Rotterdam School of Management
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Erasmus Platform for Sustainable Value Creation

Working paper

Balancing micro and macroprudential perspectives

Aligning financial supervision with systemic climate and nature-related risks

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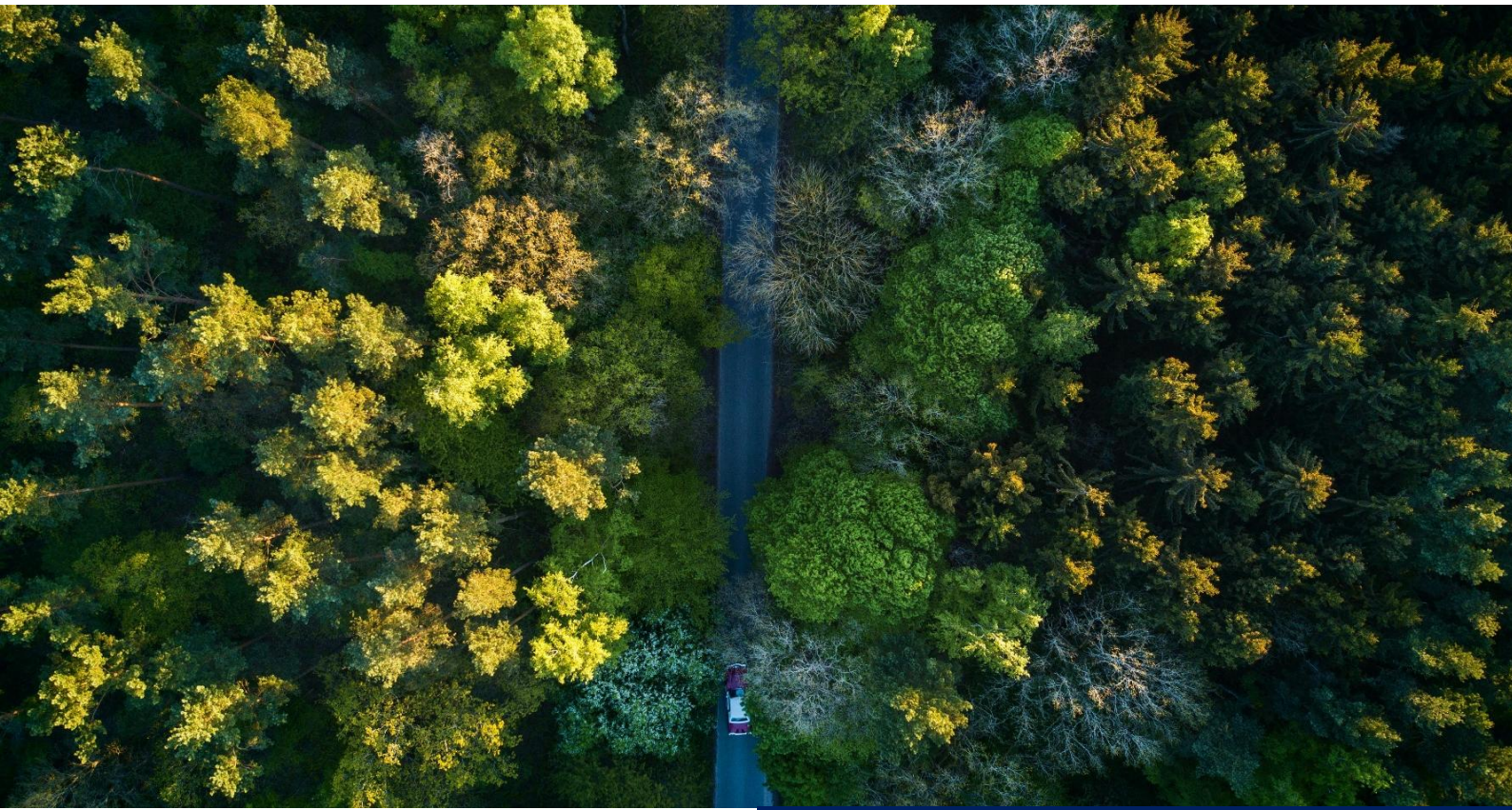

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Colophon

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The Erasmus Platform for Sustainable Value Creation is an academic think-tank at Rotterdam School of Management, Erasmus University (RSM) that collaborates with leading sustainability experts in the financial sector. Through its strategic collaboration with NWB Bank, it participates in the Dutch working group on Biodiversity and Finance.

