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ASEAN +3 MACROECONOMIC RESEARCH OFFICE

ADDRESSING NOVEL RISKS, STRENGTHENING FINANCE, AND BUILDING RESILIENCE IN ASEAN+3

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POLICY BRIEF
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EXECUTIVE SUMMARY

Welfare and economic growth in ASEAN+3 depend on the region's ability to align economic priorities and the effective management of novel risks with the need to address structural challenges, associated transformations and the ability to harness future opportunities.

Solutions to immediate challenges, such as the cost-of-living crisis and the increasing frequency and intensity of extreme weather events, will be more beneficial if aligned with strategies to manage long-term structural changes, such as ageing populations and transitions towards climate-resilient economies. Seizing the opportunities presented by profound structural transformations will be essential for economic growth, societal welfare and sustainable prosperity.

Some novel risks, like those stemming from climate change and nature degradation, ageing populations or advances in artificial intelligence and digitalization are unprecedented, systemic, and associated with deep uncertainties. Furthermore, there is a higher likelihood of compound risks materialising concurrently. Thereby, some novel risks pose considerable challenges to standard financial risk management methods and require adjusted and unique approaches to sustain financial stability, price stability and balanced prosperity. At the same time, they are associated with profound structural economic changes, which, if well managed, represent considerable economic and financial opportunities.

Financial markets, being at the center of risk management and enabling economic growth, could exacerbate risks and vulnerabilities, or contribute to resilience, harness opportunities and sustain prosperity.

Central banks and financial supervisors have important instruments to support an orderly financial market response to deep structural changes, to ensure price and financial stability, and to developing financial markets towards harnessing the opportunities of change.

For example, various central banks and financial supervisors in the ASEAN+3 support human capital development, aim to advance financial inclusion, and consider climate-related risks for managing price stability and financial stability, making use of novel innovative, collaborative governance approaches and adopting "whole of the nation" strategies.

It is now the correct time to scale up central bank and financial supervisory measures, ensure that risk management expectations for novel risks are comprehensively met, and that investment opportunities into sustainable prosperity are unlocked at scale.

This policy brief outlines various approaches and next steps that ASEAN+3 financial supervisors and central banks can consider in their financial supervision and monetary policy implementation to meet novel risk challenges, to maintain price and financial stability, and to support sustained economic growth.

Next Steps for Central Banks and Financial Supervisors

Financial Supervision and Regulation

Microprudential

- **Update guidance for risk-weighted assets calculation** to account for novel risks, especially for market risk and credit risk standardized approaches (SA) and internal ratings-based approaches (IRB).
- **Adjust risk weights** for specific assets that considerably contribute to the overall exposure of financial markets and the real economy to novel risks.
- **Issue novel risk management guidance** for novel risks and ensure that the risks are appropriately reflected in the risk appetite statements and the Internal Capital Adequacy Assessment Process (ICAAP) produced by financial institutions.
- **Review the implementation** of supervisory expectations in supervisory dialogues with financial institutions, assess compliance and identify areas for improvement.
- **Align disclosure requirements** such that comparable, decision-useful, strategic information enables forward-looking analyses of novel risk exposures and related opportunities.
- **Co-operate in regional fora** and working groups and with multilateral institutions to adopt policies based on best practice approaches, reduce regulatory fragmentation and enable regional capacity building.

Macroprudential

- **Embed novel risks** in macroprudential surveillance activities.
- **Implement or adjust macroprudential tools**, such as capital buffers, to ensure their effectiveness for financial resilience in the light of novel risks and to mitigate the build-up of these risks.
- **Regularly revise and recalibrate tools** as novel risks intensify or are mitigated.
- **Enhance collaboration amongst financial supervisors** in the region and with core financially connected jurisdictions.

Monetary Policy Implementation

- **Revise and adjust collateral frameworks** and reserve requirements to appropriately account for novel risks and scale-up economic activities for sustainable prosperity.
- **Integrate novel risks in asset allocation** and asset purchase programs.
- **Define expectations for fund managers** about the management of novel risks and the maximization of exposure to future opportunities.
- **Revise all existing refinancing and credit schemes** to align financial incentives and obligations with the need for investments that support sustainable prosperity and resilience.
- **Introduce targeted refinancing and credit schemes** for specific sectors and activities that enhance resilience towards novel risks and contribute to sustainable prosperity.
- **Assess regularly the effectiveness** of existing and new financing schemes towards the outlined goals and adjust the schemes if required.

INTRODUCTION

The surge in novel risks and profound structural changes is affecting economic and financial systems and societal welfare globally in an unprecedented way. A prime example of such novel risks are transition and physical risks related to climate change and nature degradation. If not addressed, the frequency and intensity of shocks related to climate change and nature loss are projected to intensify to an extent that threatens financial markets, economic development, and societal welfare alike.[1] Existing policies and governance structures need to be reviewed *"to adjust the coping range so as to maintain societal functioning within an expected or acceptable range of risk."*[2]

Welfare and economic growth in ASEAN+3 depend on the ability of the region to manage novel risks while also harnessing the opportunities associated with deep structural changes. This has been frequently stated in regional fora and by regional actors.[3] For example, the ASEAN+3 Macroeconomic Research Office (AMRO) repeatedly stressed that climate risk management is key to preventing severe threats to economic welfare, including sluggish economic growth, heightened financial instability and inflationary pressure.[4] Failure of climate change mitigation and adaptation, natural disasters and extreme weather events feature among the key long-term risks to macro-financial stability in the region.[5] AMRO's 2024 Financial Stability Report also argues that "*authorities must address the financial stability issues arising from the mispricing of climate risks in financial markets."*[6] The Joint Statement of the 26th ASEAN+3 Finance Ministers' and Central Bank Governors Meeting (AFMGM) explicitly acknowledges that *"the long-term growth outlook for the region is contingent on how the region manages risks related to possible future pandemics, and climate change including more frequent and severe natural disasters."*[7]

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[1] IPCC, 2018. Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report [...]; IPBES, 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services; Dasgupta, 2021. The Economics of Biodiversity: The Dasgupta Review; IPCC, 2023. Summary for Policymakers. [...] Sixth Assessment Report of the Intergovernmental Panel on Climate Change; World Economic Forum, 2023. The Global Risks Report 2024. 18th Edition. Insight Report; World Economic Forum, 2024. The Global Risks Report 2024. 19th Edition. Insight Report.

[2] Lavell, et al., 2018. Climate change: New dimensions in disaster risk, exposure, vulnerability, and resilience. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC).

[3] ASEAN Secretariat, 2023. Sixth ASEAN State of the Environment Report.

[4] AMRO, 2022. ASEAN+3 Regional Economic Outlook 2022. ASEAN+3 Growth Strategy in the Pandemic's Wake; AMRO, 2023. ASEAN+3 Regional Economic Outlook 2023. On the Road to Net Zero; AMRO, 2024. ASEAN+3 Regional Economic Outlook 2024. Navigating Tomorrow; AMRO, 2025. ASEAN+3 Regional Economic Outlook 2025.

[5] AMRO, 2024. ASEAN+3 Regional Economic Outlook 2024. Navigating Tomorrow; AMRO, 2025. ASEAN+3 Regional Economic Outlook 2025.

[6] AMRO, 2024. ASEAN+3 Financial Stability Report 2024. Strengthening Resilience to Challenges Ahead.

[7] AFMGM, 2023. Joint Statement of the 26th ASEAN+3 Finance Ministers' and Central Bank Governors' Meeting.

In many economies, climate and nature-related risks are already materializing and thus turning into near-term risks.[8] An IMF Staff Note outlines that "*the public finances of advanced economies and emerging market and developing economies, including mega-biodiverse countries, are especially sensitive to natural capital loss, reducing their resilience to climate change and other environmental risks. These risks are exacerbated in countries with existing structural deficits and low debt carrying capacity.*"[9] Notably, financial supervisors and central banks in various ASEAN+3 countries early on started to lead the global notion and understanding of nature-related financial risks, being exposed to considerable potential losses and impacts from nature degradation on their economic and societal welfare.[10]

Integrated responses to immediate and long-term challenges will not only enhance the region's resilience but also position it to thrive amid ongoing global change. Solutions to pressing challenges, such as the ongoing cost of living crisis and extreme weather events, will be more effective if they are aligned with strategies to address longer-term structural changes, such as dealing with an ageing population and the transition towards climate-resilient economies.

Financial markets – as key pillars of risk management and important enablers of economic growth – are critical in targeting this objective. To that end, financial supervisors and central bankers increasingly recognize that stable conditions are becoming ever more elusive. Maintaining and enhancing resilience, i.e. "*the capacity of the financial system to absorb shocks*"[11] as defined by the Financial Stability Board (FSB), is crucial. The Basel Committee on Banking Supervision (BCBS) and the FSB both stress that novel risks require more attention.[12]

Transmission channels of novel risk drivers to financial risk exposures are increasingly understood but complex to model quantitatively. For example, for climate-related risks, the distinction between physical risks stemming from the impacts of climate change and transition risks stemming from disorderly economic adjustments to low-carbon economies has proven helpful to understand individual company and asset exposures. Such channels can be mapped for specific risks (see examples in Box 1). However, a complete risk assessment would need to also include contagion and compound risk effects. It is almost impossible to capture these effects entirely.

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[8] Marsden, et al. 2024. Ecosystem tipping points: Understanding the risks to the economy and financial system. IIPP Policy Report.

[9] Gardes-Landolfini, et al. 2024. Embedded in Nature: Nature-Related Economic and Financial Risks and Policy Considerations. IMF Staff Climate Note No. 2024/002.

[10] See for example Anwar, et al., 2020. Report on The Roles of ASEAN Central Banks in Managing Climate and Environment-related Risks. ASEAN central banks and monetary authorities collaborative report; BNM and World Bank, 2022. An Exploration of Nature-Related Financial Risks in Malaysia; PBOC research, 2022. Financial support for biodiversity conservation research report.

[11] FSB, 2021. FSB Financial Stability Surveillance Framework.

[12] BCBS, 2021. Climate-related Risk Drivers and their Transmission Channels; BCBS, 2022. Principles for the effective management and supervision of climate-related financial risks; BCBS, 2024. Core principles for effective banking supervision; FSB, 2025. Assessment of Climate-related Vulnerabilities. Analytical framework and toolkit.

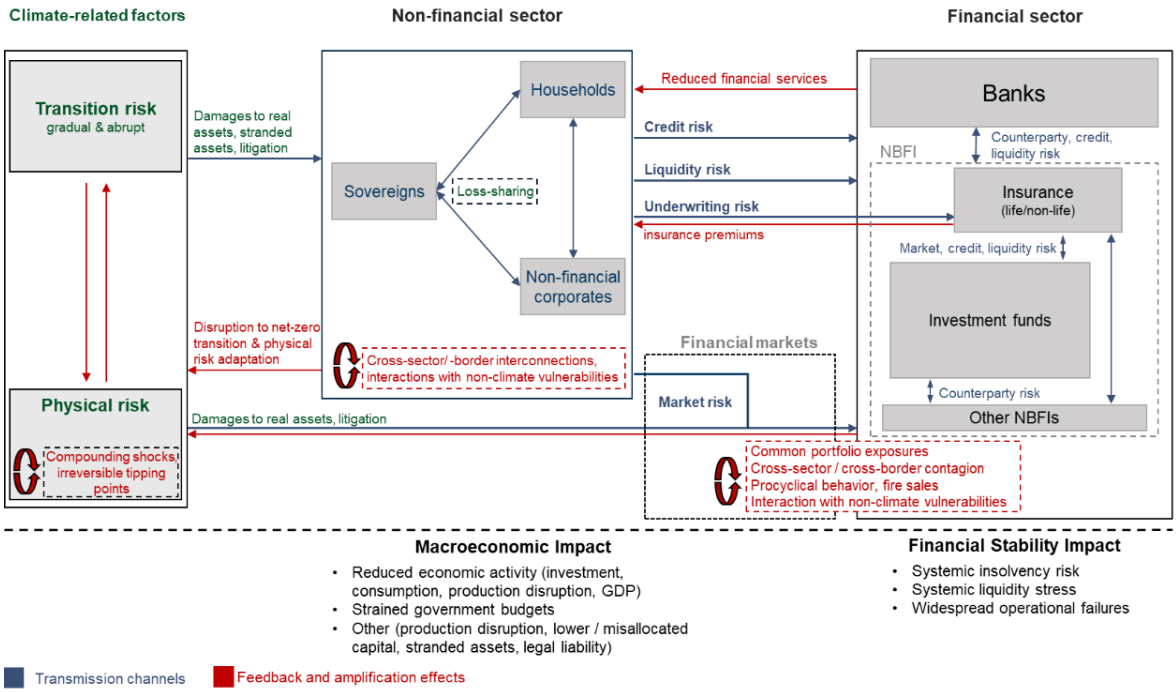
Box 1: Example - Mapping climate-related risks

Various attempts have been undertaken to map the various dimensions of climate-related risks to financial exposures and systemic vulnerabilities. Such attempts are usually the first step to understanding risk modelling needs, possible approaches and the limitations of existing modelling abilities. For example, one-directional chains of effect mainly capture static exposures to climate risks. Systemic exposure charts aim to identify nodes of systemic vulnerabilities.

