

Climate-related systemic risks and macroprudential policy

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Summary

Climate change has a clear systemic dimension: its consequences are not only widespread across all sectors and regions, but potential concentrations, spillovers and interlinkages within the financial system risk further amplifying its economic and financial impacts. The systemic nature of climate change for financial stability suggests the need for a macroprudential response that goes beyond a (microprudential) focus on individual firms and ensures a consistent approach across the financial system.

While climate change may be predictable, the timing of its financial impacts is uncertain. Therefore, central banks and financial supervisors must rapidly develop sound risk management practices adapted to a context in which policy decisions rely on imperfect data and high uncertainty.

Existing macroprudential policy toolkits can be deployed now to address climate-related systemic risks with some possible adaptations to reflect the unique features of climate-related risks, like the long time horizon over which they may materialise, their strong dependency on the speed and direction of the low-carbon transition, and the specific data and forward-looking measurement methodologies required to manage them.

Two possible instruments that can be tailored to address systemic climate-related financial risks are: (i) 'systemic risk buffers', to increase the resilience of the financial system to climate-related shocks and contribute to mitigating the build-up of future risks; and (ii) measures limiting exposure concentrations, which could target and thereby mitigate sources of risk where they are greatest. While there are undeniable challenges in devising these macroprudential responses to climate-related systemic risks (e.g. modelling complexity and uncertainty, partial data coverage), the risks will only increase with inaction. This points to the need for central banks and financial supervisors to adopt a forward-looking approach and progressive deployment of policy in their response to climate risk.

This paper is part of a toolbox designed to support central bankers and financial supervisors in calibrating monetary, prudential and other instruments in accordance with sustainability goals, as they address the ramifications of climate change and other environmental challenges. The papers have been written and peer-reviewed by leading experts from academia, think tanks and central banks and are based on cutting-edge research, drawing from best practice in central banking and supervision.



Paul Hiebert
(European
Central Bank)



Pierre Monnin
(Council on
Economic
Policies)



Centre for
Sustainable Finance

SOAS University of London



Grantham
Research Institute
on Climate Change
and the Environment

1. Introduction

Climate change and the transition to a net zero economy have a clear systemic dimension. Their consequences not only affect all agents in the economy, across sectors and regions, but they can also be amplified by financial system spillover effects and interlinkages (FSB, 2022). Additionally, climate-related risks¹ build up and embed irreversible financial risks in the financial system, although the exact outcomes, time horizon and future pathways are uncertain – even if the overall trend of global temperature rise is to a large extent foreseeable (NGFS, 2019). The resulting potential systemic risk for the financial system has been highlighted by almost all international and national financial supervisors.²

As with any financial risks, climate-related financial risks need to be addressed through a risk-based prudential framework. On one hand, this must be done at the level of individual institutions – through microprudential regulation and supervision – as climate-related financial risks are expected to manifest themselves along the traditional financial risk channels of the Basel Framework, such as credit, market, liquidity and operational risk (BCBS, 2021a; 2021b). On the other hand, the expected systemic nature of climate-related risks warrants a response that goes beyond individual firms to address these risks at the level of the financial system – through a macroprudential framework. Given the widespread presence of climate-related financial risks across financial institutions, such a framework should ensure a consistent system-wide approach that accounts for direct and indirect linkages between institutions and markets (ECB, 2022c).

In general, climate-related financial risks share several features with other financial risks. The macroprudential tools currently used by supervisors to address them can therefore be deployed in various ways to address climate-related systemic risks. However, existing tools may need to be adapted to adequately address the unique features of climate-related risks, and some entirely new tools might also be needed.

Perhaps the most notable unique feature of climate-related financial risks is the uncertainty surrounding them, alongside a lack of data. Climate-related financial risks are both complex and complicated, requiring the collection of new data and augmented modelling capacities. As their impacts lie mainly in the future, these risks are largely unobserved in current data which strongly limits the usefulness of backtesting. Their assessment requires sufficiently granular data and forward-looking measurement methodologies that are still in development (BCBS, 2021). This represents a challenge for financial supervisors when it comes to implementing macroprudential measures. As central banks and financial supervisors cannot rely on past data to address hitherto unseen and forward-looking dimensions of climate-related systemic risk, they must adapt their decision framework to this context.