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Introduction

Evidence increasingly shows that climate related risks[1] affect the stability of the financial system as a whole (Bolton et al., 2020; Lukomnik & Hawley, 2021). The Financial Stability Board also acknowledges that climate-related risks threaten financial stability (Board, 2021). Fortunately, financial supervision increasingly incorporates climate and nature related considerations. Currently, supervisors like the ECB take those risks into account to the extent that they affect financial institutions—an outside-in perspective on risks. We argue that the inside-out perspective, —how financial institutions affect climate and nature through their financing activities, positively or negatively, remains mostly overlooked. It is often argued that the supervisory mandate should eschew political interference. To that regard, expanding beyond solely outside-in risk perspectives is considered overstepping into policy making. This links to the debate of the understanding of the mandate of financial supervisor.

The plea for considering both inside-out as outside-in risk perspectives, is however growing, recognizing for example the feedback loops between exogenous and endogenous risks (Brinkman, 2023; Stiroh, 2022). In this paper we add to the debate by arguing that the dominant focus on outside-in risks affecting financial institutions also ties to the hierarchy between micro and macro prudential policy. The 2008 financial crisis showed that risks that affect the stability of the financial system can be overlooked when the focus is dominantly on the health of individual institutions and too little on the system as a whole. Under the surface, risks can be building up in the system while all its members appear fine prima facie. The crisis of 2008 led to the strengthening of macroprudential supervision, which focuses on the interaction between financial institutions and the system as a whole. It aims to safeguard the system and to prevent the disproportionate build-up of systemic risks (European Central Bank, 2014). We argue this history depicts an analogy for how financial supervision currently deals with climate and nature related risks. We argue for sufficiently addressing the systemic character of climate and nature related risks.

We plea for a more balanced approach by broadening the regulatory scope to include a stronger macroprudential perspective. While the microprudential toolbox remains critical, its prioritization over the macroprudential lens risks creating unintended consequences. In cases of friction, this can discourage financing activities that help mitigate systemic climate and nature-related risks, ultimately undermining sustainability goals. Consider a bank financing projects that enhance biodiversity or mitigate flood risks, for example by financing

[1] This paper considers both climate-related and nature-related risks, reflecting the growing recognition of their interconnectedness. While most existing literature and policy discussions tend to focus primarily on climate-related risks, this broader approach is essential to capture the full spectrum of environmental challenges.

a dike construction or riverbed restoration. However, this project is located in a flood-prone area. These activities, while beneficial at a systemic level, may expose the bank to higher individual risks, possibly leading to credit or capital charges. This paper explains how a friction occurs when microprudential regulations prioritize institution-specific vulnerabilities without accounting for broader systemic benefits. Using case studies, we illustrate the need for prudential tools that better align microprudential and macroprudential objectives. These tools should consider both the systemic benefits of sustainability-driven investments and the individual risks to financial institutions.

Micro versus macro

Micro and macro prudential supervision are both ends of a spectrum of policy instruments that aim to protect the stability of the financial system. Although they have a different focus, they have a shared overall purpose and are complementary (Boissay & Cappiello, 2014). They are different in terms of their objective, how risk is characterized and how risk should be controlled. Microprudential supervision aims to oversee and limit problems at the level of individual financial institutions to protect their customers and other stakeholders. It doesn't fully consider risks affecting the whole financial system. In contrast, macroprudential supervision aims to limit the building up of imbalances within the financial system to protect the overall economy from major losses. It focuses on the health of the entire financial system.

While the failure of one institution can pose a risk to the financial system, the bigger concern is systemic risk from many institutions facing the same dangers as recessions or housing market crashes. The need for macroprudential supervision is illustrated by the "fallacy of composition": what's true for individual parts isn't necessarily true for the whole (Brunnermeier et al., 2009). In terms of risk assessment, focusing solely on individual entities might overlook risks building-up in the whole system and vice versa. Macroprudential supervision sees risks as partly coming from within the system itself (endogenous), while microprudential supervision focuses more on institution’s vulnerability caused by threats from outside (exogenous). Macroprudential supervision takes a top-down approach, looking at risks across the whole system to set controls, while microprudential is bottom-up, setting controls based on each institution's risk (De Haan et al., 2020). The conceptual differences are summed up in Table 1.