One-directional chain of effects for physical and transition risks

Physical, acute	**Transition, acute**
Weather extremes	Unexpected shifts in regulation, technology, preferences
↓	↓
Damages	Stranding assets
↓	↓
Cash-flow volatility, change in earnings / PD-LGD	Cash-flow volatility, change in earnings / PD-LGD
↓	↓
Risk premia, haircuts, collateral revaluations	Risk premia, haircuts, collateral revaluations
↓	↓
Funding costs	Funding costs
↓	↓
Market repricing, credit losses	Market repricing, credit losses

Systemic exposure chart including feedback and amplification effects[13]



[13] FSB, 2025. Assessment of Climate-related Vulnerabilities. Analytical framework and toolkit.

Conventional risk pricing models struggle to reflect and integrate novel risks. The models tend to rely on backward-looking data and specific assumptions about the risk distribution of possible events. For climate and nature-related risks, which are characterized by non-cyclicality, endogeneity of impacts, deep structural changes, and exacerbated by increasingly severe impacts year-on-year, standard models may be particularly ineffective for an appropriate risk-return assessment.[14]

In addition, standard risk management strategies are ineffective or unavailable to manage novel risks that are associated with deep structural changes. For example, climate and nature-related risks cannot be completely priced-in, hedged away and insured, due to their endogeneity and systemic implications.[15] In addition, there is a high degree of certainty that a combination of climate-related physical and transition risks will materialize in the future, but the exact timing and outcome is uncertain. In this regard, climate and nature-related risks differ from standard "low probability, high impact" fat tail events (so-called Black Swan risk[16]), and have instead been classified as Green Swan risks. Their characteristics require dedicated and appropriately quantified instruments for effective risk management.[17]

There is currently a considerable gap between the severity of the expected impacts and the required activities to keep novel risks manageable and build resilience. For example, locally and internationally operating financial institutions are exposed to climate and nature-related risks, which – once they materialize – are projected to potentially set off a chain of events that could culminate in serious financial contagion and systemic market meltdown.[18] Various stress tests and scenario analyses have found that the direct impact of climate and nature-related physical and

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[14] NGFS, 2019. A call for action. Climate Change as a source of financial risk. Bolton, et al., 2020; The Green Swan. Central banking and Financial Stability in the Age of Climate Change. Bank for International Settlements Report; Bolton, et al., 2021. Resilience of the Financial System to Natural Disasters. The Future of Banking 3. CEPR Conference Summary; BCBS, 2021. Climate-related financial risks – measurement methodologies; Hiebert and Monnin, 2023. Climate-related systemic risks and macroprudential policy. INSPIRE Policy Briefing Paper No. 14; ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks; FSB, 2025. Assessment of Climate-related Vulnerabilities. Analytical framework and toolkit.

[15] NGFS, 2019. A call for action. Climate Change as a source of financial risk. Bolton, et al., 2020; The Green Swan. Central banking and Financial Stability in the Age of Climate Change. Bank for International Settlements Report; Hiebert and Monnin, 2023. Climate-related systemic risks and macroprudential policy. INSPIRE Policy Briefing Paper No. 14.

[16] Taleb, 2010. The Black Swan. The Impact of the Highly Improbable. Second Edition. Random House.

[17] Lavell, et al., 2018. Climate change: New dimensions in disaster risk, exposure, vulnerability, and resilience. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC); Da Silva, 2020. Green Swan 2 – Climate change and Covid-19: reflections on efficiency versus resilience. Bank for International Settlements Speech.

[18] NGFS, 2023. Nature-related Financial Risks: A Conceptual Framework to guide Action by Central Banks and Supervisors; OECD, 2023. A supervisory framework for assessing nature-related financial risks: Identifying and navigating biodiversity risks. OECD Business and Finance Policy Papers, No. 33; Calice, et al., 2023. Biodiversity and Finance: A Preliminary Assessment of Physical Risks for the Banking Sector in Emerging Markets. World Bank Group Policy Research Working Paper; FSB, 2024. Stocktake on Nature-related Risks. Supervisory and regulatory approaches and perspectives on financial risk; Gardes-Landolfini, et al. 2024. Embedded in Nature: Nature-Related Economic and Financial Risks and Policy Considerations. IMF Staff Climate Note No. 2024/002.

transition risks is likely concentrated, creating groups of considerably exposed regions and firms.[19] Climate risks are affecting balance sheets already today, with increasing losses for insurers and, in consequence, an increasing overall insurance gap, for example in the property sector.[20] Like with any other financial crisis, it cannot reasonably be assumed that all actors could manage down their high carbon and climate-risk exposed assets at the same time without causing major financial systemic turbulence. Various amplification mechanisms and cross-sectoral and cross-border transmission channels could exacerbate losses even further if the risks are not well managed.[21]

The characteristics of some novel risks require adjustments of existing instruments and policy approaches, adding precautionary elements to prudential considerations. For example, ESRB highlights, in the context of climate and social risks, that "*[i]n any case, it is unlikely that we can wait until we have sufficient empirical evidence to recalibrate risk management models used by financial institutions, general capital requirements or more specific macroprudential tools. The radical uncertainty generated by climate change calls for the development of a forward-looking precautionary approach*."[22]

Central banks and financial supervisors have important instruments at their hands to support orderly financial market responses to deep structural changes, and to ensure that the related risks are appropriately assessed and managed. International recommendations and standards such as the Basel Core Principles for Effective Banking Supervision[23] and the FSB Financial Stability Surveillance Framework[24] have been partially adapted in a first attempt to integrate the needs for novel risk monitoring and management. Additional work to better adjust the frameworks is required for full integration of novel risks. Various central banks and financial supervisors in ASEAN+3 have started to develop approaches for climate and nature risk management, and for harnessing the opportunities of energy and economic transformation.[25]

ASEAN+3 central bankers and financial supervisors have already started to assess what the novel risks would mean for their tasks and the future effectiveness of their instruments. Moving from diagnosis to action, central bankers and supervisors across all divisions now need to identify where and how instruments need to be adjusted, reformulated or complemented by additional measures, to fulfil their mandates in times of structural changes. In this context, the

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[19] BNM and World Bank, 2022. An Exploration of Nature-Related Financial Risks in Malaysia; JFSA and BOJ, 2022. Pilot Scenario Analysis Exercise on Climate-Related Risks Based on Common Scenarios; Endut, 2023. Assistant Governor's Keynote Address at the Conference on Nature, Finance, and the Macroeconomy. Bank Negara Malaysia; MAS, 2023. Financial Stability Review 2023.

[20] BIS Financial Stability Institute and IAIS, 2025. Mind the climate-related protection gap – reinsurance pricing and underwriting considerations. BIS Financial Stability Institute and IAIS - FSI Insights on policy implementation No.65; Arnold, Harris, 2025. Top financial watchdog warns climate change set to trigger market panics. Financial Times 16 January 2025.

[21] FSB, 2025. Assessment of Climate-related Vulnerabilities. Analytical framework and toolkit.

[22] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[23] BCBS, 2024. Core Principles for effective banking supervision.

[24] FSB, 2021. FSB Financial Stability Surveillance Framework.

[25] Del Rosario and Ho, 2023. ASEAN+3 Climate Initiatives. AMRO Database.

ESRB argues that "*immediate priority must be to consider how the existing micro- and macroprudential tools can be used under conditions of extreme uncertainty*."[26]

Innovative governance approaches are critical to managing novel risks effectively and to harness investment opportunities for sustainable prosperity. This includes enhanced collaboration within and across jurisdictions. Central banks and financial supervisors' policies for price and financial stability and for financial market development are more effective if combined with an enabling overall policy environment. Setting the appropriate policy frameworks and aligning financial incentives is key. This requires cooperation between policy institutions, the financial sector and actors in the real economy. Cooperative governance schemes have already been explored and implemented, for example in the context of the Joint Committee on Climate Change (JC3) in Malaysia, and the associated launch of the Climate Finance Innovation Lab (CFIL), where the financial sector works together with the central bank and the real economy to develop innovative finance mechanisms and accelerate investments in climate solutions.[27] Strengthening cooperation and governance across ASEAN+3 has been highlighted as a core element for sustainable prosperity and resilience to novel risks in the region, such as in the context of the ASEAN+3 Finance Ministers and Central Bank Governors Meetings.[28]

Box 2: Example - Mitigating climate-related risks

With regards to climate-related risks, an orderly and just transition has been shown as the least costly, the least financially risky and the most inclusive economic development approach, compared to the alternatives of serious physical climate impact or disorderly and disruptive transitions.[29] An orderly transition is also a core enabler for central banks and financial supervisors to remain able to steer price- and financial stability whilst supporting macroeconomic welfare.[30] Such a transition requires the various levels of governance and

[26] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[27] BNM, 2025. Joint Statement by Bank Negara Malaysia and Securities Commission Malaysia on the Rollout of the Climate Finance Innovation Lab. Press Release, 18 June 2025.

[28] ASEAN+3 Finance Ministers and Central Bank Governors, 2025. Joint Statement of the 28th ASEAN+3 Finance Ministers' and Central Bank Governors' Meeting. 5 May 2025; Khor, Lee, 2025. ASEAN+3 in a Fragmenting World. AMRO Blog, 24 June 2025; Watanabe, 2025. Beyond Crises, Growing Together: Evolving ASEAN+3 Financial Cooperation as a Living Institution. AMRO Blog, 2 July 2025.

[29] Alogoskoufis, et al. 2021. ECB economy-wide climate stress test. Methodology and results. ECB Occasional Paper Series; JFSA and BOJ, 2022. Pilot Scenario Analysis Exercise on Climate-Related Risks Based on Common Scenarios; Emambakhsh, et al., 2023. The Road to Paris: stress testing the transition towards a net-zero economy. The energy transition through the lens of the second ECB economy-wide climate stress test. Occasional Paper Series; MAS, 2023. Financial Stability Review 2023; AMRO, 2025. ASEAN+3 Regional Economic Outlook 2025.

