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The climate crisis meets the ECB: tinkering around the edges or paradigm shift?

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Abstract: The European Central Bank (ECB) has recently incorporated climate considerations into its operations. In this paper, I assess whether the ECB's approach is consistent with the challenges of the climate crisis era. I first identify three transformative implications of the climate crisis for central banking. These are that central banks (i) are becoming less able to control inflation via monetary policy tools, (ii) can no longer ignore their responsibility to support decarbonisation, and (iii) cannot rely on traditional risk exposure approaches to prevent financial instability that stems from physical risks. I then analyse to what extent these implications are reflected in the ECB climate actions and plans, showing that there is a very significant gap between the ECB's 'tinkering around the edges' approach and the central banking challenges posed by the climate crisis. Using post-Keynesian, critical macro-finance and political economy perspectives, I develop the theoretical underpinnings of a climate-aligned central banking paradigm and analyse the implications of this paradigm for the ECB policy toolbox and mandate. I also identify the ideological and political economy factors that prevent the ECB from undergoing a climate paradigm shift.

Keywords: European Central Bank, monetary policy, financial stability, inflation, climate crisis

JEL codes: E44, E58, Q54

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Introduction

The global economy has entered the climate crisis era. The rise in global warming is increasingly affecting human lives and ecosystems around the world. Climate-related events are becoming more frequent and severe, undermining economic stability and exacerbating inequalities. Governments are under growing pressure to act decisively on climate change and achieve decarbonisation targets.

Although it is widely recognised that the climate crisis is fundamentally re-shaping our economies, it is unclear how the crisis will unfold. On the one hand, if we manage to achieve a quick transition to a net zero economy, global warming will be limited, but the decarbonisation of economic and financial structures might have some adverse transition effects. On the other hand, if the transition does not take place in time, the increase in global warming and in the severity and frequency of climate-related events will become very significant sources of economic, social and financial instability.

Irrespective of how the climate situation will evolve in the coming years and decades, the climate crisis era has three transformative implications for central banking. First, climate change makes it more difficult for central banks to achieve their targets about inflation using their traditional tools. Second, it is becoming increasingly difficult for central banks to ignore calls for supporting (or, at least, not undermining) the climate transition. Third, even if global warming is limited to 1.5 or 2 °C, the financial system will be increasingly exposed to physical risks that will be difficult for central banks and financial supervisors to manage; the financial needs for adaptation and for covering damages and losses will also grow substantially. These three implications reflect a new normal for central banking.

How has the European Central Bank (ECB) responded to this emerging new normal? Despite its initial hesitation to engage with climate change, over the last few years the ECB has taken actions and developed plans to incorporate climate issues into its operations. The 2021 Strategy Review included a detailed climate action plan (ECB, 2021) that was updated in 2022 (ECB, 2022a) and 2024 (ECB, 2024) and has led to a substantial engagement of the ECB with climate change. This engagement includes the incorporation of climate change into macroeconomic modelling, adjustments to monetary policy tools and several financial supervision exercises.

The first question that I ask in this paper is whether these climate actions and plans of the ECB successfully address the challenges that the climate crisis poses to central banking. I show that this is not the case: there is a very significant gap between the ECB's 'tinkering around the edges' approach and an approach that would be required to address the implications of the climate reality. I then move on to analyse the theoretical

underpinnings of a climate-aligned central banking paradigm, explaining how it differs from the existing paradigm. To do so, I draw on post-Keynesian, critical macro-finance and political economy perspectives.¹ I finally explore how a climate-aligned central banking paradigm would transform the ECB policy toolbox and what implications it would have for the ECB mandate; I also explain the ideological and political economy factors that prevent the ECB from undergoing a climate paradigm shift.

The paper contributes to the emerging literature that analyses the reactions of central banks to the climate crisis from a political economy perspective. So far, this literature has mostly focused on three inter-related questions: first, what has led central banks to engage with the climate crisis (Deyris, 2023; DiLeo, 2023; Quorning, 2024); second, to what extent this engagement departs from the central banking status quo (Dafermos, 2022; Dafermos et al., 2022b; DiLeo, 2023; Thiemann et al., 2023; Aguila-Wullweber, 2024a; Kedward et al., 2024); and, third, why this engagement differs between central banks (Baer et al., 2021).

