021h, 2022f, 2023h, 2023j). The webpage also contains links to the green finance guidelines from organisations such as the NGFS, the BCBS, the FSB, and the TCFD. The bank has participated in other international settings where climate change is a significant agenda topic, including the G7, the G20, the IMF, the BIS, and the EMEAP.

In the financial stability area, the bank strengthened its collaboration with the FSA, the Japanese supervisory authority, concerning the integration of climate risks into the supervision of financial institutions. The BOJ and the FSA undertook a climate scenario analysis of the largest financial institutions based on the NGFS templates. Japanese banks were expected to publish climate-related information following the TCFD guidelines (Bank of Japan, 2022b, 2022d, 2023e). At a corporate level, the bank set forth an action plan to reduce the carbon footprint of its own facilities and business operations. It also disclosed the carbon footprint of the bank's portfolios for 2022 and 2023 in line with the TCFD recommendations. To coordinate the bank's climate work, the BOJ set up a Climate Coordination Hub in 2021 (Bank of Japan, n.d.-c, 2021f, 2021h, 2022c, 2022e, 2023h; Kuroda, 2021b).

5.2.9 *Korea – Bank of Korea*

The Bank of Korea (BOK) Act established the national central bank with the objective of keeping price stability by means of 'monetary and credit policies' (Statutes of the Republic of Korea, 2018, Article 1). In conducting its duties, the BOK shall take financial stability into

account. According to the bank's law, price stability—defined as the preservation of the currency value—constitutes the chief objective of monetary policy (Bank of Korea, n.d.). The BOK is among the top five central banks in this study with the fewest environmental-related publications obtained through the search strategy. This could have resulted from the effective absence of such information in English, as the retrieved research papers only provided abstracts or executive summaries in English. Despite the limited number of English publications, the BOK has endeavoured to communicate its efforts in 'playing a leading role in responding to climate change' (Bank of Korea, 2021c, p. 2, 2022, p. 51).

Along with the climate actions undertaken by other leading central banks, such as the ECB, the BoE, the BOJ, and the Riksbank (Bank of Korea, 2021c), the BOK has incorporated climate change elements into its activities. In essence, the bank added climate change to the bank's Medium and Long-Term Strategic Plan 2030, established the Joint Task Force of Relevant Departments to Establish a Climate Change Response Strategy in April 2021, and devised a climate roadmap dated October 2021—that is, right before COP26, in November 2021—where it committed to using 'lending . . . and open market operations to encourage the smooth supply of funds to eco-friendly sectors' (Bank of Korea, 2021c, p. 16, 2022). To this end, the BOK decided to exclude from the bank's foreign exchange investments certain companies that did not factor ESG criteria in their decision-making processes, known as 'negative screening' (Bank of Korea, 2023, p. 71). This measure was adopted in 2022. However, the BOK has purchased ESG assets since December 2019, with the aim of aligning the bank's practices with responsible investment principles (Bank of Korea, 2021c, 2023).

The 2021 climate strategy further announced the central bank's prospect to accept green bonds as collateral and support SMEs through its Financial Intermediated Lending Support Facility (Bank of Korea, 2021c, 2022). These 'more sophisticated measures' were considered on the grounds that climate change was 'being perceived as a new type of risk' (Bank of Korea,

2021c, p. 2, 2022, p. 51). Protracted climate responses could make other crises more significant and frequent (Rhee, 2023). Against this backdrop, the BOK argued that 'the role of central banks is currently expanding from being an inflation fighter to being a crisis fighter' (Bank of Korea, 2021c, p. 1).

Except for the negative screening mentioned earlier, which some central banks often justify on the grounds of investment performance, no evidence was found concerning other GMP measures implemented by the BOK. It is worth noting that although the 2021 annual report pointed to the possibility of a green lending facility and the acceptance of green bonds as collateral (Bank of Korea, 2022), as outlined in the BOK's climate strategy, these measures were not mentioned in the bank's 2022 annual report (Bank of Korea, 2023). This finding may suggest the bank's hesitancy towards greening its monetary policy framework. In light of the bank's narrow mandate, the BOK was classified as a typical case study. Should the previously proposed two measures come into force, the BOK can become a deviant case.

The BOK's thinking and work on environmental matters. The BOK recognised the adverse effects of climate change on the bank's mandate. Further to the physical risks arising from climate events, the bank advocated that firms engaged with polluting industries must adopt preventive measures to lower their exposure to climate transition risks (Bank of Korea, 2021b; Jeayoon & Eunkyung, 2022; Lee, 2023). The risks associated with the green transition were argued to be particularly significant in Korea, as the country's economic structure relied heavily on exports from carbon-intensive industries, including steel, cement, oil refining, and chemicals. Consequently, Korea remained highly vulnerable to carbon taxes and other climate protection policies implemented worldwide (see also Ahn, 2022; Bank of Korea, 2021b; Rhee, 2023; Seonjin et al., 2021).

In addition, the bank argued that SMEs lacked access to green funding due to their limited resources to tackle and disclose climate-related risks (Bank of Korea, 2021d; Rhee,

2023). Although the Korean government was implementing an action plan to achieve carbon neutrality by 2050, including an intermediate milestone to reduce 40% of its emissions by 2030, the BOK contended that further efforts were needed from other policy fronts (Seonjin et al., 2021). The inability of SMEs to mobilise green funding, coupled with the small dimension of the Korean green finance market, led the BOK to consider supplementary measures, such as the greening of collateral and favourable credit conditions.

Following 'public expectations' towards the central bank's research and policymaking on broader economic and societal issues, such as 'aging population and climate change' (Bank of Korea, 2021a, p. 124), BOK hired climate experts and set out a Climate Risk Research Section to advance studies, including NGFS climate scenario analyses and stress tests, as well as devise policy measures (Bank of Korea, 2021b, 2021c, 2022, 2023; Jongwook & Nayoon, 2021). Regarding the bank's corporate operations, the BOK established carbon emission targets and offered training programmes on climate change for its employees (Bank of Korea, 2022).

Much like other central banks advancing a green strategy, the BOK was planning to launch a climate change webpage (Bank of Korea, 2021c). The bank has contributed to the international policy debate on climate change through its participation in meetings at the G20, BIS—the BOK supports the BIS Asia Green Bond Fund (Bank of Korea, 2022)—the IMF, the World Bank, the EMEAP, the South East Asian Central Banks (or SEACEN), the BCBS, and the NGFS (Bank of Korea, 2020, 2023). The BOK became an NGFS member in November 2019, having participated in the network's macrofinancial workstream (Bank of Korea, 2022).

5.2.10 *Mexico – Banco de México*

The main objective of *Banco de México* (Banxico) is to maintain 'the purchasing power' of the 'national currency' by keeping inflation low and constant. In addition, Banxico shall promote the 'sound development' of the financial and payment systems (Banco de México, n.d.; Banco de México Law, 2014, Article 2). Recognising the adverse impact of

climate risks on both the performance of individual firms and the financial system as a whole (Guzmán Calafell, 2019), the bank included climate change within its legal objective of contributing to the 'sound development of the financial system' (Díaz de León, 2020, p. 2). Specifically, Banxico sought to promote risk management practices that counter the negative externalities of environmental degradation, leaving the role of devising the necessary green economic policies to political authorities (Díaz de León, 2019b).

Concerning the bank's policymaking, Banxico adopted ESG components in the purchase and risk management of its foreign exchange reserves in 2021 (Banco de México, 2021b; Guzmán Calafell, 2019). No further GMP measures were announced up to January 2024, despite the bank being a founding member of the NGFS, publicly supporting the network's work, and expressing its commitment to greening the financial system (Banco de México, 2021a, 2021b; Díaz de León, 2019a, 2019b, 2021b; Espinosa, 2022, 2023). Given the bank's limited mandate, which is centred on currency value and financial stability, Banxico exemplifies a typical case study.

Banxico's thinking and work on environmental matters. Banxico has long published studies on the macroeconomic effects of weather events, given the country's significant exposure to climate and environmental shocks (Arellano Gonzalez, 2023; Arellano Gonzalez et al., 2023; Juárez-Torres, 2015; Juárez-Torres et al., 2013). In 2019, the bank conducted a financial market survey with the United Nations Environment Programme to assess how Mexican financial firms incorporated climate-related risks and opportunities in their management practices (Banco de México, 2020). The findings were detailed in the report *Climate and Environmental Risks and Opportunities in Mexico's Financial System. From Diagnosis to Action*, which highlighted the incipient stage of the green financial system in Mexico (Banco de México & United Nations Environment Programme, 2020). Therefore, a set of measures was suggested to mainstream climate risk management practices and mobilise

green funds in line with the country's Nationally Determined Contributions (also known as NDCs) and the SDGs. Particular emphasis was placed on creating a green taxonomy and a working group to develop a sustainable finance framework in Mexico.

In 2020, Banxico proposed the creation of the Sustainable Finance Committee, led by the Ministry of Finance, which comprised all national financial authorities, with Banxico serving as the Committee's Secretary. The Committee was tasked with designing and implementing environmental disclosure standards, financial regulation, and supervisory guidance. For the bank's senior officials (Díaz de León, 2019b; Guzmán Calafell, 2019), the classification of green activities and consistent disclosures were crucial for developing green finance instruments, such as green and sustainability-linked bonds and loans. The shortage of these tools, combined with the high cost of capital in the EMDE due to their extensive exposure to climate risks, was depriving the mobilisation of green financing in Mexico (Díaz de León, 2021b). Therefore, the bank's governor assigned an essential role to multilateral organisations and development banks in promoting green investments in the EMDE (Díaz de León, 2021a).

Banxico established the Directorate for Analysis and Policies of Environmental and Social Risks in 2021 to align the bank's climate work and engage with international forums, notably the FSB, the BCBS, and the G20 (Banco de México, 2021a, 2021b). In 2022, the Sustainable Finance Committee conducted scenario analyses based on NGFS templates (Banco de México, 2021b; Espinosa, 2023). Overall, Banxico's role in the low-carbon transition primarily focused on building knowledge and raising awareness by producing information about methodologies and risk management practices, convening workshops and seminars, and advising financial institutions (Banco de México, 2021a; Díaz de León, 2019a, 2020).

In 2022, Banxico and the Bank of France jointly led the NGFS work on biodiversity loss, which was seen as a new 'source of economic and financial risk' and a more complex issue than global warming (Espinosa, 2023; NGFS, 2022b). The biodiversity topic was

considered particularly relevant for EMDE, given their richness in natural resources and limited means to protect and restore them. The bank's deputy governor argued that Mexico was one of the most biodiverse countries, and therefore, was jeopardised by climate change and the overexploitation of natural resources (Espinosa, 2022, 2023). Hence, the bank supported an enhanced framework that addressed both climate change and biodiversity loss, as they were related and aggravated each other's adverse effects on economic growth and financial stability.

5.2.11 *Norway – Norges Bank*

The statutes of Norges Bank define the bank's core activities as follows: '(1) . . . to maintain monetary stability and to promote the stability of the financial system and an efficient and secure payment system.' Additionally, '(2) the central bank shall contribute to high and stable output and employment' (Act relating to Norges Bank and the Monetary System (Central Bank Act), 2019, Sections 1–2). Through its investment mandate, Norges Bank is also responsible for managing the Norwegian Government Pension Fund Global (GPFG) (Matsen, 2019b; Norges Bank, 2020a, 2021b; Olsen & Vikøren, 2019). According to the law and the monetary policy description on the central bank's website (Norges Bank, 2021g), Norges Bank's primary monetary policy goal is to keep inflation low and constant. Although the mandate is not explicit regarding the positioning of output and employment within the bank's overall mandate, they appear subordinated to price stability. In any event, the presence of economic variables within the bank's mission provides it a greater margin of manoeuvre to select between them and implement policy measures that support green output and jobs.

Norges Bank has extensively written about the risks associated with climate change and how it affects Norway's economy and financial system. Norway seems to be less impacted by climate risks compared to other countries. On the one hand, the country was one of the first jurisdictions to introduce a tax on carbon emissions, in 1991 (Norges Bank, 2020c; Norwegian Petroleum, 2034). On the other hand, energy consumption in Norway is substantially based on

renewable sources (Matsen, 2019b). According to the International Energy Agency, 98% of Norway's electricity system was generated by renewable energy in 2020 (International Energy Agency, 2022). While advances on the regulatory and technological fronts alleviate the pressure on national authorities to achieve environmental targets, the bank recognised that some economic and financial disruptions may unfold from a changing climate and related regulations, new consumer preferences, and the development of (risky) green technologies. It is worth noting that Norway is committed to reducing carbon emissions by 50% by 2030 and achieving 'a low-carbon economy in 2050'(Norges Bank, 2021c).

Despite these challenges, the bank's former Deputy Governor, Egil Matsen, stated that 'measures to influence industry structure are not within Norges Bank's remit' (Matsen, 2019b). Additionally, the bank lacked suitable policy instruments to resolve climate change. Its main policy tool, the interest rate change, was said to have an undesired effect before climate shocks for several reasons. Firstly, an increase in overall prices caused by a climate event leads to a rise in the policy rates, further depressing output and employment. Secondly, as climate change and the transition to a low-carbon economy affected sectors, industries, and groups differently, a single policy rate cannot account for these varying implications. Therefore, the bank argued, climate change requires policy solutions from political authorities and, especially, fiscal policy tools (Matsen, 2019a, 2019b; Norges Bank, n.d., 2019b, 2020b, 2020c, 2021b, 2021c, 2021d, 2021f, 2021f, 2022b; Olsen & Vikøren, 2019). The bank's main contribution to output and employment was to keep a flexible inflation target that distinguishes between climate and demand-side shocks (Norges Bank, 2020a).

In addition, the bank has excluded companies on environmental grounds from its equity portfolio since 2016—the equity portfolio corresponded to circa 20% of the central bank's foreign exchange reserves (Matsen, 2019a; Norges Bank, 2017; Norges Bank Investment Management, 2021d). As of 2021, 58 companies have been banned from the bank's

investments due to failure to meet environmental and other sustainability criteria (Norges Bank, 2022b). Extending climate and other environmental principles to additional policy investments, such as sovereign bonds, was argued to put monetary and financial stability at risk, since 'some green securities are linked to new technology, which historically have entailed high risk' (Norges Bank, 2020b). The former deputy governor also maintained the need to preserve central bank independence and avoid 'conflicts of interest' (Matsen, 2019a).

As for other monetary policy operations, the bank recognised that central banks may consider applying climate risk considerations to collateral haircuts. However, the bank did not see this need (Wolden, 2021), nor did it mention the possibility of forging green nonstandard measures. On the whole, as I shall explain below, the bank sought to be recognised as a propulsor of the green transition through activities other than monetary policymaking, most notably via its GPFG mandate. For the current purpose, the bank is classified as a deviant case given its theoretically broader mandate and low GMP index (GMPI = 4).

Norges Bank's thinking and work on environmental matters. Despite the bank's measured approach to green monetary policies, Norges Bank believed that monetary and supervisory authorities could nonetheless support the financial system in adapting to and mitigating climate change. To that end, the bank increased knowledge and guidance on climate risks, promoted the integration of these risks into risk management practices, and incentivised the disclosure of climate-related information (Norges Bank, 2019b, 2020b; Olsen & Vikøren, 2019). The bank reached these goals through the companies that form the GPFG. This fund was operated by Norges Bank Investment Management under the aegis of the Norwegian Ministry of Finance. It was the largest single owner in the world's stock markets, with investments in over 9,000 companies (Norges Bank Investment Management, 2020).

The GPFG sought to maximise returns through economic, social, and environmental development. The engagement in responsible investment was based on the premise that 'by not

investing in [unsustainable] companies, the GPFG's exposure to unacceptable risks is reduced' (Norges Bank, 2021c, p. 92, 2021e, 2023; Norges Bank Investment Management, 2021a, 2021b). Therefore, the bank encouraged companies to align their business with the Paris Agreement goals, for instance, by exercising voting rights at companies' board meetings and divesting from companies that promote unsustainable products or behaviours (Matsen, 2019a, 2019b; Norges Bank, 2012, 2021c; Norges Bank Investment Management, 2021a, 2021c).

The bank issued its first expectations on managing and reporting climate risks in 2009 (Norges Bank, 2022b; Norges Bank Investment Management, 2021c, 2022). From 2011, part of the GPFG was invested in environmental projects (Matsen, 2019b). Between 2012 and 2016, climate change was discussed in the bank's annual reports, focusing on the bank's corporate operations and premises management. As of 2016, environmental responsibility became one of the bank's core goals (Norges Bank, 2017). The year 2018 marked a turning point towards a more systematic approach to climate change. The bank published a new document, *Climate Change—Expectations of Companies* (Norges Bank Investment Management, 2018), which required investee companies to present their transition plans towards climate neutrality by 2050. Companies also needed to report metrics and targets in line with the TCFD recommendations. In the same year, the bank published a climate and sustainability strategy that included its own disclosures and targets to curb the bank's carbon footprint, set up a sustainability strategy group led by the deputy governor, and joined the NGFS (Norges Bank, 2019a, 2021c, 2022b).

Within the NGFS, Norges Bank has contributed to the network's work on scenario analyses, responsible investments, and monetary policy (Norges Bank, 2021a, 2021c). The central bank has also collaborated with other international organisations and central banks with a climate agenda, especially the BIS, the IMF, the FSB, the European Systemic Risk Board (ESRB), the EBA, the ECB, and other Nordic central banks. The bank has invested in research

and conducted stress tests on the Norwegian financial system to enhance its knowledge and competencies regarding climate risks (Norges Bank, 2019a, 2021c; Olsen & Vikøren, 2019). The results pointed to the limited exposure of Norwegian banks to carbon-intensive industries (Norges Bank, 2020c, 2023). In 2021, the bank added biodiversity and ecosystems to the list of expectations that the GPFG investee firms must consider and, in 2022, launched the 2025 Climate Action Plan with further instructions on GPFG investments (Norges Bank, 2022a, 2022b; Norges Bank Investment Management, 2022). The bank's responsible investment practices have been validated by an external auditor (Norges Bank, 2022b).

5.2.12 *Poland – National Bank of Poland*

The Act on Narodowy Bank Polski (National Bank of Poland or NBP) informs that 'the basic objective of the activity of NBP shall be to maintain price stability, while supporting the economic policy of the Government, insofar as this does not constrain the pursuit of the basic objective of NBP' (The Act on Narodowy Bank Polski of 29 August 1997, 1997, Article 3). The search strategy defined in this study did not retrieve any relevant publications from the bank's website. Therefore, the bank's annual reports between 2010 and 2022 were carefully reviewed (the last one available in January 2024). The analysis pointed to some involvement of the bank in environmental topics, though superficial.

The transition to a low-carbon economy was briefly mentioned in the 2018 annual report in the context of the EBRD Strategy for Poland for 2018-2023 (National Bank of Poland, 2019). In 2019, the NBP and the European think tank Bruegel jointly convened a seminar on climate change and the role of central banks (Bruegel, n.d.; National Bank of Poland, 2020). Following international trends, the bank expanded its investments in green and sustainability-related bonds in 2021 to diversify and augment the profitability of foreign reserves (National Bank of Poland, 2022). While the bank stated that such investments underpinned the development of a sustainable economy, no strong claims were made in favour of the

environment or the green transition. The investment in the green market represented only 0.6% of the bank's foreign exchange reserves. In the same year, the bank conducted a survey on the Polish economic outlook, which covered the impact of environmental regulation on non-financial firms. The BNP also organised the sixth Annual Research Conference with the National Bank of Ukraine, where the macroeconomic implications of climate change were debated (National Bank of Poland, 2022).

The BNP liaised with central banks and international organisations that pledged ambitious climate strategies, among others, the ESCB, the European Commission, the BIS, the OECD, the World Bank Group, the IMF, the EBRD, the International Bank for Economic Cooperation and the Asian Infrastructure Investment Bank (National Bank of Poland, 2022). Yet, the NBP was the only central bank in this study that was not a member of the NGFS as of July 2025. Poland was represented in the network by the Polish Financial Supervision Authority (NGFS, 2025b). Given the limited textual data obtained through the search strategy, the BNP case deserves an expanded investigation into the national political and economic context to understand what prevents the bank from advancing the green debate, despite the broader scope of its mandate and its close relationship with economic and financial institutions that have made strides in the fight against climate change.

5.2.13 *Russia – Central Bank of the Russian Federation*

The Federal Law No. 86-FZ on the Bank of Russia (CBR) defines the purposes of the bank as follows: 'to protect the ruble and ensure its stability; to develop and strengthen the banking system of the Russian Federation; to ensure stability of and develop the national payment system; to develop the financial market of the Russian Federation; to ensure stability of the financial market of the Russian Federation' (Russian Federation Federal Law On The Central Bank of the Russian Federation (Bank of Russia), 2002, Article 3). Regarding the CBR's monetary policy, the legal text further states that '[t]he principal objective . . . shall be

to protect and ensure stability of the ruble by way of maintaining price stability, including for the creation of conditions for balanced and sustainable economic development' (Russian Federation Federal Law On The Central Bank of the Russian Federation (Bank of Russia), 2002, Article 34). It follows that price stability, defined as 'sustainably low inflation', is the primary objective of monetary policy and the cornerstone of sustainable economic development (Bank of Russia, 2020c, 2023e).

Given the high share of carbon-based exports, Russia has paid particular attention to the economic and financial losses arising from increased international penalties on carbon emissions (Bank of Russia, 2023b, 2023d, 2023n; Burova et al., 2023). In order to expedite the industrial transition to a low-carbon model, the bank worked with Russian authorities to establish a framework that supported responsible investments. The CBR's 'key role' in this process was claimed to create the financing conditions for sustainable development (Bank of Russia, 2021g). To this end, the CBR developed new financial market products, regulations, and banking practices in conjunction with the federal authorities and other national agencies (Bank of Russia, 2021f, 2021e). Most notably, the bank encouraged and guided financial market participants to identify and manage ESG risks. No monetary policy decisions were cited in the increasing number of publications released by the bank. Given its narrow mandate focused on price and financial stability, the CBR was classified as a typical case study.

The Bank of Russia's thinking and work on environmental matters. CBR has published English communications on green banking and finance since at least 2017. The actions taken so far have been primarily based on 'soft regulation' concerning the inclusion of ESG risks into companies' investment decisions, management, and disclosure of those risks (Bank of Russia, 2023m, see also 2020a, 2020b, 2021c, 2021h, 2022c, 2023a, 2023c, 2023d, 2023e, 2023f, 2023g, 2023h, 2023i, 2023j, 2024; Sergey, 2020). In 2019, along with the announcement of the EGD and the subsequent tax on carbon imports, the Russian government

approved the inclusion of green finance principles in the Guidelines for the Development of the Russian Financial Market. The EU carbon tax was estimated to affect approximately 42% of Russia's exports from the oil, gas, and mining industries (Bank of Russia, 2020d, 2020e, 2021b, 2021d). To uphold Russia's competitiveness, the country forged ways of reducing the economy's exposure to climate-related risks (Bank of Russia, 2023e).

From 2019, a number of incentives were introduced to support the green transition of the Russian economy. Notably, the CBR established the Guidelines on Responsible Investment and the regulation On Securities Issue Standards, which enabled the launch of the first green and social bonds in 2020 (Bank of Russia, 2020e, 2021d). In 2020, the bank issued a new regulation, On Disclosing Information by Securities Issuers, and set up the Working Group on Sustainable Development Financing (Bank of Russia, 2021d, 2021g, 2022a). The group comprised members from the bank, government agencies, and other institutional and market representatives to design and coordinate a sustainable development strategy.

In 2021, the bank established 'new sustainable financing instruments—SDGs-linked bonds, adaptation and transition bonds' (Bank of Russia, 2022a, p. 186)—and encouraged public companies to manage and disclose ESG risks (Bank of Russia, 2021c, 2021h, 2022a). Meanwhile, the pressure to accelerate the green transition was alleviated due to Russia's conflict with Ukraine and the ensuing international sanctions. As a result, Russian exports were been redirected to Asian countries, which have less ambitious green targets (Bank of Russia, 2023b, 2023e). In 2022, the CBR expanded the range of financial market instruments targeting SDGs to attract ESG investors (Bank of Russia, 2023d). Under the revised Securities Issue Standards, Russian companies can issue adaptation, sustainability-linked, and climate transition bonds against the disclosure of the bonds' proceeds, which must be validated by independent auditors (Bank of Russia, 2022b, 2023e, 2023l).

Several other recommendations and guidelines were issued in 2022 and 2023 (Bank of Russia, 2022c, 2023a, 2023c, 2023f, 2023g, 2023h, 2023i, 2023k, 2023o, 2024). Yet, based on the collected data, no stringent measures were imposed on corporations. First, missing data and expertise inhibited the issuance of further regulations (Bank of Russia, 2020a, 2023b). Second, firms needed time and no more regulatory constraints to recover from international sanctions (Bank of Russia, 2023d). In October 2023, Russia decreed a new Climate Doctrine, a revised version of the 2009 doctrine, which reaffirmed the country's commitment to achieving net-zero emissions by 2060 (Bank of Russia, 2023n; Climate Change Performance Index, 2023; Eastern Economic Forum, 2023; Presidential Executive Office, 2023; The Moscow Times, 2023).

The CBR assisted the government in setting national regulations, including the Russian taxonomy and a carbon unit trading system (Bank of Russia, 2020e, 2021a, 2022a, 2023e). The bank also took part in the creation of a Sustainable Development Sector at the Public Joint-Stock Company Moscow Exchange (Bank of Russia, 2020e) and conducted stress tests and surveys of market participants, as described in the consultation paper *Impact of Climate Risks and Sustainable Development of the Financial Sector of the Russian Federation* from 2020 (Bank of Russia, 2021b, 2021d).

The Bank of Russia stated that it contributed to the G20 Sustainable Finance Roadmap, as well as to climate change and green finance discussions and activities at the FSB, the IMF, the BIS, the BCBS, the International Organization of Securities Commissions, and the NGFS (Bank of Russia, 2021d, 2022a, 2023e). The CBR joined the NGFS in December 2019 (Bank of Russia, 2019). Similar to other central banks included in this study, the CBR promoted events on sustainable development and committed to reducing the carbon footprint of its facilities and operations, for instance, by including environmental clauses in the bank's procurement agreements (Bank of Russia, 2021d, 2022a, 2023e).

5.2.14 *Saudi Arabia – Saudi Central Bank*

According to the Saudi Central Bank Law, the bank's objectives consist of 'maintaining monetary stability . . . supporting the stability of the financial . . . and economic growth' (Saudi Central Bank Law, 2020, Article 3). The legal text suggests a dual mandate, as it explicitly instructs the Saudi Central Bank (SAMA) to contribute to economic growth alongside price and financial stability. Given the positive relationship between output growth and environmental degradation, as outlined earlier, SAMA's mandate offers the bank greater leeway to adopt policies conducive to green economic growth. However, notwithstanding its broader mandate and the bank's expressed commitment to assist the Saudi government in attaining SDGs, no green monetary policies were announced during the research period.

The bank stated that climate policy was a government responsibility. Furthermore, the bank considered it inappropriate to develop climate-related policies for the Saudi financial system due to the lack of expertise in the field and the incipient stage of climate risk assessments. As explained below, the bank's stance concerning sustainability was confined to the adoption of a corporate social strategy and initial estimations of the exposure of domestic banks to polluting sectors. Against this background, SAMA was considered a deviant case.

SAMA's thinking and work on environmental matters. The search key retrieved only three relevant documents produced by SAMA on environmental matters: two on renewable energies, published in 2019 and 2022, respectively, and one on achieving carbon neutrality, released in 2023 (Al Yousif, 2019; Almulhim & Al Yousif, 2022; Alyousef et al., 2023). However, the bank's annual reports revealed that the bank has publicly addressed climate change, environmental protection, and sustainable development since the start of the research period, in 2010. These topics were primarily mentioned in the context of discussions held in international forums, including at the World Bank Group, the G20, the OPEC, and the FSB (Saudi Central Bank, 2011, 2013a, 2013b, 2016, 2017, 2018, 2019, 2020, 2021).

In 2014, the bank set up the Group of Corporate Social Responsibility in Banks, involving SAMA and other representatives from the banking industry, to encourage domestic banks to establish departments of corporate social responsibility (Saudi Central Bank, 2015). These departments were assigned specific budgets for activities related to education, the environment, health, and social inequalities. The 2017 annual report highlighted the bank's support for Saudi Vision 2030, a government programme designed to assist the country in achieving SDGs (Saudi Central Bank, 2018). The programme entailed a set of measures to diversify the country's economic structure, reduce reliance on oil exports, and elevate Saudi Arabia to the world's top 15 largest economies by 2030. The programme also proposed a tax on environmentally harmful products (Saudi Central Bank, 2018, 2020, 2021).

In order to align the bank's operations with the government's strategy, SAMA adopted its own Social Responsibility Strategy, whereby it contributes to social and environmental projects and follows a resource management plan for its business activities (Saudi Central Bank, 2020, 2021). On the supervisory side, the bank conducted analyses on the exposure of Saudi banks to brown sectors and convened events to encourage banks to identify and manage ESG risks (Saudi Central Bank, 2023). The 2023 financial stability report underlined the bank's contribution to the G20SFWG, the BCBS's TCFR, and the NGFS (Saudi Central Bank, 2023). SAMA joined the NGFS in 2022 (NGFS, 2023b).

5.2.15 *Sweden – Sveriges Riksbank*

The Sveriges Riksbank Act defines the bank's legal mandate as follows: 'the overriding objective of the Riksbank is to maintain permanently low and stable inflation (the price stability target). Without neglecting the price stability objective, the Riksbank shall also contribute to a balanced development of production and employment (consideration for the real economy)'

(The Sveriges Riksbank Act, 2022, Chapter 2 sec. 1).[40] The objectives stated above were promulgated in November 2022 and entered into force in January 2023. The previous Riksbank's Act afforded a more targeted scope of action centred on the stability of prices and a sound payment system (The Sveriges Riksbank Act 1988, 2015, Chapter 1 art. 2).

Although the annual reports of the bank have long highlighted the role of monetary policy in contributing to 'the objectives of general economic policy' (Sveriges Riksbank, 2013, p. 20, 2020k, 2021b, 2021a, 2021e), the new Act made the alignment of the Riksbank's objectives with those of the Swedish government more explicit, particularly regarding 'sustainability and climate change adaptation' (Sveriges Riksbank, 2021e, p. 6; Brattström & Gajic, 2022a). The revised objectives not only stipulate the bank's contribution to specific macroeconomic variables—production and employment—but also introduce a novel provision requiring the bank to contribute 'to the stability and efficiency of the financial system' (The Sveriges Riksbank Act, 2022, Chapter 3 sec. 1). As a result, the bank shall 'identify risks of severe disruptions' and manage its assets in ways that promote sustainable development (The Sveriges Riksbank Act, 2022, Chapter 3 sec. 9; see also The Sveriges Riksbank Act, 2022, Chapter 9 sec. 1). Arguably, the new legal text expands the Riksbank's areas of responsibility.

The bank stated that new economic and financial threats demanded new ways of thinking and working (Sveriges Riksbank, 2019b, 2020e). Regarding climate change, which was identified as one of these risks (Sveriges Riksbank, 2023c), the bank's deputy governor asserted that the Riksbank did 'not need to wait for a dual mandate' to take action (Breman, 2020e). Irrespective of the uncertainties as to when, how, and to what extent global warming would impact the economy, the reasons for an immediate response were manifold (e.g.,

[40] The English version of the Riksbank's formal objectives is available in the Riksbank's *Monetary Policy Report* from February 2023 (Sveriges Riksbank, 2023d).

Breman, 2020a, 2020a; Flodén, 2019b; L. Mann, 2023; Sveriges Riksbank, 2020i, 2020m, 2021b, 2021a, 2021e, 2021m).

From a monetary policy perspective, the bank contended that price fluctuations caused by climate change events complicate economic and financial forecasts, making it difficult to set the most appropriate monetary policy rate. Concerning the wider financial system, the bank not only invoked the NGFS view according to which 'climate-related risks are a source of financial risk' but also pointed to the economic and financial risks arising from 'social responsibility and governance' (Sveriges Riksbank, 2021h, p. 43, see also 2019e, p. 34, 2020e). By embedding ESG factors in the bank's asset management, the Riksbank uses public money consciously and protects the financial health of its balance sheet (Andersson & Stenström, 2021; Breman, 2020e; Sveriges Riksbank, 2020k, 2020n, 2022a).

On a broader political level, the bank emphasised the absence of an effective global tax to curb climate change and supported complementary actions from other fronts. In particular, the bank stressed the importance of coordinated efforts between political authorities and central banks, as well as the risks that could arise if these entities acted separately. According to the bank's deputy governor, 'being alone is not strong. . . . constitutional independence does not prevent [the Riksbank] from actively working together with other authorities in Sweden and with international organisations' in the fight against climate change (Breman, 2020a, p. 15). Given that the central bank's operations could cancel out the desired effects of government policies, the bank maintained that it needed to act in ways that, at the very least, do not contribute to global warming.

The first steps towards embedding sustainability components in the bank's core functions date back to November 2018, when the executive board decided on a new investment strategy. According to the new procedures, the central bank considers sustainability criteria in the purchase and management of foreign exchange reserves (Sveriges Riksbank, 2019b). In

particular, the bank does not purchase assets from issuers that use substantial amounts of fossil fuels in their activities or that infringe sustainability principles, insofar as such considerations do not significantly impact the reserves' return and risk.

The bank's new strategy was based on the assumption that companies disregarding international recommendations for sustainable development are unprepared to handle natural disasters and the transition to a greener economy. As these companies tend to have a riskier profile, refraining from investing in or divesting from them lessens the central bank's exposure to financial risks (Andersson & Stenström, 2021; Sveriges Riksbank, 2020k).[41] The new policy decision came into force in January 2019. Subsequently, the bank sold some of its Australian and Canadian assets, which were linked to high carbon emissions. (Brattström & Gajic, 2022a; Breman, 2020a; Flodén, 2019b; Sveriges Riksbank, 2020k). The new strategy started a 'change process' in how the bank manages its investments (Sveriges Riksbank, 2020e, p. 4).

The bank reinforced its environmental direction in January 2021 by adopting a 'norm-based negative screening' when purchasing corporate bonds (Sveriges Riksbank, 2021h, p. 39; Andersson & Stenström, 2021; Sveriges Riksbank, 2020k, 2021f). Similar to the investment decision taken in 2018 regarding the bank's foreign exchange reserves, this new measure implied that the Riksbank only purchases bonds from issuers that follow international principles of sustainability, notably those outlined in the 'UN Global Compact, the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights'(Andersson & Stenström, 2021, p. 8; Sveriges Riksbank, 2020k, 2023c). The bank further extended its asset purchases to include green municipal and government bonds (Breman, 2020e; Hansson & Birging, 2021; Sveriges Riksbank, 2020i, 2020j).

[41] Financial risks include credit, liquidity, and market risks that may arise from climate change events and public policies aimed at achieving the Paris Agreement goals. In addition, the Riksbank also highlighted the operational risks from climate change (Breman, 2020a).

In order to increase market transparency on sustainability risks, the executive board added a new requirement for purchasing corporate bonds in September 2022. Specifically, the bank only purchases bonds from companies that disclose their carbon emissions in line with the TCFD standards (Sveriges Riksbank, 2023e). Given the bank's extended areas of responsibility, which became more evident with the new Sveriges Riksbank Act in 2023, the implemented measures fall within the typical typology defined in this study. However, the bank's crucial decisions to incorporate climate change and other sustainability criteria into its operations were made in 2018, 2020, and 2022, when the bank's formal objectives adhered to the narrow classification. Thus, until January 2023, the Riksbank belonged to the group of deviant cases.

The Riksbank's thinking and work on environmental matters. Country-wise, Sweden set its climate neutrality goals by 2045 in the 2017 Climate Act (Government Offices of Sweden, 2021; Swedish Environmental Protection Agency, n.d.). The transportation sector aimed to become carbon-free earlier, by 2030 (Cella, 2021). Research undertaken by the bank pointed to the diminished exposure of Sweden's economy and financial system to both natural hazards and transition risks, as the country is substantially reliant on green sources of energy (Apel, 2022; Olovsson, 2018; Sveriges Riksbank, 2021c). The Swedish progress in the environmental front partly resulted from the national carbon tax introduced in the early 1990s and the growing EU environmental regulations (Sveriges Riksbank, 2021e). Still, for a 'small and open economy' like Sweden, international policies and natural hazards at the global level could impact the country's economic and financial stability (Olovsson, 2018, p. 6; Apel, 2022; Bylund & Jonsson, 2021; Sveriges Riksbank, 2023c).

Looking into the Riksbank's publications, the bank has long addressed the environmental topic as part of its 'wide functions' (Sveriges Riksbank, 2011, p. 54). The bank's corporate social responsibility has emerged from 2015 onwards, when the Riksbank started

measuring and disclosing the carbon emissions from its activities, namely travelling and energy consumption (Sveriges Riksbank, 2016). As the perception of climate risks grew, the bank intensified the debate on physical and transition risks, as well as 'the risks of irreversible threshold effects' (Sveriges Riksbank, 2020i, p. 64; Breman, 2020a; Bylund & Jonsson, 2021, 2021; Sveriges Riksbank, 2021e).[42]

With regard to monetary policy, the bank emphasised the novelty and unpredictability of climate change developments and how these could severely affect the economy, the 'long-term real interest rate', and the collateral value, no matter when these events occur (Sveriges Riksbank, 2021e).[43] For this reason, the Riksbank contended that central banks must increase knowledge and research in the field, consider climate and other sustainability factors in macroeconomic forecasts, and cooperate with national and international organisations to find solutions that strengthen collective efforts towards climate change (Breman, 2020a, 2020e; Sveriges Riksbank, 2020i, 2020m, 2021b, 2021e).

The Riksbank invested in research, having produced several papers and reports on the position of central banks in climate change, the relationship between climate change, the economy, and the financial system, as well as on climate change mitigation measures (e.g., Apel, 2022; Bylund & Jonsson, 2020; Carbone et al., 2022, 2022; Cella, 2021, 2022; Danielsson, 2020; Ferlin & Fryxell, 2020; Gars & Olovsson, 2015; Hassler et al., 2019; Olovsson, 2016, 2018, 2020; Sveriges Riksbank, 2019e, 2020m, 2021e, 2023c). Additionally, the bank hosted and participated in numerous climate change and sustainability events to propagate the research findings and elevate the climate change debate (e.g., Breman, 2020b,

[42] Also known as tipping points, irreversible effects involve a situation in which climate change damages can no longer be reversed. Moreover, reaching a certain level of destruction paves the way for increasing natural disasters and subsequent radical political measures to counteract them (Sveriges Riksbank, 2023b).

[43] The long-term real interest rate differs from the central bank policy rate as the former is not influenced by monetary policy operations but by other components of the economy, which monetary policy must consider when setting the bank's policy rate. These include changes in the climate.

2020c, 2020d, 2020e, 2021b, 2021c, 2021d; Sveriges Riksbank, 2019b, 2021g, 2022b; Sveriges Riksbank & Sustainable Finance Lab, 2023).

In 2021, the bank produced its first climate report that compiled the bank's activities in the sustainability area (Sveriges Riksbank, 2021e, 2021h). In the same year, the bank included climate risks in macroeconomic analyses and disclosed the carbon footprint of its corporate bonds following the standards provided by the TCFD and the Greenhouse Gas Protocol (Brattström & Gajic, 2022b; Ferlin et al., 2021). The bank started disclosing the carbon footprint of its foreign exchange reserves, in line with the NGFS and the TCFD recommendations in 2022, to improve data on the carbon intensity of its assets, help identify less risky investments, and ultimately increase the flow of funds towards sustainable investments (Brattström & Gajic, 2022a; Breman, 2021b; Ferlin et al., 2021; Sveriges Riksbank, 2020e, 2020k, 2020l, 2023e).

On the supervisory front, the bank assessed the exposure of the Swedish banking system to high-carbon industries and promoted the disclosure of climate risks by financial firms. In 2022, the Riksbank and the *Finansinspektionen* deployed the Paris Agreement Capital Transition Assessment Tool (PACTA) to evaluate the exposure of the largest Swedish banks to climate-related risks (Finansinspektionen & Sveriges Riksbank, 2022; Sveriges Riksbank, 2023c, 2023e). At the time of writing, the Riksbank was developing a climate stress test for domestic banks (Sveriges Riksbank, 2023a, 2023c). Concerning its internal work, the bank set up a 'sustainability committee' that coordinates the bank's sustainability strategy (Sveriges Riksbank, 2021b, 2021d, 2021e, 2023c), including the policy work and the bank's environmental plan to reduce the carbon emissions of its operations (Sveriges Riksbank, 2016, 2020i, 2020n, 2020o, 2022a).

The Riksbank has collaborated with various organisations to design recommendations for identifying and managing climate-related risks (Breman, 2020a). In particular, the bank

joined the NGFS in December 2018 (Sveriges Riksbank, 2018b), where the *Finansinspektionen* was also represented as a founding member and holds a permanent seat on the network's steering committee (NGFS, 2023a; Sveriges Riksbank, 2019c). The Riksbank has engaged in the NGFS work and research activities, notably in the areas of stress tests, climate scenarios, monetary policy operations, and climate disclosures (Sveriges Riksbank, 2020e, 2021h). The research findings pointed to the economic and negative implications of climate change and a disorderly transition to a low-carbon economy (Breman, 2021a; Bylund & Jonsson, 2021; Sveriges Riksbank, 2019c).

In the year of adhesion to the NGFS, the Riksbank significantly broadened the environmental section of its 2018 annual report (Sveriges Riksbank, 2019b, 2020e). In November 2021, on the occasion of COP26 and the NGFS Glasgow Declaration, the Riksbank and the *Finansinspektionen* jointly endeavoured to add sustainability principles across their operations and contribute to the Paris Climate Agreement (Finansinspektionen & Sveriges Riksbank, 2021; NGFS, 2021c; Sveriges Riksbank, 2021e, 2021k). Additionally, the bank has collaborated with the IMF, the BCBS and related TCFR—having coordinated one of its working groups (Sveriges Riksbank, 2021h)—as well as with EU working groups tasked with developing methodologies to handle CRFRs, including the ECB, the ESRB, and the EBA (Sveriges Riksbank, 2020e, 2021e, 2021g, 2023a).

5.2.16 *Switzerland – Swiss National Bank*

The Federal Act on the Swiss National Bank (SNB) states that the 'Bank shall pursue a monetary policy serving the interests of the country as a whole. It shall ensure price stability. In so doing, it shall take due account of economic developments' (Federal Act on the Swiss National Bank, 2003, Article 5 para. 1). On the requirement to serve 'the interests of the country as a whole', the SNB clarifies that it 'must gear its policy to the needs of the entire Swiss economy rather than the interests of individual regions or industries' (Swiss National Bank,

n.d.). The consideration of economic developments while pursuing price stability suggests that the bank factors in the country's economic outlook when deciding on policy rates. Arguably, taking economic developments into account does not mean designing policy tools to steer those developments. One thing is to consider economic trends when setting interest rates, and another is to adjust monetary policy in a way that allocates resources across sectors and individuals differently. Provided that the mandate does not explicitly instruct the bank to support government policies or specific macroeconomic variables beyond inflation, the SNB's mandate can be classified as narrow since it primarily focuses on price stability.

The SNB's stance on sustainable development and other environmental matters was described as follows: '[the bank's] greatest contribution to the sustainable development of Switzerland lies in fulfilling [its] mandate to ensure price stability while taking due account of economic developments. In doing so, it creates an important basis for economic growth and prosperity' (Swiss National Bank, 2023b, p. 5). The SNB recognised the risks that climate change poses to the Swiss economy and financial system. Whereas transition risks were not estimated to have a significant impact, the bank assumed that global warming could negatively affect snow tourism due to milder winters.

However, members of the bank's board held that the best tool to internalise the costs associated with carbon emissions was a carbon tax, the scope of which fell outside the SNB's remit of keeping price stability (Maechler & Moser, 2019). In the bank's view, it was not up to the SNB to influence 'any particular economic or societal development' but to promote the stability of the economy at large (Maechler & Moser, 2019, p. 3). The hurdles resulting from the bank's engagement in environmental matters were made clear in the following statement:

> Broadening this mandate to pursue other objectives, such as promoting a greener economy, would pave the way for conflicts of interest and politicise monetary policy. This would affect the very essence of the SNB's independence and thus its

> ability to make decisions that are occasionally difficult but absolutely necessary in order to fulfil its mandate and support Switzerland's economy. (Maechler & Moser, 2019, p. 11)

In the years following this statement from 2019, the bank regularly emphasised the lack of a legal basis to affect specific areas of the economy (Swiss National Bank, 2020, 2021a, 2022b, 2023a). This stance was corroborated by Switzerland's Federal Council in 2022. In a report on the SNB, the Federal Council underscored the inadequacy of the central bank's mandate in tackling climate and environmental goals (Swiss National Bank, 2023a). The main duties of the SNB regarding climate change rested on gauging how climate-related risks affected prices and financial stability, embedding those risks in macroeconomic assessments, and monitoring the financial system (Swiss National Bank, 2021b).

Given that climate risks impacted the returns of the SNB's foreign currency investments, which included government bonds, shares, and corporate bonds, the SNB adopted measures to reduce the risk profile of its balance sheet (Swiss National Bank, 2022b, 2023a). Specifically, it decided to include green bonds in the bond portfolio of its foreign exchange reserves. The acquisition of green bonds associated with financing environmental projects has been emphasised in the bank's public communications since 2019 (Maechler & Moser, 2019; Swiss National Bank, 2021b).

As for the equity portfolio, the bank has employed a negative screening based on ESG principles since 2013—the SNB is the first central bank in this study to adopt ESG considerations in its investment strategy. In practical terms, the bank assesses and excludes from its foreign exchange portfolio companies that either significantly damage the environment, are involved in the production of weapons, or infringe fundamental human rights. In December 2020, the bank expanded the exclusion criteria to include companies primarily involved in coal mining, in line with the country's values and standards, which banned the use

of coal in energy production. (Maechler & Moser, 2019; Swiss National Bank, 2020, 2021a, 2021b, 2022b, 2023a). To ensure the bank's investment decisions are insulated from political interference, the operations have been conducted in ways that minimise impacts on individual sectors (Swiss National Bank, 2018).

By and large, the SNB has viewed its sustainability policy from a risk management perspective rather than as a way to promote specific sectors of the economy. According to the bank, a more pronounced involvement in the selection of assets could propel the bank into 'structural policies', whereby the bank's asset management explicitly benefits some companies or industries over others (Swiss National Bank, 2020, p. 16, 2021a, p. 95). Such a scenario would be at odds with the bank's 'neutral and passive' investment principles (Swiss National Bank, 2019, p. 82, 2020). The bank used the expression 'politicisation of [the] portfolio management' to illustrate a situation where it may have to sell its ESG assets for monetary policy reasons and face political pressure for not doing so, thereby risking the bank's 'independence and credibility' (Maechler & Moser, 2019, pp. 10–11).

Independence was also the reason why the central bank did not purchase shares from Swiss corporations (Maechler & Moser, 2019). An overweight of green assets was otherwise argued to affect the risk and return profile of the bank's portfolio, as the bank could be unable to quickly sell these assets in a contingent situation. Hence, any ESG measures should be subject to the primacy of monetary policy goals (Maechler & Moser, 2019). Considering the SNB's narrow mandate and vigilant approach towards greening monetary policy, the SNB represents a typical case.

The SNB's thinking and work on environmental matters. The SNB has declared its concern for natural resources since 1996, when it first adopted a systematic approach to reduce resource consumption and GHG emissions in its operational activities (Maechler & Moser, 2019; Swiss National Bank, 2023b). All annual reports surveyed for this study included a

subsection where the SNB described its environmental performance in terms of resource consumption, business travel, and GHG emissions. The bank has annually published an environmental report in line with the Global Reporting Initiative guidelines since 2010.[44] In 2018, this environmental report was named *Sustainability Report*, encompassing five key dimensions: 'employment, equal opportunity and non-discrimination, standards and values, contributions to society, and the environment' (Swiss National Bank, 2023b, p. 6, 2019). The SNB became carbon neutral in 2011 by compensating remaining emissions through investments in environmental projects and the purchase of 'emission reduction certificates' (Swiss National Bank, 2016, p. 142, 2012, 2013). In 2021, the SNB set up a Sustainability Unit within its Secretariat General (Swiss National Bank, 2021a).