[30] Elderson, 2024. Sustainable finance: from "eureka!" to action. Keynote speech by Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB, at the Sustainable Finance Lab Symposium on Finance in Transition; Elderson, 2025. From concept to delivery: accounting for climate and nature in maintaining price stability and keeping banks safe and sound. Introductory remarks by Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB, at the MNI Webcast on Climate Change: Impact on Monetary Policy and Bank Supervision.

society to become active, and doing their part.[31] A "whole of government, society and nation approach" could trigger the required virtuous circles of innovation, technology deployment, economies of scale, network effects and de-risking.[32]

Financial markets play a key role in mobilizing and channeling the funding needed for climate risk mitigation and adaptation investments. According to estimates by McKinsey, more than USD 9.2 trillion per year until 2050 needs to be spent on physical assets to achieve the global net zero climate goal under the NGFS 2050 scenario, with the Asia-Pacific region accounting for one-third of this sum.[33] In this spirit, the governor of the Bank Negara Malaysia emphasized that "By 2026, we expect to see at least half of new financing by banks to be aligned with climate supporting or transitioning activities."[34]

When introducing instrument adjustments and new instruments, it is beneficial to start early and scale up efforts over time to enable orderly adjustments in financial markets and the real economy. Due to the unprecedented challenges, actors at all levels benefit from a mindset and organizational culture that enables learning by doing. As highlighted by a joint European Central Bank (ECB) / European Systemic Risk Board (ESRB) project team on climate risks, "*policy responses need to weigh the cost of early action based on imperfect information, against the risk of acting too late. Measures could be applied progressively, over time – as analytical advances manage to resolve remaining uncertainties […].*"[35] Tackling novel risks requires governance approaches that allow for adjustments on the go.[36]

This policy brief outlines core measures that financial supervisors and central banks can take to keep novel financial and economic risks manageable and support long-term prosperity. It specifically zooms in on climate-related and nature-related risks as an illustration of a much broader range of novel risks that central banks and financial supervisors find themselves and financial markets increasingly exposed to.

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[31] Lenain, 2022. All Hands on Deck to confront the Energy Crisis. CEP Policy Brief.

[32] Datuk Abdul Rasheed Ghaffour, 2023. Governor's Welcoming Remarks at the JC3 Journey to Zero Conference 2023, Bank Negara Malaysia; UN PRI, 2024. The socioeconomic implications of the transition: Analytical framework for a whole-of-government approach. Discussion Paper.

[33] Balasubramanian, et al. 2022. Green Growth: Capturing Asia's $5 trillion green business opportunity. McKinsey and Company.

[34] Datuk Abdul Rasheed Ghaffour, 2023. Governor's Welcoming Remarks at the JC3 Journey to Zero Conference 2023, Bank Negara Malaysia.

[35] ECB/ESRB Project Team on climate risk, 2023. Towards macroprudential frameworks for managing climate risk.

[36] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks; Sharma, 2024. Financial Resilience in an Age of Environmental Change: Central Banks and Financial Regulators Feel the Heat. CEP Policy Brief.

FINANCIAL SUPERVISION AND REGULATION

Financial supervisors and regulators are responsible for ensuring that individual financial institutions manage novel risks coherently, and that the financial system is resilient against these risks. As highlighted by the BCBS and the FSB, this requires, for example, the integration of climate and nature-related risks into micro- and macroprudential regulation and supervision.[37] This is especially important given the endogenous nature of climate and nature-related risks.[38] The BCBS clarifies explicitly how financial institutions and financial supervisors are expected to assess and manage climate risks effectively.[39] In addition, climate risks can be a source of systemic risk, as stated repeatedly by the FSB.[40]

The characteristics of various novel risks require an adjustment of supervisory approaches and instruments for effective financial supervision. The BCBS highlights in its Core Principles the need to move from a backward-looking approach towards more forward-looking and resilient-focused approaches. The Core Principles are referred to as a "de facto minimum standard" for sound financial regulation globally. [41] Whilst adjusting regulatory tools in micro- and macroprudential policy in the presence of uncertainty can be challenging, not acting would escalate the risks. Starting to implement novel approaches enables learning by doing and enhances data availability and quality.[42] Learning by doing is especially effective if central banks and supervisors are open to adjusting instruments on the go, if required.

The following sections outline options for integrating novel risks into microprudential and macroprudential regulation and supervision, with a focus on climate and nature-related risks as an illustration.[43] Whilst the majority of approaches focuses on banking institutions, the instruments are in principle also adoptable for other financial institutions and indeed need to be

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[37] BCBS, 2024. Core principles for effective banking supervision; FSB, 2025. Assessment of Climate-related Vulnerabilities. Analytical framework and toolkit.

[38] ECB/ESRB Project Team on climate risk, 2023. Towards macroprudential frameworks for managing climate risk; Gardes-Landolfini, et al. 2024. Embedded in Nature: Nature-Related Economic and Financial Risks and Policy Considerations. IMF Staff Climate Note No. 2024/002.

[39] BCBS, 2022. Principles for the effective management and supervision of climate-related financial risks; BCBS, 2022. Frequently Asked Questions on climate-related financial risks.

[40] FSB, 2022. Supervisory and Regulatory Approaches to Climate-related Risks. Final Report; FSB, 2023. FSB Roadmap for Addressing Financial Risks from Climate Change Progress Report; FSB, 2024. FSB Asia group discusses cross-border payments and risks arising from artificial intelligence and climate change. Press release; FSB, 2025. Assessment of Climate-related Vulnerabilities. Analytical framework and toolkit.

[41] The BCBS, 2024 emphasizes that the Corpe Principles serve as "the de facto minimum standard" for the "sound prudential regulation and supervision of banks and banking systems", and that they are also "used by the International Monetary Fund (IMF) and World Bank as part of the Financial Sector Assessment Program (FSAP) to evaluate the effectiveness of countries' banking supervisory systems and practices." They could in consequence also have an impact on sovereign credit ratings and refinancing costs.

[42] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks; FSB, 2025. Assessment of Climate-related Vulnerabilities. Analytical framework and toolkit.

[43] The chapter on microprudential approaches builds on Durrani and Bingler, 2024. The Basel Committee's Revised Core Principles for Effective Banking Supervision: Addressing Climate-Related Financial Risks in ASEAN+3. Policy Brief.

extended more broadly to other players in the markets, particularly insurance and asset management firms. Overall, supervisors need to ensure that all financial institutions manage novel risks well. The interconnectedness of various types of financial institutions and the systemic nature of risk exposures requires, in addition, that supervisors of banks, insurers and asset managers coordinate their approaches, to ensure financial stability.

Microprudential

In 2024, the BCBS revised its Core Principles for effective banking supervision to ensure the effective supervision of novel risks. The revised Core Principles emphasize the need for forward-looking resilience-focused supervision and the role of preventive approaches, which are required to deal with various novel risks.[44] Whilst not all countries are part of the Basel III regime, the Core Principles serve as "*the de facto minimum standard*" for the "*sound prudential regulation and supervision of banks and banking systems*."[45] Non-compliance with these principles can impact sovereign credit ratings and refinancing costs, particularly as they are "*used by the International Monetary Fund (IMF) and the World Bank in the context of the Financial Sector Assessment Program (FSAP) to assess the effectiveness of countries' banking supervisory systems and practices*."[46]

Overall, the BCBS expects financial supervisors to ensure that financial institutions appropriately reflect novel risks in their asset valuation and risk management processes. As an illustration, the Core Principles emphasize that climate risks are an increasingly important driver for credit, market, liquidity and operational risks, and that institutional risk appetite setting and risk management processes need to take them into account.[47] In the Basel III framework, climate-related risks are expected to be reflected in financial risk assessments, such as for the Risk-Weighted Assets (RWA) calculation under Pillar 1 and for the Internal Capital Adequacy Assessment Process (ICAAP) under Pillar 2.[48]

Pillar 1

The BCBS' due diligence requirements are a key starting point to ensure that novel risks are appropriately reflected. As an example, climate-related risk integration is spelled out for the Basel III Pillar 1 assessment of credit risk (CRE).[49] Following the BCBS recommendations, supervisors should ideally specify that banks using the Standardized Approach (SA) need to ensure that the ratings used from External Credit Assessment Institutions (ECAIs) capture climate-related risks. If the risks are not appropriately captured by ECAIs, supervisors can ask banks to apply higher risk weights to account for the risk associated with not having explicitly considered climate risk. For the Internal Ratings-Based Approach (IRB), to reduce the likelihood of climate risk under-

[44] BCBS, 2024. Core principles for effective banking supervision.

[45] BIS, 2024. International supervisory community meets to discuss challenges ahead for global bank supervision and regulation. Press release.

[46] BIS, 2024. International supervisory community meets to discuss challenges ahead for global bank supervision and regulation. Press release.

[47] BCBS, 2024. Core principles for effective banking supervision.

[48] BCBS, 2022. Principles for the effective management and supervision of climate-related financial risks; and BCBS, 2022. Frequently Asked Questions on climate-related financial risks; BCBS, 2023. The Basel Framework.

[49] BCBS, 2023. The Basel Framework.

estimation and the risk of model arbitrage by financial institutions, supervisors should ideally define explicitly their expectations for the integration of climate-related risk drivers at the various modelling stages, e.g. using scenario analysis and climate stress testing results to adjust probabilities of default (PD) and loss given default (LGD).[50] Alternatively, to reduce modelling complexity, supervisors can require banks to add climate risk adjustments on top of the internally calculated risk assessments at the end of the modelling process. The Japan FSA finds that some financial institutions started to integrate the results of scenario analysis in their credit risk assessments and in their internal ratings judgements.[51] If well designed, supervisory guidance would support model innovation and encourage financial institutions to develop and strengthen methodologies to factor novel risks into their general risk management.[52]

In this regard, supervisors have already revised their asset valuation guidelines to ensure that financial institutions reflect the risks appropriately in the calculation of RWAs. For example, the European Central Bank (ECB) updated its guidance on internal models and now explicitly requires the integration of climate and environmental risk drivers in the risk assessment process.[53] The European Banking Authority (EBA) also identified various short, medium and longer term measures for the integration of environmental and social risks in the Basel Pillar 1 provisions.[54] And BNM just released a draft updated guidance for the Internal Ratings-Based Approach for Credit Risk in the Capital Adequacy Framework, which explicitly integrates climate-related risks in the assessment process.[55]

For some risks, additional data points can support a better assessment of novel risks. This is for example important in the context of climate-related risk analysis, where datapoints that are needed for risk analysis are still not consistently and comprehensively collected. In consequence, financial institutions struggle to integrate climate risks in their conventional risk management frameworks. This has also been a core challenge identified by Japan's FSA in its Review of Practices and Issues on Climate-related Risk Management, which summarizes the findings from supervisory dialogues with financial institutions in 2024-2025 about the implementation of the FSA's Supervisory Guidance on Climate-related Risk Management and Client Engagement.[56] Supervisors may want to encourage enhanced data collection in order to facilitate the development of

[50] See for example Pozdyshev, et al. 2025. Incorporating physical climate risks into banks' credit risk models. BIS Working Paper, No. 1274.

[51] JFSA, 2025. Practices and Issues on Climate-related Risk Management - Building on "Supervisory Guidance on Climate-related Risk Management and Client Engagement".

[52] NGFS, 2022. Capturing risk differentials from climate-related risks. A Progress Report: Lessons learned from the existing analyses and practices of financial institutions, credit rating agencies and supervisors. Technical Document.

[53] ECB, 2024. ECB guide to internal models.

[54] EBA, 2023. The EBA recommends enhancements to the Pillar 1 framework to capture environmental and social risks. Press release; EBA, 2023. On the role of environmental and social risks in the prudential framework. Report.

[55] BNM, 2025. Capital Adequacy Framework (Internal Ratings-Based Approach for Credit Risk). Exposure Draft. 20 June 2025.

[56] JFSA, 2025. Practices and Issues on Climate-related Risk Management - Building on "Supervisory Guidance on Climate-related Risk Management and Client Engagement". Press release.

granular, forward-looking climate and nature-related datasets that can inform credit risk modelling, especially for IRB banks.