This paper primarily focuses on the second question using the ECB as a case study. However, it does not simply ask whether central banking actively supports the decarbonisation process beyond what the current status quo would imply – as the literature has mostly explored so far. The paper goes one step further by investigating the response of the ECB to climate adaptation needs and the macrofinancial implications of climate losses and damages, including implications for inflation. By considering climate adaptation, losses and damages, the paper also provides new insights into what constitutes a climate-aligned central banking paradigm both from a theoretical and a policy perspective, analysing why this more holistic approach to the climate crisis matters for understanding the future of the ECB in the emerging new normal.

The paper is organised as follows. In the next two sections I explore the challenges that climate change poses to central banking in general, assess the engagement of the ECB with climate change so far and explain why the current ECB climate actions and plans are inconsistent with the central banking challenges of the climate crisis. I then move on to analyse the theoretical underpinnings of a climate-aligned central banking paradigm, its implications for the ECB policy toolbox as well as the ideological and political economy factors that prevent the ECB from undergoing a climate paradigm shift.

¹ For the theoretical foundations of critical macro-finance, see Gabor (2020).

The climate crisis era: three transformative implications for central banking

As argued by Ferri and Minsky (1992), a significant feature of capitalism is that it has an inherent tendency to instability. Destabilising forces are, however, contained through institutional structures and policies that Minsky called ‘thwarting mechanisms’ (Dafermos et al., 2023). Central banks have traditionally used such mechanisms to play a stabilising role: through their inflation targeting frameworks they have tried to keep inflation within specific bounds; through their unconventional monetary policies they have tried to prevent credit crunches during periods of crisis; through financial supervision and macroprudential regulation, they have attempted to prevent over-leverage in the financial system.

By creating new sources of instability, the climate crisis unavoidably affects how central banks should intervene to safeguard macrofinancial stability. I analyse below three transformative implications of climate change for central banking.

Implication #1: Climate change significantly limits the ability of central banks to control inflation.

Recent academic literature has shown that climate change has significant implications for inflation. First, climate-related events (such as hurricanes, draughts, heatwaves and floods) can lead to supply-side disruptions that can increase inflationary pressures – the so-called ‘climateflation’ (Schnabel, 2022). Physical supply-side effects of climate change include the reduction in labour and capital productivity, the destruction of capital equipment, the decline in agricultural productivity and the increase in crop output failures (Beirne et al., 2021a; Storm, 2022). Climate-related physical changes can also affect the demand side of the economy, since they can lead to a decline in consumption and investment. For example, households might increase precautionary saving and firms might reduce investment due to uncertainty about profitability (Dafermos et al., 2018).

There is evidence that climate-related events have already affected inflation across the globe. For example, Parker (2018) finds that the impact of weather-related disasters on inflation is significant and persistent in low-income and middle-income countries, but less significant in high-income countries. He also shows that the effects on inflation differ between disaster types, a finding that is consistent with the empirical results of Kabundi et al. (2022). Beirne et al. (2021a) focus on the euro area and show that disasters have, on aggregate, a positive effect on inflation, with heterogeneous results across inflation sub-indices. Using a sample of high-income and medium-income countries, Faccia et al. (2021) find that hot summers tend to increase food price inflation in the short run. However, in the medium term this impact is insignificant or

negative. Kunawotor et al. (2022) find a positive impact of weather-related disasters on inflation in African countries. Moreover, higher temperatures tend to increase inflation according to the empirical results of Ciccarelli et al. (2023) and Kotz et al. (2023).

Second, the policies that might be implemented for achieving the transition to a net zero economy (such as carbon pricing and environmental regulation) can lead to increasing costs for firms which might be passed on to prices – the so-called ‘fossilflation’ (Schnabel, 2022). For example, the climate scenarios that have been developed by the Network for Greening the Financial System (NGFS) show that in the case in which carbon prices increase significantly in the coming years the impact on inflation can be substantial (NGFS, 2023). The econometric literature is a bit less conclusive. Moessner (2022) finds that carbon prices have a positive impact on inflation in OECD countries. Santabárbara and Suárez-Varela (2022) show that cap-and-trade systems have increased inflation volatility in OECD countries – the same is not, however, the case for carbon taxes. Konradt and Weber di Mauro (2023) do not find significant effects of carbon taxes on inflation in Europe and Canada. However, all these empirical studies should be treated with caution: carbon prices have so far been relatively low, and inflation might react differently in the case in which carbon prices increase abruptly in the future.