Table 1 Macroprudential versus microprudential supervision

	Macroprudential	Microprudential
Intermediate objective	Limit financial system-wide distress	Limit distress of individual financial institutions
Ultimate objective	Avoid output (GDP) costs	Consumer (investor/depositor) protection
Correlations and common exposures across institutions	Important	Irrelevant
Characterization of risk	Seen as dependent on collective behavior (endogenous')	Seen as independent of individual agents' behavior (exogenous')
Calibration of prudential controls	In terms of system-wide risks; top-down	In terms of risks of individual institutions; bottom-up

Source: Borio (2003) , cited in De Haan et al, (2020)

Both concepts play vital roles in providing a safe financial system. They have a different but related focus. Despite some tension that might rise between the two concepts, the two share some similar policy instruments and in theory play an equally important role. As such, they should be complementary rather than contradictory (European Central Bank, 2014).

While sharing the same overall objective, micro and macro prudential supervision however can also conflict due to their differences in focus and intermediate objective. This can occur at several levels, like capital requirements, interest rates, liquidity requirements and financing activities. For example, on capital requirements: if the economy is under stress, the microprudential concern might require higher capital buffers across the entire banking system, which has implications for the lending capacity of individual financial institutions. This may culminate in a credit crunch. From a macroprudential view, lending is important for economy recovery and thereby the stability of the financial system (by reducing credit risk). The higher capital buffers could create tension between safeguarding the overall financial stability on the one hand, and the health of individual financial institutions on the other hand. Such frictions are more likely to occur in times of stress (Brunnermeier et al., 2009). The conflicting intermediate objectives of macro and micro prudential supervision can also create tension between financing decisions and financial stability. From the microprudential supervision perspective, financial institutions are encouraged to finance creditworthy activities – based on individual risk profiles. In the macro context on the other hand,

supervisors could be concerned about mounting credit growth leading to bubbles or systemic risks (in the upturn of the financial cycle) or about declining credit capacity leading to economic slowdown (in the downturn of the financial cycle). In the case studies below, we show some examples of this tension in relation to climate and nature.

Financial supervision on climate and nature

Financial institutions are exposed to sustainability related risks like climate change, the rapid loss of nature, transition risks, and other sustainability related challenges. Financial regulators and supervisors have the importance of climate change (and increasingly nature loss) more and more on the radar. Consensus that climate change poses risks for financial stability and price stability, and thus falls within the mandate of central banks, is growing too (Ford et al., 2022).

Financial institutions are however not only *affected* by these risks, they also *contribute* to the further acceleration or mitigation of them. This is the concept of double materiality, which is about the holistic consideration of both micro-financial risk (outside-in) and impact materiality (inside-out) (Täger, 2021). The analogy of double materiality can be linked to micro and macroprudential supervision by comparing their approaches to risk assessment and management. Microprudential supervision has an exogenous character, that considers how sustainability factors *affect* individual institutions. This is the lens of micro-financial materiality (outside-in). Macroprudential supervision has both an exogenous and endogenous character, and considers the systemic risks caused by collective behaviour – this is the lens of impact materiality (inside-out). These differences are highlighted in Table 1.

Unique characteristics of nature and climate-related risks are that they are forward-looking, non-linear, systemic, and endogenous (Ford et al., 2022). It is challenging to tackle them with the traditional instruments in the toolbox of financial authorities. For example, historical data is not fit for addressing nature and climate related risks. There is a need for scenario analysis and stress testing, that require assumptions and often underestimate the risks (Reinders et al., 2023). Furthermore, sudden cascading events, like the breach of ecosystem tipping points, can be difficult to deal with in a policy environment based on incremental change and predictability (UCL, 2024). In contrast to the latest policy debates, like Stiroh (2022) on the feedback loops between outside-in and inside-out risks, we argue that an idiosyncratic approach is unfit to deal with the endogenous and systemic character of climate and nature related risks.