Overall, adopting a conservative approach and using expert judgement is important for novel risk assessment and asset valuation. This recommendation acknowledges the issues with limited and mainly backward-looking data availability and deep uncertainty, which is a challenge to calculate for instance the appropriate RWAs. The BCBS explicitly recommends that institutions add margins of conservatism to their estimates.[57] As highlighted by the ECB, financial institutions can also use in-model adjustments and overlays for model inputs, outputs and ratings, based on expert knowledge.[58] Such an approach is also recommended in BNM's draft IRB guidance, which recommends adding margins of conservatism to estimates due to various uncertainties and data limitations.[59] Japan's FSA notes that amongst its supervised banks, one regional bank integrates climate as a risk driver for the standard categories but also allocates additional capital to cover climate-related risks as a preparation for additional tail risks.[60]

PILLAR 2

The BCBS has recommended updating supervisory expectations and guidelines to enhance novel risk integration in internal risk management and capital adequacy assessments. The committee suggests, for example, that supervisors define standards and guidelines for financial institutions regarding their climate-related risk management.[61] The expectations and guidelines can then serve as the basis for supervisory dialogues under Pillar 2 of the Basel Framework. The ECB for example assesses regularly to which extent their expectations have been met in the supervisory review and evaluation process (SREP).[62]

In this regard, some central banks and supervisors have started providing standardized reference scenarios for the analysis of novel risks. This supports consistency for forward-looking risk analyses and stress testing across financial institutions. For example, the NGFS provides a range of climate-related reference scenarios, which have been used by various supervisors and financial institutions globally.[63] Whilst the scenarios provide important reference assumptions, additional country or regional granularity would sometimes be useful. Supervisors

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[57] BCBS, 2022. Frequently Asked Questions on climate-related financial risks.

[58] McCaul and Walter, 2023. Overlays and in-model adjustments: identifying best practices for capturing novel risks. Blog post by Elizabeth McCaul, Member of the Supervisory Board of the ECB, and Stefan Walter, Director General of Horizontal Line Supervision, European Central Bank.; ECB, 2024. ECB guide to internal models.

[59] BNM, 2025. Capital Adequacy Framework (Internal Ratings-Based Approach for Credit Risk). Exposure Draft. 20 June 2025.

[60] JFSA, 2025. Practices and Issues on Climate-related Risk Management - Building on "Supervisory Guidance on Climate-related Risk Management and Client Engagement".

[61] BCBS, 2022. Principles for the effective management and supervision of climate-related financial risks.

[62] ECB, 2020. Guide on climate-related and environmental risks. Supervisory expectations relating to risk management and disclosure; Elderson, 2025. From concept to delivery: accounting for climate and nature in maintaining price stability and keeping banks safe and sound. Introductory remarks by Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB, at the MNI Webcast on Climate Change: Impact on Monetary Policy and Bank Supervision.

[63] NGFS, 2025. NGFS Climate Scenarios for central banks and supervisors - Phase V. Online resource; NGFS, 2025. Scenarios Portal. Online resource; NGFS, 2024. NGFS Climate Scenarios Technical Documentation. V5.0.

can help to translate these scenarios into ones that reflect specific climate-related country and regional specific risks that financial institutions can then use for the analysis and stress tests of their portfolios. The latest climate scenario exercise by the Bank of Japan (BOJ) and Japan's FSA, for example, uses the NGFS scenarios for a short-term analysis and includes a dedicated customized scenario for Japan with limited ability of firms to pass-through carbon tax costs to their customers, decreasing their profits and hence increasing the risk of defaults.[64]

In line with this, various ASEAN+3 financial supervisors issued adjusted risk management guidelines and expectations for banks and other financial institutions, such as guidelines on climate and nature-related risks. This includes for example the guidelines issued by Bangko Sentral ng Pilipinas (BSP)[65], BNM,[66] the Bank of Thailand (BOT),[67] the Hong Kong Monetary Authority (HKMA),[68] Japan's FSA,[69] the Monetary Authority of Singapore (MAS),[70] and the National Financial Regulatory Administration (NFRA) together with People's Bank of China (PBOC).[71] Supervisors are continuously updating their expectations as experiences evolve and climate and nature-related financial risk management practices mature. The latest example are the revised risk management expectations from BNM, where BNM states that it expects financial institutions to integrate climate-related risks and their interactions with other risk types in governance, risk management, risk appetite frameworks, ICAAP, stress testing and disclosure practices. BNM also expects banks to "*incorporate the potential impact of material climate-related risks into their business strategies to strengthen resilience against climate-related risks and promote a just and orderly transition*."[72]

Supervisors increasingly adopt an economy-wide risk management and resilience perspective, issuing specific guidelines and expectations on how to manage and mitigate economy-wide novel risks. For example, in the context of climate and nature risks, some supervisors issued guidelines and expectations for financial institutions on transition planning and

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[64] BOJ, FSA, 2025. Release of "Second Scenario Analysis on Climate-Related Risks (Banking Sector)" June 20. 2025.

[65] BSP, 2021. Environmental and Social Risk Management Framework.

[66] BNM, 2022. Climate Risk Management and Scenario Analysis; BNM, 2022. Climate Risk Management and Scenario Analysis. Supplemental Guidance; BNM, 2025. Climate Risk Management and Scenario Analysis.

[67] BOT 2023. Policy Statement of the Bank of Thailand Re: Internalizing Environmental and Climate Change Aspects into Financial Institution Business.

[68] HKMA, 2021. Sound practices supporting the transition to carbon neutrality. Circular; HKMA, 2021. Sound practices supporting the transition to carbon neutrality. Annex; HKMA, 2022. Embedding climate risk in banking supervision. Circular.

[69] JFSA, 2022. Supervisory Guidance on Climate-Related Risk Management and Client Engagement. Discussion Paper.

[70] MAS, 2020. Guidelines on Environmental Risk Management for Banks / Insurers / Asset Managers; and MAS, 2022. Information Paper on Environmental Risk Management (Banks) / (Insurers) / (Asset Managers).

[71] NFRA and PBOC, 2025. Implementation Plan for the High-quality Development of Green Finance in the Banking and Insurance Industry; NFRA, PBOC et al., 2016. Guiding Opinions on Establishing a Green Financial System.

[72] BNM, 2025. Climate Risk Management and Scenario Analysis.

for scaling up the provision of transition finance.[73] The HKMA for example expressed its expectations on core high level principles for transition planning in a letter to its supervised financial institutions.[74] The supervisory guidance by Japan's FSA also focuses on the role of financial institutions to enable an orderly transition to reduce systemic economic and financial risks.[75] The FSA and the BOJ regularly discuss climate risk management, customer engagement and progress in transition finance provision in their supervisory dialogues, as spelled out in their on-site examination policy.[76] The FSA also conducted specific in-depth dialogues with financial institutions to understand the status of progress in implementing the Supervisory Guidance on Climate-related Risk Management and Client Engagement in FY2024-FY2025.[77] MAS issued a public consultation around proposed guidelines on transition planning for financial institutions.[78] Overall, enhancing the availability of transition plans by corporates enables financial institutions to make well-informed investment decisions and lowers the risk of disorderly transitions, thereby reducing micro- and macro financial risks.[79] Supportive activities could additionally include transition taxonomies or principles-based taxonomies and sectoral roadmaps, which support financial institutions to assess, benchmark and understand the counterparties' transition activities. Such approaches have been undertaken for example in Malaysia,[80] in Japan,[81] by PBOC,[82] and in the ASEAN Transition Finance Guidance.[83]

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[73] Transition planning in this context refers to two interrelated aspects: First, the development of a strategy and risk management response to handle the risks and opportunities associated with counterparties, and second development of an own transition strategy by financial institutions to align their operations with climate and nature-related goals. One result of transition planning can be a transition plan, which is either a publicly facing or internal document that defines key governance, strategy, risk management and tracking approaches for implementing the transition planning considerations. Transition finance are the resources deployed or mobilized to enable companies, households and communities to implement their transition strategies. It could be activity- or entity-based, and oftentimes requires the availability of a general transition plan for counterparty. See for example NGFS, 2024. Transition Plan Package.

[74] HKMA, 2023. Planning for net-zero transition. Circular to all Authorized Institutions.

[75] JFSA, 2022. Supervisory Guidance on Climate-Related Risk Management and Client Engagement. Discussion Paper.

[76] BOJ, 2025. On-Site Examination Policy for Fiscal 2025; BOJ, 2024. On-Site Examination Policy for Fiscal 2024; BOJ, 2023. On-Site Examination Policy for Fiscal 2023.

[77] JFSA, 2025. Practices and Issues on Climate-related Risk Management - Building on "Supervisory Guidance on Climate-related Risk Management and Client Engagement". Press release.

[78] MAS, 2023. Consultation Paper on Proposed Guidelines on Transition Planning for Asset Managers; MAS, 2023. Consultation Paper on Proposed Guidelines on Transition Planning for Banks; MAS, 2023. Consultation Paper on Proposed Guidelines on Transition Planning for Insurers.

[79] NGFS, 2022. Capturing risk differentials from climate-related risks. A Progress Report: Lessons learned from the existing analyses and practices of financial institutions, credit rating agencies and supervisors. Technical Document.

[80] Ministry of Economy, 2023. National Energy Transition Roadmap; BNM, 2021. Climate Change and Principles-based Taxonomy.

[81] Ministry of Economy, Trade and Industry (METI), 2021 / 2022 / 2023. Technology Roadmap for Transition Finance in Iron and Steel, Chemical, Power, Gas, Oil, Pulp and Paper, Cement, Automobile Sector; FSA, METI, MOE 2021. Basic Guidelines on Climate Transition Finance; FSA, METI, MOE, 2023. Transition Finance Follow-up Guidance.

[82] PBOC, 2025. The People's Bank of China is studying the formulation of financial standards for the transformation of seven industries such as shipping and chemical industry. Press release.

[83] ASEAN Capital Markets Forum (ACMF), 2024. ASEAN Transition Finance Guidance Version 2.

Furthermore, a core aspect is the appropriate reflection of novel risks in the risk appetite statement and the ICAAP. For instance, MAS asks banks to "*integrate environmental and climate-related risks into internal capital adequacy assessment processes where appropriate*." [84] BNM repeatedly highlights the need to integrate climate risks in the risk appetite statement and the ICAAP, such as in principle 5 of its climate risk management guidance: "*Financial institutions shall embed climate-related risks into the risk appetite framework, including the potential long-term impact of these risks as drivers of existing types of material risks. Financial institutions shall reflect these material risks in the internal capital adequacy assessment process*."[85] BSP states that "*a bank shall measure and manage Environmental and Social (E&S) risks relative to its credit operations. It shall adopt measurement methodologies that capture, quantify, and assess the most relevant E&S risks. These shall include stress testing exercises and scenario analysis aligned with the banks business model, risk appetite, and credit risk strategy, amongst others*."[86] BOT states that "*Financial institutions should integrate environmental risks as part of the organizational risk culture and risk management process with regards to the Three Lines of Defense model, as well as having in place policies, mechanisms, and data capability to support effective risk management. Lastly, there should be policies and processes to identify, assess, control, monitor and report environmental risks*."[87] Japan's FSA assessed the extent to which financial institutions implemented their Supervisory Guidance on Climate-related Risk Management and Client Engagement and started to incorporate climate-related risks in their risk appetite framework and risk appetite statement. They also found that, given the complexity of integrating climate-related risks in standard risk management due to horizon mismatches and data quality, some financial institutions started to define climate risks as a separate risk category (as opposed to a driver of the standard categories).[88]

If financial institutions do not comply with the guidelines and expectations, some supervisors have started to revise their risk assessments of the institutions, imposing additional institution-specific capital add-ons, or penalty charges until the expectations are met.[89] MAS clarifies for its guidelines that how well an institution observes the guidelines "*may have an impact on MAS' overall risk assessment of that institution […].*"[90]ECB states that "*supervisors are already including bank-specific climate and environmental findings in the Supervisory Review and Evaluation Process (SREP). The ECB imposed binding qualitative requirements on more than 30 banks in its annual SREP. Moreover, for a small number of banks, the outcome of the 2022 supervisory exercises on climate and environmental risks had an impact on their SREP scores. These, in turn, impact their Pillar 2 capital requirements.*"[91] In addition, the ECB announced to impose periodic penalties

[84] MAS, 2022. Information Paper on Environmental Risk Management (Banks).

[85] BNM, 2022. Climate Risk Management and Scenario Analysis.

[86] BSP, 2021. Environmental and Social Risk Management Framework. Circular No. 1128.

[87] BOT, 2023. Policy Statement of the Bank of Thailand Re: Internalizing Environmental and Climate Change Aspects into Financial Institution Business.

[88] JFSA, 2025. Practices and Issues on Climate-related Risk Management - Building on "Supervisory Guidance on Climate-related Risk Management and Client Engagement".