Third, green technologies, such as electric vehicles, solar panels, wind turbines and batteries rely extensively on minerals like copper, lithium and nickel. If the green transition takes place within a short time period, it might be inevitable that some of these minerals will face excess demand and this can lead to inflationary pressures (see also Storm, 2022). Schnabel (2022) has called this possibility ‘greenflation’.

Central banks have limited control over most of these climate-related inflationary sources. For example, an increase in prices caused by a climate-related food supply shock cannot be addressed by increasing interest rates. Or, if governments decide to increase carbon prices as part of their decarbonisation plans, an increase in interest rates can do little to address the fossilflation that this increase can cause. Of course, central banks can affect demand by increasing interest rates. However, this is unlikely to be sufficient to keep inflation under control, unless perhaps interest rates increase substantially, which could have severe side effects, including debt repayment problems and increases in unemployment rates.

But, on top of it, climate change also impairs the so-called transmission channels of monetary policy, including expectations channels, credit channels and asset price channels (NGFS, 2020). For example, climate change can overall make the banking system more financially fragile. This can be the case due to both transition and physical risks (Battiston et al., 2021; Campiglio et al., 2018; Semieniuk et al., 2021). Transition

risks capture the impact that an abrupt climate transition might have on the financial position of carbon-intensive companies which can then have spillover effects on the financial system. Physical risks are associated with climate-related economic disasters or financial losses that stem from gradual global warming and climate events, and can lead to an increase in defaults on household and corporate loans or asset price declines.

The fact that the financial system is exposed to these climate-related financial risks implies that in a scenario, for instance, in which central banks reduce interest rates to stimulate credit in a period of low inflation, this might have very negligible effects on credit provision, as banks might be under-capitalised or might find it difficult to identify creditworthy borrowers. The climate exposure of the financial system might also result in asset prices being unresponsive to changes in interest rates.

Overall, these fundamental changes in the determinants of inflation and the transmission channels of monetary policy call into question the ability of central banks to control inflation. Controlling inflation in the future might require a more systematic use of other instruments that are under the control of governments, such as price caps or product market policies that prevent oligopolistic structures.

Implication #2: Central banks can no longer undermine the climate transition.

As governments are becoming more committed to taking climate action, central banks will have less room to implement policies that undermine the climate transition. Take the ECB. Its monetary policy tools have disproportionately supported carbon-intensive companies or have failed to make financial support conditional to climate commitments. For example, it has been shown that the Corporate Sector Purchase Programme (CSPP) and the Eurosystem collateral framework suffer from a carbon bias: the representation of carbon-intensive activities in these programmes is much higher than the contribution of these activities to the real economy (Matikainen et al., 2017; Dafermos et al., 2020; 2021). In the climate crisis era, this is a problem that central banks can no longer ignore – it is necessary for them to make sure that their operations are consistent with the climate neutrality targets of governments.

This requires a significant re-design of their asset purchases, collateral frameworks and credit operations. So far, these monetary policy tools have been designed with the purpose of supporting inflation, employment or financial stability targets. For example, one of the aims of asset purchase programmes has been to reduce bond yields to stimulate investment and borrowing when inflation is low. In the climate crisis era, asset purchases will need to reflect decarbonisation targets as well. In practice, this

means that central banks will need to take climate criteria into account when they decide which securities to buy.

Implication #3: Traditional risk exposure approaches have a limited ability to prevent financial instability that stems from physical risks.

As mentioned above, climate change poses both transition and physical risks to the financial system. Transition risks are significant, but they are more likely to have severe effects on the financial system only in a scenario in which the transition to a net zero economy is abrupt. They are also likely to be of a temporary nature. In contrast, physical risks have already materialised and will increase even in an optimistic scenario in which global warming is limited to 1.5 or 2°C. They are also of permanent nature.