Both the SNB and the Swiss Financial Market Supervisory Authority joined the NGFS in April 2019, having participated in several of its activities and working groups, including the organisation of a workshop on integrating ESG risks into asset management in 2021 (Swiss National Bank, 2022b, 2023a). At the time of the NGFS Glasgow Declaration and COP26 in November 2021, the two institutions jointly published a pledge on climate change (Swiss National Bank, 2021b). Subsequently, the SNB examined the exposure of the national banking system to the sectors most affected by climate policy and other environmental regulations (Maechler & Moser, 2019; Swiss National Bank, 2021b). The SNB and the Financial Authority also set banking expectations for managing environmental risks (Swiss National Bank, 2021a, 2022b, 2023a). In addition to the NGFS, the SNB has collaborated with other multilateral organisations involved in climate work, including the IMF, the BIS, the FSB, the G20 Finance Track, and the OECD (Swiss National Bank, 2022b, 2023a).

[44] The Global Reporting Initiative (GRI) is an international organisation launched in 1997 to provide organisations with sustainability standards in their interactions with the economy, society, and the environment (Global Reporting Initiative, n.d.).

5.2.17 *Thailand – Bank of Thailand*

According to the Bank of Thailand (BOT) Act, 'the BOT's objectives are to carry on such tasks as pertain to central banking in order to maintain monetary stability, financial institution system stability and payment systems stability'(Bank of Thailand Act, 2018, Section 7). In achieving these objectives, 'the implementation of economic policy of the government shall be taken into consideration'(Bank of Thailand Act, 2018, Section 7). The BOT has emphasised the vital role of the central bank and the banking industry in attaining the national targets set under the UN 2030 Agenda and the Paris Agreement (Bank of Thailand, 2013, 2019, 2020, 2021a, 2021b, 2022a, 2022c, 2023a, 2023b; Fiscal Policy Office et al., 2021a, 2021b; Santiprabhob, 2019). Accordingly, environmental sustainability was added to the BOT's Strategic Plan 2020-2022 (Bank of Thailand, 2020). However, the BOT's action plan had to be reprioritised to enable a swift response to the adverse economic and financial consequences of the COVID-19 pandemic (Bank of Thailand, 2021a).

The environmental topic regained momentum in 2022. In February 2022, the BOT issued a market consultation on the direction of the Thai financial sector in the context of a greener economy. Subsequently, the bank issued the document *Transitioning Towards Environmental Sustainability Under the New Thai Financial Landscape* in August of the same year (Bank of Thailand, 2022c, 2022d). This document laid the groundwork for transitioning the Thai financial sector to an environmentally friendly economy, along with national carbon and development goals. Among the announced measures, the document informed about the prospect of new financing tools to support the green transition, most notably low-interest loans for environmental projects. Yet, no timeline for implementation was made public during the research period. In addition, the document provided an overview of the GMP measures implemented by other central banks, especially the BoE, the BOJ, and the PBC.

The allusion to central banks that are early leaders in developing GMP instruments may foresee a shift in the BOT's policymaking approach. Indeed, the year 2022 witnessed some initial milestones in the BOT's efforts to green its asset purchases. In the monetary policy report of September 2022, the bank announced an extraordinary measure introduced under the Soft Loan Emergency Decree as part of the COVID-19 financial assistance programme. In essence, the BOT launched a favourable credit line offering low-interest funding for commercial banks and specialised financial institutions that supported the recovery of SMEs investing in digital technology, innovative products and services, and green business activities. These included investments in renewable energy, electric vehicles, and other products, services, and means of production compatible with the environment. The government financed the interest rates on loans during the first six months. The scheme was intended to be temporary and was, therefore, discontinued in April 2023 (Bank of Thailand, 2022a, 2022e, 2023a).

In the same year, 2022, the BOT introduced ESG criteria in the selection of investments and counterparties in foreign exchange activities. Concretely, the bank decided to exclude socially and environmentally disapproved companies, including 'casinos, brewers and tobacco' (Bank of Thailand, 2023a, p. 108). Additionally, the bank considered social and environmental risks in the countries where it invested and incorporated ESG criteria into its assessment of business partners, such as fund managers. The new investment policy was primarily justified on the grounds of improving the risk and return profile of the central bank's investments.

While investment decisions were subordinated to the main objective of keeping the 'safety, liquidity and risk-adjusted return' of the bank's reserves, the BOT still emphasised social and environmental gains in the new allocation of assets (Bank of Thailand, 2023a, p. 108). In particular, the BOT supported the view that the transition away from fossil fuels should be gradual so that the economic system, especially SMEs, could progressively adapt to the new green structure without disrupting their activities (Bank of Thailand, 2023a). The BOT's

cautious approach towards climate-related policies, coupled with its narrow mandate to safeguard monetary and financial stability, aligns with a typical case study. Yet, the evidence suggested that the bank was showing a growing commitment towards environmental goals.

The BOT's thinking and work on environmental matters. Thailand is one of the world's most vulnerable countries to climate change (United Nations Development Programme, 2024). The country's economic dependence on natural resources, its location by the sea, and the high carbon footprint of agriculture and livestock make Thailand particularly susceptible to climate events and policies. Consequently, climate change resilience is one of the government's chief priorities and is embedded in its national strategy, the Thailand Climate Change Master Plan 2015-2050 (Fiscal Policy Office et al., 2021b). Thailand adopted the UN's 2030 Agenda for Sustainable Development in 2015 and committed to the Paris Agreement in 2016. In 2021, on the occasion of COP26, the Thai prime minister pledged to reach 'carbon neutrality by 2050 and net-zero emissions by 2065' (Bank of Thailand, 2022c, p. 1, 2021b, 2023d; Climate Bonds Initiative, 2023; Fiscal Policy Office et al., 2021a).

The BOT placed Thailand's sustainable growth and social well-being high on the bank's agenda. For the bank's former governor, poverty, environmental damages, inequalities, and corruption were some of the problems that made the adoption of ESG factors in the Thai economy and financial system all the more important (Santiprabhob, 2019). The financial system was regarded as instrumental in the sustainability journey through the allocation of financial resources to ESG projects (Fiscal Policy Office et al., 2021b; Santiprabhob, 2019). The BOT's commitment to transforming the Thai financial system along with sustainability standards was visible in a number of initiatives.

In 2019, the BOT, together with the Fiscal Policy Office, the Ministry of Finance, the Securities and Exchange Commission, the Office of Insurance Commission, and the Stock Exchange of Thailand, formed the Thai Working Group on Sustainable Finance. The working

group was tasked with promoting sustainable finance practices, coordinating policies and regulations (Bank of Thailand, 2020). In the same year, the BOT chaired the ASEAN, the main working topic of which was Advancing Partnership for Sustainability (ASEAN, 2019; Bank of Thailand, 2020). During Thailand's ASEAN presidency, a task force was set up to study the role of ASEAN central banks in managing environmental and climate-related risks (Bank of Thailand, 2020). The report, published in 2020, emphasised the risks and trade-offs of using monetary policy tools to pursue green objectives (Anwar et al., 2020b).

The BOT supported the Thai Bankers' Association in developing the Sustainable Banking Guidelines for Responsible Lending. This new framework instructed financial institutions to adopt ESG elements into loan assessments (Bank of Thailand, 2020). The new procedures were based on the idea that sustainability factors, particularly climate change, increasingly affected the activities and returns of financial institutions. Furthermore, the banks' reputation could be challenged if their operations aggravated social and environmental issues (Bank of Thailand, 2020; Santiprabhob, 2019). The central bank was following the progress of commercial banks in applying responsible investment principles (Bank of Thailand, 2021a).

In 2021, the Thai Working Group on Sustainable Finance, in collaboration with the International Finance Corporation from the World Bank Group, published a study on *Sustainable Finance Initiatives for Thailand* (Fiscal Policy Office et al., 2021b). The paper laid the foundations for the Thai sustainable finance strategy. It proposed an action plan with measures such as developing a green taxonomy, collecting and disclosing ESG data, integrating environmental aspects into supervisory practices and macroeconomic analyses, developing new products and services supportive of green growth, and providing HR training (Anwar et al., 2020b; Bank of Thailand, 2021a, 2021b; Fiscal Policy Office et al., 2021a, 2021b). The proposed measures started being implemented. Concerning the Thailand taxonomy, the BOT and the Securities and Exchange Commission jointly led the Thailand Taxonomy Board. The

board comprised various organisations, from Ministries to Industry Associations, and was backed by international partners, such as the Climate Bonds Initiative and the International Finance Corporation (Bank of Thailand, 2023c, 2023a; Bank of Thailand & Securities and Exchange Commission, 2023; Climate Bonds Initiative, 2023). The first classifications for the energy and transportation sectors, considered the most polluting, were introduced in June 2023.

In the area of banking supervision, the BOT included ESG risks in the Supervisory Review Process in 2022 (Bank of Thailand, 2021b, 2022a). In the same year, the bank worked with government agencies, national regulators, and industry representatives to develop a database with environmental data. The BOT launched consultation papers and drafted guidelines for financial firms on how to integrate ESG factors into business practices, assess ESG risks through climate scenario analyses and stress tests, and disclose ESG information in line with the TCFD standards (Bank of Thailand, 2022b, 2023a). The BOT was also considering sector-wide stress testing and scenario analysis exercises (Bank of Thailand, 2021b). However, the different stages at which firms were incorporating climate change into their operations and disclosing ESG data could hamper the reliability of the tests and, notably, the implementation of regulatory requirements (Fiscal Policy Office et al., 2021b). Therefore, compared to other central banks in this study, the BOT seemed to be at an early stage of exploring some of the most commonly deployed approaches in climate risk management.

In order to boost green finance, the BOT run awareness-raising activities such as forums, training sessions, workshops, and public events, co-organised with relevant national and international organisations, including the Thai Banker's Association, the Research and Training Centre of the South East Asian Central Banks, the BIS, the UN, the WWF, the Climate Bond Initiatives, and the UK Government (Anwar et al., 2020b; Bank of Thailand, 2021a, 2022a, 2023a; Fiscal Policy Office et al., 2021b). Notably, the BOT has hosted the Sustainable Banking Forum since 2018, targeting financial institutions, regulators, and government

agencies (e.g., Bank of Thailand, 2019, 2023a; Santiprabhob, 2019). The bank joined the NGFS in January 2019 and supported the NGFS Glasgow Declaration (Bank of Thailand, 2020, 2021b, 2022a). As for its internal processes, the BOT implemented a resource management plan for its facilities and the production of banknotes to reduce GHG emissions. The bank issued its first *Sustainability Report* in 2020 (e.g., Bank of Thailand, 2019, 2021a, 2022a).

5.2.18 *Turkey – Central Bank of the Republic of Turkey*

The Law on the Central Bank of the Republic of Turkey (CBRT) informs that 'the primary objective of the Bank shall be to maintain price stability. . . . provided that it shall not conflict with the objective of maintaining price stability, [the central bank shall] support the growth and employment policies of the Government' (The Law on the Central Bank of the Republic of Türkiye, 2022, Article 4). Against the background of its secondary objective of supporting national economic policies, the CBRT falls within the classification of a broader mandate. However, the bank's monetary policy has not taken environmental issues into consideration. According to the CBRT, keeping prices stable is the bank's main contribution to achieving other national and societal objectives (CBRT, 2021).

The search strategy retrieved only one document produced by the CBRT on environmental matters. It was related to a speech delivered by the central bank's former governor in 2012 on direct foreign investment and sustainable development (Başçı, 2012). The almost nonexistence of meaningful search results can be attributed to technical problems with the search engine of the bank's website or the effective absence of such information. Therefore, the bank's annual reports were carefully reviewed. The emphasis on environmental topics emerged in the bank's 2021 annual report. As described in the previous summary statistics, 2021 was a landmark year for the monetary policy frameworks of some leading central banks. Several GMP measures were adopted or reinforced to harness the allocation of capital for sustainable finance. Accordingly, the number of publications in this field peaked in 2021 (see

Figure 2, p. 96). Yet, despite the intensifying debate on sustainable finance, the CRBT seemed to be in the early stages of collecting, assessing, and understanding green finance approaches. In light of the bank's broader mandate, the CBRT was classified as a deviant case study.

The CBRT's thinking and work on environmental matters. The first references to climate and environmental topics were found in the bank's 2017 annual report (CBRT, 2018). The report announced the bank's participation in the Turkey-EU Association Committee meeting held in Brussels, which entailed an agenda topic on environment and climate change. The document also provided details about the bank's environmental management system for its facilities. In the following years, the CRBT took part in voluntary initiatives of a social and environmental nature (CBRT, 2020). The bank also initiated research on sustainable finance in collaboration with the Irving Fisher Committee on Central Bank Statistics (CBRT, 2021).

As previously mentioned, the environmental topic was elevated in the bank's 2021 annual report (CBRT, 2022). For the first time, the report offered a subsection on 'Cultural, Environmental, and Corporate Social Responsibility Activities' as part of the bank's initiatives and major developments (CBRT, 2022, p. 66). The report also highlighted the central bank's support for climate change research and the creation of its Green Economy and Climate Change Department. Although monetary policymaking goes far beyond corporate social initiatives, these initial steps, especially the establishment of a dedicated department, can be viewed as the beginning of a new journey towards understanding and augmenting the bank's involvement in environmental issues. However, as of January 2024, the bank's approach to climate and environmental issues appeared minimal.

The CBRT joined the NGFS in December 2021. Other climate-related initiatives emphasised by the bank in 2021 included the participation in the 45th Meeting of the Central Banks Governors' Club of Central Asia, Black Sea Region and Balkan Countries, as well as the meeting of the FSB Regional Consultative Group for the Middle East and North Africa

(CBRT, 2022). During the same year, the bank improved resource management and carbon emission reductions in its business operations (CBRT, 2022). The bank's concerns about global climate change slightly increased over 2022, along with the country's efforts to achieve carbon neutrality by 2053. Related to this, the 2022 annual report introduced a new subsection devoted to 'Activities Regarding the Green Economy and Climate Change' (CBRT, 2023). The information provided is somewhat short and opaquely presented. Nevertheless, it pointed out studies undertaken by the bank's climate change department to consider options to embed climate change factors into the bank's activities. The bank has collaborated with national authorities to advance the Turkish Green Deal Action Plan, particularly in the working groups responsible for developing a green finance framework, the national taxonomy, carbon pricing, and energy and environmental standards (CBRT, 2023).

5.2.19 *United Kingdom – Bank of England*

According to the Bank of England Act, the monetary policy objectives of the bank shall be: '(a) to maintain price stability, and (b) subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment' (Bank of England Act 1998, 2024, Part 2 sec. 11). The BoE's monetary policy remit is reviewed every year. When required, the Chancellor of the UK Government updates the bank's areas of responsibility, as was the case in March 2021 (Bank of England, 2021c, 2021g, 2024; HM Treasury, 2023).[45] In a letter submitted to the central bank's governor, HM Treasury informed about the economic policy of the UK Government, which included the 'transition to an environmentally sustainable and resilient net-zero economy' and a resilient financial system underpinning the said transition (Sunak, 2021a, p. 5, 2021b). As a result, the BoE included the fight against climate change among its Strategic Priorities for 2021-2024 and committed to

[45] The role of the UK Chancellor is similar to that of a finance minister in other countries (GOV.UK, n.d.).

playing a key part in the transition of the UK's financial and economic systems (Bank of England, 2021g).

However, the bank's efforts towards creating a greener financial system started before 2021, albeit in a more responsive rather than proactive way. This was especially so from 2018 onwards, following the launch of the NGFS in December 2017, of which the bank was a founding member. The BoE had since perceived climate change as a new external challenge that threatens the stability of the economy and the financial system the bank must deal with, as it did with other economic and financial disruptions, such as the GFC and the COVID-19 pandemic. Yet, unlike the GFC, the bank's governor held that we could not wait for the end of the climate crisis to reformulate the financial system framework (A. Bailey, 2020, 2021a). Other BoE officials complemented this view by warning that it would then be 'too late' to impede the materialisation of climate financial risks and restrict global warming to below 2% (Breeden, 2018, 2019; Carney, 2019a). Compared to the pandemic, the bank placed climate change at a higher level of riskiness, pointing to the unique nature of climate change in terms of timescale, scope, and severity (A. Bailey, 2020; Breeden, 2020; Sweeney, 2020).

The BoE maintained that central banks had an important stake in the fight against climate change, even if governments were in the driving seat of the transition (Bank of England, 2021c, 2021h, 2022e, 2023h; Breeden, 2018, 2022a, 2023; Carney, 2019c; Hauser, 2021). Moreover, central bank action on climate change has to be taken with no delay. Borrowing from the bank's chief operating officer, 'the challenge we face now is unique and should not be taken lightly. Climate change is a reality we face today, not tomorrow, so action is also required today' (Stimson, 2023). In the extensive number of studies and communications published by the bank on the topic, it was possible to pinpoint several ways in which climate change impacted the macroeconomy and the BoE's operations. In a nutshell, climate change hazards, policies, and structural changes in response to them affected both the business of

supervised firms and prices. This, in turn, brought about new factors that monetary decision-makers must account for to achieve the inflation target (Bank of England, 2022d, 2023f; L. Mann, 2023). Furthermore, provided that asset prices did not include the carbon footprint of their issuers, climate change exposed the central bank to operational and financial risks, similar to any other business (Bank of England, 2023h).

Related to this, the market neutrality principle that guided the BoE's asset purchases up to 2021 was seen as ineffective, as it could not accurately reflect the market structure due to asset mispricing. Therefore, the BoE introduced the concept of 'adjusted market neutrality' (Hauser, 2021, p. 7; A. Bailey, 2021a; Bank of England, 2021c). The bank's actions on climate change were also driven by the realisation that climate risks could be exacerbated through the bank's day-to-day operations (Bank of England, 2022d, 2023f). For Governor Bailey, transforming the bank's operations and organisational rules in response to external shocks was not a new practice. It was even regarded as necessary to achieve the central bank's main goal, as explained in the following statement:

> The Bank of England's mission is to promote the good of the people of the United Kingdom by maintaining monetary and financial stability. Our understanding of how we can best deliver that stability, and what factors are relevant to it, evolves with time. . . . This is not about us adding new things to our mission, nor is it about doing that which is rightly for others. It is about taking these new things into account alongside the old as we go about fulfilling our mission. . . . Climate change is an obvious, and indeed urgent, example of this. (A. Bailey, 2021a)

Following the bank's aim to 'play a leading role, through [its] policies and operations, in ensuring the financial system, the macroeconomy, and the bank are resilient to the risks from climate change and supportive of the transition to a net-zero economy' (Bank of England, 2022e), several climate-directed measures were adopted across the bank's three policy

committees: the Financial Policy Committee, the Prudential Regulation Committee, and the MPC.[46] Regarding monetary policy, the BoE set out a detailed framework to green its Corporate Bond Purchase Scheme (CBPS) in November 2021 (Bank of England, 2021h). The CBPS was an unconventional monetary policy instrument created in 2016 during Brexit to help the BoE achieve its inflation target via quantitative easing. The scheme was extended in 2019 following the outbreak of the COVID-19 pandemic to stimulate economic activity. This instrument was expected to cease once economic conditions and the achievement of the desired inflation level were met (Bank of England, 2021c, 2021m, 2023c; Hauser, 2021).

The greening of the CBPS could be grouped into three distinct measures (A. Bailey, 2021a; Bank of England, 2021c, 2021g, 2021j, 2021m, 2021n, 2022e, 2023c): First, new eligibility criteria for the purchase of corporate bonds. Specifically, bond issuers must disclose climate-related financial information, including targets for reducing climate change and compliance with specific guidelines on the use of thermal coal. Second, purchases were tilted towards issuers whose strategies and activities were more compatible with the net-zero transition. A firm's performance was evaluated and ranked against four dimensions: current emissions, emission evolution, quality of disclosures, and emission reduction plans. Weak performers could be excluded from the central bank's portfolio through divestments. Third, firms banned by the UK Government or run under stringent conditions due to their negative impact on climate change were ineligible or faced tighter eligibility requirements—for instance, firms receiving gains from mining thermal coal were excluded from the central bank's asset purchases.

The greening of asset portfolios was a new field for central banks. Therefore, the implementation of the new CBPS terms, which was claimed to be the first such attempt to green

[46] According to the information available at GOV.UK, the Financial Policy Committee and Prudential Regulation Committee had their remits revised in March 2020 and March 2021, respectively. The new recommendations established specific clauses on climate change and support for the UK Government in achieving a carbon-neutral economy by 2050 (Sunak, 2020, 2021c).

a policy portfolio among central banks, was preceded by discussion papers and outreach events to gather the views of market participants (A. Bailey, 2021a; Bank of England, 2019c, 2021c). Arguably, the bank's early engagement with the market also helped to legitimise its new trajectory. However, it is worth noting that corporate bonds corresponded to a limited 2% of the bank's entire asset portfolio. The remaining 98% of assets were earmarked for government bonds (Bank of England, 2021c, 2021h). Moreover, given that the BoE is not a 'permanent investor', the bank's board decided in February 2022 to cease the CBPS scheme between the end of 2023 and the beginning of 2024. Subsequently, the BoE gradually sold its corporate bonds from September 2022 onwards. The bank accounted for green considerations during the selling process as long as they did not impede the achievement of monetary policy goals and the quality of the portfolio (Hauser, 2021, p. 5; Bank of England, 2021c, 2022e, 2023c, 2023e).

Notwithstanding the limitedness of the scheme in terms of 'size, scope and longevity' (Hauser, 2021, p. 19), the greening of the corporate bond portfolio was believed to send a clear message to the market on the importance of escalating decarbonisation efforts. By setting a target to reduce the carbon intensity of the CBPS, as recommended by the NGFS, the BoE aimed to encourage companies to step up their transition plans and risk management practices (Angeli et al., 2022; A. Bailey, 2021a; Bank of England, 2021h, 2021n, 2023c; Hauser, 2021). It also contributed to reducing the central bank's exposure to transition risks and set an example for other economic agents on how to green financial operations and support the green changeover (A. Bailey, 2021a; Bank of England, 2021c, 2022e, 2022e, 2023c, 2023h).

This is aligned with the view of Interviewee 5, according to which the BoE 'always knew they were going to sell [the corporate bonds] off pretty quickly. They did it for the leadership type of reason' (Interview 5). For the BoE, the timing of the policy measure was all the more important as 'the steps taken by firms between [2021] and 2030 will directly impact the action required over the subsequent period to 2050' (Bank of England, 2021l, p. 4). The

bank praised other central banks, notably the ECB, for taking similar steps towards greening their financial assets (Bank of England, 2021c, 2023h).

In addition to greening the CBPS framework in 2021, the BoE began accepting UK government green gilts under its Asset Purchase Facility and as collateral for market operations (Bank of England, 2021j, 2021i). Also, the empirical data showed that the bank has been requesting climate-related information from its counterparties since 2019 and added such information to assess collateral haircuts (Bank of England, 2020f, 2021h, 2021g).

If, until March 2021, the BoE lacked legal clarity to adjust the allocation of assets according to new green principles, the situation changed with the update to the MPC remit, which aimed to support government policies towards a low-carbon economy. The bank even stressed the reputational risks from 'failing to meet [the] expectations' embedded in its new mandate (Bank of England, 2022d, p. 57, 2021g). The rectification of the central bank's formal objectives provided a stronger legal basis for the 'typical' behaviour of the bank in climate work. Unlike the Riksbank, which saw its legal mandate revised after adopting GMP measures, the BoE's green-based approach to its policy portfolio was adopted following the update of the MPC remit. Therefore, the BoE belongs to this study's group of typical cases.

The BoE's thinking and work on environmental matters. One can find signs of environmental awareness in the BoE's publications since the beginning of the research period in 2010. Ever since, the BoE has increasingly paid attention to the environmental impact of its business practices through its Safety, Health and Environment Committee (Bank of England, 2010, 2012, 2014). In 2015, a heightened emphasis was placed on environmental matters, starting with the well-known speech by former governor Mark Carney on 'Breaking the Tragedy of the Horizon', which stresses the financial risks posed by climate change (Carney, 2015; L. Mann, 2023). For the first time, the bank devoted an entire section of its 2015 annual report to corporate social responsibility and identified climate change as one of the key external

challenges it faced, alongside demographic, digital, social, and other factors related to the rise of the EMDE (Bank of England, 2015).

In the same year, 2015, the bank started disclosing the CO2 emissions from its corporate activities, as required by the Carbon Reduction Commitment Law applicable to all large institutions based in the UK. The bank's 2015 annual report further highlighted the BoE's role in establishing the FSB's TCFD, which later became a reference institution in developing and promoting standards for disclosing climate-related information. The year 2015 was also notable since the Prudential Regulation Authority—the supervisory arm of the Bank of England (Bank of England, 2025)—issued the first report, which assessed the physical, transition, and liability risks within the UK insurance sector (Prudential Regulation Authority, 2015).

Between 2016 and 2017, the BoE established the Greener Bank programme. This initiative spanned several areas of the bank and aimed to further reduce the environmental impact of its activities, along with the Paris Agreement (Bank of England, 2017, 2018a, 2019a, 2020f). The programme encompassed dimensions of corporate sustainability beyond energy and resource management, namely gender diversity, staff inclusion, and well-being (Bank of England, 2023b). As of 2018, the research agenda on the macroeconomic and financial implications of climate change stepped up (Bank of England, 2018a, 2019a, 2023d). A new subsection dedicated to climate change was added to the 2017-2018 annual report (Bank of England, 2018a), where the bank underscored the impact of climate-related risks on monetary policy and the financial system. Since then, various events have been held, including training sessions, conferences, workshops, and other outreach activities involving staff, other central banks, academia, and the wider public. The objective was to intensify the debate on climate change and evaluate the transition needs and progress (Bank of England, 2016, 2018a, 2019a, 2020g, 2021b, 2021h, 2022e, 2023g, 2023f, 2023i).

In 2019, the Prudential Regulation Authority became the first supervisory authority to set specific recommendations for financial firms on how to embed and disclose climate risks in business operations (A. Bailey, 2020; Bank of England, 2020f, 2020g, 2021g, 2021h, 2021l, 2023h, 2023i; Breeden, 2020, 2023; Hauser, 2021; Woods, 2020). The new supervisory guidelines aimed to ensure that supervised firms were building resilience against those risks in terms of both managing and mitigating them—in other words, in terms of 'greening finance' and 'financing green' (Breeden, 2020, 2021a; Hauser, 2021). This was based on the idea that firms that adequately manage climate change risks were better equipped to deal with unforeseen financial losses (Bank of England, 2023d).

To assist firms in this process, the Prudential Regulation Authority and the Financial Conduct Authority jointly convened the Climate Financial Risk Forum, which comprised a wide range of UK financial market participants and working groups tasked with issuing guidelines on climate change management practices. The forum's main aim was to enhance expertise and promote knowledge sharing (A. Bailey, 2021b; Bank of England, 2018a, 2019a, 2020h, 2021l, 2023a, 2023f, 2023h, 2023i; Breeden, 2020; Woods, 2020). In parallel, the UK Government committed to achieving carbon neutrality by 2050 (Bank of England, 2021c, 2023g; Brader, 2023). With this new undertaking in 2019, the UK became one of the first countries among the largest economies—the first from the G7 countries—to legally enforce the pursuit of a carbon-neutral economy (A. Bailey, 2021a; Bank of England, 2021c, 2021h).

In 2020, climate change was elevated to one of the bank's 'strategic priorities' for 2021-2024, meaning that 'every financial decision takes climate change into account' (Bank of England, 2020f, p. 28, see also 2022e; Breeden, 2020). The 2020 annual report confirmed the BoE's new endeavour 'to encourage an earlier, and therefore more orderly, transition to a carbon-neutral economy' (Bank of England, 2020f, p. 23). For the first time, a central bank measured and disclosed the climate risks of its policy portfolios along with the TCFD

standards, following the supervisory expectations set out for UK financial firms in 2019 (A. Bailey, 2021a; Bank of England, 2019a, 2020f, 2020g, 2021c, 2021g, 2021h, 2022d). The findings indicated that the bank had low exposure to climate risks in both its asset portfolios and daily operations. Even so, the BoE invoked the need to speed up the transition and support national and international efforts to achieve climate goals (Bank of England, 2020f).

In the same year, 2020, the BoE established a dedicated governance structure to manage and coordinate climate efforts across its operations. This included two senior officials from the bank, a climate hub of experts providing direct support to senior managers, an Executive Directors' Climate Steering Group, as well as an incentive scheme to encourage the bank's governor, vice-governor, and managers to incorporate climate targets into performance objectives (Bank of England, 2020f, 2023g). The BoE's Court of Directors oversaw the achievement of those targets (Bank of England, 2021h, 2022e). The bank also developed a carbon pricing mechanism to inform its capital investments, thus factoring in the risks associated with the upcoming payment scheme for UK carbon issuers (Angeli et al., 2022; Bank of England, 2021h, 2021g).

The growing number of speeches, reports, and studies published by the bank stressed the idiosyncratic and systemic nature of climate risks. These risks were also regarded as non-linear, potentially irreversible, and foreseeable but uncertain as to how, when, and where they would materialise. The bank's publications highlighted the scientific evidence that pointed to the urgency of implementing climate policies, as well as the legislation adopted in the UK to achieve net-zero emissions by 2050 (Bank of England, 2018b, 2021c, 2021h, 2021l, 2021l, 2023g, 2023h, 2023i; Breeden, 2019, 2020, 2021b, 2023; Stimson, 2023; Sweeney, 2020).

The BoE urged firms to manage and disclose climate-related risks. It also promoted the benefits of an early transition, which was argued to be the only option that gives firms time to adjust, thereby reducing the risks from rushed changeovers (Bank of England, 2022e, 2023d,

2023h). Taken together, the BoE's actions on climate change in 2020 aimed to encourage risk management practices across the financial system and facilitate the pricing of climate risks through increased and better disclosures. The voluntary publication of the bank's approach to climate change in terms of deployed risk management metrics, targets, and governance was intended to serve as a role model for the industry (Bank of England, 2020f). This initiative was distinguished by the Central Banking Awards 2021 (Bank of England, 2021g).

In 2021, the BoE adopted a more strategic approach to climate change. As previously mentioned, the net-zero transition became part of the remit of the bank's three policy committees. Climate financial risks gained increased focus within the bank's risk management framework, becoming one of its main risk categories (Bank of England, 2021h, 2021g). The bank conducted a climate scenario analysis drawn on the NGFS scenarios—the Climate Biennial Exploratory Scenario (CBES)—to assess the vulnerability of the UK financial system to climate risks. During this exercise, the bank engaged in dialogue with banks and insurance firms on how to manage climate risks and transition plans (Bank of England, 2019c, 2020g, 2021d, 2021f, 2021e, 2021g, 2021l, 2022a, 2022d; Breeden, 2020; Claus, 2022). The results, published in May 2022, pointed to the gains of early and diligent climate change action (Bank of England, 2022b, 2023h, 2023i). The bank noted that this was additional proof that financial firms had an interest in managing and minimising climate-related risks by supporting an orderly transition (Bank of England, 2022c, 2022e; Breeden, 2023; Woods, 2022).

Also in 2021, the BoE issued the second *Climate Change Adaptation Report*—the first one was in 2015 for the insurance sector—whereby it assessed the progress of financial firms in tackling climate change risks and the bank's supervisory strategy (Bank of England, 2021k, 2021l, 2022d). Concerning the non-monetary portfolios, the BoE embedded climate risk considerations in the staff's pension funds and was exploring ways to account for climate risks in its own investment funds (Bank of England, 2020f, 2020g, 2021h, 2021g). Between 2021

and 2022, other nature-driven risks emerged beyond climate change, notably biodiversity hazards. Alongside the exploratory work undertaken by the NGFS and the Taskforce on Nature-related Financial Disclosures, the BoE likewise expanded its research agenda to better understand the linkages between 'nature loss and degradation' and financial risks (Bank of England, 2022e, 2023h). Crucially, the remit of the Financial Policy Committee was adjusted in March 2021 to account for wider environmental risks (Breeden, 2022b).

In 2023, the BoE launched a Climate Transition Plan (Bank of England, 2023h, 2023g). The plan set out medium- and long-term milestones for its business and financial operations. It represented a more ambitious version of the carbon emission management plan introduced in 2015 (Bank of England, 2015). By incorporating emission reduction targets in processes such as procurement, the bank sought to encourage suppliers to deliver more sustainable products and practices in their business operations (Bank of England, 2022d, 2023f; Stimson, 2023). Furthermore, according to the BoE, the reporting of the bank's climate work strived to increase the availability of climate-related information, set the example for other corporations on how to establish credible and effective transition plans, and ultimately catalyse the green shift of the economy (Stimson, 2023).

The bank has collaborated with national authorities concerning the UK green strategy, most notably in the classification of green economic activities and participation in relevant working groups such as the Transition Plan Taskforce, the Green Finance Strategy, and the Government-Regulator TCFD Taskforce, which outlined a roadmap to make climate-related disclosures mandatory across the UK economy by 2025 (A. Bailey, 2021a; Bank of England et al., 2019; Bank of England, 2020g, 2020i, 2021h, 2022e, 2023h; Breeden, 2020). Additionally, the bank has engaged with the industry, as described before, as well as with other central banks, regulators, and multilateral organisations. Most notably, the BoE was a founding member of the NGFS, sits on its steering committee, and actively contributes to the network through

research. In particular, the BoE chaired two working groups responsible for developing scenario analyses and examining the interplay between climate change and monetary policy (Bank of England, 2020g, 2021h, 2022e, 2023h; Breeden, 2021b; L. Mann, 2023; NGFS, 2023a). The NGFS studies and recommendations informed the greening of the bank's CBPS framework (Bank of England, 2021c).

In the insurance domain, the BoE was a founding member of the Sustainable Insurance Forum, established in 2016, and participates in the Climate Risk Steering Group of the International Association of Insurance Supervisors (A. Bailey, 2021b; Bank of England, 2022e, 2023i; Sweeney, 2020). The bank has also actively advocated and participated in the FSB's climate-related initiatives, notably in the design and promotion of the TCFD recommendations (Breeden, 2018; Carney, 2016, 2019a, 2019b, 2019c). Additionally, the BoE has chaired the FSB's Committee on Supervisory and Regulatory Cooperation and the more recently created Climate Vulnerabilities and Data Group. The bank further supports the work of the BCSB's TCFR and the International Sustainability Standards Board.

The BoE has participated in various activities organised by other relevant organisations working on climate issues, such as the IMF, the G7, the G20, and the OECD (Bank of England, 2021a, 2021h, 2023h, 2023i). In particular, the bank hosted and contributed to COP26, especially to the agenda item concerning private finance (Bank of England, 2020c). Mark Carney, then governor of the bank, was appointed UK Finance Advisor for the conference and UN's Special Envoy for Climate Action and Finance (Bank of England, 2019b, 2020a, 2020b). Furthermore, the bank supported the UK's presidency of the G7 in 2021, whose agenda included climate change as a top priority under the item 'protect our planet' (A. Bailey, 2021a; Bank of England, 2021g, 2021l, 2022e; Council of the European Union, 2021; Sweeney, 2020). To conclude this survey of the BoE's green finance activities, it is worth mentioning that the bank co-led the G20's Sustainable Finance Study Group together with the PBC since its

inception in 2016, being replaced by the US Treasury in 2021 (Bank of England, 2018b; Breeden, 2018; G20 Italy, 2021c; Responsible Investor, 2021).

5.2.20 *United States – Federal Reserve System*

According the Federal Reserve Act, the Fed's policymaking shall be conducted in ways 'to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates' (Federal Reserve Act, 2022, Section 2A). The Fed goes on to argue that full employment—a situation where people have a job or can easily find one—and constant prices are the two cornerstones for an environment of controlled interest rates. Given the bank's coequal objectives of full employment and price stability, the Fed holds the so-called 'dual mandate' (Federal Reserve Board, 2021b). However, notwithstanding the theoretically broader mandate, the research data suggested that the Fed is the only AE central bank in this study that did not officially communicate its views about deploying monetary policy tools to advance green objectives. Despite the steady increase in speeches and in-house research, notably from 2019 onwards, I found no documentary evidence of the bank's stance concerning greening monetary policy, apart from the opinions of a limited number of board members, suggesting the bank's inactive approach towards climate change.

According to most views from the bank's staff, climate change is a regular risk posed to the bank. The Fed's priority is to build a financial system that is resilient to any risks, no matter their source, as the following statement from Board Member Waller elucidates:

> Climate change is real, but I do not believe it poses a serious risk to the safety and soundness of large banks or the financial stability of the United States. Risks are risks. There is no need for us to focus on one set of risks in a way that crowds out our focus on others. (Waller, 2023, p. 1)

Research undertaken by the bank's staff complements Waller's statement by elaborating on the perils of assigning an outsized weight to climate risks. For instance, Holsher et al. (2022) challenged the robustness of regulatory frameworks designed upon incomplete and highly uncertain climate data. Remarkably, Stiroh (2022) claimed that the Fed features a more limited mandate than the BoE and the ECB. According to the author, the BoE and the ECB are instructed to support government policies that pursue climate goals, which is not the case with the Fed.

Arguably, the Fed's objective to achieve full employment could give it more flexibility to step up the net-zero transition. Building on the burgeoning literature on the macroeconomic effects of climate change, unemployment rates tend to rise following climate disasters, which have significantly affected the US. Besides, the introduction of climate mitigation policies, whether nationally or internationally, may imply the elimination of some job categories or even the closure of entire firms linked to carbon-intensive activities. However, the data collected from the bank's website deviated from this perspective and even contradicted the arguments raised by the 'green' central banks in this study.

For the greenest central banks, the unprecedented risks from climate change require novel and urgent strategies, whose soundness will gradually improve as available data matures. From a socioeconomic perspective, it is also common to hear these central banks emphasising the need to support government efforts during the green restructuring, as well as contributing to the ultimate goal of saving the planet. As of January 2024, the Fed had shown no indication of supporting these broader objectives or developing a climate action plan, despite its conceptually broader mandate. In this context, the Fed fits into the deviant case study typology.

The Fed's thinking and work on environmental matters. Lael Brainard, a former member of the Fed's Board of Governors, stood out as the bank's most effusive official in the debate about the interplay between climate change, monetary policy, and financial stability. In

a speech delivered in 2019, Brainard stressed the economic disruptions caused by climate change events and how these could be difficult to manage from a monetary policy perspective (Brainard, 2019). According to Brainard, the uncertainty linked to climate change and climate-related policies precluded the setting of the monetary policy that best contributed to attaining the bank's statutory goals of full employment and stable prices. In the same speech, Brainard discussed the Fed's growing efforts to build knowledge through its own research and collaboration with other central banks.[47] In particular, reference was made to the BoE and ECB's climate work, notably their advances in climate scenarios and supervisory expectations (Beltran et al., 2023; Brainard, 2019, 2020, 2021b; Brunetti et al., 2022; Holscher et al., 2022; Stiroh, 2022). Despite the benefits of this learning experience, the former board member was sufficiently cautious to highlight the need to account for contextual differences.

In a related speech in 2020 (Brainard, 2020), Brainard further pointed to the burden that climate change disasters carry on the insurance sector, the borrowing capacity of firms and households, as well as on the overall financial health of banks and the system at large. Despite recognising data gaps and missing models to measure climate risks, Brainard emphasised green finance opportunities and their vital role in the economic transformation. In the same year, the Reserve Bank joined the NGFS and one of its working groups on Bridging the Data Gaps (Brainard, 2020; Federal Reserve Board, 2020b). For the first time, the Fed's *Financial Stability Report*, as well as the *Supervision and Regulation Report*, included a section on climate change financial risks (Federal Reserve Board, 2020a, 2020c). The Fed also proposed increased financial assistance for climate-resilient measures under the Community

[47] The search strategy identified the first research papers with an explicit reference to climate change produced by the Fed's staff in 2019 (e.g., Fried et al., 2019; Kruttli et al., 2019; Tran, 2019). The three collected papers pointed to the adverse effects of climate events on the profitability of firms and households. The collected data also showed that research on climate and other environmental topics continued in the following years, especially in 2022, with 10 research papers tracked.

Reinvestment Act. This framework required commercial banks to support local communities, especially the most disadvantaged groups (Brainard, 2020).

In the subsequent period, increased priority was given to climate research, including understanding the NGFS climate scenarios to estimate and improve the US macro- and microprudential resilience to climate change risks (Brainard, 2021c). The former board member acknowledged that many authorities had already performed this exercise and that mandatory disclosures were essential for addressing missing data and price climate risks. The standards provided by the TCFD were regularly mentioned in Brainard's speeches (Brainard, 2021a, 2021b, 2021c).

Throughout 2021, Brainard reiterated her support for embedding climate considerations into the Fed's core activities, given the growing number of climate hazards and the structural changes required to mitigate them (Brainard, 2021a, 2021b, 2021c). The former board member also highlighted the uniqueness of climate change risks, which could require tailored instruments to manage them (Brainard, 2021b). By and large, Brainard conveyed some positive expectations about the Fed's engagement in climate initiatives. As stated by Brainard, 'despite the challenges, it will be critical to make progress, even if initially imperfect, in order to ensure that the financial system is resilient to climate-related risks and well positioned for the transition to a sustainable economy' (Brainard, 2021a, p. 2). Brainard was also convicted of the economic and financial benefits of a prompt and orderly transition (Brainard, 2021c).

The year 2021 witnessed a number of events that supported Brainard's encouraging stance. Most notably, the Fed established the Supervision Climate Committee and the Financial Stability Climate Committee (Brainard, 2021b). Whereas the former aimed to enhance the preparedness of financial institutions to manage climate change risks, the latter was tasked with monitoring the effects of climate change on financial stability. In November 2021, the Fed publicly backed the NGFS Glasgow Declaration and issued a statement expressing its intention

to advance climate-related initiatives in banking supervision and the wider financial system. However, no mention was made of using monetary policy tools to support green activities (Federal Reserve Board, 2021d). In December of the same year, Brainard was appointed chair of the FSB's working group on the Assessment of Vulnerabilities for two years (FSB, 2021).

Further to the NGFS, the bank's staff collaborated with other international bodies in the field of climate change, especially within the G20 Sustainable Finance Study Group, the BCBS's TCFR—the US co-led both groups—and the FSB's TCFD (Brainard, 2019, 2020, 2021b). On the FSB, it is worth mentioning that the Fed's vice chair for supervision served as the FSB's chair between December 2018 and 2021 (FSB, 2018). Under his leadership, the FSB placed increased impetus on climate-related risks, having published a framework on climate-related financial disclosures. One of the most prominent task forces within the FSB is the TCFD (Federal Reserve Board, 2022a; Quarles, 2021). In the Fed's annual reports from 2020, 2021, and 2022, extensive reference was made to the climate work and guidance issued by these international standard setters (Federal Reserve Board, 2021a, 2022a, 2023c). The fact that the Fed was both a member and chair of the FSB could have contributed to the increased visibility of the FSB's work in the Fed's reports.

With regard to the Reserve Bank's interaction with national bodies, particular emphasis was placed on joint activities with the US Financial Stability Oversight Council (FSOC), which was responsible for identifying, managing, and mitigating risks to financial stability. The US Treasury chaired the FSOC, whereas the Fed's chair of the board was one of its members (Federal Reserve Board, 2022a, 2023c). Following the publication of the FSOC report on CRFRs in 2021, the Council identified climate-related risks as a key priority for 2022. Subsequently, the Council established a Climate-related Financial Risk Committee in which the Fed participated (Federal Reserve Board, 2023c).

The Fed's involvement in climate work, as well as the determination expressed by the former Board Member Brainard, appears inconsistent with several research papers produced by the bank's staff, which suggested a vigilant approach to climate change action. In what follows, I provide some of the main findings that were published. For Brunetti et al. (2021), the risks arising from a changing climate fit into the bank's extant risk management framework. Given the uncertainty and unpredictability of climate risks, the authors contended that more research and granular data are needed to thoroughly consider climate risks in the oversight of financial stability. Fried et al. (2021) found that the widespread belief that some stringent climate policy is to be implemented yields a more significant reduction in carbon emissions than a small carbon tax. The authors explained that the expectation of climate policies leads industries to anticipate their effects and voluntarily reduce and disclose their carbon emissions. From this perspective, delayed policy action offers benefits.

Kiley (2021) held that global warming may not significantly impact the US due to its mild temperatures. Caramichael and Rapp (2022) emphasised the shortcomings of green bonds, namely the increased risk of greenwashing stemming from the lack of a comprehensive and legally binding framework for green bond issuances. The authors further pointed out the sectoral and geographical concentration of issuers within the banking industry of developed economies, suggesting that green bonds mainly benefit specific issuers rather than the global environment. Brunetti et al. (2022), as much as Beltran et al. (2023), insisted on the lack of consistent data and methodologies, as well as the uncertainty concerning new technologies, policies, and climate change. Therefore, the authors argued that assessing climate change risks remains inconclusive and establishing effective climate strategies is challenging. Related to this, Holscher et al. (2022) questioned the robustness of policy frameworks based on imperfect and highly uncertain information. Most surprisingly, Stiroh (2022) stated that the Fed's

mandate is narrower than that of the BoE and ECB, as the latter two include a secondary objective to support government policies, which also encompass climate goals.

Taken together, a great deal of research papers prepared by the bank's staff did not urge prompt central bank action, in spite of acknowledging the increased financial risks brought about by climate change. A similar message was found in a recent speech by the Fed's Board Member, Waller (2023). Even if the speech conveyed the board member's views, it can still elucidate the Fed's defensive approach towards climate change. For Waller, while the source of climate change risks may be unique, the resulting effects are similar to those of other risks already known in the US, such as migrations and asset devaluations caused by weather phenomena. Waller maintained that climate transition risks are foreseeable, contrary to other unpredictable events. Although climate policies can cause unexpected economic and financial volatility, the same is true for other policy areas where the US already has experience, such as in the environmental, health insurance, and tax sectors.

Moreover, Waller believed that climate risks are increasingly accounted for by businesses and households, who are already anticipating a carbon price and adjusting the value of riskier assets accordingly. Waller also noted that policymakers consider the negative consequences of any policy shifts and seek to shield the economy from them when designing and implementing new policies. Regarding the potentially disruptive effect of new (green) technologies, the board member argued that technological innovations, by definition, are unsettling. All told, Waller contended that climate change risks fit within the bank's existing risk management framework. There was no need to give special consideration to these risks. In order to attain the objectives stated in the bank's mandate, the board member suggested focusing on 'more near-term and material risks' (Waller, 2023, p. 9).

Despite the defensive approach previously described, the Fed announced a number of supervisory measures in 2022, following the practices adopted by other major central banks.

In particular, the Fed launched a public consultation on a framework to manage the exposure of the largest US banks to CRFRs (Federal Reserve Board, 2022d). The consultation pointed to the economic and financial impacts of growing physical and transition risks, which are likely to affect the functioning of the banking sector. In October 2023, the Fed, in conjunction with the Office of the Comptroller of the Currency and the Federal Deposit Insurance Corporation, issued the Principles for Climate-Related Financial Risk Management for Large Financial Institutions (Federal Reserve Board, 2023c; Misback, 2022). These principles covered the main operations of the largest financial firms in the US—those with consolidated assets of over 100 billion dollars—spanning from governance to policies, strategy, risk management, data measurement, reporting, and scenario analysis. Crucially, these 'principles neither prohibit[ed] nor discourage[ed] financial institutions from providing banking services to customers of any specific class or type, as permitted by law or regulation' (Gibson, 2023, p. 3).

Additionally, in 2023, the Fed launched the first climate scenario exercise involving the six largest US banks. This exercise drew on the widely accepted scenarios developed by the NGFS and aimed to assess the climate risk management practices adopted by the US's largest financial institutions and identify areas for improvement (Federal Reserve Board, 2022b, 2023a, 2023b, 2023c). Despite some progress by the Fed in addressing climate change through the establishment of two climate committees, risk management guidelines, and scenario analyses, Board Member Waller (2023) warned that this represents no sign of special treatment for climate risks. Although external shocks have at times forced the bank to adapt in response to financial difficulties, such as the GFC and during the COVID-19 pandemic, Waller argued that the Fed is not a 'climate policymaker' (Waller, 2023, p. 1).

5.3 Selection of Three Units of Analysis for In-Depth Investigation

The previous section aimed to provide a more detailed analysis of how different central banks addressed the increasing concerns related to environmental sustainability. This review

demonstrated that mandates with similar legal objectives produced varying incentives and constraints for implementing GMP measures. As the most climate-responsive central banks illustrated (as in Table 5, p. 150), GMP strategies started from both broad and narrow mandates. It is reasonable to conclude that legal acts did not fully explain the varying stances of central banks on environmental issues. In order to understand unexpected outcomes and shed light on why GMP manifested differently across central banks, this research undertakes a thorough examination of three case study central banks with significant deviance, as estimated by the GMPI. As already announced, the choice was made to select two central banks with narrow mandates that adopted substantial GMP measures, and one central bank with a broader mandate that did not initiate any green adjustments in its monetary policy toolkit.

The value of comparing two central banks that adopted environmental standards despite the constraints of their formal objectives lies in offering a range of possibilities on how monetary policy frameworks supported the green transition within the context of limited mandates. These findings can cautiously be generalised to anticipate GMP outcomes in other AE central banks with narrow mandates. This research does not opt to select central banks with broader mandates that engaged in GMP operations, since, in theory, they hold an institutional setting more conducive to direct central bank policy instruments towards environmental ends. Arguably, if GMP criteria unfold in central banks with narrow mandates, they might be more easily expected and implemented in central banks with broader mandates. Conversely, narrow mandates cannot so easily explain such developments.