[89] BCBS, 2019. Overview of Pillar 2 supervisory review practices and approaches.

[90] MAS, 2025. Supervisory Approach and Regulatory Instruments.

[91] ECB, 2022. ECB sets deadlines for banks to deal with climate risks. Press release.

for non-compliant banks if they fail to meet the expectations until the end of the communicated adjustment periods.[92]

PILLAR 3

An appropriate management of novel risks requires forward-looking information from financial institutions and their counterparties. For disclosures by financial institutions, the BCBS issued a voluntary framework for the disclosure of climate-related financial risks as part of the Basel III Pillar 3 disclosure frameworks. [93] There is an established understanding that harmonized disclosures globally would considerably reduce information asymmetries and search costs. To enhance data availability and comparability of financial and non-financial firms, the International Sustainability Standards Board (ISSB), as part of the International Financial Reporting Standards (IFRS), issued a global baseline for sustainability-related financial disclosures (IFRS S1)[94] and climate-related disclosures (IFRS S2).[95] The standards build on the recommendations of the Taskforce on Climate-related Financial Disclosures (TCFD). Currently, various regulators in ASEAN+3 are moving from TCFD-based disclosures to the implementation of the ISSB standards.[96] The move towards mandatory ISSB-based reporting is in line with recommendations by the FSB,[97] and with the recommendations by international standard setters such as the International Organization of Securities Commission (IOSCO).[98] Implementing the disclosure recommendations by the BCBS is a critical next step for financial supervisors, to make information available about a banks' strategy to navigate climate-related risks, and thereby foster market discipline.[99] In that context, it is also key for ASEAN+3 financial supervisors to support financial institutions and their real economy counterparts in implementing disclosure regulation by providing additional accounting and reporting support and guidance. Supervisors should also ideally adopt

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[92] ECB, 2022. ECB sets deadlines for banks to deal with climate risks. Press release; Elderson, 2024. Making banks resilient to climate and environmental risks – good practices to overcome the remaining stumbling blocks. Speech by Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB, at the 331st European Banking Federation Executive Committee meeting; Elderson, 2025. From concept to delivery: accounting for climate and nature in maintaining price stability and keeping banks safe and sound. Introductory remarks by Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB, at the MNI Webcast on Climate Change: Impact on Monetary Policy and Bank Supervision.

[93] BCBS, 2025. A framework for the voluntary disclosure of climate-related financial risks.

[94] IFRS, 2023. IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information.

[95] IFRS, 2023. IFRS S2 Climate-related Disclosures.

[96] Amongst these are for example: MAS, 2024. Sustainability-related Disclosures; ACRA, 2024. Response to Public Consultation on Climate Reporting and Assurance Roadmap for Singapore; HKEX, 2023. Enhancement of Climate-related Disclosures under the Environmental, Social, and Governance Framework. Consultation Paper; HKEX, 2023. Enhancement of Climate-related Disclosures under the Environmental, Social, and Governance Framework. Consultation Paper; BNM and SEC, 2023. Joint Statement by Bank Negara Malaysia and Securities Commission Malaysia: Updates from the 11th Joint Committee on Climate Change (JC3) Meeting.

[97] FSB, 2023. FSB Roadmap for Addressing Financial Risks from Climate Change Progress Report.

[98] IOSCO, 2023. IOSCO endorses the ISSB's Sustainability-related Financial Disclosure Standards. Media release.

[99] Mohan, 2024. Disclosures and Transparency in Managing Climate-related Financial Risks. SEACEN Blog, 18 November 2024.

differentiated approaches that take proportionality into account, based on the size and complexity of the financial institutions, and of their counterparties.

Decision-useful information about business strategies, transition plans and resilience to plausible future developments are especially important for forward-looking risk analysis. The ISSB explicitly recommends the disclosure of climate-related transition strategies if companies have defined such plans, and of the assessment of business model resilience against various scenarios.[100] For financial supervisors, understanding financial institutions' transition planning and plans is important to assess the appropriateness of their strategy to deal with novel risks and challenges.[101] The FSB states that "*[t]here is a growing interest in the role of transition plans of financial institutions and non-financial corporates not only in enabling an orderly transition, but also as a source of information for financial authorities to assess micro-and macroprudential risks.*"[102] The MAS for example issued a public consultation on draft supervisory expectations for financial institutions to have a sound transition planning process to manage climate-related risks.[103] The HKMA shared its expectations on core high level principles for transition planning and disclosures in a letter to its supervised entities.[104]

Macroprudential

Various novel risks could considerably impact the financial system as a whole. They are widespread and at the same time clustered within specific regions and institutions, which are particularly exposed to them. Furthermore, shocks can be quickly amplified via feedback loops in financial markets. For example, climate-related risks are systemic and will, once they materialize, most likely impact all types of financial institutions, and propagate through links between the financial system and the real economy. In addition, climate-related risks tend to be clustered in regions and financial institutions. The results of the joint FSA and BOJ pilot scenario analysis for Japan for example find that risks tend to be clustered in specific sectors, and within specific banks.[105] The same has been found by an ECB/ESRB project team on climate risk for European bank exposures.[106] The FSB emphasizes that feedback effects and financial links from risk transfers between insurers and financial institutions, fire sales in response to climate-related shocks, asset price corrections, and liquidity constraints across markets could yield to unprecedented loss cascades once climate-related risks materialize. It argues that "*Ultimately, the mutual amplifications could weaken the financial system, create systemic credit, market and liquidity risk and reduce economic activity, especially if exacerbated by the presence of other financial stability*

[100] IFRS, 2023. IFRS S2 Climate-related Disclosures.

[101] NGFS, 2023. Stock take on Financial Institutions' Transition Plans and their Relevance to Micro-prudential Authorities.

[102] FSB, 2023. FSB Roadmap for Addressing Financial Risks from Climate Change Progress report.

[103] MAS, 2023. MAS to Set Expectations on Credible Transition Planning by Financial Institutions. Press release; MAS, 2023. MAS Guidelines for Financial Institutions on Transition Planning for a Net Zero Economy. Press release.

[104] HKMA, 2023. Planning for net-zero transition. Circular to all Authorized Institutions.

[105] JFSA and BOJ, 2022. Pilot Scenario Analysis Exercise on Climate-Related Risks Based on Common Scenarios.

[106] ECB/ESRB Project Team on climate risk, 2023. Towards macroprudential frameworks for managing climate risk.

vulnerabilities at the outset of the climate-related shocks." [107] In a similar spirit, the ECB/ESRB project team states that some systemic mechanisms might amplify climate change losses, "*including those which might otherwise appear manageable*." [108] The ESRB also stresses the unique characteristics of climate-related risks which call for adjusted and additional macroprudential surveillance and regulation.[109]

The systemic nature of some novel risks and the likelihood of compound events reduce the ability of the financial system to manage the risks via standard risk mitigation and risk sharing solutions. In an attempt to quantify climate-related financial stability implications, an ECB/ESRB project team finds that a sharp rise in carbon prices affects banks directly and indirectly. It would not only result in a considerable increase in banks' risk-weighted assets that would require higher capital requirements, but also in a near-doubling of the average default correlation of a broader set of firms through counterparty risk channels. They conclude that the prevalence of climate-related risks in the financial system "*suggests limited scope for hedging via diversification*" and that exposures to firms that are currently only weakly correlated might increasingly be correlated in the future. The ECB/ESRB team also emphasizes that interconnectedness and clustered risks could lead to dynamic risk amplifications and propagation of losses, resulting in joint defaults, fire sales, and contagion.[110] The FSB outlines how climate shocks can interact with existing financial vulnerabilities, and could trigger the materialization of additional risks, leading to compound cross-sector and cross-border risk exposures and potentially considerable financial losses once the risks materialize.[111]

The systemic implications of some novel risks need dedicated macroprudential attention. There is general agreement that supervisors need to monitor the build-up of climate-related financial risks,[112] with a variety of metrics suggested for example by the FSB and the ECB/ESRB project team on climate risk.[113] Whilst acknowledging data challenges and complexities, the FSB argues that climate systemic risk monitoring is especially important for emerging market and developing economies (EMDEs), since they have on average higher exposure to climate physical risks and higher reliance on climate-sensitive sectors.[114]

The compound risks associated with some novel risks require coordination between micro- and macroprudential supervision and regulation, a move from macroprudential risk monitoring to dedicated macroprudential policy adjustments. The FSB highlights that

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[107] FSB, 2022. Supervisory and Regulatory Approaches to Climate-related Risks. Final Report; FSB, 2025. Assessment of Climate-related Vulnerabilities: Analytical framework and toolkit.

[108] ECB/ESRB Project Team on climate risk, 2023. Towards macroprudential frameworks for managing climate risk.

[109] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[110] ECB/ESRB Project Team on climate risk monitoring, 2022. The macroprudential challenge of climate change.

[111] FSB, 2025. Assessment of Climate-related Vulnerabilities: Analytical framework and toolkit.

[112] Highlighted for example here: ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[113] FSB, 2025. Assessment of Climate-related Vulnerabilities: Analytical framework and toolkit; ECB/ESRB Project Team on climate risk, 2023. Towards macroprudential frameworks for managing climate risk.

[114] FSB, 2025. Assessment of Climate-related Vulnerabilities: Analytical framework and toolkit.

"*microprudential tools alone may not sufficiently address the cross-sectoral, global and systemic dimensions of climate-related risks, tail risks and the potential for the financial system to amplify its effects.*" A system-wide approach to climate-related financial risks is needed, including macroprudential tools and policies to address these systemic risks, as also highlighted by the ESRB.[115] The FSB states in this regard that "*forming a macroprudential perspective on risks to the financial system, as a complement to microprudential measures at the firm level, is crucial to fully account for climate-related risks and their transmission channels that could have a wide-spread impact across financial sectors*."[116] This is in line with recommendations from the ECB/ESRB project team on climate risk, which also states that "*A holistic approach across both microprudential and macroprudential aspects could aim to bolster resilience and capabilities of individual institutions with targeted supervisory action at the microprudential level, while macroprudential policy addresses systemic risk by reducing risk build-up, increasing resilience to the amplifications of climate risks and focusing on attenuating the potential for and materialization of tail events.*"[117]

Some supervisors and regulators are exploring options to explicitly introduce or adjust tools to enhance resilience of the financial system to novel risks. Dedicated capital buffers are considered to be most effective to build resilience against systemic losses that are unexpected or not accounted for.[118] In the European Union, for example, the sixth EU Capital Requirements Directive (CRD VI) underlines the possibility of a systemic risk buffer (SyRB) to prevent and mitigate macroprudential or systemic risks from climate change.[119] Adjusting SyRBs to account for climate risks has also been recommended by the ESRB and the ECB/ESRB project team, together with borrower-based measures (BBMs). [120] PBOC integrates the soundness of climate and environmental stress testing, disclosures and high carbon assets held by banks in their Central Bank Financial Institution Rating. The Rating, which is monitored quarterly by PBOC for macroprudential purposes, also has an impact on various operational aspects for the financial institution, such as access to financing facilities and the amount of the deposit insurance premium.[121]

Effective macroprudential approaches for novel risks reduce the build-up of the risks and enhance resilience for the case that risks materialize. For example, with regards to mitigating climate-related systemic risks, supporting an orderly transition to net zero economies has been identified as the least damaging option for financial stability. Empirical estimates show that the benefits of net zero transitions, i.e. mid- and long-term reduced climate physical risks, by far outweigh short-term transition risks. The ECB/ESRB project team, for example, finds for an orderly

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[115] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[116] FSB, 2022. Supervisory and Regulatory Approaches to Climate-related Risks. Final Report.

[117] ECB/ESRB Project Team on climate risk, 2023. Towards macroprudential frameworks for managing climate risk.

[118] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[119] European Union, 2024. Directive (EU) 2024/1619 of the European Parliament and of the Council of 31 May 2024 amending Directive 2013/36/EU as regards supervisory powers, sanctions, third-country branches, and environmental, social and governance risks Article 133 (1).