Physical risks have important implications for both households and firms. For example, the properties of households that live in areas that are susceptible to floods, wildfires or hurricanes will be more prone to destruction. The resulting financial losses can lead to higher household debt defaults and lower consumption, with significant implications for macrofinancial stability. Firms that have operations in climate-vulnerable regions or their supply chains are prone to climate risks might face higher operational costs or production disruptions that can make them financially fragile.

Physical risks are also very important for sovereign bonds. If a country faces systematic climate-related disruptions that lead to financial losses that need to be covered by its government or create recessions that reduce tax revenues, the financial position of this government can be significantly deteriorated.² In that case, government bond yields can go up, making it more difficult for this government to borrow money from the financial markets. At the same time, the decline in bond prices can negatively affect those financial institutions that have used the bonds of this government as collateral in repo transactions.

Based on the rationale of the standard monetary and financial policy frameworks, a response to these higher physical risks would be for central banks to try to reduce both their own and private financial institutions' exposure to physical risks. For example, the rationale of the Eurosystem collateral framework is that those financial assets that are riskier should experience higher haircuts and should perhaps be ineligible.³ This, can however, be counterproductive. Excluding the bonds of companies and governments that are exposed to physical risks from the collateral framework would make them even more financially fragile (since it would increase their costs of borrowing) and would

² Beirne et al. (2021b) show that climate vulnerability increases the cost of borrowing for governments.

³ Credit quality is among the main criteria that are used to determine eligibility in the Eurosystem collateral framework.

have a negative impact on the access to finance for these government and corporations, which is crucial for adaptation investment. In turn, physical risks depend on adaptation investment: the lower the level of adaptation the higher the risks.

Instead, central banks need to find ways to play a stabilising role, for example by intervening to prevent climate-induced asset price deflation or by supporting the financing of climate adaptation. However, this requires a systems-based approach to risk, which is fundamentally different from the existing risk exposure approaches that most central banks rely on (Dafermos, 2022). A systems-based approach highlights the role of macrofinancial feedback loops: physical risks can affect the vulnerability of financial institutions, but at the same time, the decisions of financial institutions about the provision of credit can exacerbate or attenuate risks. This double materiality perspective suggests that physical risks are endogenous to the actions of the financial system and, hence, central banks have an active role to play in addressing these risks.⁴ This is at odds with the currently dominant risk exposure approach that confines its attention to the impact of climate change on finance and ignores the reverse causal chain.

ECB's climate engagement: is it consistent with the climate crisis?

Despite the fundamental changes that climate change poses to central banking, for several years the ECB was not engaging with climate discussions. This has changed recently. In July 2021, the ECB announced a four-year climate action plan in which it specified how it intends to incorporate climate change into its monetary policy operations. The 2021-2024 roadmap included, for instance, the incorporation of climate issues into ECB's macroeconomic modelling and projections, the design and run of climate stress tests and the use of disclosure requirements in the corporate QE programme and the Eurosystem collateral framework.

Since then, the ECB has particularly focused on analysing the exposure of the financial system to climate risks through stress tests. In 2021 it conducted a top-down climate stress testing exercise that indicated, amongst others, that physical risks would be prominent in the long run in the case of no climate transition (Alogoskoufis et al., 2021). The ECB has also run a bottom-up exercise that assessed the internal capability of banks to analyse climate-related financial risks (ECB, 2022b) and a second top-down exercise that focused specifically on the financial implications of net zero transition pathways (Emambakhsh et al., 2023). However, these exercises were not used to specify climate-related capital requirements for banks.

⁴ For the concept of double materiality, see Adams et al. (2021), Oman and Svartzman (2021) and Täger (2021).

In July 2022, the ECB provided further details on some key aspects of its action plan (ECB, 2022a). The most important new details were related to the incorporation of climate criteria into the corporate bond purchases and the introduction of some limits to the use of high carbon assets in the collateral framework. The decarbonisation of the ECB's corporate bond purchases was an important decision that departed from the initial hesitation of the ECB to green its QE programme and address its carbon bias (Dafermos et al., 2022b). Deyris (2023) argues that the reasons for this climate shift are three-fold: (i) external pressures from non-governmental organisations and parliamentarians; (ii) the appointment of new members in the Executive Board who had a specific interest in climate change and (iii) the leadership of Christine Lagarde who has put climate change at the core of the ECB agenda.