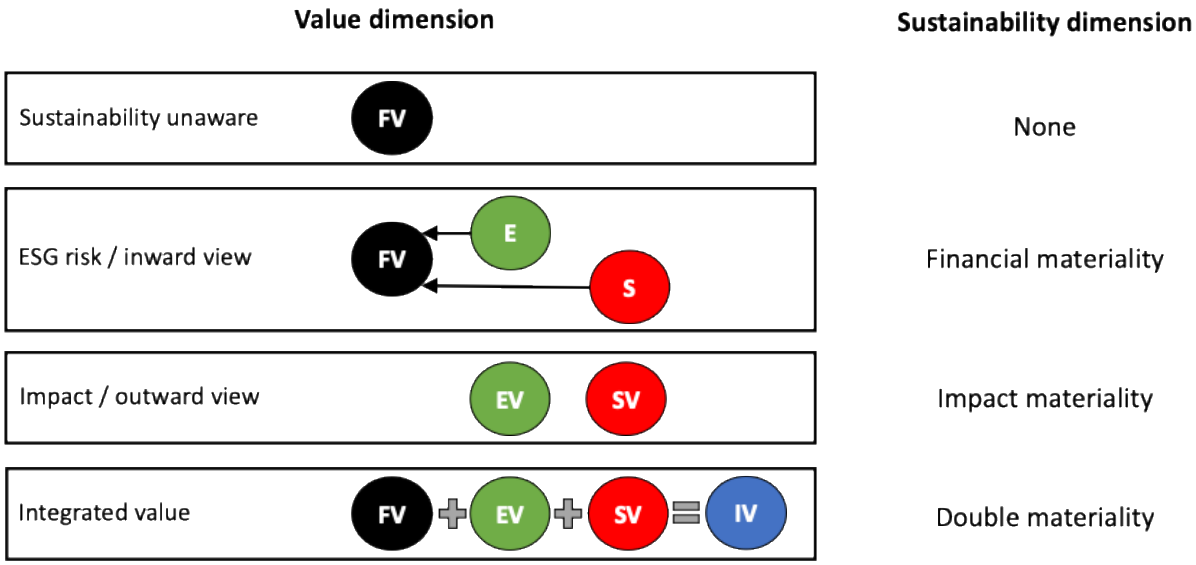
So far, policy has mostly been put into practice through microprudential measures in Pillar 2 (supervisory engagement) and Pillar 3 (disclosures), although there is the expectancy that Pillar 1 measures will follow. When these instruments are effective, financial institutions could be stimulated to focus mostly on limiting climate and nature related risks throughout their portfolio, for example through reducing lending to GHG-emitting companies or increasing lending to renewable energy companies or through engagement and ensuring sufficient ESG action plans. Some investments, as the presented case studies show, can positively contribute to overall resilience, not only at the portfolio level. Such financing activities create benefits on a larger scale and might help hedging system risks. The resilience benefits of these activities are shared among all participants in the financial sector and are not exclusive to those who make the investment (Phlippen, 2024).

On the macroprudential side, not many measures have been taken yet, while there have been efforts on 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 always require action by financial institutions. Moreover, current climate stress tests give a false sense of security, because these tests underestimate the size of climate shocks and the impact of climate shocks on the financial system (Reinders et al., 2023). Furthermore, most of these stress tests have a limited time horizon and do not include the positive or negative impact of the activities of financial institutions on climate change.

The existing prudential policies, such as pillar 2 warnings, are still mainly aimed at "voluntary improvements in financial firms' own practices" and it remains unclear how enforcement is outlined should institutions not meet the requirements (Ford et al., 2022). Some authors argue that a single rather than a double materiality approach could lead to the build-up of systemic nature and climate related risks, including so-called green swans (Boissinot et al., 2022; Bolton et al., 2020).

There are good arguments for financial authorities to endorse a broader view on materiality—both outside-in as well as inside-out, to deal with the challenging characteristics of nature and climate related risks (Chenet et al., 2022; Kedward et al., 2020). Figure 1 shows the relation between materiality outlooks and sustainability.

Figure 1 Value and sustainability



Source: Schoenmaker & Schramade (2023)

Case at hand

This paper underpins the idea that a too narrow focus on outside-in risk exposure, is insufficient and possibly even harmful (Ford et al., 2022). We would like to add to the debate by showing that some microprudential measures could end up penalising the wrong activities, undermining activities that help mitigating systemic risks at a macroprudential level. We highlight some cases, on climate adaptation and on biodiversity.

