SUSTAINABLE FINANCE LAB

BEYOND CAPITAL BUFFERS

A macroprudential approach to European bank resilience

In this paper

Fossil fuel financing by European banks have increased since 2023, following some earlier declines.

Systemic climate risk continues to grow just as heat records are been shattered.

If the political will can be mustered, the most economically efficient tool would be to cap financed emissions by means of a macroprudential limit.

Dirk Schoenmaker & Hesse McKechnie

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POLICY PAPER

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The Sustainable Finance Lab (SFL) is an academic think tank whose members are mostly professors from different universities in the Netherlands. The aim of the SFL is a stable and robust financial sector that contributes to an economy that serves humanity without depleting its environment. To this end the SFL develops ideas and provides a platform to discuss them, thus bridging science and practice.

This Policy Paper has been drafted by Dirk Schoenmaker, Professor of Banking & Finance at the Rotterdam School of Management (Erasmus University) and SFL member, and Hesse McKechnie an associate at the Sustainable Finance Lab.

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Policy Paper

Sustainable Finance Lab publishes different types of publications.
This is a Policy Paper. Policy papers are reports produced by SFL members or employees that contain specific proposals and recommendations for the financial sector or policy makers.

CONTENT

1. INTRODUCTION

As European bankers and their supervisors reflect on their summer holidays, they will have noticed that in 2026 heat record after heat record has been shattered. At the same time, climate risk on banks' balance sheets is deemed comfortably low and manageable. What is going on here?

Universal banks play a crucial capital allocation role in the real economy. In Europe (and Asia), bank finance is the dominant form of financing (Langfield and Pagano, 2016). With their lending choices, they can make or break the future of individual companies and real estate deals. Their choices affect the pathways of countries' and sectors' future economic and societal performance. And this relation is a two-way street: banks are not only important in achieving and maintaining flourishing economies, but their long-term performance also depends on having flourishing economies in the future.

We need to face up to the severe challenge of climate change. We ask ourselves how European banks could improve their role allocating finance support the transition toward a sustainable economy? This paper starts on the premise that sustainability is a systemic issue affecting the economy as a whole (Lukomnik and Burckart, 2026; Schoenmaker and McKechnie, 2024). Current microprudential efforts targeted at the bank level are therefore not sufficient. By contrast, we propose a macro-approach at the system level towards making European banking sustainable. In their financial stability role, the European System of Central Banks could lead the development and implementation of a macroprudential approach with clear targets. In their transition plans, banks can show their commitment to these targets.

The contribution of this paper is to develop a better understanding of the transition dynamics of climate change and the role of banks in these transitions. Although this paper focusses on climate change, biodiversity loss and other nature topics,

such as water scarcity and pollution, also require attention if the European banking sector is to become truly resilient and sustainable.

This paper proceeds as follows. Section 2 reviews the emerging microprudential toolkit for the management of climate-related financial risks. Section 3 explains why climate risk is a systemic phenomenon requiring a macroprudential approach. Section 4 examines why banks underprice transition risks. Section 5 develops a macroprudential framework based on emissions trajectories. Section 6 discusses the implications for central-bank mandates. Section 7 introduces macroprudential limits on financed emissions, and section 8 concludes.

2. THE EXPANDING MICROPRUDENTIAL TOOLKIT

The last few years have seen a steady improvement in the ability of the banking sector to identify and manage climate risk as a financial risk. Approaches to the identification and quantification of climate risk as a credit risk have been developed (UNEP-FI, 2018). Understanding of litigation risk, although insufficiently taken into consideration (Smoleńska et al, 2025), has increased as legal cases have been brought against major banks, such as BNP Paribas and ING, on their contribution to physical risk through financed emissions.

The European Banking Authority has set guidelines for the development of prudential transition plans which require a holistic 10-year forward looking approach. The quality of transition plans will be taken into consideration as part of the SREP process. For years now, banks have been required to carry out climate stress testing. While climate risk stress tests are a useful tool to make potential financial losses in the financial system transparent, they do not in themselves reduce financed emissions.