[120] ECB/ESRB Project Team on climate risk, 2023. Towards macroprudential frameworks for managing climate risk; ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[121] PBOC, 2021. Notice of the People's Bank of China on Issuing the Green Finance Evaluation Plan for Banking Financial Institutions; PBOC, 2021. China Financial Stability Report.

transition that "*the system-wide amplification of initial market risk shocks in an orderly transition result in revaluation losses over four times lower than under current policies*." [122] They also show that transition risks are lower with an early and orderly transition compared to other transition scenarios. The FSB also states that "*[t]he extent to which a climate event impacts the financial system depends on the system's exposure to physical or transition risks and on how well these risks are managed.*"[123] Macroprudential authorities may therefore align their instruments to reduce the systemic climate risk exposure by supporting orderly transitions.

Recommendations

MICROPRUDENTIAL

To ensure that financial institutions assess and manage novel risks appropriately, financial supervisors can undertake the following steps:[124]

- **Update guidance the calculation of risk-weighted assets to account for novel risks, for standardized and internal ratings-based approaches under Pillar 1.** As a first step, financial supervisors can integrate the wording as found in the Basel Core Principles about the need to assess novel risks explicitly.[125] Amongst these, due diligence requirements can be updated to ensure that financial institutions ensure that the ratings they use reflect novel risks, or that they internally adjust the ratings to account for those risks. For climate-related risks, supervisors can explicitly integrate the wording that is already available in various provisions of the Basel III framework in their risk assessment guidance.[126] The FAQ issued by the BCBS for enhanced climate-related risk integration can be a useful starting point to identify most important entry points where climate-related risks need to be reflected in the values used for

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[122] ECB/ESRB Project Team on climate risk monitoring, 2022. The macroprudential challenge of climate change.

[123] FSB, 2025. Assessment of Climate-related Vulnerabilities: Analytical framework and toolkit.

[124] The following recommendations focus on banks but should be transferred in principle to the supervision and regulation of other financial institutions. Acknowledging the importance of the insurance sector for climate risk mitigation and the growing insurance protection gap, additional targeted measures would be required, such as outlined for example in Crugnola-Humbert, 2024. Governing Insurance for Financial Stability and Environmental Sustainability, CEP Policy Brief, December 2024.

[125] See Footnotes related to climate in BCBS, 2024. Core principles for effective banking supervision. Examples include: (a) The supervisor considers the macroeconomic environment, climate-related financial risks and emerging risks in its risk assessment of banks; (b) Banks should include climate-related financial risks assessed as material over relevant time horizons, including in their stress testing programmes where appropriate; (c) The time horizon for establishing a forward-looking view should appropriately reflect climate-related financial risks and emerging risks as needed.

[126] Basel Framework: Various FAQs in footnotes across the full Basel Framework documents include the wording from the BCBS, 2022. Frequently Asked Questions on climate-related financial risks. Such as for example the note on CRE 20.4 (Due Diligence requirements): "FAQ1 - Should banks assess climate-related financial risks as part of the due diligence analyses with respect to counterparty creditworthiness? Climate-related financial risks can impact banks' credit risk exposure through their counterparties. To the extent that the risk profile of a counterparty is affected by climate-related financial risks, banks should give proper consideration to the climate-related financial risks as part of the counterparty due diligence. To that end, banks should integrate climate-related financial risks either in their own credit risk assessment or when performing due diligence on external ratings."

the risk-weighted assets (RWAs) calculation.[127] To account for climate-related risks and uncertainties associated with novel risks and deep structural changes, it can be especially useful to recommend adding margins of conservatism to the asset values calculated or to adjust the buckets used in the standardized approach (SA) and the supervisory slotting approach (SSA) for the calculation of RWAs. Additional recommendations on the use of input or output overlays and in-model adjustments to deal with uncertainty and missing forward-looking information can also be useful, especially for internal ratings-based approaches (IRB).

- **Adjust risk weights for specific assets that considerably contribute to the overall exposure of financial markets and the real economy to novel risks.** For some assets, for instance those associated with business models or projects that are carbon intensive or contribute significantly to climate-related maladaptation, supervisors can request higher capital charges. For example, supervisors can implement risk weight add-ons for assets particularly vulnerable to climate-related transition or physical risks. The add-ons can be adjusted using the results of sound climate risk stress tests as guiding information. However, given that stress tests bear considerable limitations in terms of assumptions, model setup, coverage and calibration, it would be advisable to complement model insights with qualitative information to adjust capital weights and adopt a conservative approach with model overrides where justified. In any case, additional capital to account for risks that are difficult to price correctly would be an important contribution to microprudential stability. In that context, supervisors can build on the approach that the BCBS has recommended for the prudential treatment of crypto assets, with higher risk weights of up to 1250% for extremely high risk assets.[128] This would ensure a one-for-one approach for very risk exposed assets, i.e. that for each $100 of lending to a high risk project or firm, the financial institution would need to hold $100 of capital to safeguard against the prospective financial loss.[129] Such a "one for one" approach would also reduce the risk and size of contagion effects across institutions if risks materialize. To keep the overall level of regulatory capital requirements on average the same, a reduction in risk charges for projects and corporates with less exposure to novel risks, such as to firms with sound transition plans, can also be considered. This could enable carbon-intensive firms to transition whilst reducing overall financial risks and supporting an orderly transition of sectors and economies.
- **Issue supervisory risk management guidance under Pillar 2 on how institutions are expected to deal with novel risks and ensure that the risks are appropriately reflected in their risk appetite statements and ICAAPs.** Supervisors should require institutions to embed novel risks into their core governance and risk management frameworks. This would include clear expectations on governance, data, scenario analysis, and model validation for novel risk management, such as climate and nature risk management. Financial institutions should also be asked to demonstrate how novel risks are incorporated into their ICAAP. This would include capital planning under adverse scenarios. In this context, supervisors would

[127] Further information on the key points to integrate into supervisory guidance can be found in BCBS, 2022. Frequently Asked Questions on climate-related financial risks.

[128] BCBS, 2022. Prudential treatment of crypto asset exposures.

[129] i.e. 8% of ($100*1250%) = $100

need to ensure that the methods, assumptions and results are not less stringent than for the RWA calculation process. Supervisors may also require that financial institutions explicitly account for novel risk exposures within their risk appetite statement, referencing specific risk sources such as climate-related risks, with clear thresholds and escalation processes.

- **Regularly review the implementation of the supervisory expectations in their supervisory dialogues with financial institutions, assess compliance and identify areas for improvement.** To do this effectively, the supervisory review process needs to be strengthened with additional novel risk review expertise. This enables supervisors to assess and challenge whether institutions adequately identify, measure, and mitigate these risks. With regards to climate-related financial risk management, supervisors may also want to spell out net zero transition planning and client engagement expectations. It can be beneficial to revise the expectations regularly, to ensure that guidance evolves in line with latest best practice. Eventually, non-compliant institutions can also be charged with additional capital add-ons or penalty payments until the supervisory risk management expectations are fully met.
- **Align financial and non-financial institutions' disclosure requirements so that comparable, decision-useful, strategic information enables forward-looking analyses of novel risk exposures and opportunities.** For financial institutions, supervisors may want to ensure that disclosure requirements are aligned with global standards for corporate disclosures, such as the BCBS framework for the voluntary disclosure of climate-related financial risks, the IFRS S1 and S2 for sustainability and climate-related reporting, and with international frameworks such as the guidance from the Taskforce on Nature-related Financial Disclosures (TNFD). Specifically, supervisors can require the reporting of transition plans as part of institutions' strategy-related disclosures, to ensure that this important forward-looking information is available, precise, comparable, and decision-useful. Furthermore, it would be useful to ask institutions to which extent their transition plans align with national or regional climate targets to enable assessment of exposures to transition risk and dependencies of transition plans. This can ideally also support macroprudential supervision, as outlined by the FSB.[130] In addition, supervisors can mandate the disclosure of basic data points and define the calculation approaches for core metrics, such as financed emissions, sectoral exposures, and climate alignment targets. Scope 3 emission disclosures with value-chain emission disclosures can be phased in stepwise with appropriate timelines based on data availability. It would be important to ensure proportionality of disclosure requirements depending on the size of financial institutions and their counterparties, and complexity of their operations. To avoid fragmentation and arbitrage, and to facilitate cross-border supervision, it would be beneficial if supervisors in ASEAN+3 collaborate to harmonize disclosure requirements. To ensure comparability, and to reduce compliance costs and information costs, supervisors would ideally request disclosures in specific human- and machine-readable templates.[131] To this end,

[130] FSB, 2025. The Relevance of Transition Plans for Financial Stability.

[131] Templates reduce compliance costs for disclosing entities (i.e. costs surrounding decision-making regarding which information should be disclosed, how it should be disclosed), and information search costs for users (i.e. costs associated with information collection, interpretation and comparison due to lack of transparent and easy to navigate information).

supervisors can build on the IFRS's release of the Sustainability Disclosure Taxonomy, which is an xbrl-based digital tagging system as used for general financial reporting.[132]

- **Cooperate in regional fora and working groups and with multilateral institutions to adopt policies based on best practice approaches, reduce regulatory fragmentation and enable regional capacity building.** A joint ASEAN or ASEAN+3 supervisory coordination group to enhance micro- and macroprudential surveillance and align some regulatory practices for sound novel risk management would benefit the stability of local institutions and the regional financial system alike.

MACROPRUDENTIAL

To enhance the resilience of the financial system to novel risks and to reduce the build-up of the risks, supervisors can undertake, for example, the following steps:

- **Embed novel risks explicitly in macroprudential surveillance activities.** This includes, for example, integrating novel risk metrics into macroprudential surveillance and decision frameworks, and the conduct of stress tests that capture the specific characteristics of novel risks and the interconnectedness of financial institutions. The results from system-wide stress tests can then be used as an input, combined with qualitative information and expert judgements, to adjust macroprudential tools.[133] A specific focus can be put on monitoring potential mispricing in specific sectors that are particularly exposed to novel risks, such as climate-related risks in the property, energy and agricultural sectors. Furthermore, this can include the establishment of early warning systems based on key indicators, for example, for extreme weather events, technology breakthroughs, or nature-related degradation thresholds, and climate-related financial risk indicators, such as exposures of financial institutions to physical and transition risk activities. Likewise, transition plans by real economy and financial institutions and the degree of business activity alignment with national policies can be useful inputs for macroprudential surveillance and macroeconomic scenario analyses once the disclosures are comparable and reliability is ensured, as highlighted by the FSB and the NGFS.[134]
- **Implement or adjust macroprudential tools, such as capital buffers, to ensure their effectiveness for financial resilience in the light of novel risks and to mitigate the build-up of these risks.** This could include adapting systemic risk buffers (SyRBs), concentration limits, loan-to-value (LTV) ratios, and debt service-to-income (DSTI) limits for structural risks; as well as adjusted countercyclical capital buffers (CCyBs) or specific sectoral capital requirements to account for exposures that may amplify cyclical vulnerabilities. For example,

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[132] IFRS, 2024. IFRS Sustainability Disclosure Taxonomy.

[133] Expert judgement is important to acknowledge the limitations of stress tests and their results. Supervisors are well advised to use stress tests for their monitoring activities, but to not solely rely on these tests for adjusting their policies and tools. See for example ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[134] FSB, 2025. The Relevance of Transition Plans for Financial Stability; NGFS, 2025. Interactions between climate scenario analysis and transition plans. Conceptual Note.

existing macroprudential tools can be adjusted to better reflect the specific features of climate systemic risks.[135] Various institutions have explored how SyRBs and BBMs can be calibrated to increase banking sector resilience to losses from transition risks.[136] The literature also highlights the dual role of such buffers to support resilience of the financial system to shocks and to mitigate the build-up of risks across financial institutions, the financial system, and the real economy.[137] With this approach, the buffers are composed of two components, which recognize the contribution of individual financial institutions to systemic resilience. Supervisors can also establish sectoral capital requirements and exposure limits, by introducing sector-specific capital surcharges or exposure concentration limits for highly exposed industries (e.g., in the climate transition risk context, for fossil fuels, greenhouse-gas intensive building materials, methane-intensive agriculture, and energy inefficient real estate) or for exposures to sectors where too few firms have a transition plan.[138] Concentration thresholds can also be set to prevent excessive exposure to geographies without adaptation plans or firms in climate transition exposed industries without climate transition plans. Furthermore, supervisors may also explore liquidity buffers that account for potential market disruptions, such as events linked to climate events, sentiment revision or disorderly transitions. In coordination with microprudential regulation, they can, for example, require banks with high exposure to climate-related risks to hold more High-Quality Liquid Assets (HQLA), or include scenario analysis and expert judgements to account for this risk in liquidity rules such as the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ration (NSFR).