Climate adaptation

Climate adaptation refers to the process of adjusting to current and possible future impact of climate change. From the microprudential side, we could think of activities that should potentially be priced higher because of a perceived higher risk profile when viewing through a climate adaptation lens, as these infrastructure projects are placed in flood prone areas. But from a macro-perspective, these activities can (possibly even significantly) contribute to climate risk mitigation.

Consider for example public banks financing investments of public authorities in flood defences mitigating flooding risks in their social housing portfolio, as well as flood risks of assets for other banks. These public banks issue green bonds to fund environmentally sustainable water projects promoting climate mitigation, adaptation, and biodiversity (e.g. NWB Bank, 2022). However, these investments in flood defences may result in an increase in

credit risk looking at the financial situation of the individual client. The investments could result in a higher capital charge for the specific client because the risk mitigating impact on the ESG risk profile of the individual client (and possibly other clients) generated by these investments is not taken into account. Conversely, from a macroprudential viewpoint the positive impact of these investments on the protection of assets of the financial sector and therefore the resilience of the system as a whole will be recognised. When these positive effects are accounted for, the micro prudential risk should be considered lower, at least not increasing because of these investments, which can lead to lower interest rates and therefore lower costs of investments to protect against flooding. To some extent we already see this as the market appears to favourably price these green bonds and thus prices the mitigating effects of these green bonds. Therefore, to prevent harming the incentives to invest in increasing the resilience of the system and thereby the micro prudential stability, it is important to not only look at micro-financial materiality but also to impact materiality. Investing in these activities will make the financial system as a whole more resilient, which leads to lower risk for the system and thereby also reduces the risk of financial institutions and their clients individually.

Another case at hand is the Prins Hendrikzanddijk (dike), located in the North of the Netherlands on the shore of the island Texel. The island is below sea level for the most part, which is why it is protected by the Waddenzeedijk (dike). The Prins Hendrikzanddijk is a separate part of the Waddenzeedijk. What is special about the reinforcement of this part of the dike is that it happened by creating sand dunes that integrate into the local ecological landscape rather than a traditional dike that is strengthened inland. This was suggested by multiple stakeholder organisations, consisting of local governments, authorities, and environmental organisations. The project not only ensured water safety for the following years, the area around the Waddenzee also environmentally improved because of the sand reinforcement. A dune- and marsh landscape was created, enabling nature around the area to grow as well as providing a better habitat for animals. The whole ecosystem was allowed to thrive, and biodiversity was stimulated due to a close collaboration between relevant stakeholders. The risk of flooding has been reduced significantly for not only Texel, but also the rest of the country. From a micro-perspective this investment could have been seen as increasing the credit risk profile of the public authority who invested in this dike. However, from a macro prudential perspective the reinforcement of the Prins Hendrikzanddijk helped diminishing flood risk and also improved the biodiversity thereby improving the resilience of the (financial) system.

Biodiversity

There are banks and funds (e.g. SLM Silva Fund Europe) which invest in forest and agricultural enterprises regenerative farmers, with positive impact on their environment. Although various interpretations exist, regenerative agriculture is a practice whereby nutrients and life are restored and returned in the soil rather than extracted and stripped (Durkin & McCue, 2021). From a microprudential view, a single financial institution like a bank should assign a higher risk profile to these types of farmers as the financial outcome of regenerative agriculture can be less profitable and more volatile in the short term (Teanby & Cackett, 2023). This agricultural practice however mitigates financial and potential regulatory risks (in the longer term) as well as ESG risks, because of the stimulation of healthy soil and thereby the value and production capacity of the land in the future. Taking a double materiality perspective, opportunities are sought after to invest in systems that contribute to biodiversity and thus reduce multiple ESG risks for institutions. Furthermore, investments in regenerative agriculture have already resulted in other benefits aside from improving biodiversity, such as reduced expenses for fertilizers and better resistance against the consequences of climate change.