These microprudential efforts have been an improvement for sure. However, they are not likely to reduce financed emissions or the probability of a hothouse world scenario. There is no mechanism to assess the state of play at the macroprudential level. Worse, these tools could give a false sense of security. The criticism of stress tests, for example, is that they underestimate the size of climate shocks and the impact of climate shocks on the financial system by ignoring feedback loops (Reinders et al, 2025).

Banks are still directing more finance to carbon-intensive sectors than the green economy. The ratio of finance harmful to nature vs nature positive finance is 30:1 (UNEP-FI, 2026). Banking on Climate Chaos (2026) reports that the top 65 global

banks committed US $906 billion to fossil fuel companies in 2025, up US $64 billion from 2024. EU banks collectively increased fossil fuel financing.[1]

[1] It is worth noting however that over a third of the banks reduced fossil fuel financing, with some European banks driving much of the progress.

3. CLIMATE RISK IS A SYSTEMIC ISSUE

The Network for Greening the Financial System has written an excellent paper on 'Central Banking in the Biosphere' (NGFS-INSPIRE Study Group on Biodiversity and Financial Stability, 2022). In climate change, a common distinction is made between physical and transition risk. Physical risk refers to environmental events including floods and storms arising from climate change. Physical risk can affect companies directly through damage/loss of assets and injuries/deaths of employees, and indirectly through its effects on value chains and customers. By contrast, transition risk arises from changes in policy, new technologies and customer preferences. The focus of the climate risk debate frequently, and rightly, is on physical risk which is a long-term existential threat to our way of life.

While our understanding of physical risk has steadily improved, we argue that systemic transition risk is underappreciated. The energy transition, which is required to combat climate change, is a process of creative destruction. New technologies and business models replace the old ones (Schumpeter, 1942). Figure 1 depicts the dynamics of socio-technical transitions as iterative processes of build-up and break-down over time (Loorbach et al, 2017). In a changing climate context, optimised carbon-intensive businesses will be disrupted because 'green' or low-carbon businesses are emerging. The actual transition is disruptive because carbon-intensive businesses that do not transform will have to be broken up and phased out.

The x-curve of transition dynamics

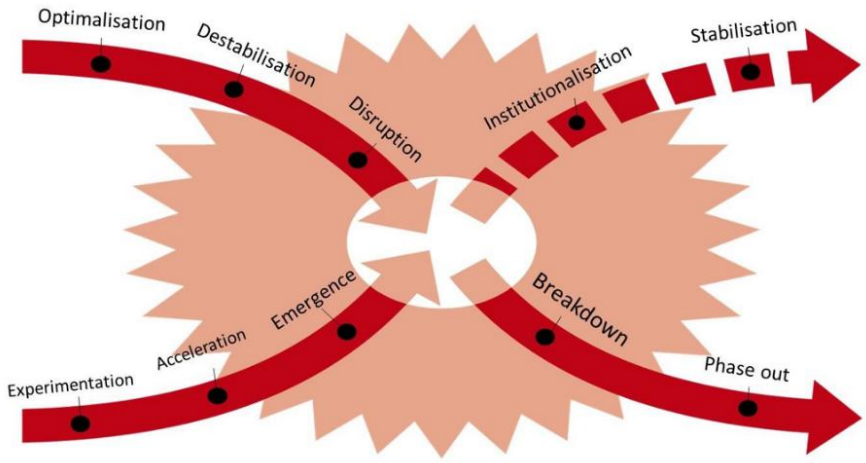

Figure 1. Source: Loorbach et al (2017).

Sustainable technologies (e.g. based on solar, wind, hydrogen) have been innovating and developing at a very fast rate and will continue to do so (IRENA, 2024). This means that disruption to the traditional fossil-fuel-dependent economy might be fast approaching - with stranded assets as a consequence (Caldecott et al, 2021). The recent energy crisis, ignited by the US-Iran war, has reinforced the need for speeding up the energy transition in Europe to reduce Europe's dependency on fossil fuels.