Given the irreversibility of climate-related risks, timely risk-mitigating action is needed. Many such efforts lie in the fiscal realm, notably through carbon pricing frameworks – for which clear commitments have been made and diligent implementation by governments is now required to ensure their effectiveness and credibility. Prudential policy would more narrowly address the financial risks associated with climate change. While such policies can complement action by governments to target the root causes of climate change, they cannot substitute for it. Central banks and financial supervisors can work within their remit to manage climate-related financial risk through targeted financial regulation and, crucially, by immediately operationalising toolkits for climate risk offered by existing financial regulation. However, an idiosyncratic approach is not suitable for systemic risks as it fails to address the externalities stemming from the interaction between

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¹In this paper, climate-related risks refer to the combination of physical and transition risks.

²This includes the Central Banks and Supervisors Network for Greening the Financial System (NGFS) with its 116 global members and 19 observers (see <https://www.ngfs.net/en/about-us/membership>), including the Financial Stability Board (FSB), Bank for International Settlements (BIS), International Monetary Fund (IMF).

individual institutions, and does not help to establish a transparent level playing field. Financial regulators and supervisors must thus rapidly develop sound systemic risk management practices to address climate-related risks at the financial system level. Ideally this will be done with close international cooperation, both formal (through standard-setting bodies) and informal (through networks such as the Network for Greening the Financial System [NGFS]).

This paper provides an overview of the currently legislated macroprudential tools available to central banks and financial supervisors and assesses their applicability for managing climate-related risks. It then explores the ways in which these tools can be adapted to climate-related risks, based on the empirical findings currently available to supervisors.

2. Current macroprudential framework

Climate-related risks share several characteristics with other systemic risks. First, they are widespread in the economy and financial markets (NGFS, 2019). Second, they materialise in the traditional risk categories used by financial institutions: credit risk; market risk; liquidity risk; and operational risk (BCBS, 2021a). Third, climate shocks can potentially trigger sharp falls in asset prices – both financial and tangible – given changed cash flows and risks of possible stranding of assets.³ Finally, climate shocks can be amplified by financial markets through spillover effects and interlinkages (Dubiel-Teleszynski et al., 2022; Emambakhsh et al., 2022).⁴

Against this background, the macroprudential framework developed by financial supervisors to deal with systemic risks is a natural starting point for addressing systemic risks from climate change. Here we present the macroprudential framework and relevant instruments currently used by financial supervisors, and then assess the applicability of this framework to climate-related risks.

2.1. Macroprudential policy in a broad context

A holistic prudential approach to climate change implies bringing together its macro- and micro-prudential components. Climate change can affect the risk profile of individual financial institutions, and groups of such institutions. The complexity lies in the externalities associated with both a risk build-up phase and a corrective phase. In the former, risks may build up through the financing of projects in the fossil fuel and infrastructure sectors that are inconsistent with a net zero transition, hence contributing to higher physical or transition risks at the level of the economy. In the corrective phase, risks may stem from the interconnectedness of climate-related financial risk within the financial system, with an increased risk of second-round effects through overlapping financial exposures and feedback from the real economy. Risk materialisation, while hard to predict, will likely be transversal and not easily compartmentalised, requiring all prudential levers to be pulled together.

Macroprudential policies can ensure that the financial system is robust and resilient in the face of emerging climate-related financial risk, in particular by addressing risks that cut across sectors and limit financial system arbitrage.⁵ Their role in limiting the rise in global temperatures as part of the build-up of overall climate-related risk is, however, less clear and certainly not direct. Macroprudential policies cannot therefore be a substitute for the many public policy measures that are required to effectively address climate change. But they can nonetheless exert some indirect effect on the economy-wide build-up of climate-related risks by, for example, reducing financial institutions' financing of activities not aligned with the transition to a net zero economy, thereby supporting broader efforts to mitigate climate change through 'double materiality'.⁶

“Financial regulators and supervisors must rapidly develop sound systemic risk management practices.”

³Climate-related risks stem from, among other things, potential abrupt changes in expectations, which can translate into significant short-term asset price movements. This is likely to happen for climate-related risks for two reasons. First, future climate costs are highly uncertain, so new information about them can trigger significant updates in investors' forecasts. Second, climate-related risks are currently not fully priced by financial markets, which makes them prone to corrections (ESRB, 2020; IMF, 2020; BIS, 2021).

⁴See Monnin (2021) and references therein for a comparison between climate-related risks and systemic risks.

⁵This might include both measures to ensure robustness (ex-ante balance sheet strength), and resilience (ex-ante contingency planning); see Brunnermeier (2021).