So, from a micro prudential perspective climate and nature resilience measures impact the credit profile of an entity directly and may impact the credit profile of other entities indirectly. The direct effect is a reduction in the potential loss due to climate related events. Next, it bolsters the revenue retention. Resilience measures taken by an entity indirectly influence the credit risk profile of other entities. For example, the risk exposure of an insurance company on a certain entity will decrease in case the entity takes resilience measures, improving the credit profile of the insurance company. The indirect effect especially holds for measures not aimed at an individual level, for instance flood protection. Flood protection reduces the exposure to climate risk for all entities located in the protected area. Hence, improving the credit profile of these entities.

Currently, the direct and indirect positive impact on the credit profile is not reflected in the standardized based capital requirements under the Capital Requirements Regulation. Hence, the capital component of the lending rate is not influenced by resilience measures. In order to set the right incentives, resilience measures should be reflected in the solvency requirements. A first possible step might be to introduce a resilience supporting factor akin to the infrastructure supporting factor where the factor depends on resilience measures taken by the entity.

Settle micro and macro tension

The global financial crisis of 2008 underscored the importance of examining the endogenous nature of financial imbalances (Brunnermeier et al., 2009). Similarly, this paper argues that sustainability imbalances also develop endogenously. Investments that maintain carbon-intensive or biodiversity-harming practices may accelerate sustainability imbalances (case 1. in Table 2). By contrast, investments that enhance sustainability can mitigate system-wide nature and climate related risks (case 2. in Table 2). Finally, some Green Swan type shocks (e.g. climate or ecosystem tipping points) may build up over a longer horizon, beyond the horizon of microprudential supervision (case 3. in Table 2).

Nature and climate related risks are increasingly integrated into microprudential measures from a single materiality perspective while macroprudential measures on climate and nature are trailing behind, possibly leading to underprioritizing the build-up of systemic risks (cases 1. and 3.). Despite micro and macroprudential supervision measures often being aligned (case 1.), sometimes they're not (case 2.). This can also be the case with regard to nature and climate related risks. Financial institutions might risk getting unjustly penalised for financing activities that improve system's resilience and therefore these activities may be undersupplied leading to higher sustainability risks.

It's crucial to establish consensus on how financial entities should assess and mitigate their risk of financial distress caused by nature and climate factors, avoid the fallacy of composition, and determine how the double materiality concept and macro prudential perspective can be taken into account in micro prudential supervision.

Table 2 Microprudential versus macroprudential instruments for nature and climate

Case	Microprudential risk	Macroprudential risk	Availbale policy instrument
1.	Yes	Yes	Micro prudential supervision Planned for pillar 2 and explored for pillar 1 Macro prudential supervision System Risk Buffer Limits on build-up nature and climate risks
2.	Yes	No	Micro prudential supervision counterproductive

			Macro prudential supervision not needed
3.	No	Yes	No instruments yet but needed in case of shocks related to climate or nature (precautionary principle).

Policy recommendations

Our paper adds to the expanding debate on financial supervision on climate and nature related risks. Others have already stressed the point that current policy instruments rely heavily on (the quality of) disclosure and leave little room to deal with the radical uncertainty that comes with climate change and nature loss (Bolton et al., 2020; Ford et al., 2022). This asks for a more qualitative and holistic approach. We add to the debate by arguing the importance of dealing with system risk at the macro prudential level.

Here lies a responsibility for the European Systemic Risk Board (ESRB) and the Financial Stability Committees of national central banks. A recent advice of the ESRB (2023b) on the prudential treatment of environmental and social risks promotes appropriate accounting for ESG risks in microprudential supervision (case 1.) and developing new macroprudential measures (cases 1. and 3.)[2]. The appropriate accounting for ESG should also be reflected in guidelines drafted by the European Banking Authority.

However, these measures are risk-based. We recommend that not only sustainability risks but also sustainability impacts should be included to achieve a holistic approach. The ESRB and Financial Stability Committees of national central banks should therefore also take measures to more actively ensure long-term financial stability by taking long-term impacts alongside long-term risks into account in stress tests. Moreover, time-horizons of capital adequacy assessments should be lengthened to allow for proper ESG risk integration. Lastly, supervisory authorities should ask for integration of key impact indicators next to key risks indicators in scorecards of clients, examples include climate reduction targets of the client or nature inclusiveness of the client (case 2.). This would promote mitigation of longer-term sustainability risks at a macro as well as micro prudential level.

[2] The ECB/ESRB (2023a) have developed recommendations for macroprudential measures.

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