To serve the 'real economy' transition, banks[2] will have to get better at two things. First, they need to get better at financing the new green economy. This is hard. Banks' risk models make low-carbon financing opportunities more expensive because of the newness and uncertainty related to the green economy. Moreover, data from the European Banking Authority (EBA) show that existing financial accounting frameworks might inadvertently create disincentives for investment in low-carbon assets, as banks are accounting for nearly double the loan loss provisions for lending to low-carbon sectors compared to high-carbon sectors (Gasparini et al, 2024). Second, banks have to hive off profitable loans to high-emitting companies (Oehmke and Opp, 2026).

[2] Banks are taken as the focus for this analysis but a similar logic can be applied to all regulated financial entities – pension funds, insurance companies and investment funds – as argued in section 4.

4. THE CURIOUS CASE OF THE MISSING TRANSITION RISK

So why aren't banks internalising the transition risk? There are many complex reasons, but two dimensions are worth pointing out.

First, the time horizon of climate risk 'by far' exceeds the average maturity of bank loans (Demekas and Grippa, 2024). Banks finance the development of energy and industrial assets that could be with us for 25 – 40 years, but will only be on the bank's books for an average of 5 years (EBA, 2025). Banks have an easy mechanism to remove transition risks from their balance sheet. They can stop rolling over corporate loans. There is already some evidence that banks are shortening loan maturities to reduce transition risk exposure (Ivanov et al., 2024). However, when banks discontinue rolling over loans or shorten loan maturities, transition risk does not go away. It shifts from debt holders to equity holders and the wider economy (Knijp and McKechnie, 2025). Equity holders are risk takers and in isolation this should not be an issue. However, if the banking sector implements such actions at scale, or in haste, there will be systemic implications which have secondary effects on the banking sector and the insurance and pension funds sector (who are holding the equity claims).

Second, the banking sector is second-guessing that the EU will abandon its climate goals when confronted with the risk of financial instability. At any point, policy makers could for example amend the Climate Law by pushing the net zero target back to 2060. As a consequence, they are underpricing transition risk. As soon as the mid-2030s, policy makers may find that achieving current climate objectives cannot be achieved without risking an economic and financial crisis (Knijp and McKechnie, 2025). Banks may therefore judge with good reason they will be deemed 'too big to fail', and ultimately rewarded for inaction. Thus, we are faced with a situation of moral hazard. Banks may discount the likelihood of climate policy enforcement and underprice transition risk. This misalignment

becomes self-reinforcing: if banks do not believe policy targets will be met, those targets become increasingly unachievable.

From today's perspective, this approach may appear sensible. Political attention is currently focused on competitiveness and geopolitics. However, policy priorities can also shift. A major climate event or a series of climate events, such as catastrophic wildfires or flooding for example, could trigger a need for abrupt climate action from policy makers and a disruptive delayed transition scenario (ASC, 2016).

5. A MACROPRUDENTIAL-APPROACH

Climate risk is a systemic issue. The starting point for treating it as such is to determine scenarios for the possible pathways of carbon emissions. It is important to derive these pathways from climate science. The most recent scenarios, developed for the IPCC (Intergovernmental Panel on Climate Change), are shown in Figure 2 (Van Vuuren et al, 2026). The very low (VL), low to negative (LN) and low (L) emissions scenarios stay likely below 2 degrees Celsius global warming in line with the Paris agreement, while the medium-to-low (ML) scenario fluctuates around 2 degrees Celsius.