As anticipated in the methodology chapter, the three selected cases are either from the AE or the EMDE to allow for more meaningful comparisons. It is assumed that the political and socioeconomic conditions within each group are more similar and, therefore, more comparable. Based on the data collected and examined, the BOJ, the Riksbank, and the Fed were the three selected AE-specific cases for in-depth investigation.

The BOJ and the Riksbank represent two compelling cases for theorising about the formation and institutional design of GMP measures. Both banks were able to adopt environmental criteria and goals despite their theoretically limited mandates and heterogeneous approaches to green policies (see Table 6, p. 249, an excerpt of Appendix A). The Fed is an example of green stalemate, notwithstanding its dual mandate. Hence, the proposed combination of deviant central banks forms a subset of three units of analysis that helps explain why green criteria played out in central banks with originally narrow mandates and not in central banks with wider statutory objectives. In the following, I shall provide a more detailed rationale for the selection of each of these three cases.

The BOJ held the fourth position in the GMP index (GMPI = 14), just after the UK, the ECB, and the Riksbank, the three of which have GMPI scores of 22, 20, and 15, respectively, by virtue of their secondary mandates (as in Table 5, p. 150). From this perspective, the BOJ illustrates not only a deviant choice but also an extreme one, as it shows the maximum 'deviantness' vis-à-vis other AE central banks with narrow mandates (Seawright & Gerring, 2008, p. 302). In pursuing its green agenda, the BOJ implemented a new green credit line with the explicit objective of supporting the country's efforts in mitigating climate change (Bank of Japan, 2021k).

Up to January 2024, the BOJ and the PBC were the only two units of analysis that launched lending programmes specifically designed to support the transition to a low-carbon economy. Paradoxically, both central banks were instructed to safeguard the stability of prices, which is, in principle, a very focused mandate. It is one thing to manage climate change financial risks—the previously mentioned 'outside-in' approach to climate change—and quite another to enact policies that target the root cause of those risks. Moreover, the BOJ was the first central bank in this study to adopt a monetary policy instrument with an environmental scope, the Growth-Supporting Funding Facility, in 2010. Learning from this policy experience

Table 6. *The Green Monetary Policy Measures of the Bank of Japan and the Swedish Riksbank*

	Implemented green monetary policy measures	Year	Planned green monetary policy measures	Instrument category	GMPI
Bank of Japan	Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth. This lending facility targeted a set of business areas, including the environment.	2010		Credit operations	3
	Investment in foreign green bonds, including the EMEAP Asian Green Bond Fund.	2021		Foreign exchange investments	3
	Funds-Supplying Operations to Support Financing for Climate Change Responses.	2021		Credit operations	5
	The purchase and sale of government bonds include Japan Climate Transition Bonds.	2024		Asset purchase programmes	3
					14
Sveriges Riksbank	Sustainability considerations in the choice of foreign assets.	2019		Foreign exchange investments	3
	Purchases of corporate bonds through norm-based negative screening. Only bonds issued by companies deemed to comply with sustainability norms are eligible for purchase.	2021		Asset purchase programmes	4
	Security purchases included green municipal and government bonds.	2021		Asset purchase programmes	3
	Purchases of corporate bonds from companies that report their annual emissions in line with the TCFD recommendations.	2022		Asset purchase programmes	4
			Evaluation of how collateral policy can incorporate sustainability and climate change criteria.	Collateral	1
					15

could have influenced how the bank later responded to climate change. Against this background, the BOJ represents an intriguing case to explore how the central bank accomplished its environmental strategy within the constraints of its narrow mandate.

The Riksbank held the third-highest GMPI score among the AE central banks, ranking behind the UK and the ECB. Although these three banks feature multiple monetary and economic objectives, which give them greater flexibility to adopt unconventional monetary policies, the Riksbank is yet an unexpected case that merits further investigation. The bank implemented its sustainability strategy in January 2021, when it still held a narrow mandate. Subsequently, in October 2021, the Swedish Government submitted a proposal to the Parliament to review the Sveriges Riksbank Act. The new Act, which entered into force in January 2023, altered the scope of the bank's monetary policy from one focused on maintaining price stability to another that explicitly accounted for production and employment as a secondary objective, as follows:

> The overriding objective of the Riksbank is to maintain permanently low and stable inflation (the price stability target). Without neglecting the price stability objective, the Riksbank shall contribute to a balanced development of production and employment (consideration for the real economy). (The Sveriges Riksbank Act, 2022, Chapter 2 sec. 1)

The newly expanded mandate made the bank's contribution to 'Sweden's climate transition clearer' (Sveriges Riksbank, 2023c, p. 26). According to the bank, 'for all measures taken by the Riksbank there must be support in law, which also applies to sustainability measures' (Sveriges Riksbank, 2023c, p. 27). This recent modification in the legal text pulled the former deviant central bank towards a typical one, opening a new field of explanation for how a deviant case resolved problems related to the lack of legal conditions to support green public policies by expanding the scope of its mandate. Against this background, the Riksbank

represents a noteworthy case to investigate how central bank mandates can change in times of growing political, economic, and social concerns. It also demonstrates that institutional change can happen faster than one thinks possible when there is a strong commitment to specific causes. The Riksbank's revision of its legal objectives can, thus, inform and serve as a model for other central banks uncertain about adopting a green path due to the lack of legal backing over areas outside their usual responsibility. Yet, an overhaul of the mandate can be a radical and difficult option to implement in other contexts.

Moreover, from the perspective of exploring a causal relationship between the environmental crisis and GMP outcomes (in Section 6.6, p. 309), the Japanese and Swedish central banks form a subset of 'typical cases' as they are positive on the cause—exposure to the climate emergency—and the outcome—adoption of GMP measures—suggesting the presence of both the permissive and productive conditions that produced change (Soifer, 2012). Both banks also share key background conditions that can affect the development of the causal process (Government Offices of Sweden, 2021; The Government of Japan, 2021a). Notably, they joined the NGFS before implementing their environmental strategies and belong to the group of advanced economies with ambitious national climate frameworks (Bank of Japan, 2019f, 2021f; Sveriges Riksbank, 2018b, 2020k). The Riksbank-BOJ comparison further allows us to investigate why the latter did not need to alter its narrow mandate to advance a green strategy.

The Fed is my third selected case study for being an important exception to the general model of deviance described for the BOJ and the Riksbank. Specifically, the Fed did not demonstrate an incentive to address environmental risks notwithstanding its dual mandate, which encompasses stable prices along with maximum employment. Arguably, broader mandates could be more supportive in achieving environmental and other sustainability goals. The Fed's passive approach to climate change hints at the existence of some path-dependent

structure that overrides the GMP tendency of other major central banks in this study. The underlying query is thus why the Fed was discouraged from behaving 'typically' and whether it was responsive enough to its mandate.

Through a historical institutionalist analysis, the next part of this study is directed at understanding monetary policy change in the cases of the BOJ and the Riksbank, as well as the 'stability of choices' in the case of the Fed (Vos & Voets, 2024, p. 1894). The development of a thick narrative about these three cases will help depict the chain of events, key actors, and discussions that dictated the policy choices adopted or not adopted. The concepts borrowed from HI will further emphasise the mode of monetary policy change in the first two cases, especially whether piecemeal reforms or structural ruptures prevailed, with a view to answering the central research question: *Under what institutional conditions can the development of GMP measures be best explained?*

Subsequently, building on the broader literature that emphasises the role of constructed ideas and norms in policy formation, the study seeks to employ a mid-range comparative process tracing to produce an explanation for the two central banks that advanced a green investment strategy, despite the limited nature of their mandates. At the start of this research, evidence suggested that global environmental welfare was becoming an entrenched priority for some governments and the general public. The convergence of new interests and ideas towards climate change mitigation could have created the permissive conditions for developing innovative GMP strategies. The interviews with central bank officials and monetary policy experts served as a valuable complement to this analysis. They provided an opportunity to discuss the importance and challenges of integrating environmental considerations into the core operations of central banks and elucidated the Fed's missed opportunity to reshape its monetary policy toolkit along green lines.

The Case Studies of Japan and Sweden

The core theme of this study is to comprehend how mandates interact with the development of GMP measures. Although legal mandates are important for explaining central bank actions and commitments, the multiple-case analysis suggested no linear link between formal objectives and GMP outcomes, as central banks with similar mandates responded differently to environmental pressures. A priori, it is reasonable to conclude that central bank mandates lack crucial elements to explain policy decisions in the environmental field. Therefore, focusing on central bank legal acts only may neglect significant institutional changes. As the comparative analysis demonstrated, beneath the seeming stability of formal objectives, significant transformations can occur at the operational and policy levels.

In order to enhance the understanding of the medium-N research, this second part of the study explores three deviant central banks that did not conform to the hypothesised relationship between central bank mandates and their GMP strategies adopted or lack thereof. The BOJ, the Riksbank, and the Fed were my selected subset of three cases for thorough investigation, given their relatively high level of 'deviantness'. In the following, I first examine the institutional and policy settings that preceded the unexpected development of green monetary policies at the BOJ and Riksbank, including the key stakeholders (both internal and external to the banks), their interests, how these stakeholders and interests influenced monetary policy change, as well as the institutional opportunities and constraints encountered.

The period of analysis for each of the three investigated cases is not perfectly aligned, reflecting the varying contexts in which the topic of GMP unfolded, which occurred at slightly different points in time across the three institutions. Therefore, it was not deemed essential to have the same starting date. The series of events leading to the adoption of GMP measures is described in chronological order, since the objective is to explain their inception. The next step is to develop a theoretical explanation for the similarities and differences in the adopted policy

approaches to the environmental crisis using the conceptual elements from historical and sociological analytical frameworks. Based on the historical accounts of the BOJ and the Riksbank, this chapter further outlines the process of greening monetary policymaking through a process tracing research method.

6.1 The Bank of Japan

Created in June 1882, the BOJ operates under the Bank of Japan Act 1997, which came into force in April 1998 amid a severe national recession and an international movement towards greater central bank independence (Bank of Japan, n.d.-b; Yasuba, 1999). The new Act aimed to restore the country's economic competitiveness and international confidence (Dwyer, 2004; Yasuba, 1999). Yet, the decline of the national growth rate persisted in the following years due to some crucial events and 'structural factors' (Bank of Japan, 2012e, p. 14). Prominent among them were a declining and aged population, low public and private investments, high unemployment rates, lack of market confidence, and the sequels of the 2007-2008 GFC (Bank of Japan, 2010a, 2010b, 2010d, 2010h, 2012e). According to World Bank data, Japan's inflation rate in 2009 and 2010 registered -1.4 and -0.7, respectively, whereas the unemployment rates in 2009 and 2010 stood at 5.1% (World Bank, n.d.-a, n.d.-b).

The national recession posed a political challenge to the Japanese Government and compelled the central bank to act beyond its commitment to price stability. As part of a national effort to reform the Japanese 'economic structure' and reverse the protracted cycle of economic stagnation and deflation, the BOJ's Policy Board decided to establish the Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth (Growth-Supporting Funding Facility) on 15 June 2010 (Bank of Japan, 2012f, p. 3, 2010e). Compared to other 'extremely accommodative' policy tools adopted by the bank to stimulate economic growth, the Growth-Supporting Funding Facility held the differentiating feature of directing financial firms' lending into specific activities with growth potential, as outlined in the New Growth

Strategy of the Japanese Government dated 30 December 2009 (Bank of Japan, 2010e, p. 14, 2010d, 2010f, 2010h; Prime Minister's Office of Japan, 2009). Such targeted ends, the bank argued, could not be achieved through standard monetary policy tools. Although the new scheme did not entail an environmental objective per se, it contributed to expanding the sector by attracting investments in environmental businesses, as explained below.

This new 'extraordinary' policy measure took the BOJ 'beyond the bounds of central banking', as it substantiated specific economic areas in line with the economic strategy of the government (Bank of Japan, 2010e, p. 16). While 'firms and financial institutions in the private sector . . . [played] a primary role' in the economic recovery, the bank contended that the prevailing macroeconomic trends of continued deflation backed the central bank's action (Bank of Japan, 2010d, p. 16; Interview 4). Consequently, the bank decided to make use of its policy functions to influence firms' investment decisions towards key areas that could boost output and demand (Bank of Japan, 2010d, 2010h). In doing so, the BOJ aimed at fighting deflationary pressures and delivering on its mission of 'achieving price stability, thereby contributing to the sound development of the national economy' (Bank of Japan, 2010e, p. 16, 2010h, p. 6, 2010b). From a financial perspective, the funding facility was also viewed as an opportunity to overturn the cycle of low profits that was hitting financial firms and risking their capacity to deal with new shocks (Bank of Japan, 2010g). The Policy Board meetings were attended by government officials, who welcomed the BOJ's initiative to support economic growth, the ultimate purpose of which, 'overcoming deflation', was a common objective for both institutions (e.g., Bank of Japan, 2010e, p. 18, 2010j, pp. 15–16).

The first disbursement of funds under the new scheme took place in September 2010. It entailed long-term financing at low interest rates (0.1%) to 66 eligible financial institutions—including large banks, regional banks, and financial cooperatives—that invested in 18 specific business activities, as set in the national New Growth Strategy (Bank of Japan, 2010d, 2010e,

2010f, 2010h, 2010g). These included '(7) Environment and energy business' and '(8) Business for securing and developing natural resources' (Bank of Japan, 2010e, p. 26).[48] The 'Environment and energy business' category received the largest amount of allocated funds in the first loan disbursement, 23,5% (Bank of Japan, 2010h, p. 9, 2010i, p. 2, 2010j, p. 14). This trend continued in the subsequent years, creating investment opportunities that this sector would not otherwise have had (Bank of Japan, 2010i, 2011d, 2012c, 2014d, 2015e, 2015f). As of December 2015, 28.5% of the funds disbursed under the Growth-Supporting Funding Facility had been allocated to environmental and energy projects (Bank of Japan, 2016c).

The BOJ recognised that this novel scheme would imply revisiting some of the guiding principles of its operations to preserve the bank's financial situation, achieve the desired effects of its standard monetary policy, and prevent 'excessive involvement in resource allocation' as required by the bank's Act (Bank of Japan, 2010b, p. 15, 2010d, 2010e; Interview 1). To that end, the design of the facility included a number of considerations. Firstly, the measure was meant to be temporary. The deadline for new loan applications was set for March 2012. In addition, a ceiling was established on the duration of loans—ranging from one to four years, including rollovers—as well as on the total amount of disbursed loans, which could not exceed 3 trillion yen. With a view to minimising the bank's involvement in the allocation of funds, financial institutions were entrusted with selecting their own investments and counterparties based on criteria pre-determined by the BOJ. The central bank validated the investment plans before the disbursement of loans.

[48] The remaining investment areas included '(1) Research and development (2) Setting up a new business (3) Business reorganization (4) Investment and business deployment in Asian and other countries (5) Science and technology research at universities and research institutions (6) Development and upgrading of social infrastructure (9) Medical, nursing care, and other health-related business (10) Business serving the needs of senior citizens (11) Business in the content creation industry (12) Tourism business (13) Regional and urban revitalization business (14) Agriculture, forestry, and fisheries business; Business linking agriculture, commerce, and industry (15) Business which supports the creation of housing stock (16) Disaster prevention business (17) Employment support and human resources development business (18) Childcare services business', among other areas supportive of economic growth (Bank of Japan, 2010e, p. 26).

At the monetary policy meeting of October 2010—one month after the first loan disbursements—one board member alerted about the need to carefully balance such a measure of fiscal nature with the bank's competencies (Bank of Japan, 2010k). After all, the scheme addressed Japan's long-lasting economic underperformance, driven by factors such as low productivity and an aged population (see also Bank of Japan, 2011a). Critiques were also raised at the December monetary policy meeting concerning the facility's unintended effects, notably the intensifying competition among financial institutions (Bank of Japan, 2010j, 2011a). Notwithstanding the reactive claims pushing for policy deinstitutionalisation, the Policy Board counter-reacted by not only keeping the lending facility but also enhancing its original features, considering the scheme's growing demand and the still-sluggish recovery of the economy (Bank of Japan, 2010j, 2011a, 2011c).

In June 2011—one year before the facility's term set in March 2012—the number of loan recipient entities had increased from the initial 66 to 153, whereas the amount of disbursed loans reached 2,942 yen, out of the credit line limit of 3 trillion yen. The invested areas went beyond the listed 18 categories and included 'initiatives to support local industries' (Bank of Japan, 2011c, p. 7). To continue supporting liquidity needs, especially in the aftermath of the Tohoku Earthquake and Tsunami on 11 March 2021—the strongest in Japan's history (Bank of Japan, 2011b; National Geographic, n.d.)—the bank approved special rules for equity investments and asset-based lending. Although the original fund-provisioning measure already covered this genre of investment, the bank increased its lending capacity with an extra budget for the asset-based loan market. The objective was to expand financial support for smaller businesses that lacked standard collateral or guarantees, such as start-ups (Bank of Japan, 2012c). The most striking feature of the tool became its broad scope. The BOJ embarked on a long cycle of new supplementary provisions entailing expanded investment activities, higher

loan amounts, stretched deadlines for loan applications, and new eligible institutions. The following paragraph summarises some of the most significant changes to the facility.

At the monetary policy meeting on 12 and 13 March 2012, the bank decided to modify the main rules of the facility established in 2010. This included extending the application deadline for new loans by two years, until 31 March 2014, and increasing the total amount of loans from 3 to 3,5 trillion yen. Equity investments and asset-based lending were likewise extended until 31 March 2014. Additionally, the bank set new special rules for investments between 1 and 10 million yen, the small-lot investments and loans, which were not eligible under the main rules. The bank further proposed and launched special arrangements for US dollar lending or investments involving foreign currencies (Bank of Japan, 2012b, 2012c, 2012d). New special rules were also set in 2015 for Member Financial Institutions of Central Organisations of Financial Cooperatives without an account at the BOJ (Bank of Japan, 2015c).

Taken together, what was initially projected to be a provisional policy instrument in the context of a monetary easing package to combat deflation turned out to be a longstanding and multidimensional one (Bank of Japan, 2023b). The funding terms and conditions of the Growth-Supporting Funding Facility have been adjusted multiple times since its establishment (for a schematic overview, see Appendix D, p. 413). In the end, new disbursements continued for more than 10 years, until 30 June 2022 (Bank of Japan, 2021f, 2021i)—the original deadline for new loan applications had been set for 31 March 2012 (Bank of Japan, 2010c, 2012a). Considering that the maximum duration of the loans, including rollovers, is four years, the measure was estimated to support participating institutions until 2026. It is worth noting that some unforeseen events related to natural disasters fed into the longer duration of the funding facility to stimulate economic growth, namely the 2011 Great East Japan Earthquake, the 2016 Kumamoto Earthquake, and the COVID-19 pandemic (Bank of Japan, 2010c, 2012a).

From the perspective of the new green finance paradigm, the environmental issue has appeared in the bank's publications since the end of 2017, especially from 2019 onwards (an overview of the making of the BOJ's climate strategy is provided in Table 8, p. 270). In the financial system reports of October 2017 and 2018, the bank briefly discussed the market preference for ESG assets (Bank of Japan, 2017b, 2018). In a speech delivered in March 2019 (Kuroda, 2019a), the former governor emphasised the UN SDGs and the threats from an economy guided by profit and overconsumption of fossil fuels. The former governor further noted the mechanisms available to governments, companies, and international organisations to mitigate carbon emissions, stressing the work carried out by the G20 and the TCFD. In the same year, Japan held the G20 presidency (The Government of Japan, 2019), which comprised 'Energy Transitions' as one of the group's main agenda items (G20 Japan, 2019). Within the G20, the BOJ co-chaired the G20 Finance Ministers and Central Bank Governors Meetings together with Japan's Deputy Prime Minister and Finance Minister (Kuroda, 2019a).

The meeting with finance ministers and central bankers was held on 8 and 9 June 2019, in Japan. On this occasion, the TCFD presented the 2019 progress report (Ministry of Finance Japan, 2019), which pointed to mixed results regarding firms' increased, albeit insufficient, disclosure of climate-related financial information (TCFD, 2019). The Japanese Government, through the Ministries of Economy and Environment, and the FSA, were strong advocates of the TCFD recommendations since 2018, having organised outreach events and published guidelines on scenario analysis and climate risk disclosures (TCFD, 2019). Therefore, Japan recorded the highest number of TCFD-supporting firms in 2021 (Kuroda, 2021b).

In the bank's *Annual Review* issued in August 2019, the BOJ emphasised the UN SDGs—as in the speech given by the former governor in March 2019—and how national efforts to achieve these goals could pose numerous challenges for central banks, requiring specific measures. This message was reiterated in subsequent publications of the bank (Bank

of Japan, 2019d, 2020e, 2021h, 2022e, 2023k). The BOJ's *Financial System Report*, published in October 2019, addressed climate change risks and the TCFD guidelines for the first time (Bank of Japan, 2019e).

In the following month, on 28 November 2019, the bank decided to join the NGFS to 'enhance its understanding' of and contribute to the international debate on climate change, considering the growing number of climate events in Japan, especially severe floods (Bank of Japan, 2019f, Interview 1). On the same day, the bank's governor delivered a speech corroborating the peculiarity and seriousness of climate change risks and highlighting the crucial role of the governor of the Bank of France in the BOJ's decision to join the NGFS (Kuroda, 2019b). It should be recalled that the Bank of France was not only a founding member and the secretariat of the network, but also a leader in green central banking initiatives, as demonstrated in the Green Central Banking Scorecard developed by Positive Money (Green Central Banking & Positive Money, 2022).

The BOJ's rising attention to climate change continued throughout 2020. The financial system reports released in April and October 2020 underlined the role of the financial sector in achieving SDGs and the climate initiatives undertaken by the BoE, the ECB, *De Nederlandsche Bank*, and the Bank of France. Importantly, the BOJ increasingly stressed the centrality of the financial sector in achieving SDGs and its willingness to contribute to the climate debate and knowledge via platforms such as the NGFS (Bank of Japan, 2020a, 2020d, 2020e, 2021h, 2021l, 2021o, 2022g). Accordingly, the bank participated in a number of NGFS publications on greening monetary policy operations, the first of which was issued in June 2020, and advertised the NGFS work on the bank's website prior to the BOJ climate strategy (Bank of Japan, n.d.-a; NGFS, 2020a, 2021d, 2023c). This can serve as evidence of the BOJ's engagement with and learning from the network's research and recommendations.

As in 2019, the *Annual Review* published in October 2020 emphasised the challenges associated with the country's commitment to SDGs, requiring tailored responses. The document announced the bank's organisation of sustainable finance workshops and in-house research on the interplay between climate change and the financial system (Bank of Japan, 2020e). In December 2020, the bank's staff published a research paper concerning the market failure resulting from mispriced carbon assets. The same document noted that the financial system could exacerbate climate change risks through its operations and suggested adopting measures that contributed to mitigating those risks (Furukawa et al., 2020).

The year 2021 marked a more fundamental shift towards a new role and purpose of the BOJ in support of environmental goals (Bank of Japan, 2021b). The climate change topic emerged during the bank's monetary policy meeting on 20 and 21 January 2021. Government representatives present at the meeting informed about the submission of the 2021 fiscal budget to the Diet's approval (the Japanese national legislature), which comprised measures towards a 'digitalized and green society' (Bank of Japan, 2021b, p. 25). The new budget was approved on 26 March 2021 (Bank of Japan, 2021e). At the BOJ's monetary policy meeting held in April 2021, a board member stressed the risks from climate change on price deviations and the importance of developing further research into the impact of climate change on the economy and financial system. Notably, the bank began deliberating on how to respond to the climate issue in compliance with its mandate (Bank of Japan, 2021e).

In the same month of April, the BOJ's *Financial System Report* stated that net-zero actions and commitments taken in Japan and worldwide could have a significant impact on the Japanese economy and society. Therefore, financial institutions needed to step up their efforts and align investment strategies with sustainability goals, particularly climate change targets (Bank of Japan, 2021c). Accordingly, the Policy Board took crucial decisions to accelerate investments consistent with climate change mitigation in June 2021, despite hesitation from

some policy members (Bank of Japan, 2021g, 2021k). A summary of the main points raised by the members of the board at their June and July meetings is provided in Table 7.

Leveraging the BOJ's experience with the Growth-Supporting Funding Facility and drawing on the assumption that there was no time to wait with regard to climate change, the bank approved a novel funding solution at the monetary policy meeting on 17 and 18 June 2021, the Funds-Supplying Operations to Support Financing for Climate Change Responses (Climate Response Financing Operations). The introduction of this innovative policy tool was grounded on the following terms: 'as each country was making its efforts to achieve carbon neutrality, it would be appropriate for . . . the central bank of Japan, to design a scheme that supports Japan's actions to address climate change' (Bank of Japan, 2021k, p. 20; Amamiya,

Table 7. *Summary of the Bank of Japan's Discussions at the Monetary Policy Meetings of June and July 2021*

- Climate change could significantly impact economic activity, prices, and financial settlements. Therefore, climate change mattered for central banks.
- As the effects of climate change were going to become more visible in the medium and long run, swift and adjustable measures were more beneficial than late ones with more information.
- The fight against climate change and the transition to a low-carbon economy encompassed massive funds.
- Since climate change involves a market failure, the government and the central bank could divide climate action according to their specific responsibilities.
- The BOJ must step up research on the macroeconomic implications of climate change and the supporting role of the private sector, apply the findings, and contribute to public knowledge.
- The BOJ's policy actions should align with its mandate.
- Financial support from the central bank would drive macroeconomic and price stability and contribute to economic growth by encouraging investments in innovative areas.
- The BOJ should refrain from interfering in the qualification of companies that contribute to green growth, which is a task for governments.
- The BOJ should report the results of the GMP measures adopted to ensure accountability.
- The adopted policies should be sufficiently flexible to adapt to the evolving climate change conditions, as well as to national and international policy responses, such as taxonomies.

2021; Bank of Japan, 2021g, 2021j, 2021i; Nakamura, 2021). The new funding facility aimed to catalyse green growth through private-sector financing, since Japanese investments were mainly undertaken through bank lending and the national taxonomy was not yet developed to enable the central bank to include green elements in the purchase of financial assets (Amamiya, 2022; Bank of Japan, 2021n; Interview 1; Kuroda, 2021b).

The Climate Response Financing Operations was intended to succeed the Growth-Supporting Funding Facility, the last disbursement of which was planned for June 2022 (Bank of Japan, 2021g, 2022e). It entailed central bank funding at a rate of 0% for financial institutions with a current account at the BOJ that invested in the following asset types: green loans and bonds, sustainability-linked loans and bonds (with performance targets associated with climate change mitigation efforts), transition finance, among other comparable investments to be identified and justified by the borrowing financial institutions (Bank of Japan, 2021g, 2021g, 2021h, 2021j, 2021k). Funds would be disbursed against qualified collateral for a period of one year, with the possibility of unlimited rollovers until the termination of the facility, in March 2031 (Bank of Japan, 2021j, 2021i, 2021k, 2021n). The funding terms were designed in ways that allowed financial firms to benefit from long-term financing, given the significant amount of time needed to fight climate change (Bank of Japan, 2021k). Disbursements were planned to occur twice a year unless the scheme impaired the achievement of other monetary policy goals (Bank of Japan, 2023b).

Cognisant that policies to support green technologies and other green growth areas are the responsibility of elected bodies through regulation and subsidies, the BOJ Policy Board decided that the choice to invest or provide loans for climate change-related projects was left to financial institutions. Practically speaking, the BOJ devised the policy tool, while commercial banks assessed the projects and financial investments. By allowing participating institutions to decide on investments that help mitigate climate change, the scheme was

believed to minimise the BOJ's involvement in selecting firms or activities that contribute to the 'green society' (Bank of Japan, 2021g, p. 18; Interview 1).

It is worth noting that the Growth-Supporting Funding Facility had followed a similar approach. For Amamiya (2021), former deputy governor, this pioneering tool set an example of how central banks could steer green investments while safeguarding market neutrality. Arguably, the institutional framework on which the scheme was built—long-term loans at a 0% interest rate—significantly contributed to the precise green trajectory the tool was intended for, by prioritising loans according to environmental principles. To ensure public accountability and consequent trust in the scheme, participating institutions were required to report their investment decisions in line with the TCFD guidelines (Bank of Japan, 2021i, 2021k, 2021n; TCFD, 2017). Mandatory reporting was believed to increase the availability of climate risk data and facilitate the identification and allocation of resources towards green activities (Kuroda, 2021c).

Government officials present at the BOJ's monetary policy meetings welcomed the bank's climate change initiative for being consistent with both the government's endeavours to achieve carbon neutrality by 2050 and the G20 climate discussions held at the group's meeting on 9 and 10 July 2021 (Bank of Japan, 2021g, 2021k, 2021n). As a G20 member, Japan sought to align with the group's sustainable finance agenda. Three days before the G20 meeting, on 7 July 2021, the Japanese Government approved the 2022 budget plan, which emphasised the shift towards a greener society (Bank of Japan, 2021k). Policy Board members, for their part, kept stressing the need to synchronise monetary and fiscal policies to handle 'important challenges, such as . . . decarbonisation' (Bank of Japan, 2021n, p. 21). Although the discourse appeared centred on the pressing need to support the greening of the economy, there was also an attempt to link the Climate Response Financing Operations to the central

bank's price stability goal. Therefore, board members demanded further research into the potential downside risks of climate change (Bank of Japan, 2021n).

Unlike other central banks in this study that based their policy measures on scientific research and market consultations, the reading of the BOJ's monetary policy meeting minutes suggests that the urgency of the matter, both nationally and internationally, took precedence over prior in-house research on the impacts of climate change risks on the bank's operations. Looking into the governor's speeches in 2021, there appears to be some sort of force majeure in the central bank's climate response, driven by the urgent need to fund the decarbonisation of the economy. The following statements reflect this argument, showing a narrative oriented to collective goals:

> (i) 'Responding to climate change is an urgent priority. In this situation, it is becoming more and more important for central banks to take necessary responses in line with their mandates' (Kuroda, 2021b).
>
> (ii) 'The Bank's Strategy on Climate Change was formulated partly in response to international discussions about climate change' (Kuroda, 2021b).
>
> (iii) Transforming the [carbon-dependent growth] model into a decarbonized one in less than three decades is a challenging task. The government and the private sector therefore need to make a concerted effort. . . . [as it] will require not only a large amount of capital and R&D investments over a long period but also the financing of those investments. Against this background, the Bank has recently decided to introduce a new operation to provide funds to financial institutions on favorable terms. . . . I hope this new operation will serve as a catalyst to boost private sector efforts to address climate change. (Kuroda, 2021d)

> (iv) In order to tackle climate change, it is essential that all constituents of society take responsible action to address climate change, in order to save our planet. . . . the Bank of Japan will work together with financial institutions and market participants, and thereby strongly support progress toward Net Zero. (Kuroda, 2021e)

The BOJ maintained that the timing of the climate policy tool was all the more appropriate, as it aligned with the climate change initiatives kicked off in other parts of the world. These included the BoE's greening of its corporate bond portfolio and the ECB's climate strategy (Amamiya, 2021, 2022; Bank of Japan, 2021n; Kuroda, 2021b). The timing of the facility was also congruent with the milestones of Japan's Green Growth Strategy. The Japanese Prime Minister expressed the country's commitment to achieving carbon neutrality by 2050 in October 2020. In December, the Japanese Government published its Green Growth Strategy, comprising an ambitious action plan to transform the economic structure along environmental goals (Japan's Ministry of Economy, Trade and Industry, 2022; Lioy, 2021; The Government of Japan, 2021a, 2021b). The plan encompassed a mid-term target to reduce Japan's carbon emissions by 46% by 2030—the BOJ's Climate Response Financing Operations was projected until 2031.

One month after approving the Climate Response Financing Operations, in July 2021, the BOJ officially published a more comprehensive climate strategy. The strategy included other measures related to monetary policy, notably investments in foreign green bonds, including in the EMEAP Asia Green Bond Fund—the fund was to be launched in March 2022 to stimulate the green bond market in Asia (Bank Negara Malaysia, 2021; Bank of Japan, 2004, 2021f, 2022c, 2022e; EMEAP, 2021; Kuroda, 2021b). However, these investments were guided by safety and liquidity principles. The bank's climate strategy was also consistent with and supportive of the G7, the G20, and the EMEAP works, which included sustainable finance

among their priority actions (Bank of Japan, 2021k, 2021n; Council of the European Union, 2021; EMEAP, n.d.; G20 Italy, 2021b; Kuroda, 2021b). The BOJ's climate strategy further noted that the bank would continue collaborating with the global agenda-setters mentioned above, as well as the FSB, the BCBS, the IMF, and the NGFS, to learn and foster new initiatives in response to climate change (Bank of Japan, 2021f, 2022e; Kuroda, 2021b).

Not surprisingly, the bank's *Annual Review* issued in August 2021 stressed climate-related issues and announced the organisation of additional sustainable finance workshops. In particular, the bank convened an international research workshop on CRFRs in March 2021, which brought together academic institutions, government representatives, and other central banks, including the BoE, the Fed, and the Deutsche Bundesbank (Bank of Japan, 2020f, 2021h). To coordinate the bank's climate work, the BOJ set up the Climate Coordination Hub in 2021 and added climate issues to the bank's Medium-Term Strategic Plan 2019-2023 in March 2022 (Bank of Japan, 2022a, 2022c, 2022e; Jones, 2021).

As with the Growth-Supporting Funding Facility, the BOJ has also expanded the spectrum of participating institutions in the Climate Response Financing Operations, thereby increasing the funds available for the green transition (Bank of Japan, 2022e). In January 2023, the Policy Board approved the implementation of Special Rules for Member Financial Institutions of Central Organisations of Financial Cooperatives. Specifically, financial institutions without an account at the BOJ could access the funding facility through their central organisations (Bank of Japan, 2023d, 2023f).

The enhancement of the facility occurred alongside the preparation of the 2023 fiscal budget, which included 'the promotion of the green transformation' among its policy aims (Bank of Japan, 2023f, p. 27). The Diet approved the budget on 28 March 2023 (Bank of Japan, 2023i). In December 2023, the Climate Response Financing Operations undertook a new adjustment. Along with the decision to include Japan Climate Transition Bonds in the BOJ's

market operations (Bank of Japan, 2023l), such bonds could also be considered for investment and pledged as collateral under the Climate Response Financing Operations (Bank of Japan, 2023m). However, in the eyes of Interviewee 1, the issuance amount of these bonds is rather small (Interview 1).

It is worthwhile mentioning that the BOJ experienced other unconventional monetary policy schemes in response to various emergencies between the launch of the Growth-Supporting Funding Facility in 2010 and the Climate Response Financing Operations in 2021. Examples of these include the Funds-Supplying Operation to Support Financial Institutions in Disaster Areas following the 2011 Great East Japan Earthquake (Bank of Japan, 2011b), the Funds-Supplying Operation to Support Financial Institutions in Disaster Areas after the 2016 Kumamoto Earthquake (Bank of Japan, 2016d), and the Special Funds-Supplying Operations to Facilitate Financing in Response to the Novel Coronavirus (Bank of Japan, 2020b, 2020c). Each scheme offered favourable funding conditions to restore economic activity and ensure the smooth operation of the financial system following economic shocks due to natural disasters. Unlike these, the Climate Response Financing Operations was a pre-emptive policy measure. It sought to promote a more sustainable economy, with a view to preventing economic and financial disruptions caused by climate change (Bank of Japan, 2022c).

The bank's governor was well aware of the significant uncertainty about how climate change and the decarbonisation process could impact economic and financial activities. The consequences, the governor argued, were complex and problematic to quantify (Kuroda, 2021b, 2021e). Nonetheless, the bank decided to proactively encourage sustainable investments, based on the assumption that they would support the green transition and lessen the risk of price and financial instability (Amamiya, 2022). Seen from this light, the Climate Response Financing Operations echoes a shift in the BOJ's thinking and approach, from one

focused on managing the economic and financial risks from environmental disasters to one that influences the environmental direction.

On the whole, the BOJ's historical-based analysis suggests a genre of central bank-centred economy, as structural needs propelled the bank to develop two innovative funding facilities to catalyse investments in environmental sectors: the Growth-Supporting Funding Facility and the Climate Response Financing Operations. The BOJ's shift towards a more prominent role in environmental issues through monetary policy is therefore part of broader national reforms aimed at supporting government spending programmes, while also maintaining price stability. In shaping its 2021 climate solution, the bank drew on its experience with the Growth-Supporting Funding Facility and benefited from expert advice from the NGFS (Interview 1). From a historical institutionalist perspective, it could be argued that beneath stable formal rules—as of January 2024, the BOJ Act had not been amended since 2007 (Bank of Japan Act, 1997)—the bank's de facto role in economic growth and sustainable development has been strengthened.

However, unlike other central banks in this study with hierarchical mandates, which may facilitate the central bank's support for government economic policies, the BOJ's mandate is limited to price stability, as reaffirmed by Interviewee 1. By embracing 'climate-related efforts' in the bank's Strategic Plan 2019-2023, one could interpret such a move as an illegitimate overstretching of the BOJ's legal mandate (Bank of Japan, 2022a, p. 3, 2022c, 2022e). Regardless of the scope or interpretation of mandates, evidence shows that 'these types of [green] policies are easier to implement in countries where the consensus for industrial policies is much larger' (Interview 7).

Table 8. *Overview of the Bank of Japan's Main Actors and Activities Leading to the Bank's Climate Strategy in 2021*

2017/2018/2019	2020	2021	2021
(Oct 17/18) The financial system reports addressed the market's preference for ESG assets. **2019** (Mar) The governor's speech emphasised the UN SDGs, the perils of fossil fuels consumption, mechanisms for climate change mitigation, as well as the G20 and TCFD progress in the field. (Jun) The BOJ co-chaired the G20 Finance Ministers and Central Bank Governors Meetings during Japan's presidency of the G20, which included 'Energy Transitions' on the agenda. The TCFD presented the state of play on climate-related financial disclosures. (Aug) The bank's *Annual Review 2019* underlined the UN SDGs, national efforts to achieve them, and how these could pose challenges to central banks and require tailored responses. (Oct) The financial system report highlighted climate risks and the TCFD guidelines for the first time. (Nov) The bank joined the NGFS. On the same day, the governor spoke about climate change risks and the role of the Bank of France in the BOJ's decision to join the network.	(Apr) The financial system report noted that the financial system was expected to contribute to a more sustainable society. (Jun) The BOJ collaborated in the NGFS publication on greening monetary policy operations. The bank advertised the network's work on its website. (Oct) The *Annual Review* 2020 announced the organisation of workshops on sustainable finance. The document also anticipated increasing in-house research on climate change financial risks and how to respond to them. (Oct) The financial system report highlighted the climate-related work undertaken by other major central banks, such as the BoE, the ECB, *De Nederlandsche Bank*, and the Bank of France. (Dec) A research paper from the bank's staff emphasised the market failure linked to the mispricing of carbon assets. It further concluded that climate change poses risks to the financial system, that the activities of the financial system can worsen these climate risks, and recommended implementing measures to mitigate them.	(Jan) The minutes of the monetary policy meeting addressed climate change for the first time. Government officials present at the meeting informed about the 2021 fiscal budget, which comprised actions towards a greener society. (Mar) An international research workshop on CRFRs brought together government and central bank officials from the BoE, the Fed, and the *Deutsche Bundesbank*. (Apr) The minutes from the monetary policy meeting stressed the need for further research into the implications of climate change for the economic and financial system, as well as potential responses from the central bank. Growing number of publications, particularly speeches, in support of central banks' climate action (see Figure 8, p. 306). (Jun) The Policy Board approved the Climate Response Financing Operations to support Japan's efforts to address climate change. Government officials welcomed the initiative for being aligned with the government's net-zero plans and the G20 discussions. (cont.)	(cont.) (Jul) Launch of the BOJ's Strategy on Climate Change, including additional monetary policy measures to support green growth. Later in the month, the governor stated that the bank's climate strategy was aligned with the efforts from other central banks, notably the BoE and the ECB, as well as the green agendas of the Japanese government, the G7, the G20, the TCFD, and the EMEAP. Establishment of the Climate Coordination Hub.

6.2 The Sveriges Riksbank

Established in 1688, the Riksbank is known as the world's oldest central bank (Bordo & Siklos, 2018; Sparve, 1995; Sveriges Riksbank, n.d.). According to the research data, the first study produced by the bank's staff on climate change dates back to 2010. It examines the implications of oil markets on global warming and social welfare. The Riksbank has reported the environmental impact of its corporate activities in all annual reports since 2010. A more strategic approach towards sustainability became more visible from the end of 2018, when the bank's monetary policy adopted a somewhat environmental direction. Consequently, this section exploits the bank's executive board monetary policy meeting minutes, monetary policy reports, monetary policy decision documents, and financial stability reports, among other relevant information produced by the bank from January 2017 onwards.[49]

The year 2017 is also significant for three additional reasons: First, it was the year before the Riksbank introduced its first monetary policy measure with a sustainability scope, indicating that throughout this year, the bank began considering environmental issues more seriously and weighing policy decisions. Second, this year was also relevant for a number of happenings that can deepen our understanding of the bank's engagement with sustainability topics as of 2018. Most notably, the Swedish Parliament adopted the Climate Act in June 2017.

The Climate Act, which entered into force in January 2018, defined a set of national policies and goals to achieve net-zero carbon emissions by 2045. It also included a mid-term target for making the transportation sector fossil-free by 2030 (Cella, 2021; Government Offices of Sweden, 2021; Swedish Environmental Protection Agency, n.d.). The whole climate framework, considered more ambitious than that of the EU, aimed to demonstrate Sweden's leadership in phasing out fossil fuels (Government Offices of Sweden, 2021). Importantly,

[49] The bank's monetary policy decision documents were made available as of 2023 only, following the adoption of the new Sveriges Riksbank Act (Sveriges Riksbank, 2024a).

third, the year 2017 witnessed the launch of the NGFS, of which *Finansinspektionen* was a founding member. The Riksbank joined the network in December 2018.

The empirical data suggested that the Riksbank started publicly reflecting on the interplay between climate change and monetary policy from 2018 (an overview of the making of the Riksbank's sustainability strategy is provided in Table 9, p. 287). On the occasion of the ESRB Annual Conference held in September 2018, the Riksbank's governor, who participated in a panel discussion on sustainable finance, sidelined the deployment of monetary policy to pursue climate goals (Ingves, 2018). The former governor maintained that the bank ought to be cognisant of climate change issues, manage the effects of shifts in public policy, and ensure the wider financial system can withstand them. However, the former governor was against a more expanded central bank action on climate change and warned against the risks of including climate considerations in the bank's investment policy.

Mark Carney, the then-governor of the BoE, chaired the panel discussion. The Governor of the Bank of France, François Villeroy de Galhau, was also among the panellists (ESRB, 2018). Carney and Villeroy de Galhau were strong advocates of sustainable finance, and their monetary authorities were leaders in green central banking matters. For many, including the Japanese monetary policy expert and the Riksbank's interviewee, Carney's 2015 speech on the tragedy of the horizon started the journey towards greening central bank operations, as noted by several interviewees in this study (Aguila & Wullweber, 2025; Carney, 2015; Interview 1; Interview 2; Interview 5; Interview 9; Interview 11; Jackson et al., 2025).

The view of the Riksbank's former governor on the inability of monetary policy to tackle climate change was backed by an economic commentary from the bank's staff on the relevance of climate change for central banks, issued two months after the ESRB conference, in November 2018. This economic analysis deserves a closer examination, as it sheds light on the Riksbank's initial resistance to environmental action. Similar to the governor's speech, the

author stated that monetary policy was not the right tool to address global warming (Olovsson, 2018). First, the Riksbank held a reduced number of policy tools. Second, the scale and long-term nature of the climate change issue required a globally coordinated response and, crucially, an effective fiscal solution. The central bank's most significant contribution to a more sustainable economy was said to be via its primary goal of keeping prices stable. By doing so, it set conducive conditions for political authorities to implement carbon-reduction measures.

Notwithstanding this more vigilant approach to environmental objectives, which framed climate change as a primary matter for politicians, the author believed that global warming affected monetary policy. This was viewed as particularly true in an open and small economy such as Sweden, which kept close relations with international markets in activities such as the funding of national banks (see also Apel, 2022; Sveriges Riksbank, 2019d). Therefore, the bank needed to be prepared to cope with spillover effects from global economic and financial disruptions caused by climate change. The bank could also play a fundamental role in conducting research and increasing public knowledge.

Accordingly, the bank's financial stability report issued in the same month as Olovsson's (2018) economic commentary addressed climate risks for the first time. The report encouraged banks and insurance companies to account for climate risks in their operations, following the G20 and the FSB guidelines (Sveriges Riksbank, 2018a). In this vein, the Riksbank's Executive Board decided to include sustainability factors in the bank's foreign exchange investments. Specifically, the bank was to consider 'climate, social responsibility and governance' when assessing foreign assets for its reserve portfolio (Sveriges Riksbank, 2021e, p. 13). The new sustainability requirement, in force from January 2019, was to be implemented along with other risk considerations related to the safety and liquidity of the purchased securities (Sveriges Riksbank, 2019a).

The outline of the new investment policy, where sustainability elements were constrained by other eligibility criteria, aimed to avoid an 'excessively negative impact on return' and safeguard the bank's ability to provide market liquidity and intervene in foreign exchange operations in contingent situations (Sveriges Riksbank, 2021e, p. 13). Within the sustainability component, special attention was placed on climate change, given the potentially large impact of global warming and the economic transition on price and financial stability (Sveriges Riksbank, 2023e). This novel investment policy was consistent with the title of the bank's 2019-2022 Strategic Plan: 'An inventive, highly prepared and responsive central bank.' As the bank put it, 'the core of the Riksbank's operations has always been to promote a strong and secure economy . . . but our focus and approach have varied as the world around us has changed' (Sveriges Riksbank, 2019a, p. 3).

In the following month, on 13 December 2018, the bank joined the NGFS with the intent to 'learn' about 'environment and climate risk management' (Sveriges Riksbank, 2018b). According to the Riksbank's press release, the bank was following the work of the network and felt encouraged by it. It is worth recalling that the Swedish supervisory authority was a founding member of the NGFS, established in December 2017. Since the Riksbank and the *Finansinspektionen* work together on matters related to financial stability (Sveriges Riksbank, 2018a), it is reasonable to assume that the Riksbank was fully aware of the NGFS progress and guidelines from its inception. The interplay between the NGFS work and the Riksbank's sustainability strategy becomes clearer when considering the sequence of main events. The order in which these events occurred showcases the influence of the NGFS sustainable finance paradigm on the Riksbank's interests and subsequent sustainable investment policy.

One month before the Riksbank addressed climate risks in its financial stability report and adopted sustainability criteria in its international reserves, the NGFS published the *First Progress Report* in October 2018. This report is widely known within the financial industry for

its groundbreaking statement, according to which 'climate risks are a source of financial risks' (NGFS, 2018a, p. 3). Most notably, the report announced an NGFS international conference on sustainable and responsible investment held two months earlier, in September 2018, bringing together participants from circa 50 central banks, the BIS, the World Bank, and academic institutions. The conference debated the inclusion of ESG criteria in central banks' foreign currency investments, with a view to enhancing the risk and return profile of the reserve portfolios and setting an example for the market (NGFS, 2018b).

The Riksbank's deputy governor confirmed that the NGFS recommendations fed into the bank's sustainable investment strategy. As observed by Deputy Governor Breman (2020a), the decision to include sustainability aspects in the management of the bank's reserves resulted from the NGFS wake-up call about CRFRs. In December 2018, climate change risks gained momentum at the Riksbank's Executive Board monetary policy meeting (Sveriges Riksbank, 2019f). Accordingly, the climate topic has received growing attention in the bank's institutional publications ever since.

In March 2019, the Riksbank published its 2018 annual report, highlighting the bank's 'new strategic plan' and 'innovative mindset' to tackle new challenges (Sveriges Riksbank, 2019b, p. 6). One of the main risks identified by the bank included 'climate threats' (Sveriges Riksbank, 2019b, p. 6). The report also announced a series of staff seminars on sustainability and climate change, featuring speakers from inside and outside the bank (see also Sveriges Riksbank, 2020e). The bank's financial stability report of May 2019 emphasised the new NGFS guidelines stated in the NGFS report *A Call for Action* (NGFS, 2019b; Sveriges Riksbank, 2019d). These included climate risk monitoring and reporting consistent with the TCFD standards, as well as adopting sustainability components in central bank portfolio management.