One way by which the ECB has justified these climate-related actions is by referring to its secondary mandate which suggests that the ECB should support EU policies. The target of climate neutrality is now an explicit target for EU governments. Thus, based on the secondary mandate, the ECB needs to support climate neutrality as long as this support does not prejudice the ECB's primary objective (see also Elderson, 2021).⁵

In January 2024, the ECB announced that it will expand its work on climate change (ECB, 2024; Lagarde, 2024). A key aspect of this announcement was that the ECB's scenarios and projections will pay more specific emphasis on the physical impacts of climate change on inflation and the financial system, as well as on the economic and financial implications of climate adaptation. The ECB also announced that climate-related disclosure requirements will be introduced in the collateral framework from 2026.

Although the engagement of the ECB with climate issues is substantial, the ECB's approach does not move beyond minimal adjustments to existing tools. First, with the exception of the greening of its corporate bond purchases, all the other climate-related actions and plans of the ECB rely on a risk exposure perspective – there is no specific plan to use climate mitigation tools beyond the corporate bond holdings (see Dafermos et al., 2023; Aguila-Wullweber, 2024a). Second, the decarbonisation of the corporate bond holdings has been unambitious. As explained in Dafermos et al. (2022b, 2023), the contribution of the decarbonised corporate bond holdings to the targets of the Paris Agreement has been restricted by the fact that the ECB decided to implement climate criteria only to re-investments and not to the whole portfolio. As a result, the decarbonisation was basically terminated in July 2023 when the ECB stopped the vast majority of its re-investments. The ECB also decided to confine its decarbonisation to tilting and not to extend it to exclusions of high carbon assets. Third, the ECB has

⁵ It should, however, be highlighted that there is some ambiguity in the interpretation of the secondary mandate of the ECB which remains unaddressed (van't Klooster and de Boer, 2023).

clarified that it does not intend to make climate adjustments to the haircuts in the collateral framework (ECB, 2022c): its empirical assessment suggested that haircuts are sufficiently high to protect from exposure to climate-related financial risks. Fourth, the ECB has not considered how it will address climate adaptation financing needs which are continuously increasing and are important for reducing climate-induced instability from physical risks, as highlighted in the previous section. The higher attention that the ECB is now paying to climate adaptation and physical risks, as reflected in the January 2024 announcement, is not going beyond scenarios and projections. Fifth, although the ECB is now paying a growing attention to climate-related inflation (see also Aguila and Wullweber, 2024a), it has not identified any concrete actions on how to address the inflationary pressures that stem from the climate crisis.

How would a climate paradigm shift look like?

Generally speaking, a paradigm shift in central banking refers to fundamental changes in the hierarchy of goals and the way that tools are used to achieve these goals (see DiLeo, 2023). A climate paradigm shift in the ECB's conceptual, operational and institutional framework requires three types of changes: (i) a change in the theoretical underpinnings of the ECB's operations; (ii) a change in the tools used by the ECB to achieve its objectives; and (iii) modifications in the ECB mandate.

Theoretical underpinnings

The conceptual underpinnings of the current ECB framework rely on theoretical ideas that have dominated monetary policy thinking over the last decades and are associated with the monetarist and the New Keynesian traditions in macroeconomics. For a climate paradigm shift to take place, these ideas need to be replaced by ideas that are consistent with the realities of the climate crisis. Table 1 shows the key ideas in the existing central bank paradigm and compares them with the ideas that are necessary in a climate-aligned central banking paradigm.

The first one is the idea that inflation is always and everywhere a monetary phenomenon. This idea goes back to Milton Friedman. In its original version it suggests that central banks can control inflation by affecting money supply (Friedman, 1970). In its more modern version, it suggests that central banks can control inflation through changes in interest rates (Woodford, 2009). This idea has been extensively criticised, especially in the context of post-Keynesian economics: it ignores the complex structural drivers of inflation and does not take into account the impact of money and credit on the supply-side of the economy (Arestis and Sawyer, 2005; Lavoie, 2022, ch.