Climate scenarios for IPCC

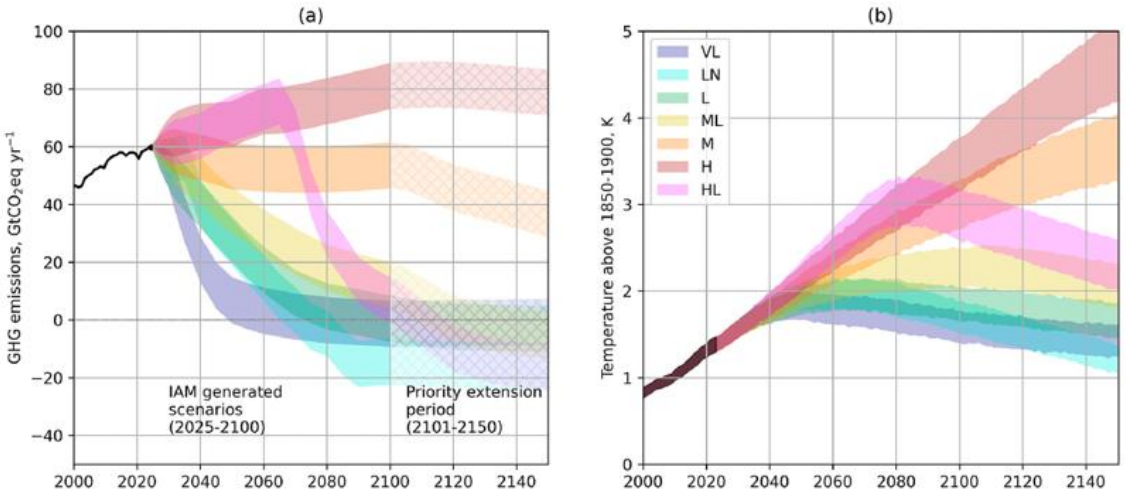

Figure 2. Source: Van Vuuren et al (2026).

Note: Panel (a) shows GHG emissions pathways as function of time; panel (b) shows the associated global average temperature outcomes. The scenarios refer to (H) High, (HL) High-to-Low, (M) Medium, (ML) Medium-to-Low, (L) Low, (LN) Low-to-Negative and (VL) Very Low emissions.

The question is how to design a macroprudential approach based on these scenarios? The policy aim of any climate transition supervisory framework should be to maintain financial stability during that transition (Schoenmaker and McKechnie, 2024). Here it is best to start with 'knowns' and to build uncertainty and risk into the framework subsequently. European policymakers have legally determined that net-zero needs to be achieved by 2050 to align with the Paris Agreement. Unlike commercial banks, who may bet against net-zero, central banks, as policy takers, should take the legally binding commitment at face value.

With the destination and the timeframe essentially fixed, the only uncertainty is when to take the hit: go early, go late or go steady. That the speed of transition is inversely correlated to financial stability is understood intuitively. An abrupt reallocation of assets from high-carbon to low-carbon assets would leave the real economy less time for adaptation and the financial sector with more stranded assets. As Carney (2016) put it, *"too rapid a movement towards a low-carbon economy could materially damage financial stability"*. This will be just as true in 2049 as it is now.

We therefore postulate that, all other things being equal, there is an inverse correlation between the speed of transition and financial stability, and it is the most steady path towards net-zero that offers the greatest amount of financial stability. At any point in time, the straight-line path towards the Paris net-zero objective will result in the least amount of financial instability (Figure 3). The world is currently, however, on the 'too late, too sudden' pathway (ASC, 2016). Internalisation of the cost of the Paris Agreement is being delayed. In other words, an illusion of financial stability now is being traded for a more rapid transition with greater financial instability later.

Financed emissions pathways and financial stability

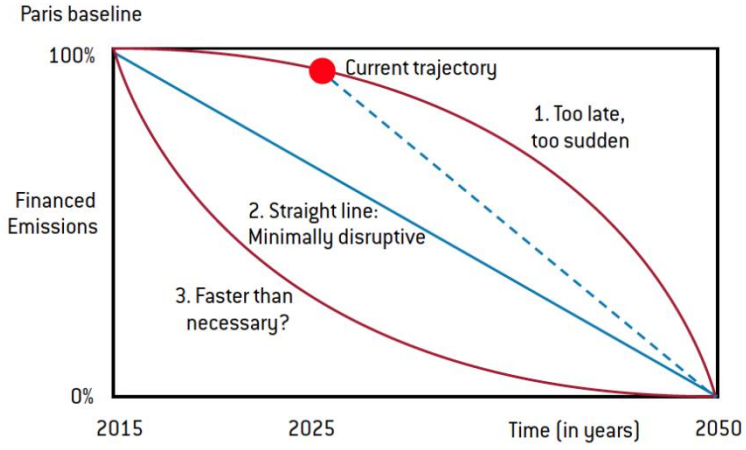

Figure 3. Source: Schoenmaker and McKechnie (2024).