The Riksbank publicly expressed its full support for the NGFS recommendations and took part in the network's working groups on climate change scenarios and GMP procedures

(Sveriges Riksbank, 2019d, 2019e, 2020e, 2021g). Later in the year, in November 2019, the bank's deputy governor delivered a speech titled 'Monetary Policy in a Changing World' (Flodén, 2019b). The speech emphasised that the bank was not a climate policymaker but could 'contribute to the climate work . . . by giving consideration to sustainability aspects when investing in the foreign exchange reserves (Flodén, 2019b). This could be done, for instance, by rejecting issuers who 'have a large climate footprint' (Flodén, 2019b). Accordingly, the bank divested from a number of Canadian provinces and Australian states in 2019, whose bonds presented levels of GHG emissions relatively higher than those of the respective countries (see also Breman, 2020a; Flodén, 2019a).

It is worth noting that the Riksbank's foreign reserves have been predominantly composed of government bonds, especially US and German bonds, due to liquidity and safety reasons. As of March 2022, US and euro-denominated bonds represented 82% of the bank's foreign currency portfolio, as these could be quickly converted into cash in contingent situations (Brattström & Gajic, 2022a; Flodén, 2019b; Sveriges Riksbank, 2024c). Therefore, the overall contribution of the bank's reserve portfolio to climate change was relatively small (Brattström & Gajic, 2022b; Flodén, 2019a; Sveriges Riksbank, 2020e). The bank stressed the limits posed to purchasing sustainable assets from the beginning of the new investment strategy. In essence, sustainability considerations only applied when the bank was 'investing in other assets than those fulfilling its contingency requirement' (Sveriges Riksbank, 2020e, p. 20). In other words, the sustainability dimension was subordinate to other fundamental decisions concerning the risk and return of the bank's portfolio (Sveriges Riksbank, 2023e).

Also, in November 2019, a working group called the Riksbank's Committee submitted a proposal to the Financial Markets Minister to amend the statutes of the Riksbank Act on the grounds that the surrounding environment had significantly evolved since the last Act entered into force in 1989 (Government Offices of Sweden, 2019; Swedish Government, 2019). The

most relevant change occurred in 1999 with the introduction of the price stability goal. Meanwhile, new economic and political challenges had emerged that affected the bank's operations. Most notably, the modification of the exchange rate regime, the EU accession, the global financial and euro crises, the digitalisation and globalisation of financial markets, as well as the long cycle of low inflation. Therefore, the older Act no longer reflected the Riksbank's de facto power and function.

The committee was appointed by the Swedish Government in 2016, comprising representatives of all national parties with a seat in the Swedish Parliament, the Riksdag (Sveriges Riksbank, 2018a). Among the most prominent additions to the Act was the bank's contribution to production and employment as a secondary objective to its primary mandate of keeping low and stable inflation. By introducing elements of the real economy into the bank's legal objectives, the new legislation laid the groundwork for a renewed and amplified monetary policy direction, providing the Riksbank with increased flexibility to adopt unconventional monetary policy measures.

The rectification of the new Act was also an opportunity to make the Riksbank's role in climate action more explicit, as it incorporated new sustainability principles into the bank's asset management (The Sveriges Riksbank Act, 2022). According to the Riksbank, 'with the new Sveriges Riksbank Act, the Riksbank's possibilities to contribute to Sweden's climate transition have become clearer. The Act requires the Riksbank to take account of sustainability in asset management and external monitoring' (Sveriges Riksbank, 2023c, p. 26). The new legislation gave the bank the authority to pre-emptively act towards correcting climate and other sustainability imbalances within the wider system. The new Act was approved by the Riksdag on 23 November 2022 and came into force in January 2023 (Sveriges Riksbank, 2022d). However, as described further above, the bank's sustainability strategy was set at the end of 2020, prior to the newly expanded mandate. Therefore, the Riksbank case holds features

worth explaining, not only for the green shift itself but also for occurring relatively early and, in a way, unexpectedly.

The year 2020 showed an intensifying communication and engagement of the bank in climate action. Out of the total number of institutional publications retrieved from the Riksbank's website using the search strategy, the percentage of releases rose from 5% in 2019 to 19% in 2020 (followed by 28% in 2021; see Figure 8, p. 306). Arguably, the proliferation of publications helped promote the debate on climate change. Most notably, at the monetary policy meeting minutes of February 2020, the deputy governor mentioned the possibility of including sustainability elements in the bank's purchase of corporate bonds and asked for further analysis on this topic (Sveriges Riksbank, 2020b). During this year, the bank continued investing in awareness-raising initiatives to engage staff in sustainability practices and observed the monetary policy reforms considered by other major central banks, especially the central banks of the Netherlands, France, England, and the ECB, especially the ECB's prospect of including environmental components in the bank's monetary policymaking (Sveriges Riksbank, 2020b, 2020c, 2020e, 2020f, 2020g).

Despite Sweden's progressive decline in carbon emissions and its low contribution to the world's GHG emissions—the country introduced a carbon tax as early as 1991 and represented only 0.11% of the world's total emissions as of 2022 (Climate Watch, n.d.-a; Emissions Database for Global Atmospheric Research, 2023; Government Offices of Sweden, n.d.)—the Riksbank's deputy governor called for urgent and multiple policy responses. In a speech delivered in March 2020, Breman (2020a) underlined the far-reaching magnitude of the climate problem and the lack of an effective global tax on carbon emissions to handle this issue (see also Sveriges Riksbank, 2020i). The deputy governor went further to say that central banks had to learn from the past, especially the GFC, and consider the severe economic dislocations that may result from mispriced assets. Therefore, the deputy governor welcomed the idea of

including sustainability principles in the Riksbank's selection of corporate bonds at the monetary policy meeting of June 2020 (Sveriges Riksbank, 2020d).[50] Otherwise, the bank would be contributing to growing economic and financial imbalances associated with climate change, a situation incompatible with the Riksbank's mandate. Breman urged central banks to take climate change risks seriously and commended the NGFS guidance (Breman, 2020a).

Based on Breman's speeches, growing climate risks and the lack of effective measures to cut global carbon emissions affected the bank's ability to achieve its objectives and required scaling up the low-carbon transition (see also Bylund & Jonsson, 2020). In this context, the November 2020 monetary policy report highlighted the potentially devastating effects of climate change, irrespective of when and where they materialise, and their linkages with the bank's monetary policy (Sveriges Riksbank, 2020i). The bank noted that the unpredictable effects of climate risks hampered macroeconomic forecasts and, consequently, the conduct of monetary policy. Additionally, climate and other sustainability risks threatened the bank's financial position, making it necessary to consider these risks within the bank's asset purchase programme (Sveriges Riksbank, 2020a).

Against this background, the November 2020 monetary policy report laid out the bank's new sustainability approach (Sveriges Riksbank, 2020a, 2020i). This included (i) promoting financial regulation to mitigate climate change risks, (ii) strengthening environmental criteria in the selection of investments involving foreign currencies (measure adopted from 1 January 2019), (iii) applying a 'norms-based negative screening' in the purchase of corporate bonds as of January 2021—a process whereby the bank only purchases bonds from companies that 'comply with international standards and norms for sustainability', such as those stipulated in

[50] The environmental dimension of sustainability included climate change mitigation, as well as production and consumption in line with environmental objectives (Sveriges Riksbank, 2020n)

the UN Global Compact[51] (Sveriges Riksbank, 2020h, p. 6, 2020a, 2021f), (iv) including green municipal and government bonds in the asset purchase programme, (v) engaging with international organisations working on green finance topics, especially the IMF, the FSB, the BCBS, and the NGFS, (vi) enhancing climate change research and disseminating its findings, (vii) disclosing the carbon emissions of the central bank's portfolios.

The Riksbank's sustainability strategy was officially published on 16 December 2020 (Sveriges Riksbank, 2020k). The announcement stressed the bank's pre-emptive work towards 'social responsibility' and 'sustainable development', as per the UN's 2030 Agenda and 'the state's core values' (Sveriges Riksbank, 2020k, p. 2, 2020n, 2022a). This argument draws our attention to the place of normative values in monetary policy frameworks, suggesting that central banks embed 'normative values' and, depending on the circumstances, structure their operations accordingly (Peters, 2019, p. 33).

The new sustainability approach also sought to be in line with the Riksbank's legal principles of managing public money in a prudent and efficient manner, as stipulated by Chapter 9 of the Riksbank's Act 1988: the Riksbank's activities shall be 'conducted efficiently . . . in accordance with the applicable laws [and] economical with public finances'(The Sveriges Riksbank Act 1988, 2015, Chapter 9 Article 1a; Breman, 2021a; Sveriges Riksbank, 2020i, 2020k, 2020n, 2021e). Companies breaching 'universal norm-based principles' were viewed as financially riskier (Sveriges Riksbank, 2020k, p. 2). Therefore, the Riksbank believed it did not have to wait for a broader mandate to undertake sustainability considerations in its investment decisions (Breman, 2020e; Sveriges Riksbank, 2021e, 2022a).

A central observation of this analysis is that the Riksbank maximised the wider scope afforded by Chapter 9 on risk analysis and control to draw a monetary policy solution for

[51] The UN Global Compact is an initiative from the UN aimed at promoting the inclusion of sustainability principles in the areas of 'human rights, labour, environment and anti-corruption' into corporate operations (UN Global Compact, n.d.).

climate change. Hence, the bank's sustainability strategy was not so much the direct result of the legal act, as it did not explicitly instruct to pursue environmental goals, but of how well climate change risks were linked to the conduct of monetary policy and the fulfilment of the bank's mandate (Sveriges Riksbank, 2021f). The emphasis on sustainability over other socioeconomic pressing areas appeared to be linked to the growing knowledge of climate change risks and the perceived imperative to support the climate transition, given the absence of timely and successful fiscal solutions at the global level. A wide range of specialised institutions and regulatory bodies promoted this knowledge. Among them, the NGFS recommendations were particularly imprinted in the Riksbank's sustainability investment strategy, as I shall explain next.

The negative screening strategy, or the inclusion of sustainability aspects in central bank portfolio management, was extensively debated in two NGFS reports prior to the launch of the Riksbank's sustainability strategy on 16 December 2020. Specifically, the report *A Sustainable and Responsible Investment Guide for Central Banks Portfolio Management*, published on 17 October 2019, and the *Progress Report on the Implementation of Sustainable and Responsible Investment Practices in Central Banks' Portfolio*, issued on 15 December 2020, in which the Riksbank participated (NGFS, 2019c, 2020c). The Riksbank's inspiration in these two NGFS reports was acknowledged by the bank's deputy governor in April 2021, who also stressed the significance of the NGFS *First Comprehensive Report, 'A Call for Action'* (Breman, 2021a).

The Riksbank's support for the NGFS work and the reproduction of its recommended practices was also highlighted in the bank's climate pledge released in the context of the COP26 Glasgow Declaration in November 2021. On this occasion, the bank announced its intention to develop further policy-based instruments in line with the NGFS recommendations (Finansinspektionen & Sveriges Riksbank, 2021). Moreover, the Riksbank's disclosure of

climate-related risks from its portfolios adhered to ‘the NGFS recommendation for central banks, which is based on recommendations from the Task Force on Climate-related Financial Disclosures’ (Brattström & Gajic, 2022b). This evidence suggests that the NGFS green policy ideas set the stage for the Riksbank’s sustainability policy choices.

Additionally, the bank’s monetary policy report from September 2021 highlighted the ECB’s new monetary policy strategy, issued in July 2021. Emphasis was placed on the ECB’s new climate action plan, which included adopting climate considerations into collateral and asset purchase decisions to support the EU’s environmental objectives (Sveriges Riksbank, 2021i). By the same token, the Riksbank announced the potential integration of sustainability elements into its collateral framework (European Central Bank, 2021c, 2021d; Finansinspektionen & Sveriges Riksbank, 2021). The Riksbank’s effort to align its activities with the ESCB was visible in several communications of the bank. The former Riksbank governor often stressed the importance of coordinating the bank’s activities, including monetary policy, with the ESCB and EU legislation. For the former governor, Sweden would have even benefited from joining the Banking Union (Ingves, 2021).

In November 2021, the Riksbank’s deputy governor claimed that climate-related risks were one of the main inflation drivers in the period ahead (Sveriges Riksbank, 2021l). In the following month, the bank released two landmark documents: an economic commentary on the outcome of the NGFS climate scenarios for Sweden’s economy and the Riksbank’s first climate report. Whereas the former highlighted the lingering uncertainty associated with climate change, the need for joint efforts, and the difficulty of implementing a global carbon tax (Bylund & Jonsson, 2021), the latter offered a comprehensive overview of the bank’s climate roadmap (Breman, 2021e; Sveriges Riksbank, 2021b, 2021a, 2021c, 2021e, 2021m). The climate report also conveyed a number of messages on the bank’s commitment to sustainable development, which warrant further elucidation (Sveriges Riksbank, 2021e).

First, as already stated, the climate report emphasised that climate change affects prices and output and, consequently, the achievement of the bank's statutory goals. Second, the report introduced the idea that climate change results from a market failure, a situation where asset prices do not incorporate information about environmental damages. To promote a more efficient allocation of resources and overcome this collective action problem, global policy action was needed to make carbon-intensive goods and services more expensive. In this connection, the report stressed the bank's commitment to foster a timely and structured transition to a sustainable economy as long as it did not jeopardise the attainment of the bank's primary objectives.

Third, the report explained that the integration of sustainability elements into the bank's policy work was substantiated in the preparatory work of the Riksbank's Act 1988, according to which the bank would support the national economic policy, including employment and sustainable growth (Sveriges Riksbank, 2023d). Hence, the bank argued, no new objectives were added to the Riksbank's policy strategy. The bank's level of support for employment and sustainable growth before the new Act can be questioned, though. Drawing on the minutes of the monetary policy meeting of September 2017, the Riksbank 'support[s] the general economic objectives of sustainable growth and high employment . . . by striving to fulfil the inflation target' (Sveriges Riksbank, 2017). From this view, the inflation target was the bank's main objective, through which it contributed to sustainable growth and employment. The latter two macroeconomic goals did not appear to constitute a monetary policy objective per se.

Fourth, the Riksbank's 2021 climate report noted that the bank's activities should not offset the effect of green public policies implemented by national and international authorities. To that end, the bank accounted for sustainability when purchasing corporate bonds and limited the carbon intensity of its foreign exchange reserves 'as far as possible' (Breman, 2021e). Fifth, the climate report underlined the bank's cooperation with international bodies with a climate

agenda and, especially, the NGFS Glasgow Declaration, which committed the bank to assist in climate change mitigation efforts (Finansinspektionen & Sveriges Riksbank, 2021; Sveriges Riksbank, 2021k). Crucially, sixth, the document commented on the new Riksbank Act and its revised policy objectives, particularly the bank's contribution to output and employment as a secondary objective to the price stability goal. Although the Riksbank's primary focus remained unchanged (Sveriges Riksbank, 2023d), the new Act allowed the Riksbank to more easily reconcile its climate action with the bank's statutory responsibilities. As the bank put it:

> In view of the priorities of the Government and Riksdag regarding sustainability and climate change adaptation in the Swedish economy, the new Act explicitly supports taking sustainability considerations into account in the Riksbank's monetary policy, provided that this does not override the price stability objective. (Sveriges Riksbank, 2021e, p. 6)

By and large, the climate report reflected '[t]he Riksbank's ambition . . . to work systematically with the sustainability dimension' (Breman, 2021e, p. 18; Sveriges Riksbank, 2021d, 2021b). Indeed, the Riksbank took further steps in September 2022 to reinforce the sustainability aspect of the bank's asset purchases. Specifically, the bank decided to purchase only bonds from companies that report their direct and indirect carbon footprint, along with the TCFD disclosure guidelines (Sveriges Riksbank, 2022c, 2023e). The purpose of this decision was to increase companies' transparency regarding their exposure to climate risks and mitigation plans (Sveriges Riksbank, 2023a). According to the Riksbank, companies with clear carbon reduction targets were better prepared to handle the climate transition and, therefore, presented lower financial risks (Brattström & Gajic, 2022b).

Arguably, reporting measures also increase the available data on how much firms affect and are affected by climate risks, which facilitates the identification and provision of funds for sustainable activities (European Central Bank, 2023h). Moreover, by requiring companies to

publish their carbon emissions, they become more aware of their climate impact and feel pressured to accelerate transition plans (Frykström, 2022a). In essence, mandatory reporting works as a public mechanism to increase the availability of financial resources for green projects and disincentivise investments in brown ones.

Before concluding the historical review of the Riksbank, it is worth mentioning that the bank's sustainability strategy was partly enabled due to the bank's existing nonstandard monetary policy tools developed in response to two earlier contingent situations: i) the large purchase of government bonds initiated in early 2015 to counteract the long period of low inflation and interest rates, and ii) the purchase of a wide range of non-financial securities started in March 2020 to alleviate the adverse effects of the COVID-19 pandemic. These included municipal, covered, and corporate bonds (Andersson & Stenström, 2021; Ingves, 2021; Interview 2; Sveriges Riksbank, 2020a, 2020f). Consequently, the bank did not have to develop a sustainability strategy from 'scratch' but rather built on its established nonconventional monetary policy tools (Interview 2). In other words, the policy tools were already in place, as the interviewee from the Riksbank elucidated when asked about why the Riksbank chose these specific policy tools to include environmental considerations:

> Our first step was in the management of foreign exchange reserves because we had foreign exchange reserves, and so, that was easy to do. Whereas the other measures, in 2020, during the pandemic, we started buying even more government bonds, covered bonds, and corporate bonds. Suddenly, there was something that we could do. . . . different central banks have done what they can. (Interview 2)

Leveraging the Riksbank's large purchase of assets, the bank's risk management division also maintained that including sustainability aspects in asset purchases neutralised the risks associated with the bank's expanded balance sheet (Sveriges Riksbank, 2020h). However, the purchase of sovereign, municipal, and corporate bonds was discontinued in 2023 due to

restrictive monetary policy (Sveriges Riksbank, 2024b, 2024e, 2024d). Therefore, it is reasonable to conclude that the bank's contribution to climate change through asset purchases may have had a mostly symbolic impact, as previously argued regarding the greening of the Riksbank's foreign reserve portfolio. Ultimately, the usefulness of the green measures adopted rested on setting an example, defining preferences, and encouraging the market to take the economic transition seriously, as stated by the BoE when it decided to cease its CBPS (Bank of England, 2022e; Interview 5). If market participants believe that central banks will implement environmental risk metrics in their investment strategies, they will more promptly adapt their products and production processes towards cleaner models.

Table 9. *Overview of the Swedish Riksbank's Main Actors and Activities Leading to the Bank's Sustainability Strategy in 2021*

2018	2019	2020	2020/2021
(Sep) Speech by the governor on sustainable finance at the ESRB annual conference. The governors of green-leading central banks, notably the BoE and the Bank of France, participated in the conference panel.	(Mar) The 2018 annual report emphasised the bank's new strategic plan. Climate risks were added to the bank's risk taxonomy. The bank's staff began participating in seminars on climate change and sustainability practices.	(Feb) The deputy governor announced the possible inclusion of sustainability considerations in the purchase of corporate bonds and highlighted the need for further research at the monetary policy meeting.	(cont.)
(Nov) Economic commentary on climate change and central banking, stressing the neutral role for monetary policy and the need to increase research on the topic.	(May) The financial stability report promoted the NGFS guidelines—particularly, TCFD disclosures and the inclusion of sustainability factors in central banks' portfolio management—and announced the bank's involvement in NGFS working groups, including the monetary policy group.	Growing research, publications, and debate on the adverse effects of climate change risks on monetary policy and the pressing need to accelerate the climate transition (see Figure 8, p. 306).	**2020**
(Nov) The financial stability report addressed climate risks for the first time and highlighted the G20/FSB guidelines to enhance the sustainability of the financial system.	(Nov) Speech by the deputy governor on 'monetary policy in a changing world'. The bank divested from certain regions due to environmental factors.	(Feb) Attention to the climate strategies developed by other green-driving central banks, especially the ECB and its prospect of including environmental elements in the bank's monetary policy operations (e.g., Sveriges Riksbank, 2020c).	(Jul) The deputy governor welcomed the 'decision guidance' from the bank's staff to include sustainability criteria in the purchase of corporate bonds as a pre-emptive measure to ensure financial and economic stability at the monetary policy meeting of 30 June.
(Nov) Accordingly, the Riksbank's Executive Board decided to include sustainability factors in foreign exchange investments.	(Nov) The Riksbank's Committee (comprising members of the national parties) submitted to the Financial Markets Minister a proposal to review the bank's statutes, including the objectives of monetary policy.	(Mar) Speech by the deputy governor on the large magnitude of the climate change issue, the lack of effective fiscal solutions at the global level, and the need for multiple policy responses, including from monetary policy. Emphasis on the NGFS recommendations.	(Nov) The monetary policy report announced the bank's new sustainability strategy, which included the purchase of green government and municipal bonds, as well as a new investment approach for the purchase of corporate bonds in line with the NGFS guidelines.
(Dec) The Riksbank joined the NGFS and collaborated in analysing how to include sustainability elements into monetary policy operations.		(cont.)	**2021**
(Dec) The monetary policy meeting addressed climate change for the first time.			(Jan) Implementation of the Riksbank's new sustainability policy strategy.

6.3 Assessment of the Research Question and Hypotheses

This section explores the answer to the following research question through the lens of a historical institutionalist analytical framework: *Under what institutional conditions can the development of GMP measures be best explained?* The BOJ-Riksbank comparison can be particularly illustrative of the most comprehensive process of monetary policy change, as both AE central banks provided GMP solutions despite their originally narrow mandates. The research findings inform the scholarly literature and offer potentially transferable insights into the institutional conditions that enabled the greening of monetary policy in AE central banks with narrow mandates, as well as whether this process involved the expansion, amendment, neglect, or replacement of existing policy instruments.

The two case study central banks will be examined in light of the following three possible research hypotheses, as theorised by historical institutionalists: (H1) Central bank mandates create a path dependency, which significantly shapes the development of GMP measures; (H2) Critical junctures—notably, the experience of environmental disasters or other event(s) of systemic relevance—result in the development of GMP measures; (H3) Most GMP measures can be explained in terms of incremental change, and especially, the layering form of change, as suggested by previous studies on the evolution of the financial system.

As explained in more detail below, the empirical results suggested that the development of GMP is best understood through incremental changes, especially layering and displacement forms of change, using Streeck and Thelen's (2005) conceptualisation. The green policy experiences of the BOJ and the Riksbank also revealed that institutional accounts of policymaking are not enough for interpreting central banks' green strategies. Besides the formal rules governing central banks, attention should also be given to political factors and the new sustainable finance solutions constructed and promoted by a configuration of national and

international bodies, most notably the NGFS. The Fed provides my third case study, which will be examined in a separate section as an intriguing example of non-adoption of GMP measures.

6.3.1 *Hypothesis 1: Central Bank Mandates Create a Path Dependency, Which Significantly Shapes the Development of Green Monetary Policy Measures*

HI is first deployed to evaluate whether legal mandates create a path-dependent structure that fundamentally influences the adoption or non-adoption of green criteria in monetary policy toolkits. In other words, whether there is a substantial correlation between the scope of central bank formal objectives and GMP outcomes. If such a correlation exists, the initial hypothesis regarding the influence of legal mandates on central bank policy outcomes must be recognised. If it does not, H1 must be rejected.

Different mandates entail varying incentives and constraints for adopting green policies. Given that environmental goals cannot be explicitly found in any legal document, this study posits that central banks with narrow monetary policy mandates focused on the stability of prices are less likely to adopt monetary policy measures in the environmental field. Conversely, central banks with broader mandates—mandates that combine monetary and economic objectives—are more likely to adjust their operations towards green ends as part of their formal goals. The rationale behind this view is that multiple monetary and economic objectives offer central banks greater flexibility and discretion to decide between them and adopt unconventional policies ‘in the interest of macroeconomic stabilisation and crisis management’ (L. Meyer, 2001, p. 58; Begg, 2013).

Following the anticipated relationship between the scope of central bank mandates and monetary policy decisions, one would expect distinct central bank responses to environmental issues. A path-dependent logic would thus respond to this study’s research question based on the differences in legal mandates. However, this tradition, based on the competencies entrenched in central bank mandates, may not easily and directly justify the GMP initiatives of

the BOJ and the Riksbank. Faced with the environmental emergency, both banks were able to establish new green parameters and goals, despite the limitedness of their mandates. This observable outcome undermines path-dependent processes and brings to the fore the assumption that formal institutions are not the only source of policy results (Steinmo et al., 1992). Moreover, by successfully establishing new green directions for monetary policy, it is likely that these directions will persist within both banks, as the transition to a more sustainable economy is a long-term endeavour. More profound transformations in the central bank's scope and objectives may occur over time.

The BOJ and the Riksbank's new environmental strategies and changed policies provide very certain and unique evidence to reject Hypothesis 1—central bank mandates create a path dependency, which significantly shapes the development of green monetary policy measures—as the green policy turn was effectively possible in both banks, notwithstanding their commitment to price stability. However, there is no denying that existing frameworks and operational principles limited the GMP decisions to some degree. As the historical review of the BOJ and the Riksbank elucidated, to facilitate the adaptation to the new green reality, the choice was made to incorporate green criteria into existing foreign currency operations and nonstandard monetary policy tools (Interview 2). Furthermore, in order to protect the principle of market neutrality, the BOJ devised a new climate financing instrument in ways that sought to minimise the bank's involvement in assessing and identifying firms that account for the quality of the environment in their investment projects. Hence, the impact of earlier decisions regarding previously established policy tools and guiding principles was highly consequential.

These pieces of evidence assign some role to path dependence in understanding the GMP options adopted. Arguably, adding new green elements to tools that have already been deployed in response to previous crises and thus approved, tested, and known to market participants is easier than creating brand-new ones. First, there is a sense of security and

confidence in tools that have been tested before, linked to the greater predictability regarding their functioning and outcomes. Borrowing from Șimandan and Păun (2021), banks that have already used specific tools 'are more likely to use them successfully' (p. 5). Second, central banks can best withstand small changes to operations with which they are already familiar. 'Technically, it can be complicated to put [a whole new structure] in place' (Interview 3). Drawing on the concept of path dependency, completely new instruments or operating procedures can impose uncertain returns and significant economic costs if current assumptions about climate change risks prove to be wrong and the measures adopted turn out to be ineffective (Jupille et al., 2017).

Hence, it is reasonable to think that central banks preferred to channel responses to new environmental goals through piecemeal changes in established frameworks, as they enabled a relatively immediate action on climate change, albeit cautiously. Moreover, from the market and public perspectives, adding new elements to existing policy tools enables the newly created elements to be more easily placed and understood within the banks' existing arrangements, facilitating their acceptance (Fioretos, 2011; Weir, 1992). As Weir put it (1992), 'the way a policy is packaged plays an important role in maintaining the diffuse support or acceptance necessary to protect it from challenge' (p. 194). This may hold particularly true in a domain surrounded by doubts as to whether central banks have a legal basis to pursue environmental goals. Consequently, some institutional constraints might have been accepted and even valued in the process of greening monetary policy. This result is consistent with extant political economy literature, which shows the prevalence of incremental reforms within financial institutions (e.g., Deeg & Posner, 2016; Fioretos, 2011; Helleiner, 2017; Moschella & Tsingou, 2013; Moschella & Vetterlein, 2016; Weaver & Moschella, 2017).

By and large, the BOJ and the Riksbank reflect two contexts where policy innovation driven by external pressures was possible. Yet, the institutional configuration or 'mechanisms

of stickiness' within which the banks operate constrained change, giving rise to a gradual pattern of green reforms (Zürn, 2016, p. 213; see also Thelen, 1999, as cited in Moschella & Tsingou, 2013). As the evidence came to demonstrate, the new environmental policy responses were manifestly linked to prior policy arrangements. Legal, technical, and legitimate considerations are among the main factors driving piecemeal reforms, explaining why the green policy options selected by these two banks were more viable than the available alternatives. Hence, although the evidence lends stronger support to incrementalism, it does not disconfirm the presence of path-dependent constituencies in the changing process, as historical legacies help explain the GMP preferences.

6.3.2 *Hypothesis 2: Critical Junctures Result in the Development of Green Monetary Policy Measures*

The environmental crisis, as it has been widely referred to, can at first appear to be a good candidate for a critical juncture. First, it has been regarded as an external economic and financial shock. Similar to other economic and financial crises, one could expect to prompt atypical policy responses from various central banks. Second, the issue of sustainable finance was being increasingly politicised at both national and international levels. The G7, the G20, national governments, public opinion, experts, and research organisations pushed for policy reforms and proposed concrete solutions, opening a window of opportunity for the development of GMP measures.

However, unlike previous economic and financial crises, the environmental emergency requires long-term responses to a problem that shares no consensus as to whether, where, and how it will occur, as well as on whether central banks should actively participate in climate solutions. Also, unlike past junctures, it is challenging to determine when the environmental crisis started and how long it will last. All we see is a handful of events that made the

environmental problem more salient within the central bank community, as discussed in the Literature Review chapter.

Reflecting on the cases of the BOJ and the Riksbank, even though the potential for a critical juncture existed and monetary policy was de facto put at the service of extra-socioeconomic and political goals, the environmental crisis did not amount to a 'paradigm shift' or rupture with the core principles of existing practices (P. A. Hall, 1993, p. 279). As in Hay's account, 'the process of paradigm shift is complex . . . and hardly instantaneous' (Hay, 2018, p. 213). Indeed, despite the diversity of actors and initiatives advocating for green reforms and the increasing concern of some central banks about the negative impacts of climate change on monetary and financial stability, the findings of this study suggest that the greening of monetary policy was conditioned by the boundaries of primary monetary policy goals, which remained subject to keeping 'inflation expectations anchored to an inflation target' (Lagarde, 2023a). To protect this main goal, both central banks highlighted from the outset that the measures adopted were time-limited and could be suspended while in force.

Specifically, the BOJ's climate financing facility is planned to run until March 2031, and its operationalisation hinges on the needs of monetary policy. For its part, the Riksbank's purchase of securities was phased out in 2023 due to monetary policy tightening, indicating that the green policy shift in the case of the Riksbank was also transient. Concerning the integration of sustainability elements into foreign exchange activities, this operation was restricted by other metrics related to the profitability and risk profile of the foreign exchange portfolios. Hence, although GMP measures gathered momentum and remained significant in assessing investments for a period of time, they proved not to be entirely sustained. Environmental considerations can be weakened, and even reversed, due to conflicts between monetary and environmental goals. From this perspective, the development of GMP tools and criteria anticipates a 'self-eroding process' to safeguard the central banks' primary goals

(Falleti & Mahoney, 2015, p. 216). This finding is consistent with the temporary nature of unconventional monetary policies.

What is also relevant to note is that, despite the seemingly innovative green policies and their larger number in 2021, the BOJ, as well as some other central banks in this study, already had a tradition of supporting environmental projects well before 2021. For instance, the BOJ's multipurpose Growth-Supporting Funding Facility has benefited environmental businesses since 2010. The multiple extensions of this facility in terms of loan amounts and participating firms, as well as its unusually long duration, allowed it to be further expanded in 2021 to form the Climate Response Financing Operations.

The transition between the two credit lines was not quick or revolutionary, but part of a gradual process: the first disbursement of the Climate Response Financing Operations was planned for December 2021, whereas the last disbursement of the Growth-Supporting Funding Facility was scheduled for June 2022 (Bank of Japan, 2021g, 2021j). For its part, the Riksbank added sustainability criteria to its existing foreign exchange activities and temporary security purchases. Neither the BOJ nor the Riksbank ventured into a completely new territory nor embarked on a process of fundamental change that dismantled old practices. Just the opposite. They looked for a climate response within existing arrangements by enhancing their features with green criteria. As noted by Interviewee 6:

> Central banks integrate climate considerations into the tools that they already have. The Riksbank did so for foreign exchange reserves because that is the main thing they have. That is also why some central banks have that in foreign exchange reserves, not in refinancing operations, maybe because they do not have refinancing operations. (Interview 6)

While the growing visibility and action on the climate change issue may have generated the permissive conditions for significant changes in monetary policy frameworks, the

institutional constraints on green policy decisions, along with the abandonment of green considerations when inflation picked up, prevented a radical type of institutional change from occurring. Put differently, although the conditions for a critical juncture mode of change may have been present, the green reforms did not substantially alter the institutional environment or the operations of the BOJ and Riksbank. Conversely, the dynamics associated with the weakening and discontinuation of green parameters to protect the central banks' main goals and principles revealed the absence of the mechanisms that would reproduce and lock in the newly implemented measures. In this context, it is reasonable to conclude that the environmental crisis heralded only a modest shift in central bank policy frameworks. This observation contradicts the critical juncture theory, which predicts sudden, destabilising, and enduring changes in organisational operations and goals.

The predominance of incremental changes over punctuations within the research period does not invalidate the possibility of upcoming policy breakthroughs that enable a more effective GMP. As more data on climate risks becomes available and experience with natural hazards intensifies, additional opportunities for a more substantial shift in monetary policy towards environmental aims may arise. Moreover, between advances and setbacks, the permissive conditions or policy window that has opened for greening monetary policy operations will likely stay open for so long as climate change remains a priority on political and economic agendas. Until when the central bank's green policy operations will be institutionally possible or needed is, at the time of writing, unclear. Equally unclear are the legacies or long-term effects of the policy measures implemented up to January 2024. Following Zürn (2016), HI 'works best as a backward-looking explanation' (p. 218). We will have to wait and see whether the selected GMP measures will have the potential to become locked in and fundamentally change the nature of monetary policy towards a more prominent role in addressing environmental issues.

In sum, this subsection developed the argument that changes in the external context linked to a perceived environmental crisis did not lead to the breakdown of the BOJ and Riksbank's policy frameworks or the creation of innovative and durable arrangements, as suggested by Krasner (1984) in his 'punctuated equilibrium' theory. Instead, the two deviant case studies demonstrated a line of continuity with past policies and goals. There was a process of gradual 'institutional change' in central banks' policy toolkits rather than 'institutional creation' of groundbreaking instruments (Jupille et al., 2017, p. 124).

The adoption of green considerations can be seen as the most recent addition to a list of existing nonstandard monetary policy measures that gained ground in 2010 in the BOJ and in 2015 in the Riksbank. Yet, the suspension of environmental considerations when macroeconomic conditions required suggests that the green shift was only partially achieved in the two banks. These findings decrease the confidence in Hypothesis 2: Critical junctures—notably, the experience of environmental disasters or other event(s) of systemic relevance—result in the development of GMP measures. However, since this study explores an unfolding and long-standing event, the possibility of more disruptive and enduring changes at a later stage cannot be ruled out (Capoccia, 2015).

6.3.3 *Hypothesis 3: Most Green Monetary Policy Measures Can Be Explained in Terms of Incremental Change*

As stated above, what is observed across the two cases is that the environmental emergency did not 'place institutional arrangements on paths or trajectories, which are then very difficult to alter' (Pierson, 2011, p. 135), as suggested by the traditional accounts of critical junctures. The evidence showed operational limits and even a 'reactive sequence' involving the backtracking of the green measures adopted due to incompatibilities with conventional policy goals and practices, bringing monetary policy frameworks to their initial stage (Hanrieder & Zürn, 2017, p. 100). This scenario of policy change held within institution-

specific constraints gave rise to a gradual pattern of institutional change, as conceptualised by scholars within HI. Therefore, an analysis was made of the monetary policy options selected by these two central banks to address environmental issues in light of four main types of incremental change (e.g., Fioretos et al., 2016; Mahoney & Thelen, 2009; Streeck & Thelen, 2005; Thelen & Conran, 2016): (a) layering or establishment of new rules atop or in tandem with existing ones, for instance, through amendments, revisions or additions; (b) displacement or outright replacement of existing rules by new ones; (c) conversion or adaptation of extant rules towards new objectives—pre-existing rules remain but are reinterpreted; (d) drift or the altered impact of established rules due to their deliberate non-adaptation to the evolving environment—drift implies that rules become dysfunctional, undermining the achievement of the organisational goals.

A crucial insight from the empirical analysis is that both central banks invoked an environmental externality that required action and drew on their established frameworks to provide a policy response. The most prominent GMP measures resulted from expanding existing nonstandard instruments that were previously deployed as temporary tools to ensure market liquidity during economic downturns. In the case of the BOJ, the climate-targeted instrument introduced in 2021 displaced the innovative and multipurpose Growth-Supporting Funding Facility launched a decade before to counteract an economic recession (Bank of Japan, 2021k, p. 20, 2021g; Kuroda, 2021b; The Government of Japan, 2021a). However, the measure was temporary—the BOJ's climate financing facility was scheduled to end in March 2031 (Bank of Japan, 2021j)—conditional on monetary policy needs, and designed in ways that minimise the bank's involvement in the selection of companies to protect the market neutrality principle (Bank of Japan, 2021g, 2023b).

The transition between the two tools was itself incremental, as they overlapped for some months. As noted earlier, the first disbursement of the Climate Response Financing Operations

was planned for December 2021, whereas the last disbursement of the Growth-Supporting Funding Facility was scheduled for June 2022 (Bank of Japan, 2021g, 2021j). The inclusion of Japan Climate Transition Bonds in the BOJ market operations was inhibited by the small issuance of these assets (Interview 1). As Interviewee 5 noted, the restricted supply of green assets compared to their high demand has been a main 'problem'.

Looking at the GMP measures adopted by the Riksbank, the bank preferred risk protection tools over more exclusive or targeted ones, in line with its existing instruments (Interview 2). Specifically, the large-scale asset purchases initiated in 2015 and reinforced during the pandemic as part of an economic stimulus package were adjusted in ways to emphasise green investments. According to the Riksbank (Interview 2), the inclusion of sustainability criteria in both foreign and domestic asset purchases lowered the bank's exposure to environmental risks and provided an incentive towards a Paris-aligned economy—whether a central bank should provide this incentive and influence the climate change direction remains a matter of debate. However, security purchases were discontinued in 2023 due to a restrictive monetary policy, meaning that the environmental support through asset purchases was a temporary opportunity (Sveriges Riksbank, 2024b). When it comes to the incorporation of green criteria into foreign currency operations, both banks made them subordinate to other fundamental decisions concerning the risk and return profile of the central banks' portfolios (Bank of Japan, 2021f; Sveriges Riksbank, 2023e).

In sum, the BOJ's Growth-Supporting Funding Facility and the Riksbank's expansion of its balance sheet became necessary and salient parts of the momentary policy toolkits to pursue environmental goals. The existence of and learning from preceding nonstandard monetary policy instruments created strategic opportunities that both banks exploited to facilitate the green transition. It follows that, despite the novelty of climate-targeted operations, the green policy measures implemented were built on and benefited from the functioning,

security, ‘positive feedback’, and legitimacy of an older monetary policy structure without fundamentally altering its purpose or operation (Mahoney, 2000, p. 523). This process of institutional change, where past institutional structures inform the newly created institutions, could also be described as ‘copying’(Verdun, 2015) or ‘a process of first-order change’, in which ‘policy instruments are modified . . . in the light of past experience and new knowledge’ (P. A. Hall, 1993, p. 278).

Against this background, the BOJ and the Riksbank’s experiences with GMP provide more substantial support to a gradual pattern of change in central bank operations related to their backing for the green transition. The empirical evidence also suggests that these two cases cannot be understood through one pattern of incremental adaptation only. Instead, there is a process of layering environmental criteria onto core policies—which is common practice in institutional settings that face high formal restrictions on change (Fioretos, 2017)—and the displacement of a pre-established policy tool. Specifically, new environmental factors were carefully incorporated into existing foreign exchange activities and asset purchase programmes, along with other risk management metrics. For its part, the BOJ’s Climate Response Financing Operations fits well within the displacement type of change, as the bank replaced the previous Growth-Supporting Funding Facility with a similar instrument that included more ambitious environmental goals. Arguably, the experience with the Growth-Supporting Funding Facility conferred the BOJ greater legitimacy and agility to institutionalise a new comparable tool.

These observable results are central in the analysis, as they indicate a clear scenario of policy change, since extant policy tools became visibly different after incorporating new environmental criteria (Rixen & Viola, 2016). This course of change goes beyond the mere reinterpretation or deliberate non-adaptation of existing policy tools and their purpose to the evolving context, as the proponents of conversion and the drift mode of institutional change

maintain. In the processes of conversion and drift of existing institutions, the policy instruments remain unchanged (Hacker et al., 2015). Yet, although central banks' support for the climate transition was initiated and, at some point, escalated with additional measures, previous 'self-reinforcing mechanisms' moulded what central banks put into practice (Zürn, 2016, p. 222). As Peters pointed out, 'structures may be transformed over time, but they also retain much of their past history', what Tolbert and Zucker called 'sedimentation'(Peters, 2019, p. 153).

Indeed, central bank legacies stemming from early policy decisions and goals persisted despite new environmental pressures. The de-layering of green criteria whenever monetary stability was at risk illustrates a 'reactive path-dependent dynamic' that can ultimately undermine the effectiveness of GMP measures and, consequently, the role of monetary policy in contributing to a greener society (Moschella & Vetterlein, 2016, p. 144). Even so, this scenario of explicit policy change, albeit constrained, assigns stronger confirmation power to Hypothesis 3, which asserts that most GMP measures can be explained in terms of incremental change, over Hypotheses 1 and 2, on strict path dependencies and punctuations.

6.4 Theorising the Determinants of Green Monetary Policy Measures

When considering the explanatory factors behind the inception of GMP measures, the reconstruction of its origins revealed the combination of two main drives, as corroborated by the key informants and illustrated in the causal process mechanism in Section 6.6 (p. 309). First, insufficient public policy responses to growing environmental risks. Consequently, second, new green finance ideas were developed during this particular period to help address this issue. To understand how these ideas were learned and became institutionally possible, the empirical work turned to the role of international agencies, particularly the NGFS, in developing and promoting alternative GMP solutions.

Reflecting on the case of the BOJ, its most impressive measures echo a concerted effort with the government to achieve specific economic goals, notwithstanding the central bank's

lack of a coherent legal basis for assuming environmental objectives. The nonstandard Growth-Supporting Funding Facility, established in 2010, sought to counter a national recession by substantiating a list of activities with growth potential, including the environment, as outlined in the 2009 New Growth Strategy (Bank of Japan, 2010e; Prime Minister's Office of Japan, 2009). The Climate Response Financing Operations, launched in 2021, supplanted the longstanding Growth-Supporting Funding Facility to support 'Japan's actions to address climate change' (Bank of Japan, 2021k, p. 20). This new monetary policy tool was aligned with the national Green Growth Strategy to achieve carbon neutrality by 2050 (see also Bank of Japan, 2021g; Kuroda, 2021b; The Government of Japan, 2021a). As the BOJ's former governor elucidated:

> Transforming the [carbon-growth] model into a decarbonized one in less than three decades is a challenging task. . . . [it] will require not only a large amount of capital and R&D investments over a long period but also the financing of those investments. Against this background, the bank has recently decided to introduce a new operation to provide funds to financial institutions on favorable terms against various investments or loans they make to address climate change. I hope this new operation will serve as a catalyst to boost private sector efforts to address climate change. (Kuroda, 2021d)

The BOJ often justified its climate action based on a sense of ethical duty to assist with this important externality (Kuroda, 2019b, 2021e; Wakatabe, 2021; Interview 1). It is as though there was 'a top-down approach of institutional legitimacy' related to a pressing national concern to attain ambitious climate targets (Ng, 2018, p. 585). The availability and attractiveness of new green finance ideas were instrumental in designing the BOJ's climate strategy (Bank of Japan, 2021f). Emphasis was placed on the recommendations of the G20 and the TCFD, which the Japanese government and the BOJ had been advocating since the country

held the G20 presidency in 2019 (Bank of Japan, n.d.-a; Kuroda, 2019a; The Government of Japan, 2019). 'Energy Transitions' and TCFD guidelines were among the G20's main agenda topics (G20 Japan, 2019; Ministry of Finance Japan, 2019).

In November 2019, the BOJ decided to join the NGFS to 'enhance its understanding' of and contribute to the international debate on climate change, considering the growing number of acute climate events in Japan, including severe floods (Bank of Japan, 2019f; Interview 1). Favourable credit lines against TCFD disclosure requirements and the inclusion of environmental criteria in foreign exchange investments and asset purchases were among the policy options proposed by the NGFS, which the BOJ came to implement (NGFS, 2021a). According to Interviewee 1, with climate change and natural disasters taking place all over the world, including floods in Japan, the central bank finally opted to join the NGFS. Interviewee 1 went further to say that discussions within the NGFS prompted the BOJ to consider how it could contribute to addressing climate change. The Climate Response Financing Operations established in 2021 was one of the outcomes of these discussions (Interview 1).

Regarding the Riksbank, it was not so much how the country defined its environmental goals that determined the Riksbank's sustainability strategy. After all, Sweden adopted a carbon tax in 1991 and contributes less than 0.1% to global CO2 emissions, whereas Japan is among the 10 most emitting countries (Climate Watch, n.d.-a; Friedrich et al., 2023; Interview 2). The historical record of the Riksbank brings to the fore the importance of investigating international politics and the work of specialised organisations to understand policy change. The NGFS warning about climate change financial risks and the techniques that can be deployed to minimise these risks were particularly imprinted on the Riksbank's sustainability discourse and policy choices (Brattström & Gajic, 2022a; Breman, 2020a, 2021a; Finansinspektionen & Sveriges Riksbank, 2021; Interview 2). As the Riksbank's interviewee observed:

> I think the NGFS has been extremely important. . . . there is nothing that is legally binding, [but] it has been extremely important. . . . we are a small central bank, so it has been very helpful to get input and have people to discuss issues with. Collaboration with other green central banks has been very, very important, and also other international bodies. . . . we designed the overall sustainability strategy of the Riksbank . . . [but] we did not invent things from scratch. . . . We are very fortunate that we have been able to talk to other central banks and participate in this global network, which is the NGFS. (Interview 2)

Additionally, the Riksbank grounded its sustainability strategy on the legal principle of managing public money in a prudent and efficient manner, as required by Chapter 9 of the previous Riksbank Act 1988 (Sveriges Riksbank, 2020a; The Sveriges Riksbank Act 1988, 2015, Chapter 9 Article 1a). The new strategy also aimed to avoid undermining the effects of green public policies through the bank's activities and compensate for the lack of effective global carbon-reduction measures to fight climate change (Breman, 2020a; Sveriges Riksbank, 2020i, 2021e). The bank urged greater international cooperation and efforts to achieve global sustainability goals.

Two key considerations result from the above account: First, the Riksbank maximised the wider scope afforded by Chapter 9 of its older Act to develop a monetary policy response to climate change. This is an indication of how the interpretation of mandates can drive policy innovation when there is a strong commitment to specific causes. Second, the Riksbank's environmental policy decisions exposed the mutual spillover effects between public and monetary policy. While environmental action from the Swedish state influenced the central bank's decision-making in a new environmental direction, the Riksbank also shaped the wider system by setting new green standards that catalysed public environmental policies. This is in line with Meyer and Rowan's (1977) premise whereby 'organisations are structured by

phenomena in their environments and tend to become isomorphic with them' due to interdependencies that become easier to handle (p. 346). Interviewee 6 corroborated this view by citing research which 'has shown that when central banks do some things, for example, on climate, that amplifies fiscal measures, making the carbon tax effect much more amplified.'

While the BOJ and the Riksbank are two similar cases with respect to the cause (exposure to the environmental emergency) and the outcome of interest (GMP measures), the weight of the main drivers influencing the development of GMP measures appears to vary slightly between the two central banks. This seems to be the result of contextual factors, notably the countries' vulnerability to natural hazards and climate finance needs, which looked higher in the case of Japan. What is relevant to emphasise is that the adoption of green elements in monetary policy decisions was not solely a question of monetary interest. In the face of insufficient incentives to align the national and global economies with the Paris Agreement goals in a timely manner, the financial system had to change swiftly to accelerate the transition (Interview 2). By steering funds to more sustainable investments and requiring investees to disclose their climate-related risks, the BOJ and the Riksbank addressed a market failure that needed to be corrected to encourage the private sector to operate in a more environmentally responsible manner.

Hence, along with risk-management grounds, a historical review of the two central banks highlights other significant sources of monetary policy change, pointing to the influence of the political and economic context and the subsequent emergence of a new sustainable finance paradigm as an alternative solution to the environmental emergency. The multiple factors underlying the adoption of GMP measures are consistent with Bennett's (2022) view, which asserts that outcomes often result from a combination of 'interacting variables' (p. 202). To gain a deeper understanding of the GMP event, the following sections explore the impact

of both the perceived environmental crisis and the role of international agencies as propulsors and mediators of new green finance ideas.

6.5 Understanding the Flow of New Ideas and Policy Learning in Monetary Policymaking

> 'Only a crisis—actual or perceived—produces real change. When that crisis occurs, the actions that are taken depend on the ideas that are lying around' (Friedman, 2002, as cited in Bordo & Siklos, 2018, p. 18).