⁶Double materiality concerns not only how a firm's financials are materially affected by climate and environment issues (“outside in”), but also how their activities impact the broad economy, society and the environment (“inside out”). See Boissinot et al. (2021) and ECB (2022c).

2.2. The existing macroprudential toolkit

Systemic risk can emerge both through a structural route across financial institutions, and over time (Caruana, 2010). The structural dimension relates to how risk is distributed across the financial system: structural systemic risk results from frequent direct exposures of financial institutions to a system-wide shock, or from indirect exposures to a shock that hits one institution and spreads to others through interconnected balance sheets. The time dimension relates to the progressive build-up of risk and fragilities over time. Climate-related risks have similar characteristics in that they constitute a common exposure for the financial system and they build up over time.

The macroprudential toolkit currently used by financial supervisors reflects these two dimensions with its structural and time-varying instruments. Structural instruments aim to strengthen the resilience of the financial system by: (i) ensuring that financial institutions have enough resources to absorb losses in a crisis; or (ii) limiting the exposure of the financial system to risky assets. Time-varying instruments aim to contain the build-up of vulnerabilities and also cushion their materialisation, for instance by reducing excessive credit growth and bank leverage in the risk build-up phase, or by improving the average quality of bank assets.

A broad range of instruments have been developed and implemented by financial supervisors to address systemic risks (see Figure 1). Capital-based instruments play a key role in the macroprudential toolkit. They are, for example, explicitly included in the Basel III framework with the introduction at the international level of the 'global systemically important bank (G-SIB) buffer' and the 'countercyclical capital buffer' (CCyB).⁷ At the national level, several supervisors have also implemented capital surcharges for systemic risk. This is the case with systemic risk buffers (SyRBs) in the European macroprudential framework, for example (see Section 3.3).

“Macroprudential policies can exert some indirect effect on the economy-wide build-up of climate-related risks.”

⁷The Basel III framework is a set of international banking regulations developed by the Basel Committee on Banking Supervision (BCBS) in response to the global financial crisis of 2007–2008, with the goal of strengthening the regulation, supervision and risk management of banks.

Figure 1. Macroprudential toolkit

	Restrictions related to borrowers, instruments or activities	Restrictions on financial sector assets and liabilities	Capital requirements, provisioning, surcharges
Risk build-up	Time varying caps, limits or rules on: <ul style="list-style-type: none"> Debt-to-income ratio (DTI), long-term-incentives (LTI), loan-to-value ratio (LTV) Margins, haircuts Lending to sectors Credit growth 	Time varying caps or limits on: <ul style="list-style-type: none"> Mismatches (foreign exchange, interest rate) Reserve requirements 	<ul style="list-style-type: none"> Countercyclical capital requirements Leverage restrictions General (dynamic) provisioning
Risk materialisation	<ul style="list-style-type: none"> Adjustment to specific loan-loss provisioning, margins or haircuts 	<ul style="list-style-type: none"> Liquidity limits (e.g. net stable funding ratio, liquidity coverage ratio) 	<ul style="list-style-type: none"> Countercyclical capital requirements General (dynamic) provisioning
Contagion through network effects	Varying restrictions on: <ul style="list-style-type: none"> Asset compositions Activities 	<ul style="list-style-type: none"> Institution-specific limits on (bilateral) financial exposure Other balance sheet measures 	<ul style="list-style-type: none"> Capital surcharges linked to systemic risk

Source: Adapted from Claessens (2014) and Claessens, Gosh and Mihet (2013).

2.3. Applicability of the current macroprudential toolkit to climate-related risks

Climate-related risks are not fully reflected in the current widely applied Basel III prudential framework (Baranović et al., 2021). This could imply that banks are likely to take excessive risks with respect to climate-related exposures, not least to the extent that they are not properly reflected in their capital requirements. This can cause economic disruptions, increase the volatility of lending and GDP growth, and ultimately cause bank losses – both predictable losses against which provisions can be made, and unexpected losses which require loss-absorbing capital (see Chaves et al., 2021 and Holscher et al., 2022).

Existing instruments in the macroprudential framework are not devised specifically to address climate-related systemic risks, but they can to some extent be fine-tuned to tackle them. In doing this, supervisors should account for the specific features of climate-related risks, as described below, and adapt their regulatory practices accordingly.

