

SECURING GREEN DEVELOPMENT: CAN ASIA-PACIFIC CENTRAL BANKS AND FINANCIAL SUPERVISORY AUTHORITIES DO MORE?

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The present paper contains a discussion on how central banks and financial supervisory authorities can foster green development in Asia and the Pacific. It is based on the argument that while fiscal policy has received much attention, central banks and financial supervisory authorities can certainly play a complementary role in accelerating the transition towards low-carbon, climate-resilient economies. Indeed, these institutions are obliged to act as inaction could compromise their mandate to maintain economic and price stability given that climate change poses an emerging risk to the financial system. The first point made in the paper is that approximately half of the Asia-Pacific central banks either have sustainability-oriented mandates or have begun to integrate climate issues into their policy conduct. The following discussion points out that while the region remains at the early stage of implementing green monetary and financial policies, some central banks and financial supervisory authorities are at the forefront in deploying monetary policy tools, prudential measures and broader initiatives to support green finance. To further promote green central banking, having clear guiding principles, effective communication and adequate technical capacity to customize the green approach is critical. Moving forward, these institutions should be mindful of possible unintended, adverse impacts of sustainable central banking, such as interfering with market neutrality, supporting green washing and crowding out green private investments.

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I. INTRODUCTION

Asia and the Pacific has made insufficient progress towards achieving low-carbon, climate-resilient green economies. Compared to other regions of the world, it is more exposed to the impacts of climate change, such as rising temperatures, rising sea levels, and weather-related natural disasters. Yet, despite abundant evidence that climate change is causing large economic and human costs, the region has either regressed or made limited progress toward achieving the environmental-related Sustainable Development Goals¹ (ESCAP, 2021a). China, India and the Russian Federation remain among the world's top carbon emitters and emissions per capita is high in other countries in the region, including, among them, Brunei Darussalam, Kazakhstan and Mongolia. Meanwhile, there is large room to make the region's response to the COVID-19 pandemic greener, as funds committed to fossil fuels dominate public spending on energy in several countries (ESCAP, 2021b).

To date, fiscal policy has been the focus in promoting green development. For example, to reduce carbon emissions, carbon taxes were introduced in Japan and Singapore and are being considered in several other Asia-Pacific economies. Countries, such as China, India, Thailand and Viet Nam, are also offering various fiscal incentives to promote clean and renewable energy and green activities carried out by non-environmental private companies. Regarding governments' own operations, public procurement practices in China, India and the Republic of Korea provide insight on how purchases of goods and services made by governments can be made more environmentally friendly (OECD, 2015).

Compared to fiscal policy, the role of monetary and financial policies in promoting green development is discussed infrequently. In most developing countries, it is not fully recognized that lack of or inadequate actions taken by central banks and financial supervisory authorities to address climate change risks could compromise their primary mandate to maintain macroeconomic and price stability. This is mainly because climate change constitutes an emerging material risk to the financial sector with direct consequences on economic stability. For example, during the period 1980–2012, headline inflation, especially food inflation, remained persistently high in the three years that followed natural disasters in developing countries caused by disruptions in food, housing and energy prices (Parker, 2018). Moreover, central banks and financial supervisory authorities arguably have a wide

¹ These include limited progress on sustainable cities and communities (Goal 11), responsible consumption and production (Goal 12), and life on land (Goal 15), and regressing trends in climate action (Goal 13) and life below water (Goal 14).

range of policy tools that can remedy market failures that have contributed to climate change, such as inefficient pricing of environmental externalities. Finally, with prudential and regulatory oversight, central banks and financial supervisory authorities can also play a critical role in addressing climate change on a systemic level, such as by examining the implications of inactions by market participants and formulating appropriate mitigation measures that can be implemented.

Against this background, this paper presents the case on how Asia-Pacific central banks and financial supervisory authorities could further promote green development. After examining some considerations for these institutions' involvement in climate action, in tandem with their respective mandates, and assessing the extent of Asia-Pacific central banks and financial supervisory authorities' current engagements, selected concepts on how climate elements can be embedded into existing monetary policy tools and prudential measures are examined. Mainstreaming this at economy-wide and institutional levels is stressed in this paper and later a description of the wide range of sustainability-oriented monetary and financial policy tools that have been introduced is given. To realize the potential of these tools, which remains largely untapped in Asia and the Pacific, there are different sets of policy and implementation issues central banks and financial supervisory authorities can consider based on their level of experience in this regard.