This study argues that the institutional perspective only partially explains the development of green monetary policies. A closer examination reveals that mandates did not automatically account for GMP measures. In the process of policy formation, it is possible to identify an interpretative component of the role of central banks in the green changeover influenced by historical, political, and socioeconomic factors. It is here that SI intersects with HI to shed light on the ideas linked to the 'preoccupations of the time' that may have influenced the BOJ and the Riksbank's green policies, irrespective of their objective gains (Farrel & Finnemore, 2017, in Fioretos, 2017, p. 19; P. A. Hall, 1993).

Ultimately, central banks' green shift proved to be a narrative about accepting new sustainable finance ideas and policy learning. The emergence of these ideas, spread by multilateral organisations, research groups, networks of experts, among other organisations, provided an opportunity to make the environmental problem part of central banks' policy problems and goals. Examining how these ideas were made available and pursued by the two central banks illuminates the influence of the new green finance paradigm in central banks' decision-making.

The empirical data showed that the BOJ and the Riksbank's publications increasingly and systematically focused on environmental issues, social responsibility, and sustainable development from 2019 onwards—an year of growing social activism on climate action (see

Figure 8. *Evolution of the Bank of Japan and the Swedish Riksbank's Publications on Environmental Matters, Jan. 2010–Dec. 2023*

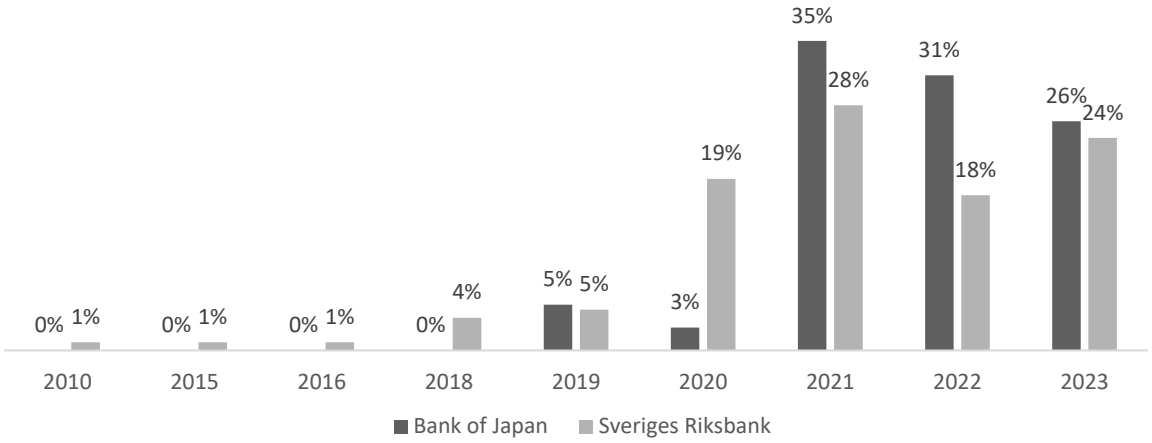


Figure 8, on the evolution of the BOJ and the Riksbank's publications on environmental topics; percentage out of the total number of publications in English by central bank). This provides evidence that the new sustainability values and interests found their way into the central banks' focus areas. Along the way, both banks closely monitored the environmental strategies of other green-driving central banks—especially the Bank of France, the BoE, and the ECB—exchanged information with national governments, supranational actors, and specialised organisations—notably, the G20, the FSB, and the NGFS—which the extant literature has identified as relevant 'change agents' (Büthe, 2016). While governments have the authority to amend central bank mandates, international agenda-setters reshape preferences, legitimise change, and put pressure on governments, thereby creating opportunities for policy change, even if indirectly.

As confirmed during Interview 1, the BOJ followed the climate work of the G20 and the FSB, the latter of which is published on the BOJ's website (Bank of Japan, n.d.-a). The country is a G20 member and presided over the group in 2019, when discussions included energy transitions and the TCFD guidelines. The Japanese Government has widely disseminated the TCFD recommendations since 2018, whereas the BOJ requires participant institutions in the Climate Response Financing Operations to report climate-related information

following the task force guidelines. Along with the growing frequency of floods and other climate-related events in Japan, the BOJ decided to join the NGFS in November 2019 (Interview 1). Since then, the bank has shared the network's research on the central bank's website and in institutional publications (Bank of Japan, n.d.-a).

Crucially, the policy options outlined in the network's policy reports appear central to explaining the BOJ's GMP decisions. In March 2021, three months before the bank announced its Climate Response Financing Operations, the NGFS published a report on how central banks could mitigate climate risks and actively support the transition. The report was compiled with the collaboration of three BOJ representatives and published on the BOJ's website on 7 June. A few days later, on 15 June 2021, the BOJ announced the climate policy tool at its Policy Board meeting. Targeted lending solutions were among the options identified in the previously published NGFS report that the central bank came to adopt (NGFS, 2021a).

Interviewee 1 acknowledged that the 2021 climate credit solution resulted from discussions at the NGFS and that the bank was committed to following the recommendations of this and other international organisations, especially the G20 and the FSB. However, the acceptance of external advice was kept within limits. If the recommendations exceeded what the central bank considered to be its mandate, it clarified its reasons for being unable to implement them, highlighting what it could and could not do (Interview 1). By and large, the historical review of the BOJ suggests that the political and economic context influenced the bank's green finance model. However, it was constrained by structural factors, notably the limited issuance of green assets, as mentioned earlier.

Sweden was not a member of the G20. However, the Riksbank's account offered multiple examples of how GMP ideas and best practices promoted by the NGFS significantly influenced the central bank's approach to sustainability. The Riksbank's senior officials and publications repeatedly emphasised the critical role of the NGFS as if to legitimise the central

bank's policy stance on climate change through a body with expert knowledge on the best way to handle such a complex issue. To further illustrate the influence of the NGFS new green finance ideas, the empirical data showed that climate risks were first addressed in the BOJ and the Riksbank's financial stability reports—also in the Fed's (Brainard, 2020; Federal Reserve Board, 2020a)—in the month prior to joining the organisation, as if to anticipate their alignment with the network's principles. Furthermore, the BOJ and the Riksbank's GMP decisions occurred shortly after the NGFS published similar policy recommendations. The Japanese monetary policy expert, as well as the Riksbank's senior official, confirmed the power of the NGFS work and advocated ESG policy proposals in shaping their climate strategies, even if such recommendations were not binding (Interview 1; Interview 2).

As mentioned in the theoretical chapter, the NGFS exhibits features of an epistemic community. Drawing on Haas's widely cited definition, it comprises a 'network of professionals with recognised expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area' (Haas, 1992, p. 3). Unlike other groups, epistemic communities are not primarily moved by material interests. Instead, their members share 'scientifically grounded beliefs and norms' that guide policy actions towards specific aims (Löblová, 2018, p. 164). This guiding effect is claimed to be especially effective in highly uncertain and technocratic areas—such as GMP—where new policy ideas may need to satisfy a number of criteria to fit within the parameters of existing frameworks.

As climate change became a priority for some governments, this coalition of central banks and supervisory authorities mobilised a growing number of members and leveraged their skills and expertise to frame the issue and develop policy options that minimised climate risks and catalysed green financing (NGFS, n.d.). The combination of growing climate risks,

inadequate public policy responses, and the NGFS policy entrepreneurship opened an opportunity to make the greening of central bank operations part of the environmental solution.

While the correlation between the BOJ and Riksbank's GMP decisions and their engagement in the NGFS seems convincing, the same does not apply to the Fed. The Federal Reserve did not agree on any specific monetary policy solution that aligns the central bank's activities with environmental considerations, although green measures appeared to be more easily implemented and justified in the case of the Fed. This result indicates that the mere predominance of GMP ideals among some of the leading NGFS central banks does not guarantee that all members accept them.

From this perspective, the NGFS seems to provide necessary yet insufficient conditions for advancing a GMP strategy. For some, this can be somewhat expected, considering that the NGFS operates in a relatively new policy area. According to Peters (2019), the practices recommended by recent networks tend to be 'less institutionalised' compared to long-lasting ones (p. 176). Moreover, networks and communities are said to be two distinct realities. While the former implies regular and more rational interactions to produce scientific knowledge and expertise, communities are geared towards shared norms and values. In any case, additional ends must have been at stake to explain the Fed's hesitance towards the green movement.

6.6 An Empirical Mechanism Tying the Environmental Crisis to Green Monetary Policy Outcomes

Drawing on the Japanese and Swedish empirical records, this section develops a mid-range theory of a causal process between the environmental crisis, described as insufficient public responses to growing environmental risks, and GMP outcomes. Notwithstanding the case-specific elements that impacted how the causal processes unfolded within the two banks, the reconstruction of the BOJ and the Riksbank's green trajectories allows us to identify key groups of actors, activities, and decisions that were similar or 'systematic', irrespective of the

different settings (Rohlfing, 2008, cited in Beach & Pedersen, 2019). In other words, although the two causal processes were not precisely the same or followed an equal timeline when considered at a detailed level, the constituent parts show a certain degree of 'mechanistic homogeneity' in terms of the most crucial events, entities, and activities that produced change and how (Beach & Pedersen, 2019, p. 41).

Figure 10 (p. 313) reconstructs four main mid-level episodes up to the adoption of GMP measures. The objective is to propose an empirically based mechanism that can be applied and tested in other contextually similar central banks. At a more general level, the process begins with identifying the environmental problem and the inability of governments to address it, as well as recognising green finance as a complementary solution. This awareness first develops among expert organisations (Part 1) and then spreads to central banks through these organisations (Part 2).

The process moves to the decision phase, where central banks accept the problem, seek additional information about it, and consider potential policy responses (Part 3). Subsequently, central banks assess how the available policy options promoted by expert organisations fit extant legal objectives, operational principles, and procedures (Part 4). At this point, the existence of nonstandard monetary policy tools that emerged in the context of previous crises seems to work as enablers of policy change. However, it is also possible to pursue green objectives using more conventional monetary policy tools, such as foreign exchange investments and collateral frameworks, as the multiple-case examination showed.

If the outcome of the decision phase is positive, central banks are likely to adopt environmental criteria in their monetary policy toolkits. Based on the BoJ and the Riksbank's accounts, the preferred approach consists of implementing a series of small and gradual adjustments to monetary policy operations, rather than creating entirely new instruments or supporting more radical reforms of institutional change. In this way, central banks can respond

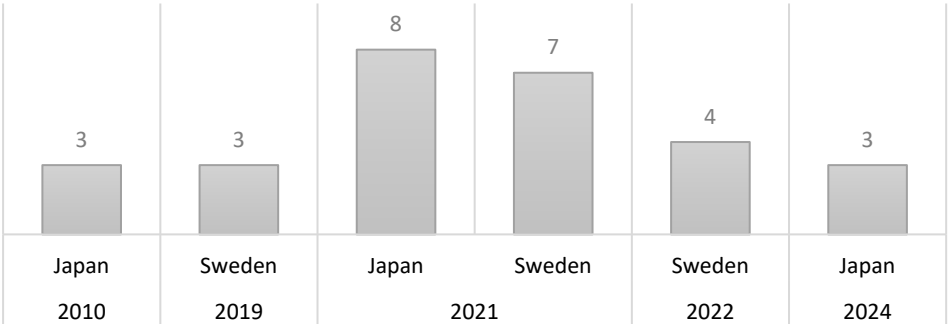
to the environmental emergency while holding better control over the change process (Moschella & Tsingou, 2013). Put differently, the adoption of environmental criteria does not significantly disrupt the bank's functioning or established frameworks. Thus, green considerations can be more easily reversed if primary objectives require it. Moreover, the gradual integration of green factors into existing monetary policy structures helps the public to understand and accept them more easily (Interview 7; Jupille et al., 2017).

Since policy action is most likely preceded by awareness, evaluation, and a formal decision, it is assumed that 'the ordering of events is consequential' and 'self-amplifying' (Falleti & Mahoney, 2015, p. 223). That is to say, there is 'productive continuity' between the parts, with each part—defined as actors engaged in specific activities—emitting 'causal forces' or positive feedback to the next, thereby increasing the probability of the outcome occurring (Beach & Pedersen, 2019, pp. 70–71).

In designing the causal mechanism, I left out strong considerations of the BOJ's Growth-Supporting Funding Facility established in 2010. This multipurpose credit facility was created as part of an ad hoc package of monetary easings to respond to the country's long-standing economic recession. Although environmental segments were one of the targeted lending activities, climate change and the underlying new green finance paradigm played a relatively minor role in the adoption of the facility. The years following 2018 marked a transition towards a more significant environmental direction, especially in 2021, when the two central banks implemented the most impactful decisions in terms of green policy intent (see Figure 9, p. 312, and Appendix A, p. 375).

As previously mentioned, the green turn could be attributed to specific happenings that occurred in 2021, notably the COP26, the revised Nationally Determined Contributions aimed at achieving the Paris Agreement goals, the climate pledges from NGFS members, as well as the policy priorities of the G7 and the G20, which included an environmental dimension.

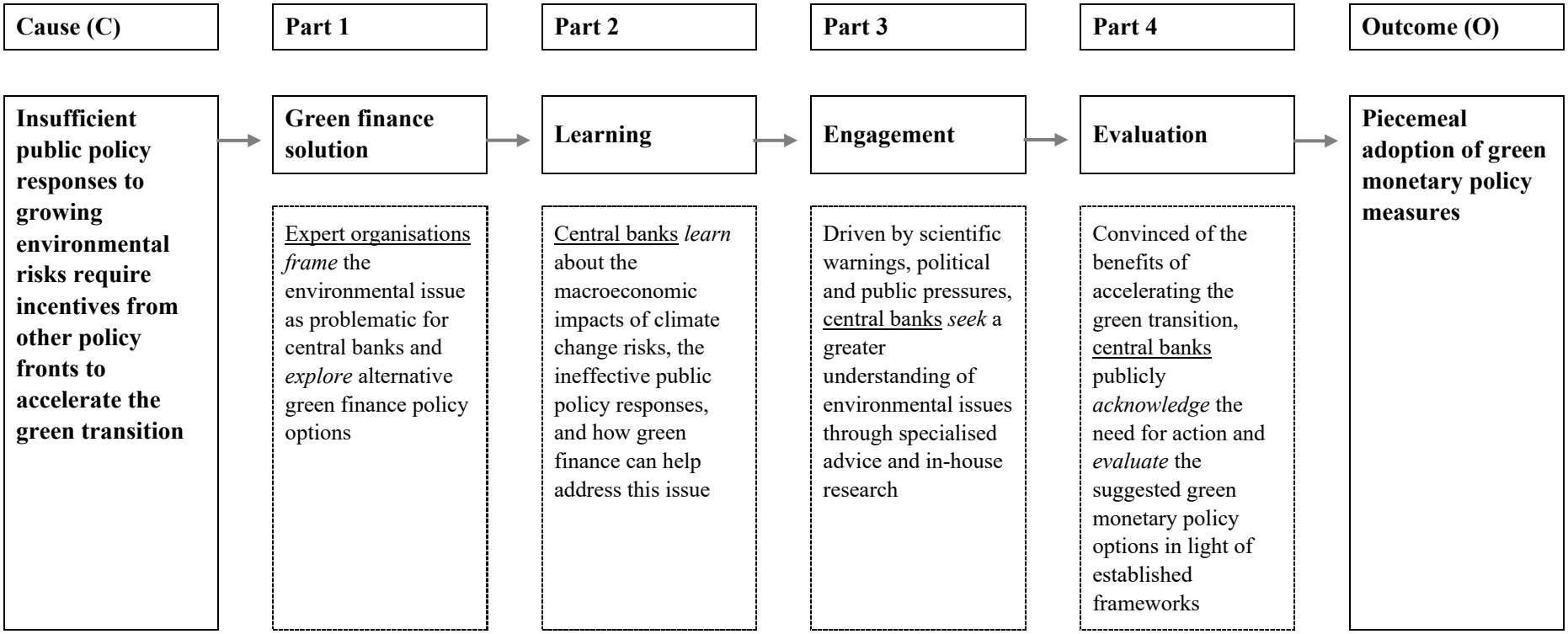
Figure 9. *The GMPI Scores of the Bank of Japan and the Swedish Riksbank per Year of Policy Implementation*



However, the move towards green initiatives and their preparation started well before 2021. The empirical narratives of the BOJ and the Riksbank provided significant evidence that confirms a previous interplay between these central banks and sustainable finance ideas, which could be more visibly traced from 2018, culminated in 2021, and continued through 2022 and 2024, once both banks had consolidated a climate strategy that gave them greater margin of manoeuvre to act.

The causal process illustrated in Figure 10 (p. 313) is followed by a detailed reasoning for each identified part that ties the environmental emergency to the BOJ and the Riksbank's green monetary policies. The systematic description includes an overview of the traces left by the actors engaged in each part's activities, as well as an explanation of how and why they can produce connecting effects with subsequent parts. It is worth noting that the theoretical frameworks supporting the analysis, as well as the narrative concerning the role of international organisations and expert communities devoted to sustainable finance, are developed in the literature review and theoretical chapters of this thesis. Therefore, the following description does not extensively reference the claims made for why the green shift occurred and the patterns of policy change pursued.

Figure 10. *A Four-Part Mechanism of How Insufficient Public Policy Responses to Growing Environmental Risks Can Lead to Green Monetary Policy Measures*



Scope conditions: Central banks from the largest AE with a narrow mandate, which are members of the NGFS, and operate in jurisdictions where environmental objectives are being institutionalised in a wide range of social and economic sectors.[52]

Notes: The activities connecting the parts of the causal process are shown in italics, while the main entities or actors involved in the activities are underlined. The causal arrows indicate the transmission channels between the constituent parts of the mechanism.

[52] What comes out from the empirical analysis of the BOJ and the Riksbank is that both banks were members of the NGFS—they both confirmed that their green monetary policy options followed the network's recommendations—and operated in jurisdictions where national governments had disclosed ambitious climate transition plans.

6.6.1 *Cause: Insufficient Public Policy Responses to Growing Environmental Risks Require Incentives from Other Policy Fronts to Accelerate the Green Transition*

The explanation begins with the pressing need to change established economic patterns, which have been claimed to destroy natural resources and pose critical risks to future economic growth and human life. This implies the collapse of the preceding brown-growth models and their replacement by environmentally friendly products and production processes. Although governments are the chief levers in driving green economic growth, they have proven to lack the political will or financial resources to tackle or adequately address environmental problems.

The force with which scientists, researchers, interest groups, and the media took up the climate crisis was central to the popularisation of the view that growing environmental risks, coupled with delayed political action, demanded responses from a wider range of policy instruments (IMF, 2020, as cited in IRC [International Relations Committee of the European System of Central Banks] Task Force on IMF and global financial governance issues, 2022). This perception was probably the most innovative idea, which broke with the earlier notions that human welfare and economic growth were the responsibilities of governments. Consequently, the climate agenda was promoted across various sectors of society and the economy, opening a 'policy window' in other institutional domains (Birkland and DeYoung, 2012, as cited in Roux et al., 2022).

While the magnitude of the environmental crisis and the insufficient public policies to address it were not a sufficient condition to automatically trigger GMP measures across the central banking system as whole—as demonstrated by the varied GMP responses among this study's 20 central banks—it nevertheless prompted a mechanism that gradually influenced some central banks to support governments and encourage the private sector to 'correct this massive market failure' via their monetary policy frameworks (Schellhorn, 2020, p. 49).

6.6.2 *Part 1 – Green Finance Solution*

Expert organisations *frame* the environmental issue as problematic for central banks and *explore* alternative green finance policy options. The notion that central banks can help solve environmental issues was central to the development of GMP measures. Part 1 of the causal mechanism addresses the crucial questions of where this idea comes from and how its advocates interacted with and influenced the environmental direction of central banks. Following Weir (1992), 'the emergence of new problems or significant political changes are the most frequent preconditions' for policy change. However, their effect 'often depends on the actions of skillful . . . entrepreneurs', who facilitate the implementation of innovative policy ideas (p. 191).

Indeed, as the climate change problem intensified and the capacity of governments to deal with it declined, a number of existing and newly established organisations provided economic analysis of the issue, explored alternative policy solutions, and infused public debate. Prominent among them are recognised agencies such as the G20, the FSB's TCFD, and the newly created NGFS, as evidenced in the historical review of the BOJ and the Riksbank, as well as in the empirical data from other green central banks discussed in Section 5.2 (p. 152).

In the absence of a global authority and formal rules for topics that demand global solutions, these more informal organisations served as central venues to share information and coordinate strategies (Bernstein & van der Ven, 2017; Farrell & Finnemore, 2016; Newman, 2016). They conducted research and debated along specific lines that made environmental action more attractive than keeping the status quo. Most crucially, some of these organisations' research findings defined the environmental issue as a serious problem affecting society, including central bank activities. They also designed policy solutions to tackle environmental challenges and launched an extensive campaign to facilitate collective learning of how sustainable finance can support a timely and orderly transition to a greener economy.

Concerning monetary matters, emphasis has been placed on the NGFS, an international network of central banks and supervisory authorities that develops sustainable finance knowledge and identifies environmental problems in ways that require central bank attention and drive action. The network's ties to key monetary and supervisory authorities allowed it to expand its efforts to the wider central bank community. The network increased from 8 founding members in 2017 to 24, 58, and 129 members in 2018, 2019, and 2023, respectively (NGFS, 2018c, 2020b, 2023d). This growing group of economists and supervisory experts became a setting for creating 'common patterns of thinking and understanding' about green central banking (Peters, 2019, p. 133). As the network grew stronger, so did the practical information and recommendations in favour of their policy proposals.

The NGFS influence was exerted through central bank memberships and participation in climate-focused working groups, targeted events, publication of research, and progress reports. These reports not only informed about the worsening of climate indicators and how they could potentially affect central bank operations, but also developed innovative ideas and helped reinterpret central banks' role in the climate transition. In particular, the network investigated and advised on alternative monetary policy solutions to tackle environmental risks and promote a green economy and financial system, since conventional monetary policy tools could not easily address them (NGFS, 2021a).

A variety of independent research institutes and pressure groups were also established and gained prominence in conducting research and spreading green finance ideas, including Positive Money, Green Central Banking, WWF's Greening Financial Regulation Initiative, E-Axes Forum, Reclaim Finance, and INSPIRE. These and other more formal national organisations played a part in the development of GMP measures by fiercely disseminating a new set of green economic and monetary standards and tracking policy progress (e.g., Abdelli & Augoyard, 2021; Carney, 2019b; E-Axes Forum, n.d.; Green Central Banking & Positive

Money, 2022; Interview 7; Interview 9; Interview 11; Kuroda, 2021b; Task Force on Climate-Related Financial Disclosures, 2019).

***Empirical observables from the BOJ, the Riksbank, and the reviewed literature*:** conferences, workshops, high-level meetings, speeches, policy reports, and other written documents published by global agenda setters and international bodies that have shown commitment to green finance, such as the BCBS, the BIS, the EMEAP, the European Commission, the FSB, the G7, the G20, the IMF, the NGFS, the OECD, the UN.

***Sources*:** institutional information issued by the international bodies mentioned above, central banks, and national authorities, as well as press releases from NGOs and media reports.

***Probative value*:** the crucial piece of evidence is the intensifying production of documentation on the climate emergency by national competent authorities and international organisations. Confirming evidence involves supporting scientific claims about the adverse macroeconomic implications of the environmental crisis, the imperative need to address this issue, recommended action plans and, notably, the role of the financial system in the climate solution. Information issued by these organisations is empirically unique since these sources are regarded as knowledgeable and trustworthy. The information published is typically clear enough to be accessible to the general public and to avoid alternative interpretations. Credible newspapers that report on environmental studies and events increase confidence in Part 1.

6.6.3 *Part 2 – Learning*

Central banks *learn* about the macroeconomic impacts of climate change risks, the ineffective public policy responses, and how green finance can help address this issue. The public and political salience of climate change, combined with the increasing empirical research on its macroeconomic implications, encourages central banks to gain a greater understanding of the topic (Carney, 2018). Central banks learn about the changing circumstances and how the financial system, including monetary policy, can minimise climate

change risks by catalysing the green changeover. They also increase capacity building through participation in policy forums, exchanges with international bodies and other central banks, as well as through in-house research. The learning process tends to be 'piecemeal' (Boin & 't Hart, 2003, as cited in Beach & Smeets, 2022, p. 1193), as it introduces new ideas in relation to a topic that is (i) evolving—many of the effects of climate change are yet to materialise and there is no macroeconomic model to estimate and assess the impacts of climate change and related policies (Interview 1), (ii) complex—central banks have no experience nor competence in climate change mitigation, therefore, the development of new knowledge takes time and successful strategies often result from an incremental learning-by-doing approach (Kuroda, 2021b), (iii) uncertain—doubts remain about whether central banks have the mandate and the means to promote sustainable development, a task for elected officials.

The gradual learning process and accumulation of expertise on a complex and uncertain topic add a new layer of support to Hypothesis 3, which suggests an incremental and prudent introduction of new ideas and policy goals into the structures already in place over transformational institutional change (see also Johnson et al., 2019, as cited in Arbogast et al., 2024). The growing clarity and recognition of the impacts of climate change on the economy and financial system link Part 2 to Part 3 of the causal process.

***Empirical observables from the BOJ and the Riksbank*:** participation in international high-level meetings and conferences focused on green finance; consultation and information exchanges with green-leading central banks; networking activities, such as through the NGFS membership and participation in its publications and working groups; institutional publications about the macroeconomic implications of climate change and other environmental issues, whether they are perceived as a real problem or not.

***Sources*:** central bank publications, media reports, and information issued by other relevant organisations with a green finance agenda.

***Probative value*:** official documents, such as press releases, meeting minutes, web reports, research papers, speeches, conference agendas, and participant lists, constitute significant confirmatory evidence of central bank participation in sustainable finance events and discussions. Such events are convened by central banks themselves, as well as prominent institutions, including the ESRB, the FSB, the G20, the NGFS, and the UN. These organisations placed growing emphasis on sustainable finance and pushed for consensus on policy reforms. While only one of the suggested pieces of evidence might not be very unique, depending on the credibility of the issuer—media coverage reports may serve as a useful tool, although incomplete—they provide stronger confirmatory evidence when combined and issued by different sources.

6.6.4 *Part 3 – Engagement*

Driven by scientific warnings, political and public pressures, central banks *seek* a greater understanding of environmental issues through specialised advice and in-house research. With climate change depicted as a new risk to central bank operations and their primary goals, and influenced by continuous scientific warnings, political pressures, and public debate, central banks look for advanced knowledge of the issue through specialised advice and in-house research. As a novel and highly complex area, central banks tend to seek information exchanges with climate scientists, academic institutions, and specialised agencies, and be more open to expert guidance (Bank of England, 2018b). The exchange with experts aims to guide central banks through the uncertainties and difficulties they face in deciding and designing green-targeted policies. As Hogg (2009) put it, uncertainty is 'a fundamental motivator for people to identify with and belong to groups' (as cited in Bell, 2017, p. 728).

At this stage, an 'agenda window' opens since a number of central banks in this study felt compelled to get the climate change issue on their wider research agenda, engaged staff in training programmes to acquire the skills to handle these new risks, and demanded extended

analyses on the economic and financial implications of climate change (Herweg et al., 2015, as cited in Roux et al., 2022). Looking into the BOJ and the Riksbank's collected data, environmental-related publications peaked in 2021 in line with the launch and implementation of the banks' environmental strategies (see Figure 8, p. 306). This is otherwise an expected observation, as research provides scientific evidence that helps legitimise the banks' action plans—or their absence—and potential failures (J. W. Meyer & Rowan, 1977). As in Diessner (2023b), 'the legitimacy of [policymakers] is grounded in their reputation for scientific expertise' (p. 315).

As a result of interactions with experts and extensive research, central banks gain a better understanding of the environmental crisis and how to address it. Eventually, central banks conclude that embedding environmental criteria in monetary policy operations is economically, financially, and socially appropriate, and take concrete steps to evaluate potential policy options more thoroughly. If the outcome of these interactions and analyses indicates a lack of significant linkages between monetary policy, climate change, and broader national economic objectives, the mechanism may break down at this stage. This is the typical scenario of 'near-miss' cases of GMP reforms, a context where climate action is considered but fails to materialise, or results in maintaining the pre-existing state (Capoccia, 2015, p. 165).

This is probably the part where the influence mechanism was interrupted for the Fed, as discussed in the following Chapter 7 (p. 326). Despite the bank's dual mandate, the Fed was not convinced of the broad new assumptions regarding climate change risks and sidelined the role of central banks in the green transition. Consequently, steps 2 and 3 on growing awareness and membership in the policy community were not sufficient to influence the Fed's policy deliberations towards a new green direction. Although both the BOJ and the Riksbank consulted the NGFS and the network's recommendations helped shape both banks' climate strategies, the Fed's negative case suggests that while framing opportunities and policy learning

through the network are part of the mechanism, they are not sufficient conditions for implementing GMP. Therefore, the Fed required a separate theorisation for its 'atypical' environmental response.

***Empirical observables from the BOJ and the Riksbank*:** public statements where central banks identify climate change as a source of financial risk and commit to further research on the issue—such statements are grounded in prior scientific evidence and academic findings to legitimise central banks' commitments; central banks express new understandings of the environmental crisis and emphasise the need to support government efforts in greening the economy; interview accounts and other official publications stating the search for alternatives to current policy practices; promotion of the NGFS work and its policy recommendations, as well as guidelines from other sustainable finance initiatives, most notably the TCFD; explicit mention of climate initiatives adopted by the greenest green central banks; creation of climate change or sustainability units; growing participation in sustainable finance activities at a more operational level, such as national and international task forces, workshops, and working groups; unparalleled increase in more advanced research, press releases, speeches, and other communications on climate and environmental topics.

***Sources*:** observables may include spikes in central banks' official communications, where a shift in narrative towards including environmental considerations in central bank operations and potential policy options is clearly stated. The systematic review of the research data provided substantial evidence that the BOJ and the Riksbank recognised the environmental crisis as a collective action problem and acknowledged its impact on the economy and the conduct of monetary policy.

***Probative value*:** this part of the mechanism requires evidence of central banks' expressed concern about the socioeconomic implications of climate change and the recognition of the challenges it may pose to central bank operations. Such data are very likely to be found.

However, it should be noted that central banks may also attempt to increase their communication on climate change without aiming to implement GMP measures. Arguably, peer pressure and the growing public demand to address environmental issues may nudge some 'glossy green banks' to increase their corporate communication on environmental matters with no practical consequences (Giannetti et al., 2023). This is done to signal the central bank's commitment to the cause and mask its policy inaction. Alternatively, the proliferation of climate-related publications can be linked to central banks being actively engaged in other sustainable finance areas, such as banking supervision, regulation, research, and corporate social responsibility, with no bearing on monetary policy operations. In this case, the mechanism stops here.

6.6.5 *Part 4 – Evaluation*

Convinced of the benefits of accelerating the green transition, central banks publicly *acknowledge* the need for action and *evaluate* the suggested green monetary policy options in light of established frameworks. The belief that society must speed up the green transition and that central banks can contribute to solving this problem to a greater or lesser extent sets the stage for changes in monetary policy. Central banks recognise the need for action and proceed with a careful analysis of the available policy options, drawing on the recommendations set forth by expert communities. This stage opens a 'decision window', during which central banks face the opportunity to undertake some sort of green adjustment in their monetary policy operations (Herweg et al., 2015, as cited in Roux et al., 2022).

This phase may involve intense deliberations as it implies modifying standard procedures. Notably, central banks must consider not only the advised policies but also those that best suit their institutional settings. In this respect, prior interventionist policy tools, namely foreign exchange investments and nonstandard monetary policy instruments, seem to facilitate policy change. Furthermore, as the BOJ illustrated, the banks' policy board members

might not all immediately agree on a particular policy solution (Bank of Japan, 2010k, 2011a). Since central bank policy choices result from a collective decision, a lack of consensus can delay the decision process, derail the intended outcome, and even reverse the agenda stage.

***Empirical observables from the BOJ and the Riksbank*:** deliberations in monetary policy meeting minutes and other institutional reports; public pledges on climate change action; inclusion of climate change and other environmental considerations in the banks' strategic priorities; publication of a sustainability or climate strategy, generally with an approximate timeline for implementation.

***Sources*:** central banks' public statements about including environmental considerations in their strategic priorities. These statements often outline how central banks plan to adjust their operations with new green criteria. Based on the principle of public accountability, adopting new policy measures is typically preceded by a substantial amount of published material that explains the new policy decisions. If no such evidence is found, the validity of Part 4 is undermined.

***Probative value*:** the evidence mentioned above confirms central banks' willingness to contribute to the fight against climate change and environmental degradation. Once central banks agree to consider environmental objectives in their monetary policy operations, this already signals a shift in priorities and guiding principles of central bank activities. When this information is disseminated across different documents or publications of the banks, it is, in principle, accurate.

6.6.6 *Outcomes (O): Piecemeal Adoption of Green Monetary Policy Measures*

The corollary of the previous parts of the causal process is the adoption of the first GMP measures in line with expert recommendations and compatible with central banks' established structures. These initial measures involve a limited, flexible, and not too controversial integration of new green criteria into existing foreign exchange operations, alongside other risk

factors and contingent on monetary policy needs. This approach, as well as the temporary tilting of asset purchases towards greener assets, is highly appealing to central banks, since asset purchase programmes are not the core of what central banks do. As Interviewee 8 pointed out, it is easier to have ‘a little line in your asset purchase programme to favour green assets’ for a short time rather than altering more permanent tools like collateral frameworks, which remain part of the central bank’s toolkit ‘regardless of the economic situation’ (Interview 8; see also Interview 11; Blondeel et al., 2024). Central banks’ collateral is viewed as one of the most powerful monetary policy tools for promoting ‘green innovation’ (Vestergaard, 2024, p. 930). Probably for this reason, green collateral was one of the measures least adopted by central banks. Alternative explanations have been attributed to the lack of developed taxonomies and the prevention of green bubbles.

Following the BOJ and Riksbank’s experiences with GMP, both banks adopted more targeted measures to support green growth over time. In the case of the Riksbank, this culminated in the formal incorporation of sustainability elements into the Riksbank’s Act. Yet, while the revision of the Act provided the Riksbank with more legitimacy to implement GMP measures, the bank’s green policy choices did not significantly deviate from the existing instruments and practices. Instead, both banks responded to the environmental problem by adapting old instruments so that the scope and impact of the new green arrangements could be easily monitored and adjusted to the banks’ overarching goals. This mode of policy change, set within the parameters of established frameworks, significantly narrowed the number of policy options to address climate change. This explains why the two banks selected certain monetary policy instruments over others.

The developments mentioned above do not indicate resistance to change but rather a cautious type of change. The outcome is a pattern of incremental adaptation that provides central banks with room to reverse the green measures adopted whenever their primary

objectives are at risk. For example, the prevalence of risk and return metrics in investment decisions, as well as the suspension of green asset purchases due to restrictive monetary policy, illustrate the limits to central bank GMP reforms. During the policy decision stage, central banks publicly communicate the green policy measures adopted, grounded in a reasonable justification typically linked to their conventional goals and ethical principles.

***Empirical observables from the BOJ and the Riksbank*:** official announcements regarding the decision to incorporate environmental considerations into monetary policy operations, including the timeline for implementation.

***Sources*:** official publications from central banks.

Probative value: institutional statements represent strong evidence. Given that central banks' monetary policy decisions are made at the highest hierarchical level, officially released information should be regarded as valid, as it reflects the formal decisions of the banks. This observation alone is sufficient to confirm the inclusion of environmental criteria in monetary policy operations. If this empirical observable is not found, the expected outcome probably does not exist, since it is highly unlikely that central banks implement policies without communicating them.

***Additional explanations for the outcome*:** the adoption of environmental considerations in monetary policy decisions has been linked to two main factors, both of which positively influence the green transition. First, from a more neoliberal perspective, to protect central bank assets and operations from CRFRs. Second, using a more reformist approach, to redirect funds from high- to low-carbon investments, thereby promoting a greener economy. In either case, the preference for green over brown assets and investments by a powerful investor such as a central bank inevitably steers financial resources away from carbon-intensive firms towards eco-friendly activities and investments, even if indirectly and to varying degrees.

The Case Study of the US and Discussion of the Within-Case Results

7.1 The Fed's Divergent Choice for Institutional Stability

Established in 1913, the Fed serves as the monetary authority of the United States. It comprises a Board of Governors and 12 Reserve Banks located in the largest cities across the US. The Fed's Board of Governors and the Federal Open Market Committee are responsible for setting the country's monetary policy, which aims 'to promote maximum employment, stable prices, and moderate long-term interest rates in the US economy' (Federal Reserve Board, 2024b, 2024c). Theoretically, if more limited mandates can be linked to the formation of GMP measures, such measures could be more pronounced and easier to explain in central banks with conceptually broader objectives. However, a careful review of the Fed's public communications revealed that the GMP topic was not a centre of interest for the bank, at least publicly.[53] In fact, the Fed illustrates an atypical case in several respects.

First, as previously noted, the Fed's resistance to join the green movement could be viewed as an improbable choice, given the favourable conditions offered by the bank's dual mandate, which directs the bank to pursue maximum employment and an inflation target or has the discretion to choose between the two objectives (L. Meyer, 2001). Second, the Fed has gradually increased its intervention in the economy by expanding its monetary policy toolkit in response to systemic crises. This shift was especially evident from 2008, following the bank's renewed focus on financial stability and its involvement in large-scale asset purchases (Hamerschlag, 2022; Schellhorn, 2020). These seemingly paradoxical results are even more puzzling given the abundant evidence from the scientific community about the harmful effects of climate change risks on inflation and unemployment rates.

[53] For consistency purposes, the strategy for data collection applied to the Fed was the same as that of the Riksbank, even though the Fed did not announce any green monetary policy measures within the research period. This involved using the same starting year, 2017, and examining similar institutional documents, including annual reports, monetary policy reports, financial stability reports, meeting minutes from the Federal Open Market Committee, and annual reports.

Third, the bank was part of a growing network that supported green monetary policy reforms, the NGFS. Although the Fed was a relatively latecomer to the NGFS compared to the Riksbank and the BOJ—the Reserve Bank joined the network in November 2020, while the Riksbank became a member of the organisation in December 2018 and the BOJ in November 2019—it is still surprising that the Fed did not embrace any environmental standards in its monetary policy activities over the researched years. The key question is: Why did the BOJ and the Riksbank, which operated under narrow mandates, prove to be more reformist than the Fed, which holds a dual mandate?

Speeches by the Federal Reserve board members suggest that climate action was considered at one point but failed to materialise. Former Board Member Lea Brainard, 'a Democratic appointee', was the Fed governor to publicly express concerns about the threats climate change posed to the US economy and monetary policy (Blondeel et al., 2024, p. 938; see also Brainard, 2019). However, her support did not yield significant results, nor did it convince the other Fed board members or the chair. Board Member Christophe Waller, who was serving on the Committee on Economic and Monetary Affairs at the time of writing, fiercely opposed the bank's involvement in climate action (Federal Reserve Board, 2024a). Waller argued that the 'risks posed by climate change are not sufficiently unique or material to merit special treatment relative to others' (Waller, 2023, p. 1).

Using Capoccia's (2015) conceptualisation, this transition in thinking between the former and current board members—described in more detail in the previous Subsection 5.2.20 (p. 239)—echoes a 'near-miss' case of GMP (p. 165). That is a situation where the potential for some sort of change was contemplated, but resulted in no change. Strikingly, the research from the Reserve Bank's staff emphasises the limited scope of the Fed's monetary policy and mandate and encourages thinking about climate change along specific lines that contradict scientific findings on the seriousness and uniqueness of climate change risks. The Fed primarily

addressed the climate issue via its banking supervision arm, by providing financial institutions with voluntary guidelines about managing CRFRs (Federal Reserve Board, 2021c, 2021d, 2022c; Rudebusch, 2019).

In light of the above, interpretative and institutional grounds emerged as possible responses to the Fed's green avoidance. The BOJ and the Riksbank, on the one hand, and the Fed, on the other hand, held differing perceptions regarding climate change risks and the role of central banks in the green transition. While the first two banks reinterpreted the statutes and values of their mission, the Fed's beliefs were not updated with the new environmental assumptions. The Fed did not recognise the widely cited environmental crisis as such, thus showing no interest in considering environmental risks in its monetary policy activities. The bank centralised the environmental authority within the federal executive and limited its operations to the traditional conduct of monetary policy (Federal Reserve Board, 2022c).

Hence, despite belonging to the same network of experts that presumably share similar knowledge and understandings, a key distinction appears to exist in the Fed's 'version of appropriateness' (Peters, 2019, p. 43), which assigns a much weaker role for central banks in the green transition than that envisioned by the NGFS and some of its leading supporters. Either the NGFS was unable to convince the Fed's policymakers, or the Fed did not need external advice on GMP matters, thereby showing disinterest in its guidelines. As a matter of fact, despite the US economic and political standing at the global level, '[t]he Fed was not a member of the NGFS Steering Committee, nor leading any workstream' (NGFS, 2025a). This scenario suggests that several options for institutional innovation were present, but demand was absent due to no affinity of interests. Following Löblová, 'without demand, the mechanism of influence of epistemic communities is disrupted'(Löblová, 2018, p. 177). This lack of demand has been otherwise documented in the international political science literature about

environmental policies, according to which differences in national economic objectives hinder international consensus and progress in the environmental policy area (Peters, 2019).

Alternatively, the bank participated in the network for other motives, such as to stay informed about the direction of the network and other central banks' activities, ensure that its interests were represented within it, and potentially, to 'slow down' the network's progress or 'block what they [did] not want to see implemented' (Interview 6; Interview 8; see also Brainard, 2019, 2021a; Federal Reserve Board, 2023d; Interview 5; Quarles, 2021). As Interviewee 6 put it, regarding more recent dynamics inside the NGFS:

> I think now there is a bit of a backlash, and central banks also joined the NGFS to slow down what a few central banks started at the beginning. . . . when they were only twenty, work was going fast. . . . the Fed . . . took a larger role in the NGFS to kind of slow down the process. (Interview 6)

Indeed, given that the NGFS brings 'everybody with them', including both green and non-green central banks, the work of pioneering green central banks, such as the BoE and the Bank of France, is considered more advanced than that of the network (Interview 5; Interview 11). Taken together, the Fed's non-acceptance of prevailing GMP narratives suggests that the mechanism through which new GMP ideas are interpreted, accepted, and integrated into monetary policy frameworks failed in the Fed's context, as climate change was not regarded as an extraordinary circumstance (Hall & King, as cited in Steinmo et al., 1992). Hence, differing perspectives or ideational paradigms on the climate change issue and its solutions may have contributed to the varied responses from central banks.

If ideas alone do not explain the Fed's resistance to GMP measures, a closer examination of the legal, technical, political, and socioeconomic aspects may offer additional insights. As previously stated, the Fed's understanding of its mandate and the climate change problem is much more limited than that of many central banks involved in green initiatives.

Drawing on Dikau and Volz (2021), central banks' actions on ESG factors depend not only on formal mandates and where they can go beyond them but also, to a great extent, on how these mandates are interpreted. Moreover, when interpreting rules, one must consider the 'political actors most advantaged' with the changing process (Hacker et al., 2015, p. 192).

In the cases of the BOJ and the Riksbank, national economic developments related to creating a new green market put pressure on central banking frameworks. Consequently, both institutions were able to accommodate climate action despite their theoretically narrow mandates. The Riksbank explored the leeway offered by Chapter 9 of its previous Riksbank Act about conducting the bank's activities efficiently to develop its sustainable strategy. The instrumental interpretation of Chapter 9, combined with the ambitious Swedish Climate Framework and support from the Swedish public (Interview 2), enabled the bank to adjust its monetary policy operations in a seemingly uncontroversial way. This provides convincing evidence that the imprecision of central bank mandates can inspire creativity and stimulate policy innovation in the face of external pressures.

With regard to the BOJ, the bank did not implement such a legislative change during the period of investigation. Rather, the BOJ was able to advance its climate strategy without the typically lengthy processes required to amend formal mandates, which could have been difficult at that particular time due to the urgency of the matter. However, it did so with the approval of the Japanese government. This demonstrates that a transfer of responsibilities to central banks can occur 'in principle or in practice' (Zürn, 2016, p. 205), even when legal mandates do not appear to recognise it.

The Fed's resistance to change may also not be solely due to 'set-up costs or sunk costs' (Zürn, 2016, p. 206). Similar to the BOJ and the Riksbank, the Fed established targeted lending facilities to support specific economic groups during past crises and engaged in large-scale purchases of nonstandard assets, notably Treasury debt and mortgage-backed securities

(American Deposit Management, 2021; Federal Reserve Board, 2021e; Sablik, 2020; Van Doorslaer & Vermeiren, 2021). These purchases could potentially accommodate green finance instruments, such as climate bonds, if issued by the Treasury or backed by government agencies (Parajon Skinner, 2021; Schellhorn, 2020; St. Louis Fed, 2016). A legitimate question is whether the US government will make green bonds available.

Additionally, the Fed has the option to buy 'foreign government debt' and deploy its 'emergency lending program' upon approval from the US Treasury (Federal Reserve Act, 2022, Section 13(3) pp. 46-47). This programme, which can be enacted in extraordinary circumstances, enables the Fed to lend to and purchase assets from the private sector, similar to the measures taken during the COVID-19 pandemic (see also Hamerschlag, 2022, pp. 593; 598). For Hamerschlag (2022), the emergency lending programme fits well within the ongoing climate change crisis, which has been hitting US citizens and businesses through severe floods and increasingly hot years. Indeed, Colacito et al. (2018) estimated that climate change has already lowered output growth in the US and projected a further decline of over 0.5% later in the century (Rudebusch, 2019).

The differences among the three central banks may also not stem from the lack of knowledge or a shared concern about climate change. The US is a leading country in 'scientific output' and education (Correa González et al., 2024, p. 2258). Government agencies, along with several other trusted national and international organisations, have stressed the potentially catastrophic effects of climate change if no action is taken. These organisations include not only the already mentioned IPCC but also the Pew Research Centre, the US Environmental Protection Agency, the US National Aeronautics and Space Administration (commonly known as NASA), the US National Oceanic and Atmospheric Administration, the World Meteorological Organisation, among others.

Hence, even if the Fed could not invest in green government bonds, it could more actively raise awareness about the financial risks associated with investing in assets tied to polluting firms. After all, the stability of the financial system is said to depend on actions that mitigate climate change risks (Schellhorn, 2020). These actions are claimed to be crucial in the US financial system, since it has typically 'overvalue[d]' investments in climate-unfriendly assets, despite being the second most polluting country in the world (Hamerschlag, 2022, p. 580; see also Climate Watch, n.d.-b; US Department of the Treasury, 2023; US Environmental Protection Agency, 2013, 2013). Thus, other determinants and vested interests provided the Federal Reserve with incentives to maintain institutional stability.

By drawing an analogy with the monetary policy experiences of the BOJ and the Riksbank, the Fed's decision not to incorporate green criteria into its policy framework is plausibly influenced by differing political and socioeconomic contexts, as highlighted by the interviewees. First, the smooth acceptance of new GMP ideas would require the endorsement of well-established and authoritative political bodies, such as the US Treasury, which is likely to prompt resistance. It is worth noting that the US federalist governance structure and divided party system incite conflicting ideas and preferences, creating barriers to reforming established institutions and policies (Stepan & Linz, 2011, as cited in Hacker et al., 2015; Weir, 1992). According to Bordo and Siklos (2018), the monetary policy of large economies is generally less flexible and innovative in response to external shocks than that of small open economies. Second, as the following subsection elucidates, social views on climate change action in the US have been significantly more 'polarised' than those in Sweden and Japan (Interview 4; see also Interview 9). This polarisation has made it much more challenging for the Fed to adjust its monetary policy in support of green segments.

Crucially, 'the US Congress has not . . . adopted policies requiring that businesses abandon carbon-rich activities' (Parajon Skinner, 2021, p. 1354). Indeed, the integration of

climate considerations into the US economic policy appears to be still in its early stages. As of November 2023, the Climate Action Tracker classified the US climate policy efforts as 'insufficient' and ranked the US 'climate finance' as 'critically insufficient' (Climate Action Tracker, 2023a). Information disclosed on the US Treasury Department's website in 2024 emphasised analyses and projections, suggesting no significant green shift in public policy (US Department of the Treasury, 2024b, 2024a). Arguably, while complex policies require studies and trade-off analyses, lengthy evaluations can be viewed as an opportunity to delay environmental regulation (Grossmann & Hopkins, 2024).

Hence, what comes out from the analysis of these three central banks is that the Fed's 'atypical response' to environmental issues may not be a matter of who is responsible for what, as often emphasised by the Reserve Bank, but rather a reluctance to discipline the market along with green standards. Ultimately, not adopting green considerations can effectively mean supporting the interests of the US Congress, the President, and the powerful business sector that they seek to protect (Interview 3; Interview 5). In other words, 'incompatible national interests' may lead central banks, like the Fed, to avoid environmental considerations and opt for policy continuity (Fioretos, 2011, p. 388). From this viewpoint, the difficulty of aligning politics with new green finance ideas contributes to central banks' inertia on environmental matters, irrespective of the seriousness of climate risks and the reach of central bank mandates.