8). From a structuralist perspective, all institutions that affect the conflict between workers and firms on the distribution of income matter for inflation. Central banks can only have an indirect effect on this conflict. Thus, their impact on inflation is limited. Moreover, within a post-Keynesian framework, the creation of money and the provision of credit does not only affect demand – it can also lead to an increase in investment that can expand the productive capacity of the economy and reduce inflationary pressures.

However, apart from these traditional critiques, the idea that inflation is a monetary phenomenon is becoming increasingly problematic in the context of the climate crisis. The ECB cannot assume that it can control climateflation, fossilflation and greenflation by using standard monetary policy tools. Instead, it has to accept that inflation is a structural phenomenon and many of the demand-side and supply-side factors that drive inflation are to a great extent out of the control of the ECB, as the 2021-2023 energy crisis has, for instance, illustrated. These structural factors include productivity, the degree of oligopoly in the industrial sector, the labour market institutions that affect the bargaining power of workers, as well as the impact that climate-related events have on supply-side factors.

Table 1. Existing vs climate-aligned central banking paradigm: theoretical underpinnings

Existing central banking paradigm	Climate-aligned central banking paradigm
Inflation is a monetary phenomenon	Inflation is a structural phenomenon
Central banks should respect market neutrality	Central banks should support climate neutrality
Monetary and financial policies are neutral in the long run and have no impact on climate risks	Monetary and financial policies are never neutral and affect climate risks

A second idea that has been at the core of the ECB’s monetary policy operations is that central banks should be market neutral, that is they should not take action that disrupts how markets work. In practice, this idea means, for instance, that when the ECB decides about the bonds that it buys in the context of its corporate asset purchases, the sectoral decomposition of its holdings should be consistent with the sectoral decomposition in the bond market.

The fact that the ECB and other central banks have defended market neutrality as a guiding principle for their policies has been criticised primarily for two reasons (Colesanti Senni and Monnin, 2020; van't Klooster and Fontan, 2020). First, central banks have violated this principle in many cases in practice. For example, many of their unconventional monetary policy tools have disproportionately supported specific financial markets and products, and specific parts of the economy. Second, in the context of the climate crisis, defending market neutrality is counter-productive since it undermines the green transition. It is broadly accepted that the current market structure is incompatible with a climate neutral economy. Thus, by trying to keep the current market structure undisrupted, central banks undermine the fight against climate change.

Thus, a climate paradigm shift requires the replacement of the market neutrality principle with the principle of climate neutrality (Schnabel, 2021; Dafermos et al., 2022b). This principle suggests that central banks should make their operations consistent with the targets of the Paris Agreement.

A third idea that has been very influential in the design of ECB's policies is that monetary and financial policies cannot affect the economy in the long run. This is linked with the conceptualisation of the supply side of the economy as independent of demand-side factors and financial factors. Again, this is a theoretical perspective that has been extensively criticised in the post-Keynesian literature (Dutt, 2006; Arestis and Sawyer, 2009; Stockhammer, 2022). Some channels that are typically used to argue in favour of demand-side and financial-side effects on supply include the impact of demand on productivity, the effects of debt-financed investment demand on capital stock and the adverse effects of unemployment on the labour force (e.g. due to loss of skills).

But the idea that supply is independent of demand and finance is becoming even more problematic in the climate crisis era. For example, current decisions about the provision of credit to fossil fuel companies (which are influenced by monetary and financial policies) lead to more emissions that not only affect the dynamics of climate change, and thus the materialisation of physical risks, but they can also create lock-in effects that undermine the climate transition and increase transition risks. The idea of long-run neutrality of monetary and financial policies should, therefore, be replaced by the idea that monetary and financial policies can affect the economy both in the short run and the long run and that risks are not exogenous to the decision of central banks and financial supervisors/regulators. In that context, the ECB should also adopt a strong macroprudential approach to the analysis of financial stability – this is an approach that explicitly recognises the endogeneity of risks (Dafermos and Nikolaidi, 2022).

A climate-aligned ECB toolbox

For the climate paradigm shift to take place, the change in the ECB theoretical underpinnings needs to translate into a new set of tools. The development of an ECB climate-aligned toolbox requires both the adjustment of existing tools and the introduction of new ones. It also requires the systematic use of fiscal-monetary policy coordination.