This paper contains three key messages. First, given that approximately half of the central banks in Asia and the Pacific already have sustainability-oriented mandates or are considering climate change issues as part of their policy conduct, monetary and financial policies have potential roles in mitigating macroeconomic and financial instability emanating from climate change. Second, while the region as a whole remains at the early stage of implementing sustainable monetary and financial policies, central banks and financial supervisory authorities in some of the more developed Asia-Pacific economies are at the forefront in deploying monetary policy tools, prudential measures and broader initiatives to foster green finance. Third, going forward, these institutions should have clear guiding principles and mandates that ensure the legitimacy of green actions, actively participate in multilateral forums on sustainable finance and be mindful about possible unintended, adverse impacts of green central banking.

This paper is organized as follows. Section II presents some arguments for and against the involvement of central banks and financial supervisory authorities in climate initiatives. Section III then examines the extent of Asia-Pacific central banks and financial supervisory authorities' commitment to green development, while section IV explores some conceptual frameworks on how central banks and financial supervisory authorities can further promote green initiatives. Section V includes a review of some

recent green policy measures adopted by these institutions in the Asia-Pacific region and beyond. Section VI is focused on selected policy and implementations issues that central banks and financial supervisory authorities could consider in moving forward. Section VII provides concluding remarks.

II. SHOULD CENTRAL BANKS AND FINANCIAL SUPERVISORY AUTHORITIES BE INVOLVED IN CLIMATE ACTION?

Amid the significant economic and human costs of climate change (box 1), a debate on green policy conduct by central banks and financial supervisory authorities has gained momentum. While an increasing number of analysts have urged these institutions to play a more active role in promoting green development, others still question the legitimacy of sustainable monetary and financial policies. In sections 2.1 and 2.2, some arguments for and those that caution against central banks and financial supervisory authorities' green policy interventions, respectively, are briefly highlighted.

2.1. Arguments in favour of the engagement of central banks and financial supervisory authorities

Climate change poses imminent risks to macroeconomic and financial stability. There are at least three types of such risks (Bailey, 2021). First, a physical risk or direct losses from climate-related natural disasters, such as damaged infrastructure and disruption of business supply chains. These losses impair asset values of businesses and erode household wealth, which, in turn, not only adversely affect businesses and households' ability to repay loans but also the public finances and underwriting cost for insurers. Second, a transition risk arising from changes in government's climate policies, climate-related disruptive technology, and shifts in consumer preferences, all of which require reassessment of carbon-intensive asset values. As these "stranded assets" could be devalued, businesses would incur higher operating costs, thus pushing up credit risk for debt holders and market risks for insurers and equity investors. Third, a liability risk stemming from materialization of climate insurance payments, contingency funds and compensation for losses due to the physical and transition risks. In addition to these risks, natural disasters induced by climate change could undermine price stability. Empirical evidence has shown that events, such as floods and storms, have elevated inflation rates in both developed and developing countries (Heinen, Khandan and Strobl, 2018; Dafermos and others, 2021b; and Beirne and others, 2021), with more notable impacts in developing economies (Parker, 2018).