The Fed did not agree to collaborate with this research or to clarify the factors that limited its ability to implement green elements in monetary policy operations. Despite several attempts to contact the Board of Governors and the 12 regional Reserve Banks, the most comprehensive response from a senior official was that this person could not participate in an interview 'due to sensitivity around this topic' (personal communication, 19 September 2024). One of the regional reserve banks referred to the research published by the Federal Reserve Bank of Kansas City on Energy and the Economy (personal communication, 29 August 2024).

However, this research did not explicitly address sustainability or climate change topics (Federal Reserve Bank of Kansas City, n.d.).

Most interview requests remained unanswered, while others were either declined or responded to with links to the Fed's limited publications on climate change. Consequently, the present analysis relies on interviews with monetary policy experts, documentary evidence retrieved from the Fed's website, insights from previous academic work, open-access data, news reports, the webinar Going 'All in' on Climate Change with Gina McCarthy (2025)—the first climate advisor to the White House, former head of the Environmental Protection Agency under the Obama administration, and head of the Climate Police Office under President Biden (America is All In, n.d.; The Institute of Politics at Harvard University, 2017)—and my own reflections after triangulating this information. This examination may, therefore, leave room for complementary interpretations and explanations regarding the Fed's stance on GMP issues.

7.2 How the US Divided Public Opinion and Politicisation of the Climate Change Issue Informs the Fed's Deviant Approach

> Climate change in the United States has become highly politicized among the warring political parties, with a growing partisan media on what has become an ideological issue and not simply a material one. Public support for policies that address climate change is declining in many countries. . . . the world may be in for continued if not greater political stalemate. (Brechin, 2011, as cited in Sussman & Daynes, 2013, p. 12)

It has been widely documented and empirically demonstrated that political parties seek solutions to collective issues that satisfy their electorate. Public opinion on specific laws and regulations significantly influences the success or failure of policies in democratic societies. This is especially true for climate change policies, whose consequences can negatively affect certain social and economic groups (Beiser-McGrath et al., 2021; M. Bergquist et al., 2022; P.

A. Hall, 1993; Harring et al., 2019; Kenny, 2024; Linde, 2018; Maier et al., 2022; S. Sharma, 2024). Existing literature highlights various country-specific factors that shape public preferences on environmental protection and the climate policy debate. Among these, political, ideological, demographic, cultural, and economic factors stand out (e.g., M. Bergquist et al., 2022, 2022; Bouman et al., 2024; Correa González et al., 2024; Hamilton et al., 2019; Harring et al., 2019; Kenny, 2024; A. G. Meyer, 2022; Sussman & Daynes, 2013; Zanocco et al., 2019).

In a nutshell, the previous research shows that democracies tend to be more supportive of climate action than authoritarian regimes. Individuals who identify themselves as liberals—those on the left side of the political scale—are generally more likely to believe in the scientific findings on climate change and to support government action than conservatives—or those on the right. Moreover, the further one leans to the left or right, the stronger their support or opposition to climate action. Economies that depend less on fossil fuels are more inclined towards climate initiatives than those that are heavily dependent on them.

Poll data reveal similar trends for people with a university degree versus those without a university degree, as well as for employed versus unemployed individuals. In addition, women tend to be more supportive of environmental initiatives than men, younger people more so than seniors, and cultures that value altruism typically exhibit greater concern for environmental protection than egoist-driven cultures. Urban residents tend to show greater environmental support than those living in rural areas and higher-income families generally favour climate initiatives more than low-income families. Besides, people who have been personally impacted by weather events are more likely to advocate for action than those who have not experienced such impacts. Some of these factors are interrelated. For instance, education often relates to party affiliation or ideology, as individuals with a university degree are more likely to identify with the left-wing political ideology than those without a college degree, who tend to align with the right-wing (see also Grossmann & Hopkins, 2024).

The statement from Brechin (2011, as cited in Sussman & Daynes, 2013, p. 12) quoted at the beginning of this subsection explains well today's stalled progress on climate change in the US. While the political debate and activities concerning environmental resolutions and bills in the US can be dated back to the 1990s, they have yet to produce significant results (Bolsen & Druckman, 2018; Ghimire et al., 2021; Grossmann & Hopkins, 2024; Sussman & Daynes, 2013). Most measures adopted, such as those under the Inflation Reduction Act of 2022 for investments in cleaner energy, are non-binding, and some have been rolled back (P. Bergquist et al., 2020; Garza & Yoder, 2025; *Going 'All In' on Climate in 2025*, 2025; Grossmann & Hopkins, 2024). As I shall describe below, the climate change topic is a highly polarising subject among the US public.

Compared to other advanced and emerging economies, the American public has been remarkably divided over the existence and primary causes of climate change (e.g., Grossmann & Hopkins, 2024). On one side are the climate change believers, who accept the extensive scientific research and evidence showing that global warming and climate change mainly result from human production of greenhouse gases. Believers advocate for immediate government action through legislation to mitigate the effects of climate change. This environmental movement includes state and non-state actors, including scientists, scholars, government agencies, business professionals, nonprofit organisations, and individuals who support enhanced environmental protection (e.g., Grossmann & Hopkins, 2024). On the other side is a relatively smaller yet vocal group of climate change deniers, who either reject the existence of climate change or hold contrary views regarding its primary causes. Deniers tend to attribute climate change to natural factors or reject it.

Donald Trump, the former and current US president (at the time of writing), offered a clear example of climate change dismissal when speaking to journalists from the Washington Post on 27 November 2018. In reference to a climate report prepared by circa 300 scientists

and 13 US state agencies, highlighting the socioeconomic threats of climate change, Donald Trump stated:

> One of the problems that a lot of people like myself—we have very high levels of intelligence, but we're not necessarily such believers. You look at our air and our water, and it's right now at a record clean. . . . As to whether or not it's man-made and whether or not the effects that you're talking about are there, I don't see it—not nearly like it is. (as cited in Wolf, 2018)

Trump's statement reflects a significant ideological divide in the US, which is hard to find in other contexts (Grossmann & Hopkins, 2024). While in most countries examined, party disagreements focused on policy priorities or the best ways to address climate change, the debate in the US remained centred on whether climate change is real.

El Armali and Rahimian (2024) identified the percentage of Americans who do not believe that global warming is occurring or that it poses a danger to people as the 'climate change agreement gap' (El Armali & Rahimian, 2024). Among the climate change opponents stands an 'extended network' of business leaders, celebrities, Congress members, policy advisors, media outlets, financial donors, and organised interest groups associated with the fossil fuel industry, which is one of the largest business sectors in the US (e.g., Grossmann & Hopkins, 2024, p. 283). According to Statista, the US was the world's largest producer and consumer of oil in 2023 (Statista, 2024a, 2024b; US Energy Information Administration, 2024). The country has also ranked among the top gas producers, leading The Guardian to label it as the 'world's largest fossil fuel state' (Milman, 2024).

The dependence of the US economy on fossil fuels has sparked contestation from the fossil fuel sector against the low-carbon transition. Individuals and businesses linked to this sector have been particularly concerned about increased government intervention and environmental regulations aimed at addressing the climate crisis. They see climate change as

an invention designed to promote liberal ideas, which they believe damages the economy and employment (Grossmann & Hopkins, 2024; Kenny, 2024; Sussman & Daynes, 2013). Indeed, provided that the US economy is highly rooted in the fossil fuel sector, 'more people [will] have to disrupt their lives if the order is to radically change' the economic structure (Ikenberry, 2017, p. 69). Climate legislation not only penalises the profits and viability of these large industries but is also viewed as a threat to the conservative principles of 'market capitalism' and 'superiority of private over public enterprise' that have historically guided the American economy (Conway, 2008, as cited in Sussman & Daynes, 2013, p. 132). Likewise, the Fed's involvement in discouraging financial investments in high-emission activities would challenge the 'neoliberal' and 'free market economy' theories that have traditionally informed central bank operations consisting of limited market intervention (Hamerschlag, 2022, p. 591).

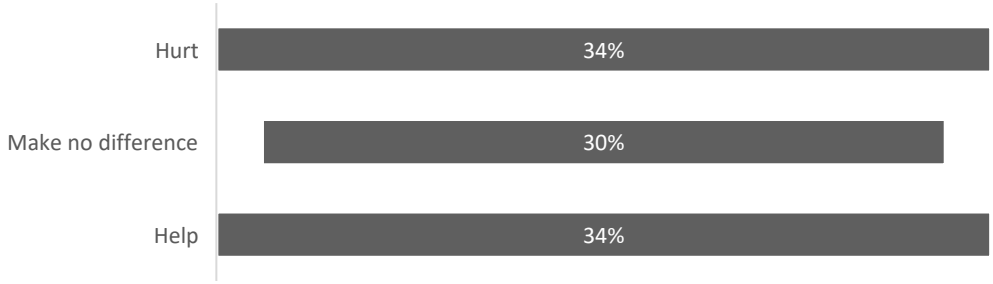
Groups associated with the fossil fuel industry 'have lots of money to spend' on campaigns that discredit climate science, foster public distrust in climate change, and lobby the government to halt or weaken transition efforts (Interview 5). This was also the view of Guber and Bosso (2010, as cited in Sussman & Daynes, 2013; see also Grossmann & Hopkins, 2024), who asserted that 'compared to their European cousins, . . . organised interest groups in the United States play disproportionately central roles in educating, organizing, and mobilizing into action relevant sectors of the mass public' (p.131).

There are numerous examples of US 'right-wing' lobby groups or climate science deniers that have played a critical role in the dissent over climate policy and have significantly obstructed attempts to limit or lower GHG emissions in the US (El Armali & Rahimian, 2024). These include the American Enterprise Institute, the American for Prosperity, the American Petroleum Institute, CATO Institute, the Heritage Foundation, the Western Fuels Association, and the big oil corporations such as Exxon Mobil and Chevron (Campaign against Climate Change, 2011; see also Ambrose, 2021; InfluenceMap, 2021; Sussman & Daynes, 2013).

Furthermore, studies show that the pessimistic views from the wealthiest corporations and business associations receive media coverage twice as much as those from pro-climate advocates. This is because the former are viewed as key actors in the national economy and are, therefore, more 'relevant to the public well-being' (Wetts, 2020, p. 19058; see also Maier et al., 2022; Marlon et al., 2022). This trend is especially evident among conservative media outlets, suggesting that journalism has also manipulated the public debate in a certain way (Wetts, 2020). As a result, the American public has proved to be less worried about climate change and more divided on the issue compared to other countries (Correa González et al., 2024; Ghimire et al., 2021; S. Sharma, 2024).

To illustrate this, a survey conducted by the Pew Research Centre based on data from October 2024 found that 34% of US adults believe that climate policies aimed at reducing the effects of climate change benefit the US economy (see Figure 11). In contrast, 30% of the respondents feel that these policies make no difference, whereas 34% believe that climate policies hurt the US economy (Kennedy & Tyson, 2024). This ideological divide regarding climate change has been further shaped and reinforced by partisan disagreements between the left and the right on a wide range of economic and social issues, including environmental issues (Ghimire et al., 2021; Mildenberger et al., 2017; Sussman & Daynes, 2013).

Figure 11. *The US Divided Public Opinion on Climate Change Policies*



Note: Unanswered responses are not shown.
Source: Adapted from Kennedy and Tyson (2024).

Party ideology and ‘identification’ have been appointed as key factors influencing the public sentiment and attitudes towards climate change, either by raising confidence or public discord (Linde, 2018, p. 544; see also Correa González et al., 2024; Funk & Kennedy, 2020, as cited in Ghimire et al., 2021; Hamilton et al., 2019; Bolsen & Druckman, 2018; Zanocco et al., 2019; Maier et al., 2022; Rohrschneider & Miles, 2015). Given the complexities of climate change and the trade-offs involved in the different policies, most ordinary citizens tend to align with the stance of their preferred political party (Linde, 2018).

In the US, the polarisation of the general public has been intensified by a political system dominated by two major parties: the Democratic Party and the Republican Party (Grossmann & Hopkins, 2024, p. 115). Democrat and Republican officials have often used the climate change topic as a pretext for political battles in favour of their preferred agendas. Democrats have historically viewed climate change as a critical issue and one of their ‘left’ priorities (Grossmann & Hopkins, 2024). They tend to trust experts to advise on climate change legislation and support international agreements. Conversely, Republicans, who prioritise the business interests of their party’s voters, argue that Americans are not interested in climate action. They regularly oppose or downplay the importance of climate change by refuting scientific conclusions, as the following statistics demonstrate.

Another study from the Pew Research Centre, based on estimates from 2019, found that only 19% of Republicans believe in environmental researchers, compared with 47% of Democrats (Grossmann & Hopkins, 2024). Furthermore, drawing on data from October 2024, the Pew Research Centre also estimated that only 16% of Republicans or those who lean towards the Republican Party believe that climate policies help the US economy, in comparison with 52% of Democrats or those who lean towards the Democratic Party (Kennedy & Tyson, 2024). These figures provide insights into the significant partisan gap between the two leading party options in the US political system.

A clear example of the US political deadlock on climate action is also reflected in the country's reluctance to commit to international agreements, which appears to be swayed by which party controls the White House. While the conservative Presidents George W. Bush and Donald Trump renounced the Kyoto Protocol and the Paris Agreement, respectively, the liberal Presidents Bill Clinton and Barack Obama signed the accords (Clinton Digital Library, 1998; Ghimire et al., 2021; S. Sharma, 2024; Sussman & Daynes, 2013). Crucially, the Fed joined the NGFS right after Democrat Joe Biden was elected President of the US in November 2020, succeeding the former Republican President Donald Trump. When Republican Donald Trump started a new term as US President in January 2025, the US withdrew from the network (Interview 5; Collinson & Reston, 2020; Munson, 2023, 2023; The US National Archives and Records Administration, n.d.). This observation is consistent with previous research, which found a strong linkage between ideology and public views towards climate change in the US (M. Bergquist et al., 2022; Bolsen & Druckman, 2018; Carter, 2013; Hamilton et al., 2019; Maier et al., 2022; Marlon et al., 2022; Zanocco et al., 2019).

The strength with which large businesses and interest groups incite aversion towards science and the low-carbon transition, combined with the 'political polarisation' of the climate issue in pursuit of distinct political agendas, has ultimately displaced US public opinion and hindered the implementation of meaningful climate policies (see also Linde, 2018, p. 546; Hamilton et al., 2019). As Linde observed (2018), 'the more polarization an individual perceives, the less will he or she be willing to support a given policy proposal' (Linde, 2018, p. 546). For many, climate change remains a complex issue that is yet to be fully understood and of difficult resolution.

Unlike the US, views regarding climate change in Japan and Sweden did not seem highly polarised. According to two surveys conducted in 2008 and 2010, Japan has long shown the highest level of concern about climate change among the top countries contributing to GHG

emissions (Sussman & Daynes, 2013). As noted in this research, environmental businesses were one of the targeted areas of the Growth-Supporting Funding Facility established by the BOJ in 2010, in line with the government priorities. In 2012, Japan became the first Asian country to implement a carbon tax, although it was considered relatively 'weak' compared to similar measures in other advanced economies (Beiser-McGrath et al., 2021, p. 4). The country also committed in 2020 to an ambitious plan to reduce carbon emissions by 46% by 2030. This national commitment aligned with the growing preference of the Japanese public for environmental protection over economic matters (see also S. Sharma, 2024).

In Sweden, the interplay between climate change, central bank action, and public opinion was recognised by the interviewee from the Riksbank. When asked why the Riksbank included environmental considerations in its policy operations, the first 'rationale' given was the 'broad recognition in societies at large that environmental issues and, in particular, climate issues [had] to be addressed by authorities, not just necessarily the central bank, but authorities and that, in turn, . . . led to a public opinion' (Interview 2). This argument was made before the realisation of the financial risks posed by climate change, which, according to the interviewee, was discussed 'afterwards' as a more 'financial economic rationale' (Interview 2). The interview participant went further to say that:

> The Swedish public is very well-informed when it comes to climate risks. They understand fully. I mean, we have had carbon taxes for 20 years. They know. So, when the Riksbank says we are doing A, B, and C, it is not misunderstood that the central bank is in charge of climate policy. We are the second or third line of defence. In other countries, in particular in those countries where the line between the central bank and the government is more fuzzy, I think this becomes very difficult to communicate. That is why some central banks are very hesitant to say anything. (Interview 2)

In a similar vein, two previous studies by Carlsson et al. in 2021 and 2022 (in S. Sharma, 2024) showed that Sweden had a larger number of climate change believers willing to pay for climate change mitigation than the US and China—although other statistics have indicated that the Chinese public has become increasingly supportive of climate action. Other studies revealed that Scandinavian countries, notably Sweden, feature a welfare political culture guided by principles of 'altruism', 'group well-being and egalitarianism' (Harring et al., 2019, pp. 639–640). These values appear to be positively associated with public backing for redistributive policies, such as a carbon tax (see also M. Bergquist et al., 2022). Sweden has also experienced cross-party consensus on climate change policies, which enabled the country to implement bold measures (Linde, 2018). Finally, both the BOJ and the Riksbank grounded their climate strategies on scientific knowledge about climate change risks and expert advice.

However, despite the potential for expert organisations to enhance central banks' understanding of climate change and influence their policy preferences, the green shift may be difficult for central banks constrained by domestic political battles and dwindling public support. As in Ghimire's account (2021), climate change touches upon 'different values, meanings, ideologies, and goals' (2021, p. 4). Indeed, compared to the BOJ and the Riksbank, the Fed has operated in a context more influenced by traditional beliefs and industry interests than scientific knowledge, and by partisan hostility rather than cooperation on climate change. While Democrat supporters tend to prioritise emission cuts and government intervention, Republicans are more defensive of market solutions and the vested interests of the mighty US oil industry and lobby groups.

This political polarisation has been compounded by a biased public opinion that is increasingly sceptical of science and any proposed climate policies, despite the quasi-universal consensus that global warming is primarily caused by the burning of fossil fuels and the growing frequency of weather disasters in the US (Bolsen & Druckman, 2018; Grossmann &

Hopkins, 2024; Hamerschlag, 2022; Hamilton et al., 2019; S. Sharma, 2024). The crucial point on polarisation was well illustrated by Interviewee 4, a former vice-governor from an AE central bank, when comparing the Swedish with the American cases:

> There are still a lot of climate deniers in the US. Even among the non-climate deniers, there are the ones that think we are not going to fix it this way. . . . that we should still be drilling. . . . In Sweden, I feel it is much less polarised. It is getting a little bit tighter now. We have right-wing parties that are showing up a bit more, but traditionally, there has been a lot more in that direction. So, it is not very polarising for the central bank to push it. What you see is that in countries where it is not a big thing, it allows the central bank to push it a little bit if it desires to. . . . But once it is polarised, it is a very different thing. (Interview 4)

From this perspective, the Fed's reluctance to adopt GMP measures mirrors the US general gridlock on climate policy, stemming from conflicting public and political ideologies and goals. Following Hamerschlag (2022), the Fed is 'not in a vacuum. Legal, political, and philosophical forces shape the Fed's monetary policy actions' (p. 591).

The Congress's lack of willingness to undertake climate action has drawn intense criticism from an increasing number of academics, who accuse US policymakers of ignoring more recent public opinion polls. Other climate change surveys indicated that citizens from both the left- and right-wing parties in the US are growing more concerned about climate change and supportive of government intervention (Bouman et al., 2024; Leiserowitz et al., 2020; Kenny, 2024; Brooks & Ebi, 2021; Mildenberger et al., 2017).

A survey conducted in October 2023 involving 1,033 American respondents found that 72% of the participants believe that climate change is occurring, whereas 65% expressed being 'at least "somehow worried" about global warming' (Leiserowitz et al., 2024, p. 4). Moreover, 46% think that climate change is currently harming the US population, while 43% reported

having experienced its effects (Leiserowitz et al., 2024). Arguably, considering that 'personal harm' or the experience with destructive weather events is positively related to the visibility of climate change and consequent 'policy support', the previous figures also reveal that not even half of the population (43%) is likely to manifest support for climate change policies (Zanocco et al., 2019, p. 1; see also Marlon et al., 2022).

Research shows that hesitancy towards climate policies often arises when climate change is confronted with other economic problems or pressing needs, such as jobs, inflation, and immigration, concerns that right-wing parties tend to prioritise (Rohrschneider & Miles, 2015). Also, individuals may show resistance to climate policies if they perceive that these measures significantly impact their lifestyle (see also Harring et al., 2019; Mildenberger et al., 2017; Sussman & Daynes, 2013). For environmental progress to be made, various scholars argue that the denial of climate change must be discontinued. To that end, US policymakers need to cooperate and positively shape the public's perceptions of climate change in ways that lessen the 'climate change agreement gap' (El Armali & Rahimian, 2024, p. 498). This can be achieved through a 'consensus message' on climate change, as well as by implementing fair and effective policy solutions that encourage citizens to reduce GHG emissions (Bolsen & Druckman, 2018, p. 398; M. Bergquist et al., 2022; Brooks & Ebi, 2021; Correa González et al., 2024; Linde, 2018; A. G. Meyer, 2022). Notably, studies show that just policy packages that combine climate, economic, and social reforms are likely to increase public support for climate action (P. Bergquist et al., 2020)—and, perhaps, for green monetary policies.

Between so much uncertainty and pushback, which are compounded by the newly elected US conservative government, future trends remain difficult to predict. In the very first days in office, the new administration withdrew the US from the Paris Agreement and the NGFS, removed references to climate issues from the websites of government departments, and annulled climate-related executive orders from the previous democratic administration

(Going ‘All In’ on Climate in 2025, 2025; Harvard Law School, 2025; Milman, 2025). According to the US transportation secretary, the new administration is focused on ‘eliminating excessive regulations that have hindered economic growth, increased costs for American families, and prioritized far-left agendas over practical solutions’(as cited in Milman, 2025).

7.3 Lessons from Historical Institutionalism and Sociological Institutionalism: Small and Hesitant Steps Towards a Greener Monetary Policy

Amidst increasing environmental risks and national efforts to meet the Paris Agreement goals, central banks could have chosen to support the green transition or not. Within the former, they could have created entirely new policy tools, reshaped existing ones, or used a combination of the two. The findings from the multiple-case investigation reveal that a growing number of central banks have steadily engaged in or committed to some form of GMP as part of an international movement to channel funds into activities that protect or enhance the quality of the environment. Beyond risk management grounds, greening monetary policy became an ethical and legitimate movement for some central banks, even though the effectiveness of such measures is yet to be fully estimated and understood (Interview 1). Other central banks resisted this trend and even defied scientific warnings and recommendations.

The BOJ, the Riksbank, and the Fed are three relevant examples that illustrate the varied approaches to GMP. The value of studying the BOJ and the Riksbank rests on uncovering the path to greening monetary policy in contexts where statutory objectives appear averse to pursuing environmental goals. For both banks, the benefits of addressing the environmental crisis—described in this study as insufficient public policy responses to growing environmental risks—outweighed those of inaction, irrespective of the scope of their mandates. As a result, both central banks sought to ‘push the boundaries of [their] authority’ and acted as ‘enforcers of structural reforms’(B. Braun et al., 2024, p. 2). The unexpected outcomes of these two cases prompted tracing the origins of GMP decisions to understand the logic of their development.

The detailed historical accounts of these two central banks reveal that they partially succeeded in adjusting their monetary policy operations in support of national and global environmental targets, despite their theoretically limited mandates. However, this relative success occurred in different ways, reflecting the central banks' pre-existing structures. For its part, the Fed is an example where green finance ideas did not play out, at least at the time that they did for the BOJ and the Riksbank, notwithstanding the Reserve Bank's multiple policy objectives which, in theory, afford more favourable conditions to promote green growth.

Using the analytical tools provided by the historical institutionalist framework, the study captured the nature of policy change in the Japanese and Swedish cases. The findings indicate a clear degree of policy change driven by increasing concerns about environmental risks and the urgent need for collective action, typical of crisis contexts. However, the extraordinary circumstances did not fundamentally alter the central banks' mission and objectives. Instead, when designing their monetary policy responses to the environmental problem, the BOJ and the Riksbank looked at their policy toolkit and, drawing on past experiences and capitalising on a period of expansionary monetary policy, shaped their green solutions accordingly. In this sense, there was continuity with earlier tools, and most importantly, with the central banks' primary goal of keeping price stability.

When economic circumstances changed, and monetary and environmental aims became incompatible, we observed delayering through the weakening or suspension of green criteria in order to achieve the inflation target. Interviewees provided several examples of this contextual change, which reflect the Riksbank's experience:

> It is interesting to see how the type of discourses in green central banking has changed over the years . . . in the past, with low inflation and low interest rates, it was easier for central banks to adopt certain policies. . . . Now, with this type of

> higher inflation environment in which central banks have to be restrictive, a lot of other puzzles appeared. (Interview 7)

> When the climate roadmap was implemented or introduced in 2021, it was a very different context . . . asset purchases were a very big tool at that time. So, it made sense to include climate considerations in this tool. . . . Unfortunately, the context has changed a lot now. This has led to the tilting programme of the ECB to become completely obsolete. I would guess that if other countries and other central banks had implemented the greening of their asset purchases programme, they would probably have the same issue. . . . Now, they are just struggling to go in that [green] direction because they have just suffered an inflationary phase. (Interview 8)

> While reflecting on the trajectory of our green monetary policy . . . green considerations were at their highest momentum when inflation was really low. . . . There was a lot of excitement. There was a new department created within [the central bank] with a lot of colleagues from many different departments who were joining and trying to see how [it] could go forward in this regard. Then, it was a bit disappointing that when inflation started to pick up, all this workstream basically stopped. From one day to the other, it was not a priority anymore. (Interview 10)

In essence, green considerations operated 'in the heavy shadow of institutional legacies' (Jupille et al., 2017, p. 131). Even if a consensus exists regarding the adoption of environmental criteria, price stability pressures may ultimately lead to the institutional collapse of the implemented GMP measures, which, in an inflationary context, become suboptimal—it makes no sense to adopt an 'expansionary monetary policy instrument' when prices are rising (Interview 10). This malleability and even reversal of green criteria illustrate the side effects of greening central bank policy operations. They also expose the vulnerability, or low 'depth'

(Rixen & Viola, 2016, p. 20), of central bank climate strategies. It is reasonable to conclude that national and international pressures to attain environmental targets did not imply a 'deep institutional rebuilding' (Streeck, 2015, p. 286). Instead, both the BOJ and the Riksbank resisted radical changes and sought prudent and institutionally fitting arrangements. Therefore, some path dependency or stickiness can be observed in the process of greening monetary policy, as reforms motivated by an environmental externality were constrained and largely aligned with established operations and principles.

This incremental approach is not overly surprising since the environmental crisis is a relatively new, complex, and evolving issue, monetary policy's ability to protect nature is limited, and its effects remain uncertain (Interview 1).[54] Moreover, governments are the key actors in driving green economic growth. Borrowing from Moschella and Tsingou (2013), change is more likely to happen gradually within a divided governance structure. This is particularly so in 'global environmental politics', which is characterised by a multitude of organisations involved (Bernstein & van der Ven, 2017, p. 293). In addition, smaller institutions tend to be introduced through gradual change, in contrast with large and innovative institutions, which are often associated with ruptures (Peters, 2019; Rixen & Viola, 2016).

Although both central banks built on older practices to put into place measures that have the potential of being dismantled to avoid compromising the main monetary policy goals, these measures may become entrenched and encourage further action in the future. We will have to wait and see if the initial GMP adjustments will prompt more extensive changes in future policy decisions, even if this may imply periods of green avoidance. Alternatively, GMP measures may ultimately prove to be too difficult to implement and lose their attraction. For instance, new circumstances and price pressures may impede later efforts to reorganise policy

[54] For example, despite the measures adopted by the BOJ, the Japanese monetary policy expert (Interview 1) revealed a high degree of uncertainty regarding the extent to which monetary policy impacts the greening of the economy. After all, Japan still lacked a robust taxonomy for defining green and brown economic activities.

frameworks along green lines. In the face of new priorities, it may also be challenging to sustain public and political support for environmental goals, which can then be seen as completely outside the monetary policy scope. Hence, central banks that did not accept reforming existing structures may have missed a historic opportunity to explore a new environmental path.

Against this background, the detailed historical accounts of the BOJ and Riksbank favoured Hypothesis 3 on incremental change over Hypotheses 1 and 2 on path dependency and critical junctures, respectively. Nevertheless, Hypothesis 1, which emphasises the power of early decisions, could not be fully rejected, as GMP responses were influenced by existing toolkits and organisational principles, the core features of which both central banks sought to reproduce. Using the terminology of Farrell and Finnemore (2016), GMP measures resulted from 'institutional reproduction and change' driven by both an external event and internal preferences (p. 155).

Hypothesis 2, concerning the radical change of pre-existing institutional settings, must be reassessed in the more distant future to be able to confirm or disconfirm its validity. While environmental pressures may have strengthened the role of some central banks in global climate governance, only time and further analysis will reveal if the environmental crisis—notably, new political developments or unexpected climate shocks—can have ramifications for an increased role for monetary policy in the green transition and be considered a critical juncture. At the time of writing, the ultimate objectives of the BOJ and the Riksbank remain relatively unchanged. The application of a critical juncture analysis can, nonetheless, significantly contribute to the institutional literature on policy change with an exploratory investigation of how the ongoing environmental crisis might become a critical juncture for central banks' policymaking and goals.

Concerning the determinants of GMP, the historical review of the BOJ and the Riksbank reveals that their climate strategies emerged from a confluence of circumstances

related to their 'timing, sequence, and context' (Solingen & Wan, 2017, p. 169; see also Interview 5). Borrowing from Interviewee 9, 'there was an alignment of coincidences that made [climate strategies] possible' (Interview 9). Despite the different terms on which each central bank responded to the environmental crisis, both banks followed a remarkably similar trajectory in the timing and sequence of more general events that led to incremental patterns of policy change, as illustrated by the mid-range empirical mechanism in Section 6.6 (p. 309).

Specifically, the relative success of the BOJ and the Riksbank's GMP reforms was connected to a period of: i) heightened political pressures to align central bank activities with a new green agenda; ii) low inflation and ensuing employment of unconventional monetary policy tools to stimulate the economy—although these measures were short-lived due to inflationary dynamics, they provided opportunities to incorporate green considerations into monetary policy operations, notably through quantitative easing and sectoral credit lines (Interview 8); iii) growing network effects driven by expert organisations and leading central banks (such as the BoE and the ECB)—in the absence of global regulatory rules to define and articulate climate action, networked central banks transmitted and sought to legitimise new green monetary policy approaches. Taken together, central banks were more likely to decide in favour of green criteria during this particular period, when a combination of political, economic, and normative incentives supported such outcomes. As Solingen and Wan (2017) noted, citing Steinmo (2008), 'only by situating the event within historical context—as directed by historical institutionalism—can we shed more light on . . . institutional outcome[s]' (p. 184).

Regarding the specific role of ideas and policy learning in interpreting institutional change, the evidence suggests that shifts in ideas paved the way for changes towards new green versions of monetary policy. The interaction between central banks and the 'flow of [green] ideas' was visible in a variety of ways (P. A. Hall, 1992, p. 95). The BOJ and the Riksbank's climate strategies would probably have been more difficult to implement if new ideas about

the appropriate role of central banks in the green transition and possible policy solutions had not been promoted by expert organisations, adopted as role models by a few leading central banks, and learned through several exchanges among central banks, with the NGFS positioned as the centre of the central banks' network. Interviewees repeatedly emphasised the guiding role of the G20, the FSB, and, most notably, the NGFS in the central banks' green policy work. Membership in the NGFS is viewed as a crucial step in structuring central banks' perception of the environmental issues and the techniques available to pursue environmental goals (Interview 1; Interview 2; Interview 3; Interview 4).

Furthermore, the BOJ and the Riksbank's institutional analysis shows a learning mechanism in which knowledge, recommendations, and interests from national and international bodies were integrated into the central banks' strategic priorities and GMP choices. However, both institutions also demonstrated that although a community of central bank experts played an influential role in identifying the need for reforms and suggesting options for their content, it would be too much to say that central banks automatically adopted such ideas. Instead, both central banks proved to be cautious about change and opted for solutions that made them feel 'safe and right' (Bell, 2017, p. 725). The final decision on the policy content and how these policies were implemented was up to the BOJ and the Riksbank to decide in ways that did not fundamentally disrupt the banks' functioning and main goals.

Moreover, while an epistemic source may have stimulated or facilitated the implementation and diffusion of green monetary policymaking, such influence appears to have waned as other priorities emerged and shifted the Riksbank's attention away from the environmental agenda. It follows that the NGFS ability to influence monetary policy existed. However, the power of such influence faced structural barriers, as reforms did not extend beyond a limited adjustment of some existing instruments, which, in some cases, did not persist. The combination of green policy recommendations sponsored by national and

international bodies with specific central bank policy structures and primary goals contributed to explaining the predominance of incremental change over sudden and deep transformations in central bank objectives and operational procedures.

Moving to the Fed, previous theoretical and empirical work suggested that the reciprocal relationship between the US fossil fuel industry, divided public opinion, and 'party politics' significantly impacted the Fed's stance towards GMP (Linde, 2018, p. 553). Indeed, the US polluting industries have remained stronger than those of cleaner alternatives, despite the increasing availability of green technologies (Roberts & Geels, 2019). The role of the carbon sector in misinforming and shaping public attitudes towards inaction on climate change, coupled with long-lasting divergences between the Democratic and Republican parties—which have made polarisation a key feature of American society—has confused the American population and stalled effective public policy responses to climate change.

The lack of significant US government action provides credible evidence to sideline arguments of monetary policy drift. Indeed, the Fed could face political and reputational risks if its research and guidelines send signals to the public that conflict with the prevailing US laws and regulations (Parajon Skinner, 2021). As in Vermeiren's account (2025; see also Blondeel et al., 2024; Interview 9), within the limits of their frameworks, central banks tend to 'adopt policies that support . . . their socio-political reputation' (Vermeiren, 2025, p. 16). Any GMP measures advanced by the Fed would have encountered resistance from zealous supporters of the status quo and dwindling public support for climate policies. It follows that, unlike past macroeconomic crises that implied a more immediate shift in policy paradigms, climate change did not reach the same level of emergency in the US. On the contrary, the US has lacked key components necessary to accelerate the green transition. Examining the perspectives of the US business sector and how they have interacted with public opinion and political debates sheds light on the Fed's dilemma in achieving a climate compromise.

Conclusion: The Rise of Green Monetary Policy Measures Under Tight Restrictions

> The very existence of central banks is a product of history, and their mandate has evolved over the years as they have responded to market failures. (Wakatabe, 2021, former Deputy Governor of the Bank of Japan)

The growing scientific evidence of the adverse effects of a changing climate, combined with the perceived need to accelerate the net-zero transition, has led a number of monetary authorities across various jurisdictions to develop plans to green their activities. In doing so, they created market incentives for investments in firms, projects, and sectors that contribute to the overall quality of the environment. However, there are still differing opinions among central bank scholars and practitioners about whether and to what extent central banks can accommodate such actions within their mandates and operations.

By examining the impact of past economic and financial crises, which prompted the development of unconventional monetary policy tools, GMP does not seem to be completely unusual. Central bank climate strategies echo the long-standing ability of central banks to innovate and reshape their policy toolkits along national economic pressures, political priorities, and social preferences towards specific goals. What is new, compared to previous systemic shocks, is that the greening of the economy is a lengthy process, which is likely to require a long-term strategy in a field that typically falls within the political domain. The engagement of central banks in climate policy can significantly change how central banks are perceived, their statutory objectives, and the guiding principles of their operations, which are becoming increasingly difficult to manage and understand.

Against this background, the rise (and fall) of GMP measures constitutes a compelling event, shedding new light on the political economy of modern central banking. However, most studies in the field dismiss historical explanations of their inception, the interaction of these measures with existing central bank formal structures, and the institutional consequences

associated with them. To fill this research gap, this thesis aimed to make a theoretical, empirical, and methodological contribution to the topic of how and why environmental issues and the transition to a greener economy influence monetary policymaking, in which contexts, and for how long. To that end, this study reviewed and examined the formal objectives and monetary policy strategies of 20 central banks from the largest advanced and emerging market economies between January 2010 and January 2024, with a view to answering the central research question: *Under what institutional conditions can the development of GMP measures be best explained?*

To answer this question, this study started by proposing a definition of 'GMP measures' and formulated three main alternative hypotheses in light of the core concepts of the historical institutionalist analytical framework, which were subsequently assessed: (H1) Central bank mandates create a path dependency, which significantly shapes the development of GMP measures; (H2) Critical junctures—notably, the experience of environmental disasters or other event(s) of systemic relevance—result in the development of GMP measures; (H3) Most GMP measures can be explained in terms of incremental change, and especially, the layering form of change, as suggested by previous analyses of the financial systems reviewed in the literature chapter. The analysis further integrated insights from SI to better understand why central banks initiated GMP reforms and empirically demonstrated a possible causal process leading to their implementation in two case study central banks. Finally, this study investigated a case of non-adoption of GMP measures to identify the motives behind their avoidance.

8.1 Aggregated Results of the Multiple-Case Analysis of 20 Central Banks

The multiple-case analysis showed that monetary authorities have increasingly rolled out policy measures in ways that provide direct support for a low-carbon economy. As of January 2024, 15 out of the 20 central banks analysed had embedded some sort of environmental criteria in their monetary policy decisions. In Europe, the number of green-

based instruments has expanded over the past decade. In Asia, specific credit facilities were launched to incentivise the funding for projects and sectors with environmental benefits. This was especially evident in 2021, when the number and scope of measures adopted within this group of 20 central banks increased significantly.

Certain events presented opportunities to make the environmental crisis more salient among central banks and reinforced their role in the resolution of this wider economic and societal challenge. Most notably, there have been intensifying pressures from global and local bodies devoted to green finance, such as the UN international conferences on climate change, the G7 and G20 environmental policy priorities, the growing national commitments to reach net-zero emissions, and networks of experts. Accordingly, some central banks progressively adapted their existing monetary policy practices with new green criteria, much like an 'interventionist economic practice' (Helleiner, 2017, p. 215), demonstrating once again that central banks think outside their traditional frameworks.

However, the success of GMP has proved to be uneven, since the approaches and strength of the measures adopted across central banks have taken diverse forms and, in some cases, are non-existent, as suggested by the GMPI constructed to capture the degree of central bank involvement in environmental matters through monetary policy operations. While a number of major banks continue in some respect to be divided or still 'at the step of understanding' how best to approach environmental issues (Interview 3), others have made climate change a top priority.

Most notably, the findings from the cross-case examination demonstrated that the most responsive central banks often have a secondary mandate that supports such initiatives. However, the greening of monetary policy operations has also occurred in contexts where structural conditions appear averse to such developments, in the so-called narrow mandates. Strikingly, central banks with dual mandates have been oblivious to such reforms, despite

holding more favourable institutional conditions to incorporate environmental provisions into their monetary policy decisions.

The varying and unexpected responses of a number of central banks to global environmental risks suggested that the greening of central bank monetary policy has been driven by factors beyond delegated powers and established principles. This observation challenged the theoretical proposition stated at the beginning of this research, which pointed to a predictable relationship or path dependency between the scope of legal mandates and central bank GMP reforms. In order to gain a deeper understanding of the explanatory factors and processes behind the (non-)institutionalisation of GMP measures, the study proceeded with a detailed analysis of three case study central banks. The BOJ, the Riksbank, and the Fed represented a varied spectrum of institutional approaches to environmental sustainability, as reviewed in the following sections.

8.2 The Case Studies of the Central Banks of Japan and Sweden

8.2.1 *Evaluation of the Research Hypotheses Through the Lens of HI and SI*

A detailed historical analysis of the BOJ and the Riksbank illustrated the ability of central banks to reinvent in response to external pressures. While the climate strategies pursued by the two banks did not converge in terms of policy choices due to their different organisational structures, both banks agreed that some monetary arrangements need to be in place to support national and global efforts in the fight against climate change. Consequently, both banks took advantage of a window of opportunity to engage in environmental-related policies, even though such goals were nowhere to be found in their legal mandates.

The GMP reform at the BOJ was dominated by the displacement of a nonstandard credit line established in 2010, which took an enhanced environmental direction in 2021. The bank also introduced a new layer of selection criteria in foreign exchange activities and asset purchases that consider environmental factors. A similar type of institutional layering was the

main approach in the Riksbank's sustainability strategy. It follows that, despite the limited scope of their formal objectives, GMP measures somehow succeeded at both the BOJ and the Riksbank. This success was largely supported by a favourable economic climate of low inflation and the availability of innovative policy tools developed from earlier historical junctures. From a central bank's standpoint, it is more prudent to confine green criteria to the central banks' existing core operations and enhance them with new environmental considerations than to adopt entirely new and transformative tools. Therefore, both central banks sought solutions to the environmental problem that hold common features with responses to previous crises.

While the announced green policy measures suggest that the two banks took on a new area of responsibility, available evidence also leads one to question the robustness and effectiveness of the measures adopted. As previously mentioned, institutional developments that pre-dated the climate agenda, notably the banks' prior experience with nonstandard monetary policy instruments, facilitated the rise of GMP measures. However, existing formal objectives and operating procedures played an important part in restraining the scope and depth of monetary policy changes towards environmental ends.

Ultimately, the incorporation of environmental considerations into monetary policy did not neglect central banks' primary objectives or disproportionally benefit some economic groups over others. On the contrary, despite the salience of the climate emergency and the development of new green finance interests and ideas, the BOJ and the Riksbank's new climate strategies turned out to be 'a series of compromises' guided by endogenous-specific structures and overarching goals (Goldstein & Gulotty, 2017, p. 211). Therefore, the policy options selected either operate on a voluntary basis, are time-limited, constrained by other monetary policy criteria, or can be weakened, suspended, or eroded to safeguard the price stability goal and the financial position of the central banks. Drawing a parallel with Margaret Weir's notion

of ‘bounded innovation’ (Weir, 1992), the interaction of new green finance ideas with the central bank’s primary goals and internal structures created a model of bounded GMP whereby past institutional arrangements offered opportunities for innovation but set boundaries for the type of policy innovation possible.

Not surprisingly, when inflation rates rose following the outbreak of the COVID-19 pandemic and the war in Ukraine, the monetary easing for green investments lost momentum. While inflation was partly driven by ‘fossil fuel prices’, which could reinforce the linkages between the climate crisis and central banks’ primary mandates (Interview 10; see also Van Doorslaer & Vermeiren, 2022; Blondeel et al., 2024), some monetary policy instruments and the green aspects within them were dissolved due to incompatibilities with the price stability goal. This finding is central in the analysis as it exposes the unintended effects of extending existing monetary policy frameworks to environmental goals. This is especially so in an inflationary environment where financial incentives for any type of investment, including green investments, become macroeconomically counterproductive.

Logically, as new environmental criteria are added to old monetary policy designs, the formal structures of central banks become institutionally denser and problematic to handle due to the various and inconsistent policy objectives (Fioretos, 2011, 2017; J. W. Meyer & Rowan, 1977; L. Meyer, 2001). This is otherwise in line with Interviewee 4, who asserted that a central bank has ‘a few tools in its arsenal’. Adding ‘secondary mandates . . . does not mean much, because central banks do not have that many tools to look at all those issues (Interview 4). Enduring GMP solutions would require an expanded and legitimate monetary policy toolkit that reconciles multiple and intersecting policy goals.

It is worth noting that although the observed cycle of institutionalisation followed by deinstitutionalisation of environmental criteria reveals the negative feedback of the newly adopted GMP measures, it also demonstrates the resilience of central bank internal structures

when overarching objectives are challenged (Hanrieder, 2016; Hanrieder & Zürn, 2017). After all, the legitimacy of central banks in greening monetary policy depends not only on their helping to transform the economy into a more sustainable model, but also on their doing so in the context of price stability. Otherwise, central banks may display levels of politicisation that are not easily justifiable with their delegated powers (Hanrieder & Zürn, 2017).

In light of the preceding results and discussion, the BOJ and the Riksbank's experiences with GMP represent cases of incremental change, as conceptualised by historical institutionalist theorists. Accordingly, Hypothesis 3 on incremental patterns of central bank policy change in support of environmental goals received the strongest support from the BOJ and the Riksbank's analysis within the studied years. Such a result is consistent with the findings observed by previous empirical work, which hint at the predominance of incremental reforms as the most common type of institutional change within financial institutions (e.g., Deeg & Posner, 2016; Fioretos, 2011; Helleiner, 2017; Moschella & Tsingou, 2013; Moschella & Vetterlein, 2016; Weaver & Moschella, 2017).

Hypothesis 1, regarding path dependencies, received less support when compared to Hypothesis 3. However, the influence of earlier policy decisions in the face of new pressures proved instrumental. While the BOJ and the Riksbank certainly modified some of their monetary policy operations towards a new environmental direction and conceded far more than many other central banks in this study—especially those with dual mandates—central bank-specific structures did matter and explain the choice of some policy options over others that did not succeed. Most importantly, central bank policy toolkits continued to be structured in ways that seek a relatively rapid return to an inflation target, suggesting that path-dependent dynamics influenced central bank climate strategies. From this perspective, it could be argued that Hypotheses 1 and 3 provide a two-level theoretical explanation for understanding the development of central bank GMP.

Hypothesis 2 on critical junctures received no strong empirical support for the reporting period. If 'the good institution' is a stable one that remains (Peters, 2019, p. 198), the wavering of environmental criteria shows the fragility of the GMP measures adopted and the limited contribution of central banks to environmental targets. Central bank founding principles and earlier policy decisions left important legacies in the evolution of GMP measures, some of which did not persist due to a situation of conflict with new economic priorities. The end result is otherwise in line with the assertion that 'history matters' (Keohane, 2017, p. 322). As in Keohane's account (2017), 'most institutional change is incremental', only periodically punctuated by a short timeframe of quick change, typically resulting from 'war[s] or the collapse of a major power' (p. 322).

It remains to be seen whether exogenous pressures related to the changing climate will more fundamentally affect future monetary policy developments in ways that initiate a critical juncture for monetary policy frameworks, or if the current piecemeal reforms will have the potential to cumulate over time and become more institutionalised, leading to significant transformations in central banks' operations and goals. For now, the usefulness of attempting to green monetary policy seems to rest on setting an example and encouraging firms to enhance their transition plans. One remaining puzzle is whether the temporary and mostly voluntary nature of the measures adopted provides markets with any meaningful incentive, and if central banks should be the entities to give that incentive in the first place (Interview 4).

Although formal institutions are the central tenet of this study, about which HI revealed valuable insights into patterns of institutional change within the BOJ and Riksbank, the theoretical elements from HI were combined with ideational-based traditions for a greater understanding of why GMP played out in institutional settings presumably averse to such developments. From the start of the research, it became evident that examining the main stakeholders involved in the GMP process and their interests was necessary to understand

central bank policy change in the environmental field. Consequently, the study explored the ideational context in which the BOJ and the Riksbank operated during the design and implementation of their climate strategies. This study develops the argument that the foundation of GMP measures is not only innovative with respect to the new monetary policy elements adopted but also in thinking about whether and how central banks can steer green economic growth, which entails both an ideational and a normative dimension.

Specifically, in a historical period of growing environmental concern, political actors, social groups, and expert organisations came together and stated the case for monetary policy reform due to the inability of governments to deal with the climate crisis in a timely manner. In particular, the creation of the NGFS brought to light the financial risks and investment opportunities associated with climate change, provided central banks interested in joining the transition efforts a handful of possible strategies and instruments to reduce these risks and promote sustainable finance, fostered learning and information exchange among central banks, and gave visibility to the green central bank pioneers (Interview 1; Interview 8; Interview 9; Interview 10). For some, greening monetary policy became an ethical and legitimate movement to address a collective action problem faced by society. Aspects related to 'social responsibility' were often invoked by the BOJ and the Riksbank, in that they showed commitment to 'collectively valued purposes' or 'the state's core values' (J. W. Meyer & Rowan, 1977, p. 349; Sveriges Riksbank, 2020k, p. 2). This logic of appropriateness to perceived dominant values sought to legitimise central banks' innovative roadmaps on climate change, serving the needs of governments to stimulate green growth.

Eventually, the adoption of environmental standards in monetary policy operations was not solely determined by a functionalist explanation related to the desire to keep prices stable or protect the financial health of central banks. In addition to risk management objectives, the greening of monetary policy was driven by a gradual replacement of ideas influenced by social

expectations and the political willingness to accelerate the transition to an environmentally sustainable economy. Ever since 2018, it has been easy to find speeches by central bank officials and other central bank publications questioning the sustainability of current brown-growth models and the need to reduce countries' dependence on fossil fuels. However, central bankers have attempted to explain change in more 'economic or rationalist terms' (P. Hall, 1997, p. 190), notably by framing the environmental issue as a matter of price stability, and therefore, a technical rather than political matter.