Table 2 illustrates how a climate-aligned ECB toolbox could look like. One key feature of such a toolbox should be the explicit acknowledgement that the ECB has limited control over inflation through adjustments in the interest rates. To successfully control inflation in the climate crisis era it will be necessary for several tools to be used at the same time: interest rates will only be one of these tools and will most likely be one of the less effective ones. Additional tools could include price controls, taxation, subsidies, product market competition measures and the institutionalisation of wage bargaining coordination that would ensure that real wages would increase in line with productivity.⁶ All these tools can be used simultaneously in the context of what could be called a ‘coordination-based inflation targeting framework’ – a framework whereby the ECB coordinates with Eurozone governments to implement a combination of fiscal, monetary and regulatory policies to keep inflation under control.⁷

Table 2. A climate-aligned ECB policy toolbox

Tool category	Examples
Coordination-based inflation targeting framework	Price controls, product market competition policies, taxation, subsidies, wage bargaining coordination, interest rates
Climate mitigation	Decarbonised QE and Eurosystem collateral framework; green TLTROs
Climate adaptation	Favourable treatment of climate adaptation bonds in the ECB’s QE programmes and the Eurosystem collateral framework.
Climate loss and damage	Climate rescuer of last resort

⁶ For the role of price controls and taxation in addressing inflation, see Jakobs et al. (2023) and Weber and Wasner (2023).

⁷ For a discussion of how such a coordination framework could work in the case of the UK, see Jakobs et al. (2023).

A climate-aligned ECB toolbox should also include several climate mitigation tools that can contribute to the achievement of emission reduction targets. As mentioned above, the ECB is already using one of these tools: the decarbonisation of its corporate QE programme. However, a climate paradigm shift would also require that climate criteria be introduced into other monetary policy operations as well (see also Bosch, 2023). These include (i) the Eurosystem collateral framework, whereby haircuts could be adjusted based on the climate performance of companies and eligibility could be denied for the bonds of highly polluting companies (see Dafermos et al., 2021, 2022a), and (ii) the Targeted Longer Term Refinancing Operations (TLTROs) which can be adjusted in order for the cost of borrowing for banks to become a function on how much they support the transition to a net zero economy via their credit provision (van't Klooster and van Tilburg, 2020; Colesanti Senni et al., 2023). This policy would effectively introduce differentiated interest rates which can be particularly important for the financing of the green transition in periods in which the ECB policy rate is high: due to their upfront costs, green investments are disproportionately affected by higher interests, so having a policy that can keep interest rates low for these types of investment is important for ensuring their smooth financing (see Aguila and Wullweber, 2024b and the references therein).

Finally, the ECB needs to use tools that can reduce the financial stability that stems from physical risks. There are two tool categories that can address this: (i) climate adaptation tools and (ii) climate loss and damage tools. Climate adaptation tools are tools that can support climate adaptation bonds and climate adaptation loans. Corporate and government bonds that have been issued to finance adaptation projects can get a favourable treatment in the Eurosystem collateral framework and the QE programme. Loans that have been provided to support climate adaptation projects could also receive a favourable treatment in green refinancing operations.

An example of a climate loss and damage tool is the climate rescuer of last resort on the bond market (Bolton et al., 2020; Dafermos et al., 2021): the ECB could institutionalise that in the case in which a country experiences significant financial losses due to climate-related catastrophes, it has a duty to intervene and buy bonds to prevent an increase in the cost of borrowing for this country. This would resemble the 'whatever it takes' approach that the ECB used in 2012 to address the Eurozone crisis (see Vestergaard and Gabor, 2022). The difference is that this type of intervention would become a permanent feature of the ECB interventions to address the permanently higher frequency and severity of climate-related events.

ECB mandate

Let me now turn to the third type of changes that are necessary for a climate paradigm shift: modifications in the ECB's mandate. Several elements of a climate-aligned ECB framework can be implemented without changes in the mandate. For example, based on its secondary mandate, the ECB can implement several of the climate mitigation tools described above. However, to be consistent with ECB's inflation targeting framework, these tools should be implemented in a way that does not undermine the ECB's primary mandate, which is currently price stability. For example, in the case of corporate asset purchases, climate considerations should determine the decomposition of asset holdings but not the size of the ECB portfolio – the latter should be decided based on inflation considerations only.