- **Regularly revise and recalibrate tools as novel risks intensify or are mitigated.** Adopting a forward-looking approach is key for the sound calibration of macroprudential tools to address novel risks. Assumptions about technology and policy changes (such as on carbon pricing) are cases in point. Tools may need to be regularly adjusted to ensure their effectiveness as experience and risk structures change over time. As discussed by the FSB, and the ECB and EFRS project team, climate-related systemic risk buffers could, for example, decrease over time as an orderly transition successfully unfolds, since this would result in a reduced risk exposure of the economy or individual sectors to transition and physical climate risks.[139] In undertaking these reviews, supervisors need to engage with the financial sector, the real economy, and further stakeholders to help maintain practical applicability and avoid unintended market impacts.
- **Enhance collaboration amongst financial supervisors and core stakeholders to ensure effective macroprudential supervision and risk mitigation across supervisory agencies**

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[135] Hiebert and Monnin, 2023. Climate-related systemic risks and macroprudential policy. INSPIRE Policy Briefing Paper.

[136] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks; Bartsch, et al., 2024. Designing a macroprudential capital buffer for climate-related risks. ECB Working Paper Series.

[137] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks; Monnin and Ikeda, 2024. Principles For addressing Climate Systemic Risks with Capital Buffers. CEP Policy Brief.

[138] ESRB, 2023. ESRB advice on the prudential treatment of environmental and social risks.

[139] ECB / ESRB Project Team on climate risk monitoring, 2022. The macroprudential challenge of climate change; FSB, 2022. Supervisory and Regulatory Approaches to Climate-related Risks. Final Report.

and across borders. Close collaboration and coordination of micro- and macroprudential surveillance, regulation and other economic and financial governance institutions would be useful to target novel risks. This is especially relevant in the context of capital add-ons under Basel Pillar 2, since targeted capital increases as an additional safety buffer for banks that do not meet the requirements and guidelines for managing novel risks can pose an additional systemic risk to the financial system due to the interlinkages of banks and financial institutions. Furthermore, ASEAN+3 supervisors, for example, may need to collaborate to harmonize the introduction and calibration of macroprudential tools, particularly for systemically important cross-border banks and financial flows. They can for example agree on the introduction of SyRBs or similar buffers to capture novel risks in jurisdictions where such instruments are not yet in place, and the introduction of climate resilience components in capital buffers across all ASEAN+3.

MONETARY POLICY IMPLEMENTATION

Novel risks can profoundly affect monetary policy and macroeconomic outcomes. For example, climate-related physical risks and delayed, disorderly transitions could put price stability at risk, hamper the monetary policy transmission channel, and are expected to increase output-inflation trade-offs considerably.[140]

To maintain future effectiveness of monetary policy, novel risks need to be integrated in the underlying analyses and accounted for in monetary policy instruments. For example, ECB's Frank Elderson argues that "*central banks must take into account their exposures to climate-related and environmental risks when designing monetary policy instruments and considering the composition of their balance sheets*", and that failing to do so "*risks adding to macroeconomic volatility*."[141]

The challenges ahead require at least a *protective*, if not a *proactive* approach by central banks to manage and mitigate novel risks. Central banks need to undertake at a minimum a *protective* approach to climate-related risks in order to fulfil their monetary policy obligations.[142] This entails protecting their own balance sheet and operations from the impact of climate-related risks and enhancing their analytical capabilities to account for climate-related risks in their macroeconomic forecasts. This also requires the adjustment of assumptions about the strength

[140] IMF, 2022. World Economic Outlook; NGFS, 2024. Climate change, the macroeconomy, and monetary policy. Technical document; NGFS, 2024. The green transition and the macroeconomy: a monetary policy perspective. Technical document; NGFS, 2024. Climate macroeconomic modelling handbook. Technical document; Talbot, 2025. The heat is on: why monetary policy makers are increasingly focusing on the impact of climate risks. Speech by James Talbot at Oxford University, Bank of England.

[141] Elderson, 2023. Policymakers as policy takers – accounting for climate-related and environmental factors in banking supervision and monetary policy. Speech by Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB, at the Peterson Institute for International Economics.

[142] Lane, 2024. Monetary Policy and Climate Change – Distinguishing Between a Protective and a Proactive Agenda. CEP Policy Brief.

and distribution of monetary policy effects, for example when specific sectors become less reactive to interest rate adjustments, and possibly altered financial stability spillover patterns, to assess whether monetary tightening could affect some sectors more exposed to novel risks more than others. Eventually, the protective approach also entails an adjustment of the monetary policy reaction functions, for example to account for more frequent supply shocks from climate-related events. Adopting a *proactive* approach would in addition support the mitigation of novel risks at their root causes. For climate-related risks, this means, for example, actively supporting an orderly low-carbon and nature-resilient transition to protect financial stability and economic welfare.[143] With this in mind the characteristics of climate risks arguably also require a proactive approach, since the combination of a high probability for adverse outcomes, deep uncertainties and irreversibility, put financial, economic and societal systems at structural risk.[144]

Various central banks have started to integrate novel risk mitigation considerations explicitly in their balance sheet management, asset management, forecasting activities and monetary policy implementation. Experience to date covers adjustments of analytical frameworks and various monetary policy instruments. Amongst the most widely adopted approaches to integrate climate risk considerations in monetary policy are the integration of climate-related developments into inflation and growth forecasting, as well as adjusted asset quality standards governing central banks' purchases, investments, and lending.[145] Reviewing some of the instruments applied by central banks, the NGFS finds that "*The fact that several central banks have managed to implement a wide range of measures suggests that operational challenges may be more manageable than initially expected*."[146]

The following sections outline specific tools that central banks may need to adjust to enhance sustainable prosperity and take the implications of novel risks for monetary policy implementation into account. This is important to ensure that monetary policy remains effective in light of economic changes, that it contributes to price and financial stability, and that monetary policy instruments contribute to enabling financial markets in harnessing the opportunities that arise from structural economic change.

Asset Management and Collateral Frameworks

Central banks are tasked to assess and manage financial risks to their balance sheets, including those associated with novel risks. For example, the NGFS states that "*managing material financial risks to their own balance sheet, including climate-related financial risk ("risk*

[143] Boneva, et al. 2022. Climate change and central banks: what role for monetary policy? Climate Policy, Vol. 22, Issue 6; NGFS, 2024. Adapting Central Bank Operations to a Hotter World: Current progress and insights from practical examples.

[144] Bolton, et al. 2021. Resilience of the Financial System to Natural Disasters. The Future of Banking 3. CEPR IESE Conference Summary Proceedings; Sharma, 2024. Financial Resilience in an Age of Environmental Change: Central Banks and Financial Regulators Feel the Heat. CEP Policy Brief.

[145] NGFS, 2021. Adapting Central Bank Operations to a Hotter World: Reviewing some options.

[146] NGFS, 2024. Adapting Central Bank Operations to a Hotter World: Current progress and insights from practical examples.

protection"), is a core responsibility of every central bank."[147] If risks are not appropriately controlled for, monetary policy might become ineffective, and central banks risk to violate fiduciary duties towards taxpayers and reduce dividends available to the government.[148] The risk exposures of central bank balance sheets is determined for example by reserve management frameworks, asset purchase schemes, and collateral frameworks.

In addition, the composition of central bank balance sheets and collateral frameworks has structural implications. Central banks are usually required to align their policies with broader economic objectives, to fulfil dual objectives, or to do no harm to secondary objectives of their mandates. As such, the terms and conditions for eligible collateral should not only reflect central banks' assessment of the risks involved but also reflect the wider impacts they have on central bank mandates, such as contributing to economic growth and sustained welfare.

The universe of eligible assets for central bank purchases and collateral oftentimes exhibits a bias towards the status quo. For example, firms and activities that contribute to risk mitigation solutions and those that explicitly address novel risks are often underrepresented in central bank portfolio holdings, due to various characteristics of firms working on novel business models. In addition, it has been shown that there are feedback loops of central bank asset purchases on firms issuing eligible assets, resulting in strengthened market positions of firms that issue eligible assets.[149] To correct for the structural status quo bias, adjusted asset eligibility criteria may be required. For example, additional sustainability-related considerations can support the balancing of risk, return and liquidity.[150]

Some central banks started to adjust their collateral frameworks to account for novel risks in their lending and loan policies. For example, the NGFS discusses how central banks can adjust their collateral frameworks to account for climate risks, revising collateral eligibility and applying larger haircut provisions to assets materially exposed to physical or transition risks.[151] The ECB recently adjusted its collateral framework for climate risks and disclosures, and uses climate risk considerations for the valuation of corporate bond assets to better take climate risks into account.[152]

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[147] NGFS, 2024. Adapting Central Bank Operations to a Hotter World: Current progress and insights from practical examples.

[148] Bingler, 2023. Keeping Risks in Check. Towards a Comprehensive Reflection of Climate Risks on Central Bank Balance Sheets. CEP Blog Article; Tamez, et al., 2024. Central Banks and Climate Change: Key Legal Issues. IMF Working Paper.

[149] Matikainen, et al., 2017. The Climate Impact of Quantitative Easing. LSE GRI Policy Paper; Monnin, 2018. Central Banks and the Transition to a Low-Carbon Economy. CEP Discussion Note; Hartman, et al., 2022. Central Banks, Climate Change, and Economic Efficiency. CEPR VoxEU Column ; Papoutsi, et al., 2022. How unconventional is green monetary policy? Standford University Mimeo.

[150] Fender, et al., 2019. Green bonds: the reserve management perspective. BIS Quaterly Review.

[151] NGFS, 2024. Adapting Central Bank Operations to a Hotter World: Current progress and insights from practical examples.

[152] ECB, 2022. ECB takes further steps to incorporate climate change into its monetary policy operations. Press release; ECB, 2024. Decisions taken by the Governing Council of the ECB (in addition to decisions setting interest rates), July 2024; ECB, 2025. ECB to adapt collateral framework to address climate-related transition risks. Press Release.

Some central banks also adjusted their provisions for eligible asset purchases and asset holdings to manage and mitigate novel risks. For protective and proactive risk management reasons, central banks increasingly integrate climate-related risks and opportunities in their own corporate bond investments and equity purchases and holdings.[153] The Bank of England applied a combination of policies to reduce its exposure to high-carbon sectors and incentivize companies to transition to net zero emissions before it started to sell its corporate bonds due to monetary policy tightening.[154] The ECB adopted a policy for integrating climate considerations in its corporate bond portfolio to reduce climate risks and align with the European Union's climate goals.[155] It started to decarbonize its corporate bond holdings in the reinvestments of maturing bonds until the discontinuation of reinvestments in the Asset Purchase Programme (APP) and the Pandemic Emergency Purchase Programme (PEPP).[156] Additional measures to align the remaining portfolio holdings and adapt the policy to periods of monetary policy tightening are also being explored.[157]

Furthermore, various central banks started to adopt the policies for the management of Official Foreign Reserves (OFRs) to take novel risks and opportunities into account. For example, MAS considers climate-related risks and opportunities in its management of OFRs.[158] MAS' portfolio actions include defining a set of stewardship principles and expectations for their external fund managers, investing in transition opportunities and climate solutions, and tilting portfolio exposures towards companies that are more aligned with the low carbon transition over time. MAS also excludes investments in companies that derive more than 10% of their revenues from thermal coal mining and oil sands activities as they are exposed to significant risks of asset stranding.[159] Collectively, these actions seek to enhance the climate resilience of the MAS portfolio. BNM also integrates sustainability considerations in the management of its reserves.[160] Various large pension funds have ratcheted up their strategies to manage climate-related and sustainability risks and better harness climate-related opportunities, such as the Government Pension Investment Fund (GPIF) in Japan and the Kumpulan Wang Persaraan (KWAP) in

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[153] NGFS, 2024. Adapting Central Bank Operations to a Hotter World: Current progress and insights from practical examples.