Had the 'minimally disruptive' pathway (Figure 3) been followed globally starting in 2015, the annual percentage point decrease in financed emissions would have needed to be approximately 3 percent (100 percent divided by 35 annual steps towards 2050). Now (the red point in Figure 3), with little progress so far, the annual percentage point decrease is now approximately 4 percent. Following this logic, the inaction that has persisted under the current supervisory framework since 2015 has caused a build-up by a third (i.e. the difference between 3 percent and 4 percent) in the financial instability that results from the Paris Agreement. Should the next five years see as much progress as the last decade, the annual percentage point decrease in financed emissions will have to increase to 5 percent, a build-up of financial instability by two third (compared to starting in 2015). Although these numbers will vary by jurisdiction depending on progress towards net-zero, the fact is that very few central banks (if any) collect the data to measure financial stability in this way.

Note that Figure 3 is a deliberately limited abstraction of the impact of the climate transition on financial stability. It only focusses on the known Paris Agreement requirement to achieve the 2050 goal, not on the physical and transition risks associated with climate change. The unknown tipping points and feedback loops that may result from 'physical', 'social' or 'economic' phenomena add more complexity (Bolton et al, 2020).

Overall, there are likely to be more downside than upside risks. Physical risks will increase as climate tipping points are reached, such as permafrost collapse, icesheet loss and rainforest dieback. The frequency and severity of physical climate events (e.g. major floods, wildfires, heatwaves, droughts or storms) are already increasing in the run up to 2050, causing both human tragedy and financial losses. In terms of a global just transition, historically wealthy countries are calculated to require a decarbonisation pathway faster than the straight-line approach we propose.

6. ROLE OF CENTRAL BANKS IN FINANCIAL STABILITY

How central banks manage and, if necessary, enforce financial stability objectives in line with the climate transition is far from settled. Bolton et al (2020) commented on the tension over central bank supervisory mandates. There is a recognition that central banks must do more and that they *"may inevitably be led into unchartered waters"*. But central banks also *"can only do so much"* and should avoid the *"risk of overburdening existing mandates"* (Bolton et al, 2020).

The preferred instrument of many macroprudential policymakers is the imposition of systemic risk buffers. ECB/ESRB (2023) proposed a systemic risk buffer (called concentration charges) for climate-related concentration risk. If and when carbon-intensive exposures exceed a concentration threshold, the systemic risk buffer kicks in, as greater concentrations are associated with larger bank losses. Systemic risk buffers can be calibrated to give incentives for banks to align with the transition and thus mitigate the build-up of climate risk for the system (Ikeda and Monnin, 2024).

However, banking supervisors tend to set capital buffers at the lower level, making them less effective. A case in point is the countercyclical capital buffer, implemented after the global financial crisis, which is not regarded as sufficiently substantial to be able to counter the credit cycle when activated. In the climate case, the buffer has to be large enough to tilt the balance from carbon-intensive to low-carbon loans (Oehmke and Opp, 2026). In the current outlook, with energy shortages and high interest rates, fossil-related loans are more profitable than loans for renewable-energy projects, which need high upfront investment at currently high interest rates. So, just like the counter cyclical capital buffer, a systemic risk buffer for climate concentrations is likely to have limited effect, unless it is set at a variable and sufficiently high level (which is unlikely to happen for political-economy reasons).

7. MACROPRUDENTIAL LIMITS FOR FINANCED EMISSIONS

How could things be different? First, central banks could apply the precautionary principle: scientists argue for staying within the safe operating space of the earth system, as there are many uncertainties about climate effects (Richardson *et al*, 2023) as well as tail risks (Stiglitz, Stern and Taylor, 2023). Taking EU Climate Law at face value, the best proxy for measuring financial instability currently available is the annual required decrease in financed emissions in excess of 4 percent (represented by the dotted line in Figure 3).