Structural (vs. cyclical) nature

The current macroprudential framework includes instruments designed to address risks that increase and then dissipate throughout the financial cycle, like countercyclical buffers, for example. These instruments have a dual aim: improving financial institutions' resilience to such risks and mitigating their build-up in the system. Instruments that are tailored to the financial cycle in this way might be less suited to secular risks that increase gradually over an extended period, like climate-related risks. In particular, capital regulation might be less efficient in mitigating the build-up of climate-related risk than it is for other financial risks because it has only an indirect impact on their evolution.

Time horizon

Climate-related risks might develop over longer time horizons than those usually considered by central banks and financial supervisors. However, the scenarios used by supervisors show that climate-related risks could already become systemically material within the next decade if net zero objectives are reached (ESRB/ECB, 2021; Alogoskoufis et al., 2021), even when these scenarios likely underestimate climate-related risks (FSB/NGFS, 2022). In the short term, severe weather events will increase in intensity and frequency, possibly leading to disruptions in regional value chains and significant financial shocks. Climate-related risks might also be reflected in market prices much earlier than their actual realisation through changes in market expectations. Financial supervisors have highlighted that a late and sudden transition is the most destabilising scenario for the financial sector and some financial supervisors have started to prepare accordingly (see Routledge [2022] for an example on Canada).

Leakages

Climate-related risks are spread all over the world: physical risks impact all regions, albeit in different ways, and all economies face transition risks. Determining the climate-related risk exposure of one specific financial system requires the assessment of climate-related risk beyond its borders. Semeniuk et al. (2022), for example, show that 15% of the total global risk of stranded assets outside of OECD economies is borne by OECD-based investors. In addition, climate-related risks affect all financial actors, including banks, insurance companies and investment managers. Macroprudential regulation must thus take a holistic approach across the financial sector to address climate-related systemic risks.⁸

“Existing instruments in the macroprudential framework can to some extent be fine-tuned to tackle climate-related systemic risks.”

⁸It should be noted that, in contrast to banks, in insurance the current prudential capital regime does not contain an analogous capital buffer aimed at macroprudential risk.

Irreversibility

Climate-related risks are characterised by irreversible physical tipping points. Once they are reached, the economic and financial costs of climate change are permanent. Environmental tipping points thus represent a risk of a collapse of the system rather than a temporary downturn (Vaccaro, 2022). The current macroprudential framework aims to improve the resilience of the financial system, for example by ensuring that financial institutions have enough capital buffers to withstand shocks, resolve them and return to business as usual. The framework is not intended to prevent shocks from happening in the first place, which is probably the most prudent policy to adopt in the presence of irreversible costs (Ford et al., 2022). In the context of climate change, the possibility of implementing such a policy is largely dependent on the ability of macroprudential instruments to curb the build-up of climate-related risks.

Complexity and uncertainty

Climate-related risks will eventually materialise. However, the form they will take – whether as large physical shocks or a combination of physical and transition shocks – is not yet known and depends heavily on whether and how the transition to a net zero economy occurs. This path dependency, combined with the complexity of the physical, economic and financial interactions – characterised by non-linearity, feedback loops, and tipping points – implies a high degree of uncertainty around climate-related risks. This uncertainty is amplified by the lack of data and historic precedents with which to assess climate-related risks.

2.4. Challenges in adjusting current regulatory practices to climate-related risks

One of the challenges in deploying the current macroprudential framework to address climate-related risks is the use of standards to calibrate instruments that do not yet sufficiently reflect these risks, such as expected default frequencies (ESRB/ECB, 2022).

The coverage of climate data is also an issue. Data are available for some asset classes and some segments of the economy, with more reporting from listed companies, for example. In this context, reflecting climate-related risks might require a more targeted or sequenced proportional implementation, starting with the asset classes and firms for which data are available.

Lastly, the current calibration of macroprudential measures relies on relatively precise risk estimation, based on large data sets and backtested on observed financial cycles. An alternative forward-looking probabilistic paradigm is needed for climate-related risks: past data are not relevant in this case since events of the magnitude forecasted with climate change have not been observed yet. Additionally, granular forward-looking data are scarce and subject to large uncertainty. In this context, reflecting climate-related risks would imply supervisors having to accept high uncertainty, and possibly consider more ‘blunt’ calibration for macroprudential tools.

“Reflecting climate-related risks in macroprudential frameworks would imply supervisors having to accept high uncertainty.”