[154] BOE, 2023. Greening our Corporate Bond Purchase Scheme (CBPS); BOE, 2023. Asset Purchase Facility: Bank of England concludes corporate bond sales programme. Market Notice.

[155] ECB, 2022. ECB provides details on how it aims to decarbonize its corporate bond holdings. Press Release; ECB, 2025. Frequently asked questions on incorporating climate change considerations into corporate bond purchases.

[156] ECB, 2025. ECB adds indicator of nature loss in climate-related financial disclosures as portfolio emissions continue to decline. Press release, 12 June 2025; ECB, 2025. Climate-related financial disclosures of Eurosystem assets held for monetary policy purposes and of the ECB's foreign reserves; ECB, 2024. Climate-related financial disclosures of Eurosystem assets held for monetary policy purposes and of the ECB's foreign reserves; ECB, 2023. Annual Report.

[157] Schnabel, 2023. Monetary Policy Tightening and the Green Transition. Speech by Isabel Schnabel, Member of the Executive Board of the ECB, at the International Symposium on Central Bank Independence, Sveriges Riksbank, Stockholm; European Parliament Committee on Economic and Monetary Affairs, 2023. Monetary Dialogue with Christine Lagarde, President of the European Central Bank. Meeting notes.

[158] MAS, 2024. Investment Portfolio.

[159] MAS, 2023. Sustainability Report 2022/2023.

[160] BNM, 2024. Annual Report.

Malaysia.[161] Moving ahead, these could also be useful inputs for central bank balance sheet management considerations.

Refinancing Operations

Central banks' refinancing operations are designed to transfer the policy market rate to the banking system, which also has structural implications. For example, it has been argued that higher interest rates might be a considerable challenge for technology investments that are required to mitigate climate-related risks, thereby favoring investments in assets that contribute to macroeconomic and macro financial climate risk exposures.[162]

Targeted refinancing operations provide preferential refinancing to banks when they lend or invest money towards priority sectors or projects. The preferential terms include, inter alia, lower interest rates, longer maturities and higher repayment flexibility in support of priority investments to sustain and enhance sustainable prosperity.[163] Preferential terms are usually designed to correct market failures and to acknowledge the investments' contribution to societal goals and welfare. This can be particularly important in times of rising interest rates. For example, for climate risk mitigation projects, targeted refinancing schemes can be decisive to compensate for the relatively higher cost of capital that many transition-related projects currently still face due to large upfront investment costs and perceived higher risks from comparably less market experience.[164]

ASEAN+3 has rich experience with the use of targeted refinancing schemes to contribute to financial resilience and sustainable prosperity. Schemes that support an orderly transition to net-zero economies and reduce climate-related risks, such as the BoJ's Climate Response Financing Operations, are a case in point. The program has been introduced in 2021 and offers long-term stable refinancing for climate-related lending and investment.[165] Eligible financial institutions are required to disclose efforts to address climate change, and to report the targets and actual results of their investments and loans under the scheme.[166] As of July 2025, BOJ reports a total of JPY 17,130 billion (approximately USD 115 billion) loans outstanding under the scheme.[167]

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[161] GPIF, 2025. GPIF's Initiatives for Sustainability Investment; Azizuddin (2025). Malaysia's KWAP weighs up first dedicated climate fund.

[162] NGFS, 2024. Adapting central bank operations to a hotter world: current progress and insights from practical examples.

[163] Qaisar, 2025. Hitting the Mark: Design Choices in Targeted Refinancing; Qaisar, 2025. Central Banking and Asia's Energy Future: The Role of Targeted Refinancing in ASEAN+3. CEP Policy Brief.

[164] Schnabel, 2023. Monetary Policy Tightening and the Green Transition. Speech by Isabel Schnabel, Member of the Executive Board of the ECB, at the International Symposium on Central Bank Independence, Sveriges Riksbank, Stockholm.

[165] BOJ, 2021. Statement on Monetary Policy; BOJ, 2021. Principal Terms and Conditions of the Funds-Supplying Operations to Support Financing for Climate Change Responses; BOJ, 2024. Principal Terms and Conditions of the Funds-Supplying Operations to Support Financing for Climate Change Responses, Revision: July 31, 2024

[166] BOJ, 2025. Outline of Transactions for Climate Response Financing Operations.

[167] BOJ, 2025. Loan Disbursement under the Funds-Supplying Operations to Support Financing for Climate Change Responses

The PBOC´s Carbon Emission Reduction Facility (CERF) stands at RMB 535 billion (almost USD 75 billion) loans outstanding as pf September 2024.[168] Another example are the Low Carbon Transition Facility (LCTF)[169] and the High Tech and Green Facility (HTG)[170] by BNM. Cumulative funds provisioned under the facilities amount to RM 3.6 billion (equivalent to approximately USD 0.85 billion) as of May 2025.[171] For the financial year 2024, a total of RM 1.8 billion and RM 0.8 billion were approved for disbursement for HTG and LCTF respectively.[172]

Recommendations

To manage novel risks, harness future opportunities, and align balance sheets with the economic transition needs for sustainable prosperity, central banks can implement the following steps:

- **Revise and adjust collateral frameworks and reserve requirements to appropriately account for novel risks and scale-up economic activities for sustainable prosperity.** Thereby, central banks can reduce novel risk exposure of their own balance sheet and support better novel risk management by financial institutions. Depending on the type and structure of novel risks, central banks can for example adjust eligibility criteria, limit the amount of especially risky assets that can be pledged as collateral, and apply haircuts or alternative valuation provisions. For climate-related and nature-related risks, central banks can also require that collateral from corporate assets needs to be backed by corporate transition plans, limit the amount that can be pledged and apply haircuts to assets from corporates without climate transition plans. Central banks may also manage concentration risk for their own exposures by defining limits to climate risk exposed assets that are accepted for certain collateral pools, for example based on sectoral or transition plan availability considerations.
- **Integrate novel risks and sustainable prosperity considerations in asset allocation and asset purchase programs.** Central banks may adjust eligible assets for the asset purchase programs to avoid excessive exposure to novel risks of their balance sheets. In addition, central banks may acknowledge the structural effects of purchase programs and the de facto financial benefits for entities that issue eligible assets. They can in consequence adjust eligible asset frameworks to maximize the likelihood of sustainable prosperity and contribute to the mitigation of systemic novel risks, such as those stemming from climate change. For example, focusing eligibility on assets that support an orderly economic transition would contribute to another feedback loop which could then further reduce the central bank's own balance sheet exposures to these risks. The same

[168] PBOC, 2024. Structured Monetary Policy Instruments (As of End of September 2024).

[169] BNM, 2022. Establishment of New Financing Facilities by Bank Negara Malaysia. Press release; BNM, 2024. Low Carbon Transition Facility (LCTF).

[170] BNM, 2024. High Tech and Green Facility (HTG).

[171] BNM, 2025. BNM's Fund for SMEs; BNM, 2025. Annual Report 2024.

[172] BNM, 2025. Sidang Akhbar / Press Conference Presentation of the Annual Report 2024.

considerations would apply for overall asset allocation policies and frameworks, such as for internally managed reserves.

- **Set clear expectations about the management of novel risks and the maximization of exposure to future opportunities for internal and external fund managers.** Central banks may want to start with the requirement that external fund managers (EFMs) need to explain how novel risks such as climate and nature-related risks are currently assessed and integrated in the investment process. This would support due diligence and ensure that there are no blind spots in the asset management process. For internal and external fund managers, central banks can issue expectations and guidelines on how specific novel risks are to be taken into account at the various stages of the investment process for various asset classes. Such guidelines and expectations can, for example, cover asset eligibility criteria, ratings and investment indices. For corporate assets, they can ask for the integration of information obtained from transition plans and firm-level strategies to deal with climate and nature-related risks and opportunities. Guidelines on stewardship and voting right execution can also be beneficial and support overall risk management.
- **Revise all existing refinancing schemes to align financial incentives and obligations with the need for investments that support sustainable prosperity and resilience.** Some refinancing schemes could, for example, unintentionally contribute to higher novel risks and could be detrimental to future welfare. It would be beneficial to take stock of all refinancing and credit lines and potentially adjust existing schemes such that they do not contribute to the build-up of novel risks.
- **Introduce targeted refinancing and credit schemes for specific sectors and activities that enhance resilience towards novel risks and contribute to sustainable prosperity.** Central banks can introduce preferential financing conditions for banks that invest in potentially underserved areas of the economy that are particularly important for sustainable prosperity but suffer from market failures and status quo biases. They can, for example, introduce schemes that support an inclusive, just climate and nature resilient economy. To identify priority areas for targeted refinancing schemes and credit lines, central banks can build on national plans to sustain and enhance welfare, such as national energy transition plans, technology roadmaps, net zero pathways, and sustainable and transition finance taxonomies. To avoid excessive credit going into particular sectors, central banks would need to carefully design the target activities and set sunset clauses to reduce the risk of contributing to overcapacity and financial bubbles.
- **Asses regularly the effects of existing and new financing schemes towards the outlined goals and adjust the schemes if required.** It is important to understand the schemes' actual impact and real-world effects to ensure its effectiveness and make necessary adjustments if required. Regular dialogues with financial institutions and actors in the targeted activities can be especially beneficial, to ensure that the schemes contribute to increases in investments in underserved areas and avoid potential unintended side effects and inefficiencies. Overall, any targeted scheme should be carefully designed and regularly reviewed to address concerns about possible market distortions and inflationary pressures. A core feature would be sunset clauses and clearly defined lending volumes.

CONCLUSIONS

Novel risks are increasingly threatening financial stability, economic development, and societal welfare in ASEAN+3. Some novel risks, such as those from climate change and nature degradation, are systemic and associated with deep uncertainty and deep structural changes. Standard risk mitigation and management options can be ineffective for an appropriate management of these risks. Left unaddressed, they could disrupt financial markets, intensify economic shocks, and erode the foundations of sustainable prosperity.

Coordinating responses to both immediate and long-term challenges will strengthen the region's resilience and better equip it to prosper in a rapidly changing global environment. Addressing urgent issues, such as the ongoing cost of living crisis and the need to adapt to extreme climate-related weather events, will yield greater benefits when these efforts are integrated with broader strategies targeting structural shifts, including population ageing and the transition to climate-resilient, sustainable economies.

Central banks and financial supervisors need to shift from reactive, backward-looking approaches to proactive, forward-looking strategies that build economic resilience, enhance the capacity of financial markets to absorb future shocks and harness the investment opportunities associated with economic structural change. Acknowledging that there will be no more business as usual in the future is an important first step. Being prepared for deep structural changes, economic transitions and novel risks is amongst the most important areas of challenges that central banks and financial supervisors need to address. Central banks and financial supervisors also have a considerably important role to play in developing the market conditions that enable financial markets to harness the opportunities of economic change and finance sustained economic growth.

This policy brief has outlined various options that central banks and financial supervisors in ASEAN+3 can implement to ensure the future effectiveness of monetary policy and support sustainable prosperity in the light of novel risks and structural changes. Various existing tools can be adjusted, and additional instruments can be introduced. These include adjusted micro- and macroprudential regulation and supervision to enhance financial sector resilience, and adjusted asset management, collateral frameworks, refinancing operations and credit facilities.

Central banks and financial supervisors in ASEAN+3 are recommended to start soon with implementing instruments and adjusting existing approaches, to ensure novel risks are well managed, investment opportunities are harnessed and to foster sustainable prosperity in the region. Scaling up the activities as experience matures would then be the next step to maintain orderly markets and support macroeconomic development. Adopting novel governance approaches that foster cooperation across actors within the jurisdictions and with actors across the region is key to successfully harnessing the opportunities that come along with the ongoing deep structural changes.