Of course, government regulation and taxation, such as carbon taxes, are first best responses to the need to cut emissions. However, an 'all-hands-on-deck' approach is needed to deal with systemic climate risk, in which both policymakers and policy takers must take action that is mutually reinforcing (Blanchard, Tirole and Gollier, 2023). Central banks, as policy takers, could take the net-zero commitment of the policymakers as the foundation of such an approach.

Unlike commercial banks, who may bet against net-zero, central banks, as policy takers, should take the legally binding commitment at face value, as argued earlier. Following from their financial-stability mandate, the question then for central banks is what they could do to minimise financial instability?

There is therefore a need for further policy tools that require banks (and other financial institutions) to reduce financed emissions in line with the Paris goal. An alternative to buffers (which are basically pricing tools) is to cap financed carbon emissions by means of a large exposure rule limit (Schoenmaker and Van Tilburg, 2016). Such a hard budget constraint would directly limit – 'quantitatively cap'— the amount of financed carbon emissions in an effective way. Hard budget constraints overcome the first-mover disadvantage problem by creating a level playing field for all banks and better price signals for financed emissions.

Given the limitations of buffers, we explore the possibility of applying bank-specific macroprudential limits for financed emissions, starting from a baseline and extending forward to 2050. Bank-specific means a limit based on a bank's absolute financed emissions, taking into consideration the actual portfolio baseline at a certain date. Macro means that the aim of the limit is to reduce financed emissions in the wider financial system, in the aggregate. Within the constraints of such hard limits, a price for financed emissions will emerge. This will help banks steer towards Paris-aligned loan and investment portfolios that limit bank-specific and systemic losses resulting from the climate transition. Limits beat buffers on efficacy, even if they require central banks to align more with policymakers in order to implement and enforce.

Hard limits on financed carbon emissions to reach net-zero in 2050 could be designed top-down from a systemic perspective. As indicated in Figure 3, the starting point is the amount of today's financed emissions as a percentage of bank capital. This prudential limit could be tightened to achieve absolute emission reductions of 4 percentage points per year, relative to the base year 2025 (Schoenmaker and McKechnie, 2024).[3] Given this tightening, banks have an incentive to lend to companies that adapt to greener business models as they will contribute to reduced financed emissions. Lending to companies that do not adapt will be hard to come by as these companies will never contribute to reduced financed emissions. The aim would be to achieve timely reductions, not to punish high-carbon companies that are on a credible and timely path to reduce their carbon emissions.

The aim of the prudential limit would be to steer the climate transition in an even-handed way to net-zero by 2050, over time and across banks. All banks, no matter what their baseline of financed emissions, will have to set annual steps towards net-zero. Under the auspices of the European Systemic Risk Board (ESRB), limits could be set for all regulated financial entities: pension funds, insurance companies and investment funds. The result of the limit will need to be a decline in finance to companies that are unable to adapt and thus to prevent climate-transition losses to the financial system.

Moreover, the macroprudential limit could be location based, just like the countercyclical capital buffer. Non-EU institutions operating in the EU would then also fall under the macroprudential limit. To prevent international leakage, these macroprudential limits could also be implemented at the global level through the Financial Stability Board and the G20 (Schoenmaker, 2025).

[3] 100 percent divided by 25 annual steps towards 2050. So, a prudential limit of 100 percent (of 2025 emissions) in 2025, 96 percent (of 2025 emissions) in 2026, 92 percent (of 2025 emissions) in 2027, to 0 percent in 2050. The annual 4 percent reduction in the starting limit could be adjusted for increases in aggregate bank capital. So, in case bank capital grows by 10 percent (in comparison to the bank capital in the starting year), the annual reduction would increase to 4.4 percent (4 percent x 1.1).

8. CONCLUDING REMARKS

The proposed solution may appear radical. It is not unfair to say that limits are far removed from our current mainstream policy discussion. Consequently, we should welcome any incremental improvements to the microprudential or macroprudential toolkit that are currently politically palatable. We should not however fool ourselves to think that we have climate risk under control whilst fossil fuel financing continues to increase at system level. We must be mindful to avoid giving ourselves a false sense of security. To those who are skeptical of the proposed approach of limits, we ask this: how else can the sustainability of the European banking system be achieved?

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