While the institutional or organisational aspect may partly be true, evidence shows that central banks' green shift appears particularly evident in contexts where the environmental topic is becoming institutionalised in a broad range of economic and social domains (Interview 2). An alternative theoretical interpretation of this event, which could be explored in future research, is the possibility of 'coercive isomorphism' to conform central bank operations to national regulations and social expectations (DiMaggio & Powell, 1983, p. 150). In Sweden, there has been a long tradition of public support for environmental protection. As a result, the national government not only implemented an ambitious Climate Policy Framework but also effectively amended the statutes of the central bank in ways that more unambiguously support climate action. The new Riksbank Act functioned as the basis for subsequent sustainability initiatives, as the central bank received explicit parliamentary support to do so. The inclusion of sustainability elements in the Riksbank's operations was also justified by the need to prevent the central bank's activities from undermining the effects of public climate policies and by the absence of effective global climate policies.

The BOJ continued on the same legal grounds throughout the research period. The bank's climate strategy resulted from a long-standing practice of government support, which involves offering preferential loans for certain economic activities, including environmental projects. The first signs of this trend were visible as early as 2010, although the green direction

gained momentum from 2021, along with the growing public and private investments to decarbonise Japan (Interview 1; Interview 9). Arguably, the Riksbank became legally better equipped to handle GMP than the BOJ, which appears to lack the jurisdiction to sustain green-targeted policies. In Japan, the central bank-government relations have been central to the national growth strategy. The BOJ's 'loyalty' to broader political and social aims has enabled changes in monetary policy without prior revisions of its legal mandate (Haggard, 2015, p. 48).

The depicted interplay between central bank green arrangements and the magnitude of national commitments to net-zero also demonstrates the intricacies and spillover effects between the public and monetary spheres. On the one hand, the inability of governments to meet ambitious environmental targets within short timeframes compelled some central banks to act, notably by helping create new green markets (Interview 5). On the other hand, the greenest central banks have also influenced the wider system by setting new sustainability standards that increased the demand for clean assets and investments, thereby catalysing public environmental policies.

What emerges from this reciprocal relationship, and a key insight of this study, is that GMP measures have become a creative form of aid to strengthen governments' capacity to attain climate commitments faster. This led to the development of new competencies in an area where the Riksbank had none, and the BOJ had some, due to its previous involvement in government development plans. Whether such measures produce effective results, or if central banks hold the authority and tools to perform such a role, remains an unresolved question. Evidence from this study suggests that the engagement of central banks in environmental policymaking exposes them to new levels of risk. Therefore, the 'depth' of the green measures adopted in terms of their robustness against other central bank priorities has been overall limited (Rixen & Viola, 2016).

8.2.2 *Takeaways from the Mid-Range Comparative Process Tracing*

While the previous analysis using the concepts of HI and SI aimed to describe the pattern and determinants of change in monetary policy frameworks linked to environmental goals, the second part of the research sought to explicitly outline one mechanism of change through a mid-range comparative process tracing. Drawing on a more inductive research design, the study systematically explored when, how, and why national and international pressures to accelerate the green transition intersected with new green finance ideas and created sufficient pressures to induce institutional change at the BOJ and the Riksbank.

The theoretical and practical implications of the within-case examination for the historical-comparative literature and the international debate on green central banking and unconventional monetary policies are manifold. Through process tracing, the empirical narratives of the BOJ and the Riksbank enabled to:

(1) confirm gradual shifts in the monetary policy activities as part of addressing the environmental emergency; (2) outline the temporal ordering of events that influenced these operational shifts, including main actors, activities, and decisions; (3) emphasise the role of timing in the formation of GMP preferences and strategies, notably during in a period of growing emphasis on environmental risks and low inflation rates, which provided those central banks 'interested in the topic' the momentum to look more into indirect objectives (Interview 8; Interview 10); (4) illustrate that legal acts carry ambiguities and central banks leveraged their vagueness to justify other indirect or more normative objectives; (5) demonstrate how institutional legacies channelled central bank responses to environmental issues along different paths, in line with organisation-specific structures; (6) elucidate the unintended consequences of layering environmental criteria on existing structures, namely policy incoherences that caused the suspension of some of the GMP measures adopted; (7) identify the key contextual factors that enabled and inhibited the gradual adoption of GMP measures, especially political

support, pre-existing nonstandard monetary policy tools, and overarching goals; (8) theorise a mid-range causal process linking the environmental crisis to incremental GMP reforms, suggesting that we may find a comparable mechanism in other contextually similar organisations; (9) show how legal mandates have been of little significance in articulating the adoption of environmental factors in monetary policy decisions; (10) suggest how such a mechanism failed to influence GMP developments in the case of the Fed, as discussed in the following subsection.

In particular, the BOJ-Riksbank comparison revealed that one needs to attend to both the wider context and the formal structures within which central banks operate to make sense of GMP and the timing of its implementation. Certain ideas and values that grew out of political and socioeconomic interests during a time of intensified environmental concern can make a case for central bank policy change in ways that, for some, represent a departure from the old central bank model. The membership in the NGFS stood as a crucial moment for structuring the BOJ and the Riksbank's perception of environmental risks, as well as the techniques that can be deployed to protect them from these risks and pursue climate goals.

Yet, although a network of central bank experts played an influential role in signalling the need for a greener monetary policy and proposed options for their content, the final decision on how these options were implemented was up to the BOJ and the Riksbank to decide upon ways that did not undermine the banks' main functions and goals. In the end, the combination of national and international pressures to achieve environmental goals, expert knowledge, and the central bank's internal structures contributed to explaining the BOJ and the Riksbank's GMP preferences, consisting of limited adjustments in operating procedures and policy goals.

8.3 The Case Study of the US Federal Reserve System

The defenders of the status quo tell a different story about the environmental crisis, as evidenced by the case of the Fed. They stress the diminished impact of climate change risks

and the role of central banks in addressing those risks. While this study does not benefit from direct feedback from the Fed due to the unwillingness of its staff to participate in this research, one could expect the Fed to have stronger institutional incentives to adopt GMP measures. However, the construction of the climate issue as a real problem that central banks must deal with has not worked out in the case of the Fed.

Challenging scientific advice and the growing consensus on climate change financial risks, the Fed's leadership has not perceived the changing climate as an uncertain and idiosyncratic problem, unlike 'green' central banks. Consequently, despite announcing voluntary guidelines to improve the oversight of climate risks, the core activities of the Fed have remained intact. At first, different interpretative frames through which the Fed views climate change appeared to have played a role in the Reserve Bank's lack of involvement in environmental matters, although it was not the only factor.

This is relevant evidence that points to the need to examine expert communities with caution, since this study brings together two positive cases of success and one negative case of failure, where membership in an epistemic community has not resulted in the adoption of GMP measures. As previously discussed, amid rising environmental concerns and national commitments to meet environmental targets, the creation of the NGFS 'bolstered a change in culture' and was instrumental in guiding some of the most prominent central banks to learn and reconsider their role and policy tools to promote green finance (Interview 9). However, the NGFS efforts have not translated into substantial changes in the monetary policy operations of central banks at large.

Notably, the central banks with dual mandates examined in this study have not undertaken any green adjustments in their monetary policy frameworks, despite the growing body of knowledge about climate risks, their holding more favourable institutional conditions to support green segments, and their being part of the NGFS, a renowned 'coalition of the

committed' to sustainable finance (Elderson, 2021d). It follows that the existence of a policy network does not imply that all members are aligned and integrated. The 'different dynamics within the NGFS' demonstrate that the links that tie the network and its members vary, with some being stronger than others (Interview 3). Ultimately, central banks committed to what they wanted. As Interviewee 8 put it:

> The NGFS is a great forum . . . but the [NGFS] is very limited in what it can do. It is just a forum . . . it is [not] going to push big actors who are not willing to go in that [green] direction. So, it is good that it exists, but it is not going to be the reason for greening anyone. (Interview 8)

Although differing interpretations of the climate change issue may constitute one piece of the larger puzzle in explaining the Fed's choice for institutional stability, further research was needed to substantiate the non-adoption of environmental criteria in the Fed's policymaking. Drawing on previous academic work and feedback from the interview participants—all of whom agreed with the widely held view that social and political dimensions played an important role in the US case (see also Blondeel et al., 2024)—this study conducted an exploratory analysis of the American socio-political context to understand the Fed's defensive approach towards environmental issues.

It concluded that, despite being an NGFS member between December 2020 and January 2025, 'local . . . considerations [held] a bigger role than what [was] happening within the network in driving [the green] agenda' (Interview 10). Most notably, the gridlock surrounding climate change policy in the US, resulting from a divided public opinion and ongoing divergences between the two main political parties, Democrats and Republicans, greatly influenced the Fed's tendency to downplay scientific warnings about the risks of climate change. With climate risks continuing to rise, and polarisation remaining a key attribute of American society and its political system, the Fed's inaction on environmental issues will

become increasingly evident, encouraging greater scrutiny of the Fed and its independence from political divides.

Hence, an important corollary of the BOJ, the Riksbank, and the Fed's analysis is that 'local intervening factors are important in explaining' central bank institutional developments in the environmental field (Alter, 2017, p. 268). In particular, differences in domestic environmental regulation, which are directly linked to political and socioeconomic preferences, are highly consequential in the development of GMP measures. As Interviewee 11 pointed out, 'central banks in different countries and [at] different moments actually follow, to a quite large extent, what the politicians feel about climate' (Interview 11). In essence, the more information governments provide on their (ambitious) climate transition plans, the more likely central banks are to embed climate considerations into monetary policy activities. By the same token, the influence of the NGFS appears to be more pronounced when national governments are aligned with the network's values.

Back when GMP measures unfolded in Japan and Sweden, environmental regulation was being enacted in many sectors of society and the economy, giving the BOJ and the Riksbank an opportunity to promote green standards more legitimately. This was not the case in the US. In the words of Interviewee 7, 'it is all about politics and coalitions and how this pushes the central banks to reinterpret their mandates' (Interview 7). Ultimately, central banks embraced the solutions with the most political appeal and social consensus. Input from experts was not as influential as the options of political leaders or powerful interest groups. Experts and scientists were just among the many stakeholders in a field that is markedly 'political in tone' (P. A. Hall, 1993, p. 280; Grossmann & Hopkins, 2024; Volz, 2017). Consequently, one must account for contextual conditions, especially the power of interest groups, a mobilised public supporting climate change action, and a political climate of greater agreement on climate

policies, to understand the differences in central banks' involvement in environmental issues through their monetary policy frameworks.

8.4 Final Remarks, Policy Implications, and Recommendations for Future Research

The primary focus of this research project was on the process linking the environmental crisis and green momentary policy outcomes, drawing on the Japanese and Swedish cases. To expand our understanding of the development of green monetary policies, the study further laid out a theoretical explanation for the absence of green reforms in a deviant consistency case, the Fed. While this study did not test counterfactuals or 'what could have been different' (Beach & Pedersen, 2019, p. 34), one could plausibly imagine what if the causal process outlined in this study, or a part thereof, had not occurred. For instance, what if the NGFS had not existed or if the three central banks had made different choices (Capoccia, 2015): the Fed had adopted GMP measures, while the BOJ and the Riksbank had either not established or withdrawn green criteria from their operations.

Indeed, alternative choices would have likely placed central banks and potentially the national economies on different trajectories. However, it is difficult to substantiate this view given the scarcity of data to ascertain the environmental impact of any GMP measures (Interview 1). In principle, the absence of the NGFS would probably have made the formulation and broad implementation of GMP measures more challenging. As the interviewees conceded, the NGFS provided topical expertise and resources that many central banks lacked. Had the Riksbank not undone the purchase of green assets, this could have possibly fuelled inflation, thereby conflicting with the primary goal of maintaining low and stable prices, undermining the central bank's credibility.

What appears clear from the Riksbank's experimentation with GMP measures is that the implemented measures do not seem to be a far better solution than the counterfactual of not having them. As the events demonstrated, inflationary pressures weighed on their functioning,

leading to the decline of environmental considerations in the bank's most relevant monetary policy operations. For its part, the Fed's non-incorporation of green considerations in its monetary policymaking may imply failing to meet the bank's contribution to green employment opportunities and a climate-resilient financial system. As noted by the US Pro-Growth Climate Policy, rising pollution levels do impact workers and jobs (US Department of the Treasury, 2023). Whether supporting green employment or shifting funds away from carbon sectors is a de facto priority for the American federal government and society can be called into question.

This brings us to the topic that has been the subject of considerable academic study: the effective political independence of central banks and the examination of whether monetary policy is conducted predictably and insulated from political and other external influences. The empirical narratives of the BOJ, the Riksbank, and the Fed suggested that 'public policies that are dear to national governments' influence how central banks experience and react to new environmental pressures (Büthe, 2016, p. 44). Building on this observation, it could be argued that monetary policy operations and goals are not 'apolitical' (Högenauer & Mendes, 2025, p. 2). Governments counted on central banks to shape market preferences according to what was politically desirable and 'economically feasible' (Hay, 2018, p. 202). This is in line with the view that 'a *de facto* separation of central banking from democratic processes is impossible to achieve fully in a democratic society, even if it is mandated *de iure* in the form of central bank independence' (Diessner, 2023a, p. 237). One should therefore avoid a rigid distinction between central banks' 'pure' economic rationales and political developments and opt for more nuanced analyses that consider the political and socioeconomic context in which central banks operate to better gauge the adoption or non-adoption of GMP measures.

Whatever the decision taken, whether to go green or remain brown, the global environmental crisis seems to have brought central banks to a crossroads. On the one hand,

discussions remain as to whether supporting a less fossil-based economy is a power to be delegated to unelected officials or a democratically acceptable task for an 'independent' central bank. On the other hand, the proponents of green central banking object to this view, holding that in a world of growing environmental risks, 'not acting on climate change' reveals central banks' lack of independence from political interests. As observed by Interviewee 8:

> Climate change should not be a political issue in the sense that there is no doubt that the climate crisis is happening. . . . this is going to be a massive issue for the stability of the system, for price stability, and for financial stability, so we need to take it into account. People have made it political, and that is, unfortunately, the problem. . . . Not acting on climate change is actually losing independence because it means that central bankers are being scared by politicians and by some actors into doing something that is definitely within their mandates. . . . those [central banks that] do not act are actually the ones who are no longer independent because they do not think rationally, based on scientific facts. They are just basing their logic on the propaganda, which is anti-climate. (Interview 8)

As the world evolves and priorities shift, a broader range of political and social issue areas may attract the increased attention of a larger number of central banks, potentially resulting in their developing new areas of expertise and responsibility. These issue areas include social and economic inequalities, geopolitics, gender equality, and ageing populations. As noted by Interviewee 10, 'price stability is a very complex phenomenon that comes from very different drivers. So, the question is: Should . . . central banks in general act on these drivers as well?' (Interview 10). The collected empirical data showed that a number of central banks have been focusing increased research and public discussion of these issues as well.

Arguably, as long as central banks maintain that their primary goal of price stability is kept, and their independence towards achieving that goal is preserved, they might be tempted

to engage in these other political and social areas. From this perspective, and in line with the statement from the BOJ deputy governor cited at the beginning of this chapter, central bank strategic priorities are historical constructs largely resulting from challenges that occur outside their formal mandates.

By way of conclusion, this study uncovered crucial insights into how central banks address political and socioeconomic pressures related to environmental risks and goals. It also provided significant theoretical and practical implications for understanding the gradual rise and weak consolidation of GMP criteria in guiding future central bank monetary policy decisions. As it turns out, while past crises prompted more revolutionary monetary policy tools, the measures taken in response to the environmental emergency have been insufficient to establish a new GMP paradigm due to inconsistencies with the overall monetary policy terms. As policymakers and broader society seek ways to reform the economy and financial system along with green standards within tight deadlines, this is noteworthy evidence that helps us identify and comprehend the limits of the possible within existing central bank frameworks.

To strengthen the validity of these findings and significantly contribute to theory development, further comparative analysis over an extended period of investigation is needed to corroborate the institutional dynamics discussed in this thesis or to understand better new ones. For instance, it would be relevant to explore whether the pending environmental crisis and the growing availability of climate data will drive more significant and enduring changes in future monetary policy decisions or if such changes will prove inefficacious or institutionally impossible to implement.

It would also be worth conducting additional central bank case studies in other regions of the world to identify whether those banks adopted or failed to adopt environmental elements in their monetary policymaking, the incentives and hindrances encountered, as well as the permissive and productive conditions in place. Central banks in emerging economies might be

especially interesting to observe, given the larger climate finance needs in these countries, resulting from high growth rates and resulting pressures on natural resources (Ananthakrishnan et al., 2023; Mengze & Wei, 2015). Furthermore, since the African continent is not represented in this study, empirical research is needed to evaluate whether this study's results are valid in the low-income countries of the Global South.

Other potential areas for future research include investigating alternative mechanisms through which environmental concerns shape central bank GMP preferences. While the present analysis seeks to offer a comprehensive understanding of some of the main drivers of action and inaction over greening monetary policy, it does not empirically test all the incentives behind the GMP stance of the 20 leading central banks examined. To address this topic, the application of QCA – Qualitative Comparative Analysis can provide a differentiated research design to determine the sufficient conditions that lead to GMP outcomes. Finally, follow-up research could build on the GMPI drawn up in this study to monitor the progress of central bank GMP responses in the coming years. This index also creates opportunities for other scholars to delve into new versions of it to enable, for example, panel data analysis in comparative research.

It is my hope that this study makes a useful contribution to the comparative political science and political economy literature on central bank unconventional monetary policies by proposing a novel analysis of evidence and a framework that is intended to stimulate further research on green monetary policy issues at a global scale.

Appendices

Appendix A. Central Bank Green Monetary Policy Responses, as of January 2024

For online reading

Country	Economic group	Central bank	Legal mandate	Monetary policy objectives on the banks' website	Positioning of economic policies	Title of legal document	Version date	Link to the mandate	Link to the banks' website	Implemented green monetary policy measures	Year	Planned green monetary policy measures	Instrument category	GMPI	Reference links
Australia	AE	Reserve Bank of Australia	'It is the duty of the Reserve Bank Board, within the limits of its powers, to ensure that the monetary and banking policy of the Bank is directed to the greatest advantage of the people of Australia and that the powers of the Bank under this Act and any other Act . . . are exercised in such a manner as, in the opinion of the Reserve Bank Board, will best contribute to: (a) the stability of the currency of Australia; (b) the **maintenance of full employment in Australia**; and (c) the **economic prosperity and welfare of the people of Australia**.'	'The goals of monetary policy are set out in the Act, which requires the Reserve Bank Board to conduct monetary policy in a way that, in the Reserve Bank Board's opinion, will best contribute to: the stability of the currency of Australia; the maintenance of full employment in Australia; and the economic prosperity and welfare of the people of Australia.'	First	Reserve Bank Act 1959	Oct-20	https://www.legislation.gov.au/C1959A00004/latest/text	https://www.rba.gov.au/monetary-policy	Investment in the EMEAP Asian Bond Fund. The Fund started purchasing green bonds in 2022.	2022		Foreign exchange investments	**3**	https://www.rba.gov.au/about-rba/our-policies/pdf/ngfs-pledge.pdf; https://www.emeap.org/wp-content/uploads/2021/11/Final-2nd-Press-Release.pdf; https://www.rba.gov.au/statistics/frequency/reserve-assets.html; https://www.rba.gov.au/publications/annual-reports/rba/2022/pdf/rba-annual-report-2022.pdf

Brazil	EMDE	Central Bank of Brazil	'The fundamental objective of the Central Bank of Brazil is to ensure price stability. **Without prejudice to its fundamental objective**, the Central Bank of Brazil also has the objectives of fostering the stability and efficiency of the financial system, smoothing fluctuations in the level of economic activity, and **promoting full employment**.'	'Keeping inflation around the target is a fundamental objective of the Banco Central do Brasil (BCB). . . . BCB uses monetary policy to achieve that objective. . . . Keeping inflation low, stable and predictable is the best contribution that monetary policy can make to sustainable economic growth. Economic growth depends on several factors that are beyond central banks' control, such as productivity growth.'	Secondary	Banking Law (No 4,595) 1964 [Supplement: Complementary Law 179]	Feb-21	https://www.bcb.gov.br/content/about/legislation_norms_docs/complementary_law_179_24february2021.pdf	https://www.bcb.gov.br/en/monetarypolicy	Green, social and sustainability bonds are accepted as collateral for liquidity facilities.	2021	Collateral	**3**	https://www.bcb.gov.br/content/publications/report-risk-opportunity/Report_social_environmental_climate_risks_opportunities_1222.pdf; https://www.bcb.gov.br/conteudo/home-ptbr/TextosApresentacoes/RCN_Pavilhão%20COP26_MMA_3.11_11h.pdf; https://www.bcb.gov.br/content/about/presentationstexts/BCB_Agenda_BChashtag_Sustainability_Dimension_Sep2020.pdf
Brazil	EMDE	Central Bank of Brazil	'The fundamental objective of the Central Bank of Brazil is to ensure price stability. **Without prejudice to its fundamental objective**, the Central Bank of Brazil also has the objectives of fostering the stability and efficiency of the financial system, smoothing fluctuations in the level of economic activity, and **promoting full employment**.'	'Keeping inflation around the target is a fundamental objective of the Banco Central do Brasil (BCB). . . . BCB uses monetary policy to achieve that objective. . . . Keeping inflation low, stable and predictable is the best contribution that monetary policy can make to sustainable economic growth. Economic growth depends on several factors that are beyond central banks' control, such as productivity growth.'	Secondary	Banking Law (No 4,595) 1964 [Supplement: Complementary Law 179]	Feb-21	https://www.bcb.gov.br/content/about/legislation_norms_docs/complementary_law_179_24february2021.pdf	https://www.bcb.gov.br/en/monetarypolicy	Investment in foreign green bonds since 2015, approximately. In 2021, the Bank deliberately increased the exposure to green and other corporate bonds using an ESG classification, along with other investment requirements.	2021	Foreign exchange investments	**3**	https://www.bcb.gov.br/content/publications/report-risk-opportunity/Report_social_environmental_climate_risks_opportunities_0921.pdf

Brazil	EMDE	Central Bank of Brazil	'The fundamental objective of the Central Bank of Brazil is to ensure price stability. **Without prejudice to its fundamental objective**, the Central Bank of Brazil also has the objectives of fostering the stability and efficiency of the financial system, smoothing fluctuations in the level of economic activity, and **promoting full employment**.'	'Keeping inflation around the target is a fundamental objective of the Banco Central do Brasil (BCB). . . . BCB uses monetary policy to achieve that objective. . . . Keeping inflation low, stable and predictable is the best contribution that monetary policy can make to sustainable economic growth. Economic growth depends on several factors that are beyond central banks' control, such as productivity growth.'	Secondary	Banking Law (No 4,595) 1964 [Supplement: Complementary Law 179]	Feb-21	https://www.bcb.gov.br/content/about/legislation_norms_docs/complementary_law_179_24february2021.pdf	https://www.bcb.gov.br/en/monetarypolicy	ESG factors as an additional criterion in the selection of counterparties for foreign exchange investments.	2022		Foreign exchange investments	**3**	https://www.bcb.gov.br/content/publications/report-risk-opportunity/Report_social_environmental_climate_risks_opportunities_1222.pdf; https://www.bcb.gov.br/content/financialstability/irmr/relatorio_anual_reservas_internacionais_en_2022.pdf
Canada	AE	Bank of Canada	'WHEREAS it is desirable to establish a central bank in Canada to regulate credit and currency in the best interests of the economic life of the nation, to control and protect the external value of the national monetary unit and to mitigate by its influence fluctuations in the general level of production, trade, prices and employment, so far as may be possible within the scope of monetary action, **and generally to promote the economic and financial welfare of Canada**.'	'The objective of monetary policy is to preserve the value of money by keeping inflation low, stable and predictable. This allows Canadians to make spending and investment decisions with more confidence, encourages longer-term investment in Canada's economy, and contributes to sustained job creation and greater productivity. This in turn leads to improvements in our standard of living.'	Secondary	Bank of Canada Act	Jun-23	https://laws-lois.justice.gc.ca/eng/acts/b-2/fulltext.html	https://www.bankofcanada.ca/core-functions/monetary-policy		The Bank is considering options to include climate elements in market operations.	To be defined	**1**	https://www.bankofcanada.ca/2023/04/bank-of-canada-disclosure-of-climate-related-risks-2022/; https://www.bankofcanada.ca/wp-content/uploads/2022/02/annual-report-2021.pdf; https://www.bankofcanada.ca/2022/06/financial-system-review-2022/?#climate-change-considerations
China	EMDE	The People's Bank of China	'The People's Bank of China shall, under the leadership of the State Council, formulate and implement monetary policy, prevent and resolve financial risks,	'The objective of the monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'	Not mentioned	Law of the People's Republic of China Law on The People's Bank of China	Dec-03	http://www.pbc.gov.cn/english/130733/2941519/2015082610	http://www.pbc.gov.cn/en/3688229/3688299/3688302/index.html	The collateral framework includes qualified green credit and green bonds	2018		Collateral	**3**	http://www.pbc.gov.cn/en/3688229/3688353/3688362/3711354/index.html; http://www.p

			and maintain financial stability. . . . The objective of monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'				50104930 4.pdf		that are rated AA and above.				bc.gov.cn/en/3 688110/36882 59/3689032/3 709448/38411 02/3927702/2 019112611065 024784.pdf
China	EMDE	The People's Bank of China	'The People's Bank of China shall, under the leadership of the State Council, formulate and implement monetary policy, prevent and resolve financial risks, and maintain financial stability. . . . The objective of monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'	'The objective of the monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'	Not mentioned	Law of the People's Republic of China Law on The People's Bank of China	Dec-03	http://ww w.pbc.gov. cn/english /130733/2 941519/20 15082610 50104930 4.pdf	http://ww w.pbc.gov. cn/en/368 8229/3688 299/36883 02/index.h tml	Strategic increase of green bonds and limitation of carbon-intensive assets in foreign investments.	2021		Foreign exchange investments	**3**	http://www.p bc.gov.cn/en/3 688110/36881 75/4213306/in dex.html
China	EMDE	The People's Bank of China	'The People's Bank of China shall, under the leadership of the State Council, formulate and implement monetary policy, prevent and resolve financial risks, and maintain financial stability. . . . The objective of monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'	'The objective of the monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'	Not mentioned	Law of the People's Republic of China Law on The People's Bank of China	Dec-03	http://ww w.pbc.gov. cn/english /130733/2 941519/20 15082610 50104930 4.pdf	http://ww w.pbc.gov. cn/en/368 8229/3688 299/36883 02/index.h tml	Carbon Emission Reduction Facility (CERF).	2021		Credit operations	**5**	http://www.p bc.gov.cn/en/3 688229/36882 99/3688305/4 385345/index. html; http://www.p bc.gov.cn/en/3 688006/39955 57/4848503/in dex.html; http://www.p bc.gov.cn/en/3 688006/39955 57/4791152/in dex.html; http://www.p bc.gov.cn/en/3 688006/39955 57/4385345/in dex.html; http://www.p bc.gov.cn/en/3 688229/36883 53/3688356/4 583781/48499

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China	EMDE	The People's Bank of China	'The People's Bank of China shall, under the leadership of the State Council, formulate and implement monetary policy, prevent and resolve financial risks, and maintain financial stability. . . . The objective of monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'	'The objective of the monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.'	Not mentioned	Law of the People's Republic of China Law on The People's Bank of China	Dec-03	http://www.pbc.gov.cn/english/130733/2941519/2015082610501049304.pdf	http://www.pbc.gov.cn/en/3688229/3688299/3688302/index.html	Special Central Bank Lending for Clean and Efficient Use of Coal.	2021	Credit operations	**5**	http://www.pbc.gov.cn/en/3688110/3688172/4437084/4587509/index.html; http://www.pbc.gov.cn/en/3688006/399555/4848503/index.html; http://www.pbc.gov.cn/en/3688006/399555/4544483/index.html; http://www.pbc.gov.cn/en/3688229/368853/3688356/4583781/4849961/2023090113491468715.pdf
Euro area	AE	European Central Bank	'The European Central Bank, together with the national central banks, shall constitute the European System of Central Banks (ESCB). . . . **The primary objective of the ESCB shall be to maintain price stability. Without prejudice to that objective, it shall support the general economic policies in the Union** in order to contribute to the achievement of the latter's objectives.'	'Our main aim at the ECB is price stability. We serve people living in the euro area by working to preserve the value of the euro.'	Secondary	Consolidated version of the Treaty on the Functioning of the European Union	Mar-20	https://eur-lex.europa.eu/eli/treaty/tfeu_2016/2020-03-01/eng	https://www.ecb.europa.eu/mopo/html/index.en.html	Purchase of green bonds under the Asset Purchase Programme (Public Sector Purchase Programme and Corporate Sector Purchase Programme).	2018	Asset purchase programmes	**3**	https://www.ecb.europa.eu/pub/economic-bulletin/focus/2018/html/ecb.ebbox201807_01.en.html; https://www.ecb.europa.eu/ecb/access_to_documents/document/correspondence/shared/data/ecb.dr.cor20210326Lalucq.en.pdf?78f7d81e4edb29c0cf1e6bdbb20144d3; https://www.ecb.europa.eu/mopo/implem

													ent/app/html/index.en.html
Euro area	AE	European Central Bank	'The European Central Bank, together with the national central banks, shall constitute the European System of Central Banks (ESCB). . . . **The primary objective of the ESCB shall be to maintain price stability. Without prejudice to that objective, it shall support the general economic policies in the Union** in order to contribute to the achievement of the latter's objectives.'	'Our main aim at the ECB is price stability. We serve people living in the euro area by working to preserve the value of the euro.'	Secondary	Consolidated version of the Treaty on the Functioning of the European Union	Mar-20	https://eur-lex.europa.eu/eli/treaty/tfeu_2016/2020-03-01/eng	https://www.ecb.europa.eu/mopo/html/index.en.html	Credit operations accept sustainability-linked bonds as collateral.	2021	Collateral	**3**	https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200922~482e4a5a90.en.html; https://www.ecb.europa.eu/ecb/access_to_documents/document/correspondence/shared/data/ecb.dr.cor20210326Lalucq_and_others.en.pdf?187d4b9e4b999f9e00419ccfd3870872; https://www.ecb.europa.eu/press/key/date/2021/html/ecb.sp210125~f87e826ca5.en.html
Euro area	AE	European Central Bank	'The European Central Bank, together with the national central banks, shall constitute the European System of Central Banks (ESCB). . . . **The primary objective of the ESCB shall be to maintain price stability. Without prejudice to that objective, it shall support the general economic policies in the Union** in order to contribute to the achievement of the latter's objectives.'	'Our main aim at the ECB is price stability. We serve people living in the euro area by working to preserve the value of the euro.'	Secondary	Consolidated version of the Treaty on the Functioning of the European Union	Mar-20	https://eur-lex.europa.eu/eli/treaty/tfeu_2016/2020-03-01/eng	https://www.ecb.europa.eu/mopo/html/index.en.html	Asset purchase programmes include sustainability-linked bonds.	2021	Asset purchase programmes	**3**	https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200922~482e4a5a90.en.html; https://www.ecb.europa.eu/ecb/access_to_documents/document/correspondence/shared/data/ecb.dr.cor20210326Lalucq_and_others.en.pdf?187d4b9e4b999f9e00419ccfd3870872; https://www.ecb.europa.eu/

														press/key/date/2021/html/ecb.sp210125~f87e826ca5.en.html
Euro area	AE	European Central Bank	'The European Central Bank, together with the national central banks, shall constitute the European System of Central Banks (ESCB). . . . **The primary objective of the ESCB shall be to maintain price stability. Without prejudice to that objective, it shall support the general economic policies in the Union** in order to contribute to the achievement of the latter's objectives.'	'Our main aim at the ECB is price stability. We serve people living in the euro area by working to preserve the value of the euro.'	Secondary	Consolidated version of the Treaty on the Functioning of the European Union	Mar-20	https://eur-lex.europa.eu/eli/treaty/tfeu_2016/2020-03-01/eng	https://www.ecb.europa.eu/mopo/html/index.en.html	Integration of climate scores in asset purchases under the Corporate Sector Purchase Programme and the Pandemic Emergency Purchase Programme, and subsequent tilting towards issuers with higher climate performance.	2022		Asset purchase programmes	**4**	https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220919~fae53c59bd.en.html; https://www.ecb.europa.eu/mopo/implement/app/html/ecb.cspp_climate_change-faq.en.html; https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704_annex~cb39c2dcbb.en.pdf?e1cc4f3420e8e9f906855410f40e73b5; https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op318~5276c392d6.fr.pdf?70e17d049b5a584be42f12279b15a88b; https://www.ecb.europa.eu/press/pr/date/2024/html/ecb.mp240125~f738889bde.en.html

Euro area	AE	European Central Bank	'The European Central Bank, together with the national central banks, shall constitute the European System of Central Banks (ESCB). . . . **The primary objective of the ESCB shall be to maintain price stability. Without prejudice to that objective, it shall support the general economic policies in the Union** in order to contribute to the achievement of the latter's objectives.'	'Our main aim at the ECB is price stability. We serve people living in the euro area by working to preserve the value of the euro.'	Secondary	Consolidated version of the Treaty on the Functioning of the European Union	Mar-20	https://eur-lex.europa.eu/eli/treaty/tfeu_2016/2020-03-01/eng		Incorporation of climate risks in the assessment of corporate bonds proposed as collateral.	2022		Collateral	**3**	https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704~4f48a72462.en.html; https://www.ecb.europa.eu/pub/conferences/shared/pdf/climate_change_and_monpol.pdf; https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704_annex~cb39c2dcbb.en.pdf?e; https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op318~5276c392d6.fr.pdf?70e17d049b5a584be42f12279b15a88b
Euro area	AE	European Central Bank	'The European Central Bank, together with the national central banks, shall constitute the European System of Central Banks (ESCB). . . . **The primary objective of the ESCB shall be to maintain price stability. Without prejudice to that objective, it shall support the general economic policies in the Union** in order to contribute to the achievement of the latter's objectives.'	'Our main aim at the ECB is price stability. We serve people living in the euro area by working to preserve the value of the euro.'	Secondary	Consolidated version of the Treaty on the Functioning of the European Union	Mar-20	https://eur-lex.europa.eu/eli/treaty/tfeu_2016/2020-03-01/eng	https://www.ecb.europa.eu/mopo/html/index.en.html		Reform of the collateral framework to limit the number of assets from high carbon-intensity issuers (expected as of the end of 2024).	Collateral	**2**	https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704~4f48a72462.en.html; https://www.ecb.europa.eu/pub/conferences/shared/pdf/climate_change_and_monpol.pdf; https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op318~5276c392d6.fr.pdf?70e17d049b5a584be42f12279b15a88b

Euro area	AE	European Central Bank	'The European Central Bank, together with the national central banks, shall constitute the European System of Central Banks (ESCB). . . . **The primary objective of the ESCB shall be to maintain price stability. Without prejudice to that objective, it shall support the general economic policies in the Union** in order to contribute to the achievement of the latter's objectives.'	'Our main aim at the ECB is price stability. We serve people living in the euro area by working to preserve the value of the euro.'	Secondary	Consolidated version of the Treaty on the Functioning of the European Union	Mar-20	https://eur-lex.europa.eu/eli/treaty/tfeu_2016/2020-03-01/eng	https://www.ecb.europa.eu/mopo/html/index.en.html			Companies subject to the EU Corporate Sustainability Reporting Directive must disclose their climate-related risks in line with the Directive to get their assets and credit claims accepted as collateral (expected from 2026).	Collateral	**2**	https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704~4f48a72462.en.html; https://www.ecb.europa.eu/pub/conferences/shared/pdf/climate_change_and_monpol.pdf; https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704_annex~cb39c2dcbb.en.pdf?e1cc4f3420e8e9f906855410f40e73b5
India	EMDE	Reserve Bank of India	'Whereas it is expedient to constitute a Reserve Bank for India to regulate the issue of Bank notes and the keeping of reserves with a view to securing monetary stability in [India] and generally to operate the currency and credit system of the country to its advantage . . . the primary objective of the monetary policy is to maintain price stability while keeping in mind the objective of growth.'	'Objective: maintaining price stability while keeping in mind the objective of growth.'	Not mentioned	The Reserve Bank of India Act, 1934	Aug-22	https://www.indiacode.nic.in/handle/123456789/2398	https://rbi.org.in/Scripts/AboutusDisplay.aspx	Priority Sector Lending (LSI) scheme. The facility offers loans at favourable terms for a range of projects, including renewable energies.	2012		Credit operations	**3**	https://rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=20563; https://rbi.org.in/scripts/BS_SpeechesView.aspx?Id=1344; https://www.rbi.org.in/Scripts/BS_ViewMasDirections.aspx?id=11959#M1
Indonesia	EMDE	Bank Indonesia	'The objective of Bank Indonesia is to achieve rupiah stability, maintain Payment System stability, and participate in maintaining Financial System Stability to	'Bank Indonesia is mandated with achieving rupiah stability, maintaining the stability of the payment system as well as preserving financial system	Not mentioned	Law of the Republic of Indonesia Number 23 of 1999 on Bank Indonesia	Mar-23	https://www.bi.go.id/en/tentang-bi/profil/uu-bi/Undang Undang%2	https://www.bi.go.id/en/fungsi-utama/moneter/Default.aspx	Investment in green and other sustainability-related bonds.	2019		Foreign exchange investments	**3**	https://www.bi.go.id/en/publikasi/laporan/Pages/LKBI-2022.aspx

			support sustainable economic growth.'	stability to support sustainable economic growth. . . . Rupiah stability implies price stability of goods and services as well as rupiah exchange rate stability. In general, the performance of prices for goods and services is measured by low and stable inflation, while rupiah exchange rate stability is measured against other currencies.'				0BI/The-Consolidation-of-Law-on-Bank-Indonesia.pdf					
Japan	AE	Bank of Japan	'(1) The purpose of the Bank of Japan, or the central bank of Japan, is to issue banknotes and to carry out currency and monetary control.(2) In addition to what is prescribed in the preceding paragraph, the Bank of Japan's purpose is to ensure smooth settlement of funds among banks and other financial institutions, thereby contributing to the maintenance of stability of the financial system. . . . The Bank of Japan conducts currency and monetary control, aiming at achieving price stability, thereby contributing to the sound development of the national economy.'	'The Bank of Japan, as the central bank of Japan, decides and implements monetary policy with the aim of maintaining price(1) stability. Price stability is important because it provides the foundation for the nation's economic activity.(1) 'Price' here denotes the overall level of prices of various goods and services.'	Not mentioned	The Bank of Japan Act	Jun-07	https://www.japaneselawtranslation.go.jp/en/laws/view/3788	https://www.boj.or.jp/en/mopo/outline/index.htm	Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth. This lending facility targeted a set of business areas, including the environmental.	2010	Credit operations	**3**	https://www.boj.or.jp/en/mopo/measures/term_cond/yoryo49.htm/; https://www.boj.or.jp/en/research/wps_rev/rev_2010/data/rev10e05.pdf; https://www.boj.or.jp/en/mopo/mpmdeci/mpr_2023/mpr230118a.pdf
Japan	AE	Bank of Japan	'(1) The purpose of the Bank of Japan, or the central bank of Japan, is to issue banknotes and to carry out currency and monetary control.	'The Bank of Japan, as the central bank of Japan, decides and implements monetary policy with the aim of maintaining price(1) stability. Price stability	Not mentioned	The Bank of Japan Act	Jun-07	https://www.japaneselawtranslation.go.jp/en/laws/view/3788	https://www.boj.or.jp/en/mopo/outline/index.htm	Investment in foreign green bonds, including the EMEAP Asian Green Bond Fund.	2021	Foreign exchange investments	**3**	https://www.boj.or.jp/en/about/press/koen_2021/data/ko210727a.pdf; https://www.boj.or.jp/en/ab

			(2) In addition to what is prescribed in the preceding paragraph, the Bank of Japan's purpose is to ensure smooth settlement of funds among banks and other financial institutions, thereby contributing to the maintenance of stability of the financial system. . . . The Bank of Japan conducts currency and monetary control, aiming at achieving price stability, thereby contributing to the sound development of the national economy.'	is important because it provides the foundation for the nation's economic activity. (1) 'Price' here denotes the overall level of prices of various goods and services.'									out/climate/tcfd22.pdf; https://www.bnm.gov.my/-/emeap-promote-green-bond-investment-via-abf; https://www.emeap.org/wp-content/uploads/2021/11/Final-2nd-Press-Release.pdf; https://www.boj.or.jp/en/intl_finance/meeting/un0412a.htm
Japan	AE	Bank of Japan	'(1) The purpose of the Bank of Japan, or the central bank of Japan, is to issue banknotes and to carry out currency and monetary control. (2) In addition to what is prescribed in the preceding paragraph, the Bank of Japan's purpose is to ensure smooth settlement of funds among banks and other financial institutions, thereby contributing to the maintenance of stability of the financial system. . . . The Bank of Japan conducts currency and monetary control, aiming at achieving price stability, thereby contributing to the sound development of the national economy.'	'The Bank of Japan, as the central bank of Japan, decides and implements monetary policy with the aim of maintaining price(1) stability. Price stability is important because it provides the foundation for the nation's economic activity. (1) 'Price' here denotes the overall level of prices of various goods and services.'	Not mentioned	The Bank of Japan Act	Jun-07	https://www.japaneselawtranslation.go.jp/en/laws/view/3788	https://www.boj.or.jp/en/mopo/outline/index.htm	Funds-Supplying Operations to Support Financing for Climate Change Responses.	2021		Credit operations	**5**	https://www.boj.or.jp/en/mopo/measures/mkt_ope/ope_x/index.htm; https://www.boj.or.jp/en/about/press/koen_2021/data/ko210727a.pdf; https://www.boj.or.jp/en/about/climate/tcfd22.pdf

Japan	AE	Bank of Japan	'(1) The purpose of the Bank of Japan, or the central bank of Japan, is to issue banknotes and to carry out currency and monetary control. (2) In addition to what is prescribed in the preceding paragraph, the Bank of Japan's purpose is to ensure smooth settlement of funds among banks and other financial institutions, thereby contributing to the maintenance of stability of the financial system. . . . The Bank of Japan conducts currency and monetary control, aiming at achieving price stability, thereby contributing to the sound development of the national economy.'	'The Bank of Japan, as the central bank of Japan, decides and implements monetary policy with the aim of maintaining price[(1)] stability. Price stability is important because it provides the foundation for the nation's economic activity. [(1)] 'Price' here denotes the overall level of prices of various goods and services.'	Not mentioned	The Bank of Japan Act	Jun-07	https://www.japaneselawtranslation.go.jp/en/laws/view/3788	https://www.boj.or.jp/en/mopo/outline/index.htm	The purchase and sale of government bonds include Japan Climate Transition Bonds.	2024		Asset purchase programmes	**3**	https://www.boj.or.jp/en/mopo/mpmdeci/mpr_2023/mpr231207a.pdf; https://www.boj.or.jp/en/mopo/mpmdeci/mpr_2023/mpr231207b.pdf
Korea	AE	Bank of Korea	'Article 1 (Purpose) (1) The purpose of this Act is to contribute to the sound development of national economy by establishing the Bank of Korea and seeking the price stabilization through the establishment and execution of efficient monetary and credit policies. (2) The Bank of Korea shall take heed of financial stability in performing its monetary and credit policies.'	'The Bank of Korea Act stipulates that the purpose of this Act is 'to contribute to the sound development of the national economy by pursuing price stability through the formulation and implementation of efficient monetary policy.' Accordingly, the Bank of Korea takes price stability as the most important objective of its monetary policy. . . . for the national economy to achieve stable growth, it should be supported by not only price stability but also financial stability.	Not mentioned	Bank of Korea Act	Mar-18	https://elaw.klri.re.kr/eng_service/lawView.do?lang=ENG&hseq=47917	https://www.bok.or.kr/eng/main/contents.do?menuNo=400012	Investment in ESG stocks.	2019		Foreign exchange investments	**3**	https://www.bok.or.kr/eng/bbs/E0000740/view.do?nttId=10065233&menuNo=400204; https://www.bok.or.kr/eng/bbs/E0000740/view.do?nttId=10071574&menuNo=400204&pageIndex=1; 2311https://www.bok.or.kr/eng/bbs/E0000634/view.do?nttId=10067642&menuNo=400069; https://www.bok.or.kr/eng/bbs/E0000740/view.do?nttId=

				Regarding this, Article 1, Clause 2 of the Bank of Korea Act stipulates that 'The Bank of Korea needs to pay attention to financial stability in the implementation of monetary policy.' Thus, the Bank of Korea is also making policy efforts to maintain financial stability while pursuing price stability through implementing its monetary policy.'										10078310&menuNo=40022
Korea	AE	Bank of Korea	'Article 1 (Purpose) (1) The purpose of this Act is to contribute to the sound development of national economy by establishing the Bank of Korea and seeking the price stabilization through the establishment and execution of efficient monetary and credit policies. (2) The Bank of Korea shall take heed of financial stability in performing its monetary and credit policies.'	'The Bank of Korea Act stipulates that the purpose of this Act is 'to contribute to the sound development of the national economy by pursuing price stability through the formulation and implementation of efficient monetary policy.' Accordingly, the Bank of Korea takes price stability as the most important objective of its monetary policy. . . . for the national economy to achieve stable growth, it should be supported by not only price stability but also financial stability. Regarding this, Article 1, Clause 2 of the Bank of Korea Act stipulates that 'The Bank of Korea needs to pay attention to financial stability in the implementation of monetary policy.' Thus, the Bank of Korea is also making policy efforts to maintain financial stability while pursuing price stability	Not mentioned	Bank of Korea Act	Mar-18	https://elaw.klri.re.kr/eng_service/lawView.do?lang=ENG&hseq=47917	https://www.bok.or.kr/eng/main/contents.do?menuNo=400012	Application of a negative screening in foreign exchange investments to exclude firms that do not embed ESG standards in investment decisions.	2022		Foreign exchange investments	**4**	https://www.bok.or.kr/eng/bbs/E0000634/view.do?nttId=10067642&menuNo=400069; https://www.bok.or.kr/eng/bbs/E0000740/view.do?nttId=10078310&menuNo=40022

				through implementing its monetary policy.'										
Korea	AE	Bank of Korea	'Article 1 (Purpose) (1) The purpose of this Act is to contribute to the sound development of national economy by establishing the Bank of Korea and seeking the price stabilization through the establishment and execution of efficient monetary and credit policies. (2) The Bank of Korea shall take heed of financial stability in performing its monetary and credit policies.'	'The Bank of Korea Act stipulates that the purpose of this Act is 'to contribute to the sound development of the national economy by pursuing price stability through the formulation and implementation of efficient monetary policy.' Accordingly, the Bank of Korea takes price stability as the most important objective of its monetary policy. . . . for the national economy to achieve stable growth, it should be supported by not only price stability but also financial stability. Regarding this, Article 1, Clause 2 of the Bank of Korea Act stipulates that 'The Bank of Korea needs to pay attention to financial stability in the implementation of monetary policy.' Thus, the Bank of Korea is also making policy efforts to maintain financial stability while pursuing price stability through implementing its monetary policy.'	Not mentioned	Bank of Korea Act	Mar-18	https://elaw.klri.re.kr/eng_service/lawView.do?lang=ENG&hseq=47917	https://www.bok.or.kr/eng/main/contents.do?menuNo=400012		Funding of firms that contribute to green growth through the established Financial Intermediated Lending Support Facility.	Credit operations	**1**	https://www.bok.or.kr/eng/bbs/E0000740/view.do?nttId=10071574&menuNo=400204&pageIndex=1; https://www.bok.or.kr/eng/bbs/E0000634/view.do?nttId=10067642&menuNo=400069; https://www.bok.or.kr/eng/bbs/E0000737/view.do?nttId=10069646&menuNo=400219