It is, however, clear that a coordination-based inflation targeting framework would require a change in the current primary mandate of the ECB. If it is acknowledged that the ECB has limited control over inflation in the climate crisis era, it can no longer be held accountable for achieving price stability, or, at least, this should not be its sole target. In the context of a climate paradigm shift, it would perhaps be necessary for the ECB to have multiple targets (e.g. both price stability and employment). At some point it might also become essential for climate targets to become an explicit part of the ECB's primary mandate.

Financial stability already plays a key role in the ECB's operations. This is mostly justified by the fact that financial stability is a prerequisite for price stability as well as by the fact that the ECB has macroprudential responsibilities (for more details, see Albertazzi et al., 2021). Thus, for the ECB to take action against the financial instability that is associated with physical risks, no changes in the mandate would be necessary. Actually, as mentioned above, the ECB has already made some progress on addressing climate risks from the perspective of financial stability. However, it would be essential for the ECB to change its conceptual approach to how it tries to address physical risks by adopting a systemic risk perspective and a strong macroprudential approach.

What prevents the ECB from undergoing a climate paradigm shift

There are two types of barriers to an ECB climate paradigm shift: *ideological* barriers and *political economy* barriers. As explained in the previous section, a paradigm shift requires that the ECB get rid of outdated concepts that become increasingly problematic as the climate crisis deepens. However, this might not be easy in practice. For example, the idea that central banks have the primary responsibility for controlling inflation cannot be easily abandoned. In central banking circles, the idea that inflation is a monetary phenomenon is still very powerful. Equally difficult is for the ECB to

accept that it will no longer be market neutral. The idea that central banks should not interfere in markets is still very central in the ECB's monetary policy framework.

Political economy barriers are very powerful as well. The fossil sector would not easily accept measures that penalise its operations, especially if these measures become a central component of the ECB's framework. In addition, measures that are perceived as (direct or indirect) monetary financing are very likely to continue to face resistance from politicians in the Eurozone. This was very clear during the Eurozone crisis. This means that institutionalising 'climate rescuer of last resort' interventions would be challenging.

Private finance is also very likely to resist a climate paradigm shift that would create clear rules about the direction of financing and would affect private profitability. So far, private financial institutions have supported carbon-intensive industries substantially and are continuing to do so despite the urgency of the climate crisis (see RAN et al., 2023).

However, these barriers might gradually weaken as the climate crisis deepens. For example, as climate-related events become more frequent and severe and have more clear-cut effects on the euro area inflation, the view that inflation is always a monetary phenomenon might gradually become less popular. In addition, if sovereign bond yields become more susceptible to climate-related events, the idea that the ECB should support countries that suffer from climate-related losses might gain more popularity.

6. Conclusion

The climate crisis is fundamentally changing how our economies and societies function. Economic policies and institutions will unavoidably adjust to reflect the new climate realities. As one of the most powerful policy financial institutions in the global economy, the ECB has already started adapting to the needs of the climate crisis. However, the process of adaptation is very slow. In this paper, I have argued that there is a need for a climate paradigm shift, which goes much beyond the current climate initiatives and plans of the ECB.

This paradigm shift involves changes in the theoretical underpinnings of the ECB policies, fundamental transformations in the ECB policy toolbox and changes in the ECB mandate. There are, however, powerful ideological and political economy sources of resistance to such a paradigm shift. These prevent the ECB from adopting a more transformative agenda. Their strength might, however, be attenuated as the climate crisis becomes more severe.

The paper has not covered all the aspects of the environmental crisis that are relevant to the ECB. The challenges for the ECB are even higher once we consider other adverse non-climate environmental problems that are enhanced by the financial system and can affect inflation and financial stability. These include water scarcity, deforestation and the loss of biodiversity. The case for a paradigm shift is reinforced once these effects are taken into account. The paper has also not considered the implications of the global climate justice agenda for the ECB (see Dafermos, 2023). The analysis of these implications is left for future research.

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