3. Reflecting climate-related systemic risk in macroprudential policy

A rapidly growing body of empirical evidence is available to central banks and financial supervisors to assess climate-related risks and take adequate policy measures to mitigate them. This section first highlights the main features of climate-related risks, which can be used to base policy responses on. It then presents some key principles to follow when managing climate-related risks. Finally, it suggests instruments in the current macroprudential framework that can potentially be deployed to address climate-related systemic risks.

3.1. Empirical evidence basis for policy design

In recent years, central banks and financial supervisors have considerably strengthened their knowledge of climate-related risks – including the consequences of such risks for financial stability (see e.g. ESRB/ECB, 2022; 2021; 2020; ECB, 2022b; Bank of England, 2022; ACPR, 2021) – and have highlighted the key empirical features that characterise climate-related risks. From this knowledge base, we have identified six findings that are important to consider in the design of adequate and effective macroprudential tools.

(i) Climate shocks are inevitable

Climate-related risks will materialise in one form or another, i.e. as physical or transition risks – or a combination of both. This makes climate-related risks different from many traditional systemic risks, which are deemed possible and likely, but not certain to happen (albeit the timing of climate impacts is uncertain).

(ii) Climate-related risks are lower in an early and orderly transition scenario

Several supervisors have highlighted that an early and orderly transition to a low-carbon economy generates lower financial risks than a late and sudden transition (which carries high transition risks) or no transition at all (with high physical risks) (ECB, 2022a; Alogoskoufis et al., 2021; Helmersen et al., 2020). For financial stability reasons, supervisors have an interest in implementing measures that support an early and orderly transition and thus minimise climate-related risks compared with other scenarios.

(iii) Financial institutions have yet to fully manage climate-related risk

Several surveys highlight that financial institutions are not prepared to manage climate-related risks (ECB, 2022b; Bank of England, 2018): they have not yet implemented the institutional processes, compiled the data or developed the tools necessary to do so. In Europe, for example, the ECB found that virtually none of the institutions it supervises meets all supervisory expectations regarding climate-related risk management (ECB, 2022c).

(iv) Substantial adjustments are required in financial markets

Despite the considerable development of green financial markets, climate-related risks do not appear to be fully reflected in the emissions intensity of investment fund portfolios (ESRB/ECB, 2021). Accounting for this would mean substantial portfolio reallocations. In addition, the portfolio allocation of financial markets overall is not currently aligned with the transition to a sustainable economy. This misalignment supports the build-up of physical risks for the economy and the financial system. Shifting portfolios in a way that is compatible with an early and orderly transition also implies substantial adjustments to reduce informational and allocative market failures (ESRB/ECB, 2020).

(v) Financial exposure appears limited in aggregate but might be concentrated in some institutions

The evidence so far gives the overall indication that the financial system may be able to absorb and recover from climate shocks, especially under an early and orderly transition scenario. However, some institutions are much more exposed than others and their losses are likely to be material (ESRB/ECB, 2021). The concentration of climate-related risks in only a few financial institutions is still a cause for concern when it comes to financial stability as the climate-related damages triggered in these institutions can also indirectly affect other institutions connected to them, creating system-wide instabilities.⁹

“For financial stability reasons, supervisors have an interest in implementing measures that support an early and orderly transition.”

⁹Mandel et al. (2021) show that the financial effects of flood risks in high-income countries can be amplified by the banking sector's leverage – i.e. its reliance on borrowed funds and debt to fund investments. In severe climate scenarios, this could lead to the emergence of systemic risk as potential losses commensurate with the capital of the banking sectors of countries that are hubs of the global financial network.

(vi) The magnitude of financial risks highly depends on short-term actions

The evolution of climate-related risks is highly path-dependent as these risks are largely determined by the scale of the transition and the shape it will take. Although they develop over a relatively long time frame, these paths are contingent on policy measures taken in the short term. To achieve an early and orderly transition – i.e. a scenario that minimises risks for the financial sector – adequate policies, including macroprudential policies, need to be implemented sooner rather than later.

3.2. Managing climate-related systemic risks

The sound management of climate systemic risks rests on three main pillars:

1. Broad and meaningful data disclosure to enable all financial market participants to assess and address climate-related risks.
2. Adequate risk management practices by market participants.
3. Macroprudential measures to ensure that the financial system is resilient to climate shocks and that climate-related risks do not build up excessively.