Korea	AE	Bank of Korea	'Article 1 (Purpose)(1) The purpose of this Act is to contribute to the sound development of national economy by establishing the Bank of Korea and seeking the price stabilization through the establishment and execution of efficient monetary and credit policies.(2) The Bank of Korea shall take heed of financial stability in performing its monetary and credit policies.'	'The Bank of Korea Act stipulates that the purpose of this Act is "to contribute to the sound development of the national economy by pursuing price stability through the formulation and implementation of efficient monetary policy". Accordingly, the Bank of Korea takes price stability as the most important objective of its monetary policy. . . . for the national economy to achieve stable growth, it should be supported by not only price stability but also financial stability. Regarding this, Article 1, Clause 2 of the Bank of Korea Act stipulates that 'The Bank of Korea needs to pay attention to financial stability in the implementation of monetary policy.' Thus, the Bank of Korea is also making policy efforts to maintain financial stability while pursuing price stability through implementing its monetary policy.'	Not mentioned	Bank of Korea Act	Mar-18	https://elaw.klri.re.kr/eng_service/lawView.do?lang=ENG&hseq=47917	https://www.bok.or.kr/eng/main/contents.do?menuNo=400012		Green bonds as part of eligible collateral for lending operations.	Collateral	**1**	https://www.bok.or.kr/eng/bbs/E0000740/view.do?nttId=10071574&menuNo=400204&pageIndex=1; https://www.bok.or.kr/eng/bbs/E0000634/view.do?nttId=10067642&menuNo=400069
Mexico	EMDE	Banco de México	'The purpose of Banco de México shall be the provision of national currency to the Mexican economy. In pursuing this purpose, its main objective shall be to procure the stability of the purchasing power of said currency. The Bank shall also have as purposes, promoting	'The main goal of Banco de México is to preserve the value of Mexico's currency in the long term in order to improve Mexicans' well-being.'	Not mentioned	Banco de México Law	Jan-14	https://www.banxico.org.mx/regulations-and-supervision/legal-framework/banco-de-mexico-law/%7B073CCF98-39BE-	https://www.banxico.org.mx/getting-to-know-banco-de-mexico/mission-and-vision-objetives-.html	ESG elements in the purchase and risk management of foreign exchange reserves.	2021	Foreign exchange investments	**3**	https://www.banxico.org.mx/financial-system/d/%7B80FDF3B4-F5C1-E88F-442E-EF77C6A7BE59%7D.pdf

			the sound development of the financial system and fostering the proper functioning of the payment systems.'					EC8F-E03E-6D4CFFC9FA1A%7D.pdf							
Norway	AE	Norges Bank	'(1) The purpose of central banking operations is to maintain a stable monetary value and promote stability in the financial system and an efficient and secure payment system. (2) **The central bank must contribute to high and stable production and employment**.'	'The primary objective of monetary policy is to maintain monetary stability by keeping inflation low and stable. This is articulated in the Regulation on Monetary Policy by specifying that the operational target is annual consumer price inflation of close to 2 percent over time. The Regulation also states that inflation targeting shall be forward-looking and flexible so that it can contribute to high and stable output and employment and to counteracting the build-up of financial imbalances.'	Secondary	Central Bank Act	Nov-20	https://www.norges-bank.no/en/topics/about/Mission-core-responsibilities/Legislation/Central-Bank-Act/	https://www.norges-bank.no/en/topics/Monetary-policy/monetary-policy-strategy/	The Bank does not invest in companies excluded from the Government Pension Fund (GPFG) due to incompatibility with environmental and other sustainability criteria. This measure has been in force at least since 2016, when it was first mentioned in the Bank's Annual Report.	2016		Foreign exchange investments	**4**	https://www.norges-bank.no/contentassets/e31db2c97ccb4ccc9e89199a811f5593/2016_annual_report.pdf?v=04/06/2017121801; www.norges-bank.no/globalassets/upload/om-norges-bank/klima/statement-by-norges-bank-to-the-cop26.pdf?v=11/03/2021113236&ft=.pdf; https://www.norges-bank.no/contentassets/e7f1824db12b4c9b98cc60588d9d7341/corporate-social-responsibility-2020.pdf; https://www.nbim.no/en/responsible-investment/2025-climate-action-plan/; https://files.nettsteder.regjeringen.no/wpuploads01/sites/275/2021/11/Guidelines-for-Observation-and-Exclusion-GPFG-29-

														November-2021.pdf
Poland	EMDE	National Bank of Poland	'The basic objective of the activity of NBP shall be to **maintain price stability, while supporting the economic policy of the Government, insofar as this does not constrain the pursuit of the basic objective** of NBP.'	'The basic statutory objective of monetary policy is to maintain price stability. At the same time, monetary policy is conducted in a way that helps maintain sustainable economic growth and financial stability. . . . According to the Monetary Policy Guidelines, monetary policy parameters, including NBP interest rates, are adjusted to the economic situation so as to ensure long-term price stability and, at the same time, support sustainable economic growth and financial stability.'	Secondary	The Act on Narodowy Bank Polski	Sep-22	https://nbp.pl/wp-content/uploads/2022/10/the_act_on_the_nbp.pdf	https://nbp.pl/en/monetary-policy/	Increased exposure to green bonds and sustainable development bonds to support funding sustainable development.	2021		Foreign exchange investments	**3**	https://nbp.pl/wp-content/uploads/2023/02/Annual-Report-2021.pdf
Russia	EMDE	Bank of Russia	'The purposes of the Bank of Russia shall be as follows: to protect the ruble and ensure its stability to develop and strengthen the banking system of the Russian Federation; to ensure stability of and develop the national payment system; to develop the financial market of the Russian Federation; to ensure stability of the financial market of the Russian Federation. . . . The principal objective of the Bank of Russia's monetary policy shall be to protect and ensure stability of the ruble by way of maintaining	'The key goal of the Bank of Russia's monetary policy is to maintain price stability, that is, sustainably low inflation.'	Not mentioned	Federal Law on the Central Bank of the Russian Federation (Bank of Russia)	Aug-23	https://www.cbr.ru/Content/Document/File/37343/law_cb_e.pdf	https://www.cbr.ru/eng/dkp/objective_and_principles/					**0**	

			price stability, including for the creation of conditions for balanced and sustainable economic development.'											
Saudi Arabia	EMDE	Saudi Central Bank	'The objectives of the Bank are as follows: 1. Maintaining monetary stability. 2. Supporting the stability of the financial sector and promoting trust therein. 3. **Supporting economic growth**.'	'SAMA's mission is to maintain monetary and financial stability in kingdom and support a balanced and sustainable economic growth.'	First	Saudi Central Bank Law	Nov-20	https://www.sama.gov.sa/en-US/Documents/SCB-EN.pdf	https://www.sama.gov.sa/en-US/About/Pages/SAMAFunction.aspx				**0**	
Sweden	AE	Sveriges Riksbank	'The overriding objective of the Riksbank is to maintain permanently low and stable inflation (the price stability target). **Without neglecting the price stability objective, the Riksbank shall contribute to a balanced development of production and employment (consideration for the real economy).**'	'The objective of monetary policy is to maintain a low and stable rate of inflation. More precisely target is to hold CPIF inflation at around 2 per cent a year. Without neglecting the inflation target, the Riksbank shall moreover contribute to a balanced development of output and employment. Monetary policy is the measures the Riksbank takes to achieve this.'	Secondary	Sveriges Riksbank Act	Nov-22	https://www.riksbank.se/en-gb/about-the-riksbank/how-the-riksbank-is-governed/the-sveriges-riksbank-act	https://www.riksbank.se/en-gb/monetary-policy/	Sustainability considerations in the choice of foreign assets.	2019		Foreign exchange investments	**3**	https://www.riksbank.se/en-gb/financial-stability/financial-stability-report/2019/financial-stability-report-20192; https://www.riksbank.se/globalassets/media/rapporter/ppr/fordjupningar/engelska/2020/how-is-the-riksbanks-work-affected-by-climate-change-article-in-monetary-policy-report-november-2020.pdf; https://www.riksbank.se/globalassets/media/rapporter/klimatrapport/2023/klimatrapport-pdf/the-riksbanks-climate-report-2023.pdf

Sweden	AE	Sveriges Riksbank	'The overriding objective of the Riksbank is to maintain permanently low and stable inflation (the price stability target). **Without neglecting the price stability objective, the Riksbank shall contribute to a balanced development of production and employment (consideration for the real economy).**'	'The objective of monetary policy is to maintain a low and stable rate of inflation. More precisely target is to hold CPIF inflation at around 2 per cent a year. Without neglecting the inflation target, the Riksbank shall moreover contribute to a balanced development of output and employment. Monetary policy is the measures the Riksbank takes to achieve this.'	Secondary	Sveriges Riksbank Act	Nov-22	https://www.riksbank.se/en-gb/about-the-riksbank/how-the-riksbank-is-governed/the-sveriges-riksbank-act	https://www.riksbank.se/en-gb/monetary-policy/	Purchases of corporate bonds through a norms-based negative screening. Only bonds issued by companies deemed to comply with sustainability norms are eligible for purchase.	2021	Asset purchase programmes	**4**	https://www.riksbank.se/globalassets/media/rapporter/klimatrapport/2021/the-riksbanks-climate-report-december-2021.pdf; https://www.riksbank.se/globalassets/media/rapporter/klimatrapport/2023/klimatrapport-pdf/the-riksbanks-climate-report-2023.pdf; https://www.riksbank.se/globalassets/media/rapporter/ekonomiska-kommentarer/engelska/2021/sustainability-considerations-when-purchasing-corporate-bonds.pdf; https://www.riksbank.se/globalassets/media/riksbanken/hallbarhetsstrategi/engelska/sustainability-strategy-for-the-riksbank.pdf

Sweden	AE	Sveriges Riksbank	'The overriding objective of the Riksbank is to maintain permanently low and stable inflation (the price stability target). **Without neglecting the price stability objective, the Riksbank shall contribute to a balanced development of production and employment (consideration for the real economy).**'	'The objective of monetary policy is to maintain a low and stable rate of inflation. More precisely target is to hold CPIF inflation at around 2 per cent a year. Without neglecting the inflation target, the Riksbank shall moreover contribute to a balanced development of output and employment. Monetary policy is the measures the Riksbank takes to achieve this.'	Secondary	Sveriges Riksbank Act	Nov-22	https://www.riksbank.se/en-gb/about-the-riksbank/how-the-riksbank-is-governed/the-sveriges-riksbank-act	https://www.riksbank.se/en-gb/monetary-policy/	Security purchases included green municipal and government bonds.	2021		Asset purchase programmes	**3**	https://www.riksbank.se/globalassets/media/rapporter/ppr/engelska/2020/201126/annex-to-the-minutes-b-programme-for-the-riksbanks-asset-purchases-for-monetary-policy-purposes-in-2021.pdf; https://www.riksbank.se/globalassets/media/rapporter/ppr/penningpolitiska-rapporter-och-uppdateringar/engelska/2020/monetary-policy-report-november-2020.pdf; https://www.riksbank.se/en-gb/press-and-published/notices-and-press-releases/press-releases/2020/zero-policy-rate-and-extended-asset-purchases
Sweden	AE	Sveriges Riksbank	'The overriding objective of the Riksbank is to maintain permanently low and stable inflation (the price stability target). **Without neglecting the price stability objective, the Riksbank shall**	'The objective of monetary policy is to maintain a low and stable rate of inflation. More precisely target is to hold CPIF inflation at around 2 per cent a year. Without neglecting the inflation target, the Riksbank	Secondary	Sveriges Riksbank Act	Nov-22	https://www.riksbank.se/en-gb/about-the-riksbank/how-the-riksbank-is-governed/	https://www.riksbank.se/en-gb/monetary-policy/	Purchases of corporate bonds from companies that report their annual emissions in line with the TCFD	2022		Asset purchase programmes	**4**	https://www.riksbank.se/globalassets/media/rapporter/klimatrapport/2023/klimatrapport-pdf/the-riksbanks-climate-

			contribute to a balanced development of production and employment (consideration for the real economy).'	shall moreover contribute to a balanced development of output and employment. Monetary policy is the measures the Riksbank takes to achieve this.'				the-sveriges-riksbank-act		recommendations.				report-2023.pdf
Sweden	AE	Sveriges Riksbank	'The overriding objective of the Riksbank is to maintain permanently low and stable inflation (the price stability target). **Without neglecting the price stability objective, the Riksbank shall contribute to a balanced development of production and employment (consideration for the real economy).**'	'The objective of monetary policy is to maintain a low and stable rate of inflation. More precisely target is to hold CPIF inflation at around 2 per cent a year. Without neglecting the inflation target, the Riksbank shall moreover contribute to a balanced development of output and employment. Monetary policy is the measures the Riksbank takes to achieve this.'	Secondary	Sveriges Riksbank Act	Nov-22	https://www.riksbank.se/en-gb/about-the-riksbank/how-the-riksbank-is-governed/the-sveriges-riksbank-act	https://www.riksbank.se/en-gb/monetary-policy/		Evaluation of how collateral policy can incorporate sustainability and climate change criteria.	Collateral	**1**	https://www.riksbank.se/globalassets/media/rapporter/ovriga-rapporter/joint-pledge-from-the-swedish-members-of-the-ngfs-at-the-occasion-of-the-ngfs-glasgow-declaration-during-cop26.pdf
Switzerland	AE	Swiss National Bank	'The National Bank shall pursue a monetary policy serving the interests of the country as a whole. It shall ensure price stability. In so doing, it shall take due account of economic developments. Within this framework, it shall have the following tasks: a. It shall provide the Swiss franc money market with liquidity. b. It shall ensure the supply and distribution of cash. c. It shall facilitate and secure the operation of cashless payment systems. d. It shall manage the currency reserves.	'Article 99 of the Federal Constitution entrusts the SNB, as an independent central bank, with the conduct of monetary policy in the interests of the country as a whole. The mandate is explained in detail in the National Bank Act (art. 5 para. 1), which requires the SNB to ensure price stability and, in so doing, to take due account of economic developments. The SNB is thus charged with resolving in the best general interests any conflicts arising between the objective of price stability and business cycle	Not mentioned	Federal Act on the Swiss National Bank	Sep-23	https://www.fedlex.admin.ch/eli/cc/2004/221/en; https://www.snb.ch/en/mmr/reference/Bundesverfassung_Art_99/source/Art_99_Geld_und_Waehrung_en.pdf	https://www.snb.ch/en/iabout/monpol/id/monpol_strat#t2	The Bank does not invest in companies that severely damage the environment, including coal mining.	2013	Foreign exchange investments	**4**	https://www.snb.ch/en/mmr/reference/annrep_2021_rechenschaft/source/annrep_2021_rechenschaft.en.pdf; https://www.snb.ch/en/publications/communication/speeches/2020/ref_20201217_tjn; https://www.snb.ch/dam/jcr:17c7cb74-7d66-4a13-adc9-8ea1dcc5a086/snb_legal_richtlinien.en.pdf; https://www.s

			e. It shall contribute to the stability of the financial system.'	considerations, giving priority to price stability. The requirement to act in the interests of the country as a whole also means that the SNB must gear its policy to the needs of the entire Swiss economy rather than the interests of individual regions or industries. . . . The objective of the SNB's monetary policy is to ensure price stability in the medium and long term.'										nb.ch/en/mmr/reference/annrep_2022_komplett/source/annrep_2022_komplett.en.pdf; https://www.snb.ch/en/mmr/speeches/id/ref_20191114_amrtmo/source/ref_20191114_amrtmo.en.pdf
Switzerland	AE	Swiss National Bank	'The National Bank shall pursue a monetary policy serving the interests of the country as a whole. It shall ensure price stability. In so doing, it shall take due account of economic developments. Within this framework, it shall have the following tasks: a. It shall provide the Swiss franc money market with liquidity. b. It shall ensure the supply and distribution of cash. c. It shall facilitate and secure the operation of cashless payment systems. d. It shall manage the currency reserves. e. It shall contribute to the stability of the financial system.'	'Article 99 of the Federal Constitution entrusts the SNB, as an independent central bank, with the conduct of monetary policy in the interests of the country as a whole. The mandate is explained in detail in the National Bank Act (art. 5 para. 1), which requires the SNB to ensure price stability and, in so doing, to take due account of economic developments. The SNB is thus charged with resolving in the best general interests any conflicts arising between the objective of price stability and business cycle considerations, giving priority to price stability. The requirement to act in the interests of the country as a whole also means that the SNB must gear its policy to the needs of the entire	Not mentioned	Federal Act on the Swiss National Bank	Sep-23	https://www.fedlex.admin.ch/eli/cc/2004/221/en; https://www.snb.ch/en/mmr/reference/Bundesverfassung_Art_99/source/Art_99_Geld_und_Waehrung_en.pdf	https://www.snb.ch/en/iabout/monpol/id/monpol_strat#t2	Foreign investment portfolio includes green bonds.	2019		Foreign exchange investments	**3**	https://www.snb.ch/en/mmr/speeches/id/ref_20191114_amrtmo/source/ref_20191114_amrtmo.en.pdf

				Swiss economy rather than the interests of individual regions or industries. . . . The objective of the SNB's monetary policy is to ensure price stability in the medium and long term.'										
Thailand	EMDE	Bank of Thailand	'The BOT's objectives are to carry on such tasks as pertain to central banking in order to maintain monetary stability, financial institution system stability and payment systems stability. To undertake the tasks in paragraph one, the implementation of economic policy of the government shall be taken into consideration. . . . The Monetary Policy Board shall have powers and duties conferred as follows; (1) determining targets of national monetary policy, provided that the fundamental state policies, national economic and monetary status shall be taken into consideration; (2) determining policies of managing the currency exchange under the exchange rate regime as to the law on currency; (3) determining any necessary measure in compliance with the target and policies in (1) and (2); (4) monitoring the BOT's implementation	'Monetary policy is a central bank's tool for determining the cost of borrowing and money supply in an economy. The Bank of Thailand uses the policy interest rate as a key instrument of the monetary policy. The Bank of Thailand pursues three goals with its monetary policy: medium-term price stability, sustainable economic growth, and financial stability.'	Not mentioned	Bank of Thailand Act	Oct-18	https://www.bot.or.th/content/dam/bot/documents/en/laws-and-rules/laws-and-regulations/legal-department/1-bot-act/1.1%20LAW01_BOTAct.pdf	https://www.bot.or.th/en/our-roles/monetary-policy/about-monetary-policy.html	ESG criteria in the selection of investments, including the exclusion of industries harmful to society and the environment, 'such as casinos, brewers and tobacco' (BOT, p. 108, 2022).	2022		Foreign exchange investments	**4**	https://www.bot.or.th/content/dam/bot/documents/en/research-and-publications/reports/annual-report/AnnualReport2022.pdf

			according to (3) to be correct and efficient.'											
Thailand	EMDE	Bank of Thailand	'The BOT's objectives are to carry on such tasks as pertain tocentral banking in order to maintain monetary stability, financial institution system stability and payment systems stability. To undertake the tasks in paragraph one, the implementation of economic policy of the government shall be taken into consideration. . . . The Monetary Policy Board shall have powers and duties conferred as follows; (1) determining targets of national monetary policy, provided that the fundamental state policies, national economic and monetary status shall be taken into consideration; (2) determining policies of managing the currency exchange under the exchange rate regime as to the law on currency; (3) determining any necessary measure in compliance with the target and policies in (1) and (2); (4) monitoring the BOT's implementation according to (3) to be correct and efficient.'	'Monetary policy is a central bank's tool for determining the cost of borrowing and money supply in an economy. The Bank of Thailand uses the policy interest rate as a key instrument of the monetary policy. The Bank of Thailand pursues three goals with its monetary policy: medium-term price stability, sustainable economic growth, and financial stability.'	Not mentioned	Bank of Thailand Act	Oct-18	https://www.bot.or.th/content/dam/bot/documents/en/laws-and-rules/laws-and-regulations/legal-department/1-bot-act/1.1%20LAW01_BOTAct.pdf	https://www.bot.or.th/en/our-roles/monetary-policy/about-monetary-policy.html	ESG criteria in the selection of 'counterparties and external fund managers' (BOT, 2022, p. 109).	2022	Foreign exchange investments	**3**	https://www.bot.or.th/content/dam/bot/documents/en/research-and-publications/reports/annual-report/AnnualReport2022.pdf.html

Thailand	EMDE	Bank of Thailand	'The BOT's objectives are to carry on such tasks as pertain to central banking in order to maintain monetary stability, financial institution system stability and payment systems stability. To undertake the tasks in paragraph one, the implementation of economic policy of the government shall be taken into consideration. . . . The Monetary Policy Board shall have powers and duties conferred as follows; (1) determining targets of national monetary policy, provided that the fundamental state policies, national economic and monetary status shall be taken into consideration; (2) determining policies of managing the currency exchange under the exchange rate regime as to the law on currency; (3) determining any necessary measure in compliance with the target and policies in (1) and (2); (4) monitoring the BOT's implementation according to (3) to be correct and efficient.'	'Monetary policy is a central bank's tool for determining the cost of borrowing and money supply in an economy. The Bank of Thailand uses the policy interest rate as a key instrument of the monetary policy. The Bank of Thailand pursues three goals with its monetary policy: medium-term price stability, sustainable economic growth, and financial stability.'	Not mentioned	Bank of Thailand Act	Oct-18	https://www.bot.or.th/content/dam/bot/documents/en/laws-and-rules/laws-and-regulations/legal-department/1-bot-act/1.1%20LAW01_BOTAct.pdf	https://www.bot.or.th/en/our-roles/monetary-policy/about-monetary-policy.html	Special loan facility to support the economic recovery from COVID-19. It included funding at favourable terms for investments in 'digital technology, green business practices and innovation' (BOT, 2022, p. 5).	2022		Credit operations	**3**	https://www.bot.or.th/content/dam/bot/documents/en/our-roles/monetary-policy/mpc-publication/monetary-policy-report/MPR_2022_Q3.pdf; https://www.bot.or.th/content/dam/bot/documents/en/research-and-publications/reports/annual-report/AnnualReport2021_En.pdf; https://www.bot.or.th/content/dam/bot/documents/en/research-and-publications/reports/annual-report/AnnualReport2022.pdf

Thailand	EMDE	Bank of Thailand	'The BOT's objectives are to carry on such tasks as pertain to central banking in order to maintain monetary stability, financial institution system stability and payment systems stability. To undertake the tasks in paragraph one, the implementation of economic policy of the government shall be taken into consideration. . . . The Monetary Policy Board shall have powers and duties conferred as follows; (1) determining targets of national monetary policy, provided that the fundamental state policies, national economic and monetary status shall be taken into consideration; (2) determining policies of managing the currency exchange under the exchange rate regime as to the law on currency; (3) determining any necessary measure in compliance with the target and policies in (1) and (2); (4) monitoring the BOT's implementation according to (3) to be correct and efficient.'	'Monetary policy is a central bank's tool for determining the cost of borrowing and money supply in an economy. The Bank of Thailand uses the policy interest rate as a key instrument of the monetary policy. The Bank of Thailand pursues three goals with its monetary policy: medium-term price stability, sustainable economic growth, and financial stability.'	Not mentioned	Bank of Thailand Act	Oct-18	https://www.bot.or.th/content/dam/bot/documents/en/laws-and-rules/laws-and-regulations/legal-department/1-bot-act/1.1%20LAW01_BOTAct.pdf	https://www.bot.or.th/en/our-roles/monetary-policy/about-monetary-policy.html		Low-interest rate loans to support SMEs in the transitional phase.	Credit operations	**1**	https://www.bot.or.th/content/dam/bot/financial-innovation/sustainable-finance/green/GreenDirectionalPaper-EN.pdf

Turkey	EMDE	Central Bank of the Republic of Turkey	'The primary objective of the Bank shall be to maintain price stability … The Bank shall, **provided that it shall not conflict with the objective of maintaining price stability, support the growth and employment policies of the Government**.'	'The CBRT Law sets the primary objective of the Central Bank as to achieve and maintain price stability in Türkiye.'	Secondary	The Law on the Central Bank of the Republic of Türkiye	Jan-22	https://www.tcmb.gov.tr/wps/wcm/connect/d6ac47f4-379f-43da-bf2b-7ad855dca0ff/The_Law_on_the_Central_Bank_of_the_Republic_of_Turkiye.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-d6ac47f4-379f-43da-bf2b-7ad855dca0ff-nWcODLa	https://www.tcmb.gov.tr/wps/wcm/connect/en/tcmb+en/main+menu/core+functions/monetary+policy				**0**	
United Kingdom	AE	Bank of England	'In relation to monetary policy, the objectives of the Bank of England shall be— (a) to maintain price stability, and (b) **subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment**.'	'Low and stable inflation is good for the UK's economy and it is our main monetary policy aim. We also support the Government's other economic aims for growth and employment. Sometimes, in the short term, we need to balance our target of low inflation with supporting economic growth and jobs. Every year, the Chancellor sets out a framework under which we have to set monetary policy.'	Secondary	Bank of England Act 1998	Jan-24	https://www.legislation.gov.uk/ukpga/1998/11/contents	https://www.bankofengland.co.uk/monetary-policy	Climate risk considerations in the assessment of collateral.	2019	Collateral	**3**	https://www.bankofengland.co.uk/-/media/boe/files/annual-report/2020/climate-related-financial-disclosure-report-2019-20.pdf; https://www.bankofengland.co.uk/prudential-regulation/publication/2021/june/climate-related-financial-disclosure-2020-21

United Kingdom	AE	Bank of England	'In relation to monetary policy, the objectives of the Bank of England shall be— (a) to maintain price stability, and (b) **subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment**.'	'Low and stable inflation is good for the UK's economy and it is our main monetary policy aim. We also support the Government's other economic aims for growth and employment. Sometimes, in the short term, we need to balance our target of low inflation with supporting economic growth and jobs. Every year, the Chancellor sets out a framework under which we have to set monetary policy.'	Secondary	Bank of England Act 1998	Jan-24	https://www.legislation.gov.uk/ukpga/1998/11/contents	https://www.bankofengland.co.uk/monetary-policy	The Asset Purchase Facility includes UK green gilts.	2021		Asset purchase programmes	**3**	https://www.bankofengland.co.uk/news/2021/july/green-gilt-eligibility-in-boe-market-operations; https://www.bankofengland.co.uk/markets/market-notices/2021/july/green-gilt-eligibility-in-boe-market-operations-market-notice-july-2021
United Kingdom	AE	Bank of England	'In relation to monetary policy, the objectives of the Bank of England shall be— (a) to maintain price stability, and (b) **subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment**.'	'Low and stable inflation is good for the UK's economy and it is our main monetary policy aim. We also support the Government's other economic aims for growth and employment. Sometimes, in the short term, we need to balance our target of low inflation with supporting economic growth and jobs. Every year, the Chancellor sets out a framework under which we have to set monetary policy.'	Secondary	Bank of England Act 1998	Jan-24	https://www.legislation.gov.uk/ukpga/1998/11/contents	https://www.bankofengland.co.uk/monetary-policy	The collateral framework accepts UK green gilts.	2021		Collateral	**3**	https://www.bankofengland.co.uk/news/2021/july/green-gilt-eligibility-in-boe-market-operations; https://www.bankofengland.co.uk/markets/market-notices/2021/july/green-gilt-eligibility-in-boe-market-operations-market-notice-july-2021

United Kingdom	AE	Bank of England	'In relation to monetary policy, the objectives of the Bank of England shall be— (a) to maintain price stability, and (b) **subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment**.'	'Low and stable inflation is good for the UK's economy and it is our main monetary policy aim. We also support the Government's other economic aims for growth and employment. Sometimes, in the short term, we need to balance our target of low inflation with supporting economic growth and jobs. Every year, the Chancellor sets out a framework under which we have to set monetary policy.'	Secondary	Bank of England Act 1998	Jan-24	https://www.legislation.gov.uk/ukpga/1998/11/contents	https://www.bankofengland.co.uk/monetary-policy	Corporate Bond Purchase Scheme Greening Framework. The framework includes **disclosure of climate targets by firms**, ineligibility of coal mining activities and tilting of purchases towards climate performers.	2021		Asset purchase programmes	**4**	https://www.bankofengland.co.uk/markets/greening-the-corporate-bond-purchase-scheme; https://www.bankofengland.co.uk/prudential-regulation/publication/2022/june/the-bank-of-englands-climate-related-financial-disclosure-2022; https://www.bankofengland.co.uk/climate-change/the-bank-of-englands-climate-related-financial-disclosure-2023
United Kingdom	AE	Bank of England	'In relation to monetary policy, the objectives of the Bank of England shall be— (a) to maintain price stability, and(b) **subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment**.'	'Low and stable inflation is good for the UK's economy and it is our main monetary policy aim. We also support the Government's other economic aims for growth and employment. Sometimes, in the short term, we need to balance our target of low inflation with supporting economic growth and jobs. Every year, the Chancellor sets out a framework under which we have	Secondary	Bank of England Act 1998	Jan-24	https://www.legislation.gov.uk/ukpga/1998/11/contents	https://www.bankofengland.co.uk/monetary-policy	Corporate Bond Purchase Scheme Greening Framework. The framework includes disclosure of climate targets by firms, **ineligibility of coal mining activities** and tilting of purchases towards climate performers.	2021		Asset purchase programmes	**4**	https://www.bankofengland.co.uk/markets/greening-the-corporate-bond-purchase-scheme; https://www.bankofengland.co.uk/prudential-regulation/publication/2022/june/the-bank-of-englands-climate-related-financial-disclosure-

				to set monetary policy.'										2022; https://www.bankofengland.co.uk/climate-change/the-bank-of-englands-climate-related-financial-disclosure-2023
United Kingdom	AE	Bank of England	'In relation to monetary policy, the objectives of the Bank of England shall be— (a) to maintain price stability, and (b) **subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment**.'	'Low and stable inflation is good for the UK's economy and it is our main monetary policy aim. We also support the Government's other economic aims for growth and employment. Sometimes, in the short term, we need to balance our target of low inflation with supporting economic growth and jobs. Every year, the Chancellor sets out a framework under which we have to set monetary policy.'	Secondary	Bank of England Act 1998	Jan-24	https://www.legislation.gov.uk/ukpga/1998/11/contents	https://www.bankofengland.co.uk/monetary-policy	Corporate Bond Purchase Scheme Greening Framework. The framework includes disclosure of climate targets by firms, ineligibility of coal mining activities and **tilting of purchases towards climate performers**.	2021		Asset purchase programmes	**4**	https://www.bankofengland.co.uk/markets/greening-the-corporate-bond-purchase-scheme; https://www.bankofengland.co.uk/prudential-regulation/publication/2022/june/the-bank-of-englands-climate-related-financial-disclosure-2022; https://www.bankofengland.co.uk/climate-change/the-bank-of-englands-climate-related-financial-disclosure-2023

United Kingdom	AE	Bank of England	'In relation to monetary policy, the objectives of the Bank of England shall be— (a) to maintain price stability, and (b) **subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment**.'	'Low and stable inflation is good for the UK's economy and it is our main monetary policy aim. We also support the Government's other economic aims for growth and employment. Sometimes, in the short term, we need to balance our target of low inflation with supporting economic growth and jobs. Every year, the Chancellor sets out a framework under which we have to set monetary policy.'	Secondary	Bank of England Act 1998	Jan-24	https://www.legislation.gov.uk/ukpga/1998/11/contents	https://www.bankofengland.co.uk/monetary-policy			Consideration of climate risks in the assessment of counterparties for lending operations.	Credit operations	**1**	https://www.bankofengland.co.uk/prudential-regulation/publication/2021/june/climate-related-financial-disclosure-2020-21; https://www.bankofengland.co.uk/-/media/boe/files/annual-report/2020/climate-related-financial-disclosure-report-2019-20.pdf
United States	AE	Federal Reserve	'The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to **promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates**.'	'Monetary policy in the United States comprises the Federal Reserve's actions and communications to promote maximum employment, stable prices, and moderate long-term interest rates--the economic goals the Congress has instructed the Federal Reserve to pursue. // The Federal Reserve Act mandates that the Federal Reserve conduct monetary policy 'so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.' Even though the act lists three distinct goals of monetary policy, the Fed's mandate for monetary policy is commonly known as the dual	First	Federal Reserve Act	Dec-22	https://www.govinfo.gov/content/pkg/COMPS-270/pdf/COMPS-270.pdf	https://www.federalreserve.gov/monetarypolicy.htm#:~:text=Monetary%20policy%20in%20the%20United,the%20Federal%20Reserve%20to%20pursue; https://www.federalreserve.gov/monetarypolicy/monetary-policy-what-are-its-goals-how-does-it-work.htm; https://www.federalreserve.go				**0**	

	mandate. The reason is that an economy in which people who want to work either have a job or are likely to find one fairly quickly and in which the price level (meaning a broad measure of the price of goods and services purchased by consumers) is stable creates the conditions needed for interest rates to settle at moderate levels.’	v/aboutthefed/files/the-fed-explained.pdf			

Appendix B. Examples of Interview Scripts

Case-specific

INTERVIEW SCRIPT FOR RESEARCH PROJECT

Central Banking and Environmental Sustainability: How Monetary Policy Strategies Have Been Shaped Towards Green Objectives

Online meeting, [date], [time]

Introduction: green monetary policy initiation and evolution

The Riksbank has long expressed its concern about the environmental impact of the bank's corporate activities. A more strategic approach to sustainability is visible from the end of 2018 onwards. In November 2018, the Riksbank's Executive Board decided to include sustainability factors in the management of foreign exchange reserves. In December 2020, the bank published its sustainability strategy, which announced the application of a 'norms-based negative screening' in purchasing corporate bonds as of January 2021. The strategy also highlighted the inclusion of green municipal and government bonds in the bank's asset purchases. In 2022, the bank decided to only purchase bonds from companies that reported the direct and indirect carbon footprint of their operations following the TCFD disclosure guidelines. The purchase of bonds was, however, discontinued in 2023.

1. In your view, what is green monetary policy?
2. Why has the Riksbank included environmental considerations in its policy operations?
3. Why did the Riksbank choose these specific policy options, not others?
4. Was the new Riksbank Act important to substantiate the bank's sustainability strategy?

On the Riksbank's collaboration with national and multilateral organisations

5. The Swedish Climate Act entered into force in January 2018. How do you understand the role of the central bank in supporting government commitments towards a net-zero economy?
6. Some academic experts, economists, and policymakers are concerned with the possible loss of central bank independence due to their engagement in environmental goals. They also see this as a diversion from the central bank's core tasks. What is your view on these risks?
7. Has the collaboration with other 'green' central banks or the recommendations of international bodies contributed to the design of the Riksbank's sustainability strategy? The NGFS appears to be particularly emphasised in several written publications of the bank.
8. In your opinion, what are the main barriers preventing a larger number of central banks from incorporating green considerations in their policy frameworks?

Conclusion: Reflecting on the green monetary policy outcomes

9. What lessons can be learned from the green monetary policy experience thus far in terms of opportunities and challenges?
10. Are there other facets of this topic that are, in your view, important to examine?

Generic

INTERVIEW SCRIPT FOR DOCTORAL RESEARCH

Central Banking and Environmental Sustainability: How Monetary Policy Strategies Have Been Shaped Towards Green Objectives

Online meeting, [date], [time]

Climate change and environmental degradation are crucial issues of our time. While governments are the primary actors in addressing these matters, there has been an intensifying debate about the role of central banks in the green transition, given their powerful policy instruments to influence economic activity. However, the topic is surrounded by many questions about the extent to which monetary authorities can or should promote the greening of the economy and the financial system.

1. Can you please summarise your own professional experience in central banking?
2. In your view, what is green monetary policy?
3. How do you understand the role of the central bank in supporting governments' net-zero commitments?
4. Some academic experts, economists, and policymakers are concerned with the possible loss of central bank independence due to their engagement in environmental goals. They also see this as a diversion from the central bank's core tasks. What is your view on these risks?
5. A number of leading central banks have included environmental criteria in their monetary policy operations – such as the Bank of England, ECB, Bank of Japan and the Swedish Riksbank – whereas others are not doing this, most notably the Fed. In your opinion, what is preventing a larger number of central banks from incorporating green elements in their monetary policy frameworks?
6. Some central bank mandates are focused on price and financial stability, while others allow for a broader interpretation of the central bank's mission by including support for productivity, employment, or government policies. In your view, are the competencies entrenched in central bank mandates important to substantiate an environmental monetary policy strategy?
7. The most adopted green monetary policy measures consist of incorporating environmental criteria in foreign exchange investments and asset purchase programmes. However, the latter has not been exploited in the largest Emerging Market and Developing Economies. Moreover, the Bank of Japan and the People's Bank of China appear to be the only two major central banks with green credit facilities. In your opinion, why have banks opted for these policy options and not others?
8. The 'greenest' central banks [in this study] are members of the Network for Greening the Financial System and often emphasise the Network's guiding role. How do you see the Network's contribution to the greening of central bank monetary policy operations, if any?
9. Are there other facets of this topic that are, in your view, important to examine?
10. Could you recommend to me central bank officials, academic experts, and/or civil society officers with whom I could meet to discuss these topics further?

Appendix C. Information Sheet and Consent Form for Interviewees

INFORMATION NOTICE ABOUT PERSONAL DATA PROCESSING

As part of the Research Project *Central Banking and Environmental Sustainability: How Monetary Policy Strategies Have Been Shaped Towards Green Objectives*, personal data will be collected, processed and analysed to achieve the scientific objectives of the Research Project.

What data do we collect and process?

We will collect your views about the greening of monetary policy frameworks in response to climate change and other environmental targets. We will also collect personal data such as name, surname, date of birth, job position, department, institution of affiliation, professional email address and telephone.

Please note that your interview will be audio-recorded. If the interview takes place via Microsoft Teams or WebEx, the audio recording will be performed via these tools.

All necessary procedures and precautions will be taken to maintain the confidentiality of research participants.

Why do we collect and use your personal data?

We collect and use your data to address the research questions that the Research Project aims to tackle; this may involve writing dissertations or research papers, storing and analysing the data and publishing our research results.

What is our legal basis for processing the data?

Your personal data relating to the Research Project will be processed in accordance with the General Data Protection Regulation (**GDPR**) and the Luxembourg Act of 1 August 2018 on Data Protection. The legal basis for the processing of your personal data in the context of the Research Project is laid down in Article 6 (1) GDPR: e) processing is necessary for the performance of a task carried out by the University in the public interest. In this case, academic research aimed to provide broader society with a greater understanding of the role of central banks and their decision-making processes.

The research mission of the University is laid down in the Act of 27 June 2018 concerning the organisation of the University of Luxembourg.

Who is responsible for the processing of my personal data?

The Data Controller in respect of the processing of your data is the University of Luxembourg, a public institution for higher education and research, whose registered office is at 2 avenue de l'Université, L-4365 Esch-sur-Alzette, Luxembourg, acting for the Department of Social Sciences in the Faculty of Political Science.

If you have any requests concerning the processing of your personal data you can contact the University of Luxembourg's Data Protection Officer by email at dpo@uni.lu, or by post at the following address:

UNIVERSITÉ DU LUXEMBOURG
Data Protection Officer
Maison du Savoir
2, Avenue de l'Université
L-4365 Esch-sur-Alzette

How do we protect your personal data?

In order to protect the confidentiality of your data, you will only be identified by a code number (pseudonym) in the data analysis. Any reports or publications that will be produced by the research team during this Research Project will be anonymous.

How long is your personal data stored for?

Your personal data will be digitally stored in a password protected folder on the server of the University of Luxembourg for a duration of 10 years after the publication of the results of the Research Project.

Who can access or see your personal data?

The recipients of your personal data are the researcher and scientific supervisor at the University of Luxembourg involved in this Research Project.

Please note that audio recordings via Microsoft Teams or WebEx may be accessible by Microsoft or CISCO, respectively, which store and process the data on our behalf as our processor.

Do we transfer data outside the European Union?

Your personal data will be processed by the University within the European Union.

Please note that the use of Microsoft Teams and WebEx may entail the transfer of your personal data outside the European Union. The University of Luxembourg ensures that appropriate measures are in place. In particular, the University has put in place Standard Contractual Clauses with Microsoft and CISCO respectively.

For more detailed information on the appropriate measures taken by the University, please send your request by email to the University's Data Protection Officer at dpo@uni.lu.

What are your rights under the General Data Protection Regulation?

You will have the right to access and rectify your personal data. In certain cases (in accordance with the conditions set out by the General Data Protection Regulation (Regulation (EU) 2016/679)), you will also have the right to object to the way in which your data is used,

to request that your data be deleted, to ask to restrict certain aspects of the processing of your data and to retrieve your data to forward it to a third party (right to data portability).

If you wish to exercise your rights, you should contact the researcher, Susana de Matos Rosa, at susana.matosrosa@uni.lu. She will liaise with the University of Luxembourg's Data Protection Officer to handle your request. You can also contact the Data Protection Officer by email at dpo@uni.lu (the DPO will liaise with the PI of the Research Project to handle your request) or by post at the following address:

Data Protection Officer
Maison du Savoir
2, Avenue de l'Université
UNIVERSITÉ DU LUXEMBOURG
L-4365 Esch-sur-Alzette

You also have the right to lodge a complaint with the Luxembourg National Commission for Data Protection (CNPD) regarding the processing of your personal data. Further information is provided at http://www.cnpd.lu. You can also use the CNPD contact form at https://cnpd.public.lu/fr/support/contact.html.

INFORMED CONSENT FORM

in relation to

Research Project ***Central Banking and Environmental Sustainability: How Monetary Policy Strategies Have Been Shaped Towards Green Objectives***

I have read the information sheet and I have been informed by Susana de Matos Rosa about the nature and the potential consequences and risks of the above-mentioned research project (the Research Project), and I have had sufficient opportunity to ask any questions.

I understand that my data will be collected and used in connection with this Research Project and to enable publication of the research results.

I have been informed that I am entitled to withdraw my consent to participate in the Research Project at any time without giving a reason and without negative consequences to myself. Furthermore, I may object to further processing of my personal data or request that these be deleted. I may do so by contacting Susana de Matos Rosa at susana.matosrosa@uni.lu.

Please tick the appropriate boxes in the table below:

I consent to the use of the following personal/professional data in the publications related to the Research Project: job position, department and institution.	☐ Yes	Yes, except: ☐ Job position ☐ Department ☐ Institution	☐ No
I consent to my interview being recorded in audio format for the purposes of the Research Project.	☐ Yes	☐ Only if my identity is not disclosed	☐ No
I agree to the data I provide being archived at the University server and used in pseudonymised form.	☐ Yes		☐ No

I voluntarily agree to take part in this Research Project.
PARTICIPANT

Last name: _____

First name: _____

Date of birth: _____

Place & date: _____

Signature: _____

RESEARCHER

I have informed the above-mentioned participant (see pages 1 and following) about the nature and the potential consequences and risks of the Research Project, and I have given the participant the opportunity to ask any questions.

In addition, the participant has received a copy of the information sheet(s) and of this consent form.

Name: _____

Place & date: _____

Signature: _____

Appendix D. Evolution of the Growth-Supporting Funding Facility of the Bank of Japan

For online reading

Initial scheme/main rules for investments ≥ 10 million yen														
Date of establishment/ change	15 June 2010	13 March 2012	18 February 2014	11 March 2014	21 January 2015	18 December 2015	29 January 2016	31 January 2017	23 January 2018	23 January 2019	25 April 2019	20 June 2019	21 January 2021	19 March 2021
BOJ total amount of dedicated loans	3 trillion yen	3.5 trillion yen	7 trillion yen		10 trillion yen									
Maximum duration of loans (including rollovers)	4 years													
Supplementary measures			Borrowing at the fixed rate of 0.1% per annum was 'extended from one to three years to four years' (Bank of Japan, 2014b, p. 18). Each financial institution can receive up to 1 trillion yen, instead of 150 billion yen.	'Overseas subsidiaries of Japanese firms' can benefit from investment and loans in both foreign and yen currencies (Bank of Japan, 2014c, p. 8).	Each counterparty can receive up to 2 trillion yen, instead of the previous 1 trillion yen.	New eligibility category: investments in physical and human capital.	Loan rates dropped from 0.1% to 0% to counterbalance the negative rates applied to current accounts at the Bank and stimulate lending.					Expansion of eligible collateral.		Application of a 0% interest rate under the terms of the Loan Support Program.
Deadline for application for new loans	31 March 2012	31 March 2014	31 March 2015		31 March 2016	31 March 2017		31 March 2018	31 March 2019	31 March 2020	30 June 2021 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2021).		30 June 2022 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2022).	

Special rules for equity investments and asset-based lending ≥ 1 million yen										
Date of establishment/ change	14 June 2011	13 March 2012	18 February 2014	17 March 2015	18 December 2015	31 January 2017	23 January 2018	23 January 2019	25 April 2019	21 January 2021
BOJ total amount of dedicated loans	0.5 trillion yen									
Maximum duration of loans (including rollovers)	4 years									
Supplementary measures			Borrowing at the fixed rate of 0.1% per annum was 'extended from one to three years to four years' (Bank of Japan, 2014b, p. 18). Each financial institution can receive up to 1 trillion yen, instead of 150 billion yen.		New eligibility category: 'Firms that are proactively making investment in physical and human capital' (Bank of Japan, 2016a, p. 24).					
Deadline for application for new loans	31 March 2012	31 March 2014	31 March 2015	31 March 2016	31 March 2017	31 March 2018	31 March 2019	31 March 2020	30 June 2021 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2021).	30 June 2022 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2021).
Special rules for small-lot investments and loans ≥ 1 < 10 million yen										
Date of establishment/ change	13 March 2012	18 February 2014	17 March 2015	18 December 2015	31 January 2017	23 January 2018	23 January 2019	25 April 2019	21 January 2021	
BOJ total amount of dedicated loans	0.5 trillion yen									

Maximum duration of loans (including rollovers)	4 years									
Supplementary measures		Borrowing at the fixed rate of 0.1% per annum was 'extended from one to three years to four years' (Bank of Japan, 2014b, p. 18). Each financial institution can receive up to 1 trillion yet, instead of 150 billion yen.								
Deadline for application for new loans	31 March 2014	31 March 2015	31 March 2016	31 March 2017	31 March 2018	31 March 2019	31 March 2020	30 June 2021 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2021).	30 June 2022 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2021).	
Special rules for loans in the US dollar										
Date of establishment/ change	10 April 2012	18 February 2014	17 March 2015	18 December 2015	29 July 2016	31 January 2017	23 January 2018	23 January 2019	25 April 2019	21 January 2021
BOJ total amount of dedicated loans	12 billion US dollars				24 billion US dollars					
Maximum duration of loans (including rollovers)	4 years									
Supplementary measures										

Deadline for application for new loans	31 March 2014	31 March 2015	31 March 2016	31 March 2017		31 March 2018	31 March 2019	31 March 2020	30 June 2021 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2021).	31 March 2022
Special Rules for Member Financial Institutions of Central Organisations of Financial Cooperatives without an account at the BOJ to use the Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth										
Date of establishment/ change	17 March 2015	18 December 2015	31 January 2017	23 January 2018	23 January 2019	25 April 2019	21 January 2021			
BOJ total amount of dedicated loans	Equivalent to that applied to central organisations.									
Maximum duration of loans (including rollovers)	Equivalent to that applied to central organisations.									
Supplementary measures										
Deadline for application for new loans	31 March 2016	31 March 2017	31 March 2018	31 March 2019	31 March 2020	30 June 2021 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2021).	30 June 2022 (deadline for new loan disbursements, meaning that the deadline for new applications should be 31 March 2022).			

Source: Adapted by the author (Bank of Japan, 2014b, p. 18, 2015b, p. 19, 2010e, 2011c, 2012b, 2012d, 2014a, 2015a, 2015c, 2015d, 2016a, 2016a, 2016a, 2016b, 2016e, 2017a, 2019a, 2019b, 2019c, 2021b, 2021d, 2021g, 2021m, 2023c).

Appendix E. List of Interviewees

The interview transcripts are available in a separate file

Identifier	Job Position/Institution [(1)]	Date	Form
Interview 1	Japanese monetary policy expert	05/04/2024	In person (recorded)
Interview 2	Senior adviser to the Executive Board of the Sveriges Riksbank	13/05/2024	Online (MS Teams)
Interview 3	Lead at the WWF Green Financial Regulation Initiative	26/06/2024	Online (MS Teams)
Interview 4	Academic and former vice-governor of a deviant AE central bank with a broad mandate	26/06/2024	Online (MS Teams)
Interview 5	Academic and former member of the MPC at the Bank of England	11/07/2024	Online (MS Teams)
Interview 6	Monetary policy expert and former central bank official at a typical AE central bank with a narrow mandate	28/08/2024	Online (MS Teams)
Interview 7	Researcher from the International Organisation Positive Money EU	19/09/2024	Online (MS Teams)
Interview 8	Central banks campaigner from the NGO Reclaim Finance	19/09/2024	Online (MS Teams)
Interview 9	Researcher and policy entrepreneur in macroeconomics and finance	20/09/2024	Online (MS Teams)
Interview 10	Policy advisor from the Greens/EFA Group at the European Parliament	27/10/2024	Online (MS Teams)
Interview 11	Member of the Sustainable Finance Lab	29/10/2024	Online (MS Teams)

[(1)] The job positions of the interviewees at the time of the interview. Some roles and institutions are more explicit than others, following the preferences of the interviewees.

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[55] The links to this thesis references were last checked and updated between 10 and 16 October 2025. By that time, some links were broken, mainly due to the deletion of webpages. To address this issue, the non-working links are indicated, and alternative links are provided when records remain available online from other sources. When public records no longer exist, the original files used for the research can be accessed upon request.

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