Climate-related risk data disclosure and risk management practices

Most central banks and financial supervisors highlight that broad and meaningful disclosure of climate data by firms is required for all market participants to best manage climate-related risks at the system level. Several international initiatives, both by industry and supervisors, are currently being developed to improve climate-related disclosure.¹⁰ However, it is commonly agreed that the current level of disclosure is far from satisfactory and that the data currently available do not allow financial market participants to assess with precision the climate-related risks to which they are exposed (ECB, 2022c; NGFS, 2022).

Most supervisors also agree that financial institutions do not currently manage climate-related risk adequately. Even if they are aware of the relevance of climate-related risks, a large majority of financial institutions do not have the processes and tools in place to properly reflect climate-related risks in their operations (ECB, 2022b).

Furthermore, even with perfect disclosure and adequate climate-related risk management at the firm level, systemic risk can emerge due to, for example, failures of the market to account for externalities, amplifying mechanisms within financial markets, and interconnectedness between financial institutions (ESRB/ECB, 2022).

These systemic features call for policy action – specifically macroprudential regulation – to manage systemic climate-related financial risk. Capital requirements are an essential element of the toolkit. To best address climate-related systemic risk, such considerations should include two components: one that ensures the financial system can absorb climate shocks; and another that ensures that risk does not build up excessively in the system over time.

Risk absorption component

Capital requirements have two main functions for central banks and financial supervisors. First, higher capital requirements increase the buffer that financial institutions have available to absorb losses from shocks, thus enhancing the resilience of financial institutions. Second, higher capital requirements can reduce risk-taking by financial institutions.

Since climate-related risks are not yet directly accounted for in current capital requirements (as prescribed in the commonly applied Basel Framework), neither at the micro- nor the macroprudential level, one option is to account for them using

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¹⁰See e.g. the Task Force on Climate-related Financial Disclosures (TCFD, 2022) and the International Sustainability Standards Board (ISSB, 2022).

earmarked capital – i.e. additional capital for loans to emitting economic activities that more exposed to transition risks (see e.g. Dankert et al., 2018). However, such a policy could increase aggregate capital costs for financial institutions that are in the process of transitioning, while also potentially limiting the overall volume of loans provided to other activities of high economic value. At the limit, this might even crowd out loans to firms with green credentials, as part of a more general conflict between financial stability objectives and sustainability objectives. Oehmke and Opp (2022) offer a framework that illustrates how a combination of additional capital for loans to emitting economic activities and lower capital for economic activities that contribute to the transition might be the optimal policy in such a case.

Risk build-up component

Banks' current exposures to climate-related risks is not the only dimension relevant to managing climate-related systemic risk; the climate impact of the economic activities that they fund (via double materiality) also matters for the build-up of systemic risk (Boissinot et al., 2022). With the knowledge that an early and orderly transition scenario mitigates climate-related systemic risk the most, an ideal macroprudential framework would not only ensure that financial institutions are well capitalised to absorb potential climate shocks, but also be designed to support an early and orderly transition by setting incentives for financial system participants to promptly align with a scenario that limits the build-up of climate-related financial risks.¹¹

Forward-looking macroprudential policy could therefore include a component that reduces climate-related risks for the financial system in the medium term. Higher capital requirements for loans to firms that are not aligned on the transition could provide such an incentive. However, this measure might be limited in its ability to support the achievement of transition goals (Oehmke and Opp, 2022). Its effectiveness could be maximised by applying high capital requirements to a limited scope of harmful economic activities (Chamberlain and Evain, 2021). Novel hybrid instruments that combine borrower-based and capital-based measures could also be a way for macroprudential policy to better support the transition (ESRB/ECB, 2022).

3.3. Adapting the current toolkit

The existing macroprudential toolkit provides a good starting point for addressing climate-related systemic risk. Several instruments already implemented by financial authorities for systemic risk (see Figure 1, Section 2.2) can potentially be adapted and deployed for climate-related financial risks. Here we highlight two particularly promising options for addressing system-wide risks by adjusting requirements to capture relative risk: a 'systemic risk buffer' for climate-related risks (Monnin, 2021); and climate-related risk concentration limits, either through prices, i.e. concentration charges (see Baranović, 2021; Coehlo and Restoy, 2023), or quantities, i.e. large exposure limits (see Miller and Dikau, 2022).

Both instruments have already been successfully used for other systemic risks with similar features to climate-related financial risks, for example a progressive build-up and concentration of risks in a limited number of institutions. Applying a systemic risk buffer to loans to firms with economic activities that are not aligned with the transition, possibly combined with limiting concentration, would provide both a risk absorption and a risk build-up component as they would generate a relative disincentive at the system level for financial institutions to fund firms most exposed to transition risk.

“Applying a systemic risk buffer reflecting financial institutions' exposure would provide both a risk absorption and a risk build-up component.”

¹¹Stroh (2022) highlights that a double materiality perspective is important in a broader macroprudential framework incorporating financial sector externalities.

Systemic risk buffer for climate-related risks

The European macroprudential framework provides central banks and financial supervisors with so-called systemic risk buffers (SyRBs), a tool that is designed to address long-term, non-cyclical risks for the financial sector stemming from the real economy (ESRB, 2017) – exactly the type of risk posed by climate change. They have been widely used by European supervisors since 2014 to mitigate different sources of risks including banking sector concentration, external shocks and sectoral shocks, and also to adjust lending incentives for groupings of systemically important institutions.¹² Addressing climate-related risks requires similar measures to those implemented by these supervisors – i.e. targeting specific economic activities or regions exposed to climate-related risks proportionally to banks' specific exposure to them. SyRBs could be easily deployed to address climate risk at the system level and their potential has been acknowledged by the ECB, for example (ECB, 2022).

When it comes to adapting SyRBs to the particularities of climate-related risks, Monnin (2021) highlights three recommendations. First, supervisors should allocate the buffer across financial institutions in proportion of their exposure to climate-related risks. The alternative – a system-wide buffer equally distributed across banks – would dilute the effectiveness of the measure (by not addressing risks directly where they are), and potentially increase the costs associated with higher capital for the whole banking sector. Furthermore, a proportional scheme introduces incentives for financial institutions to reduce their exposure to climate-related risks in order to limit capital costs. Second, supervisors should target high exposures to climate-related risks. The risk metrics currently available to assess climate exposure can be used here because, although they display significant heterogeneity overall, they tend to concur on identifying assets most exposed to climate-related risks (see Bingler et al., 2022). The third recommendation is that supervisors follow transparent rules and metrics. The experience of using SyRBs shows that clear rules, and their explanation by supervisors, are key to the effectiveness of systemic risk buffers (ESRB, 2017).

Concentration limits for climate-related risks

Placing limits on specific activities or charging their concentration in some financial institutions could address the unequal distribution of climate-related financial risk across the system by targeting where its financial risk is greatest. The Basel Committee on Banking Supervision (BCBS) recognises that concentrated exposures to single counterparties or groups of connected counterparties can undermine banks' resilience and, accordingly, implemented a prudential framework to address large risk exposures (BCBS, 2014). The BCBS also acknowledges that concentrated sectoral and regional exposures constitute a risk for banks. Climate-related risks fall into these definitions: empirical evidence shows that sectoral and regional risks linked to transition and physical risks are concentrated in some financial exposures (ESRB/ECB, 2020) and that these risks arise from a few counterparties (ECB, 2022b). Measures included in the Basel III framework to address concentrated exposures can therefore apply to climate-related risks with limited adaptation, targeting concentration either with price-based or quantity-based measures (charges or limits). In an example of such an application, Miller and Dikau (2022) propose to recalibrate large exposure limits to capture transition risks. They suggest using the Climate Policy Relevant Sectors (CPRS) of Battiston et al. (2017) to assess the exposure of individual banks to transition risks. In their proposition, when a bank's exposure exceeds a given level, supervisors could ask this bank to disclose additional climate-related risk exposure information to get a better sense of whether this exposure is still covered by the bank's capital. Alternatively, the supervisor could ask the bank for a capital charge in line with its large exposure to CPRS.

“Systemic risk buffers can be designed to address long-term, non-cyclical risks for the financial sector stemming from the real economy – exactly the type of risk posed by climate change.”

¹²Norway and Estonia, for example, implemented SyRBs for the whole banking sector to mitigate common exposures to specific economic sectors (the petroleum sector in the case of Norway). Austria and Denmark implemented a buffer reflecting individual bank's exposure to specific geographical risks (Eastern European countries and Faeroe Islands, respectively). Sweden requires a buffer for large institutions because of their similar business models.

4. Implementation challenges

While the conceptual case for macroprudential policy is clear, there are several challenges when it comes to its operationalisation and implementation. One challenge is the modelling required to gain a view of prospective losses from climate-related financial risks, given that the past is likely a poor blueprint for the future materialisation of risks. The mapping and modelling exercises of many central banks and financial supervisors are helping to build a growing body of knowledge. However, most central banks and financial supervisors remain in an evidence-gathering phase and are assessing their options (see e.g. Coehlo and Restoy, 2023; Bank of England, 2023; Baranović et al., 2021). None have yet announced the implementation of specific macroprudential instruments to address climate-related financial risks.

A second challenge to the operationalisation of macroprudential policy is uncertainty. In particular, available data on climate risk remain incomplete and imprecise, notably transition plans. While strides are being made and concrete initiatives are taking shape, effective reporting at scale may take time to mature. That said, central banks and academics have highlighted that the risks of inaction are far greater than the risks of acting based on partial data (see Baranović et al., 2021). With this in mind, several options are available to accelerate the deployment of instruments and ensure timely action despite high path dependency. One option is to rely on the ‘proportionality principle’ and focus macroprudential measures on exposures to large firms for which more data are available than for SMEs. The same principle can be used to focus on the highest-emitting activities at risk of imminent stranding, to reflect that some economic activities, such as firms linked to the value chain for thermal coal, carry considerable embedded risk. Applying macroprudential measures on new loans first, instead of targeting the existing stock of loans, might also accelerate their implementation. This will also create incentives for firms to adjust their practices while allowing authorities more flexibility to calibrate the measures (Coehlo and Restoy, 2023).

A third challenge is for macroprudential measures to not prevent high-emitting firms from obtaining the funding needed to green their activities. Accounting for transition plans in macroprudential measures is likely to play a key role here (NGFS, 2023).

A final element is robustness, whereby macroprudential measures ensure that the financial system can withstand the most adverse climate scenarios – implying a complete assessment of higher prospective climate-related risk loss exposure.

“Central banks and academics have highlighted that the risks of inaction are far greater than the risks of acting based on partial data.”

Recommendations

These challenges, while notable, should not foster inaction; addressing the physical risks of climate change only when they become salient would imply higher transition and physical risk. Research also clearly highlights that macroprudential policymakers need to be forward-looking, given that there tend to be long lags between policy announcements, their implementation, and eventual effects. There is scope for policy errors in an uncertain and evolving environment, and a balance must be struck between avoiding false alarms and avoiding missing a far more costly crisis. In this respect, a willingness to be proactive might go hand in hand with a progressive deployment of measures, with some tolerance for potential errors in activation and calibration to avoid losing credibility in the short term.

Of course, unintended consequences should be avoided – notably overburdening financial supervisory mandates while ensuring that financial regulation is appropriately targeted to minimise the possibility of putting objectives in conflict. Here, attribution of climate-related macroprudential policy needs to be judged

carefully across institutional sectors. For example, tackling physical risks from climate change, both chronic and acute, with prudential tools directed at banks, might instead be better allocated to insurance regulation in case such measures create aggregate credit supply shocks and unwanted disruptions in regional lending, which would be counterproductive from a macroprudential standpoint.

5. Conclusion

Climate change poses a systemic risk to the financial system that requires a response at the macroprudential level. The salient points to consider in its design lie in the interplay of financial policy with the broader policy landscape, including with its microprudential cousin, and a need for focus and complementarity.

Elements of the existing macroprudential toolkit could potentially be repurposed for addressing systemic risk specific to climate change, with existing macroprudential instruments such as systemic risk buffers or concentration limits the two clearest options. Such tools, along with more novel options, could be geared toward addressing the specific systemic risk attributes of climate change, notably its structural nature, its time horizon, the scope for leakages, its irreversibility and its complexity.

A resilient, evidence-based policy could be tailored to bolster risk absorption of climate-related risk, while macroprudential policy to directly prevent risk build-up might be more challenging, in terms of desirability and feasibility. Considering that modelling complexity and uncertainty are formidable challenges in operationalising a macroprudential framework for climate-related risk, a progressive deployment of policies, both within the macroprudential realm and in conjunction with broader policies, could still ensure timely action against the cumulation of financial stability risk while minimising mission creep and unintended consequences.

“A progressive deployment of policies could still ensure timely action against the cumulation of financial stability risk while minimising mission creep and unintended consequences.”

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About the authors

Paul Hiebert is Head of the Systemic Risk and Financial Institutions Division at the European Central Bank, Chair of the ESRB Analytical Working Group and Visiting Professor at the College of Europe.

Pierre Monnin is Senior Fellow at the Council on Economic Policies and Visiting Professor in Practice at the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science.

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