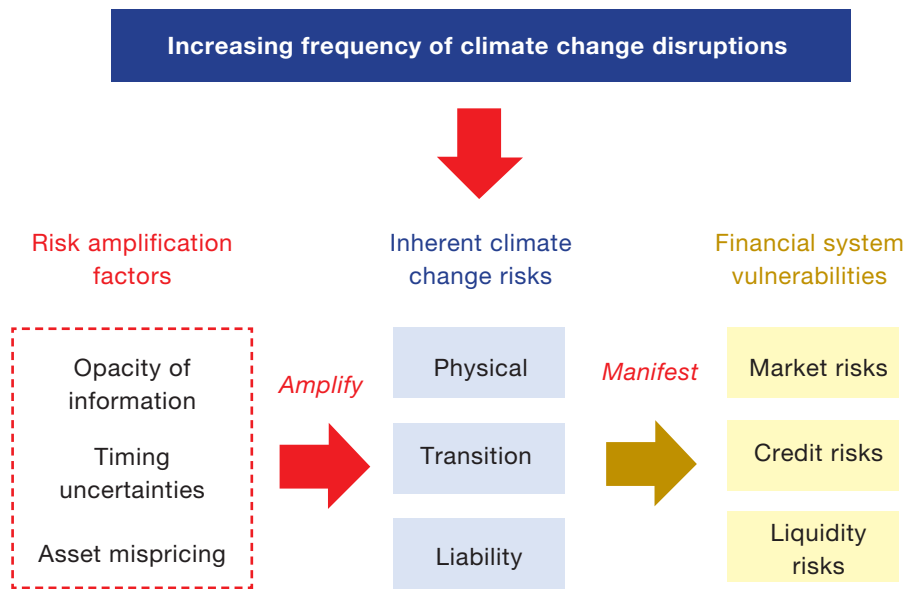
Box 1. The impacts of climate change in Asia and the Pacific

Asia and the Pacific is more exposed to climate change impacts than any other region in the world. Partly because of its large land mass, temperatures in the Asia-Pacific region have risen two times faster than the world average (Dabla-Norris and others, 2021). This is more pronounced in the Northern part of the region where temperatures have risen by up to 0.5°C over the past decade. Moreover, low-lying territories, many small islands and extensive coastlines make the region highly susceptible to rising sea levels and severe weather conditions (UNDP, 2019). Driven by these conditions, the region has suffered more from weather-related disasters, which account for 37 per cent of all disaster occurrences during the period 2000–2019 (Dabla-Norris and others, 2021). In addition to more frequent floods and droughts, greater monsoon variability in South and South-West Asia and South-East Asia has also led to more extreme rainfalls in some areas and droughts in others. At the same time, the warmer oceans have intensified tropical storms, making them harder to predict.

Climate change has incurred large economic and human costs. At a global level, under the current trajectory, which suggests a temperature rise of between 2.0 and 2.6°C by 2050, the output loss is estimated at between 11.0 and 13.9 per cent of global gross domestic product (GDP) (Swiss Re, 2021). For Asia and the Pacific, the loss is estimated to be approximately \$50 billion annually over the period 2010–2019, mainly driven by increases in the frequency and severity of weather-linked disasters (Dabla-Norris and others, 2021). During this same period, the region also incurred significant human cost, with more than three billion people being affected. Moreover, approximately 200 million people in the region depend on healthy oceans, which are increasingly exposed to acidifying and coral bleaching (UNDP, 2019). The impact of climate change on workers' incomes and employment can also be sizeable, as the livelihood of more than 60 per cent of the Asia-Pacific population is susceptible to changing weather patterns.

Central banks and financial supervisory authorities that do not consider climate change risks may fall short in fulfilling the mandate of maintaining price and financial stability. The manifestation of the physical, transition and liability risks can result in financial shocks. This is mainly because of the large sudden shifts in risk perceptions posed by climate change, as demonstrated by more frequent climate-related hazards, could lead to abrupt repricing events. Financial system vulnerabilities could also arise due to several other factors, including, among them, opacity of exposure amid limited information, time uncertainties over the emergence of risk, mispricing owing to underestimation of climate risks and risk asset exposure from a synchronous shock. All these factors reduce the accuracy of existing risk models and make financial risk forecasting challenging. Overall, financial instability can be compromised from the sudden repricing of assets and liabilities within the financial system, and further exacerbated by a liquidity crunch (figure 1).

Figure 1. Possible transmission channels from climate-related risks to financial system vulnerabilities



Source: Authors, adapted from Brunetti and others (2021).

Climate-related disruptions in the real economy sectors could also compromise price and monetary stability. Traditionally, need for monetary policy responses is determined by events that affect prices and/or price expectations, as these responses are aimed at adjusting aggregate demand to achieve long-term price stability. Regarding climate risk, climate-related demand and supply shocks and the transition process can affect not only macroeconomic variables, such as good prices, but also the natural interest and unemployment rates (Bailey, 2021). As a result, the ability of central banks to deliver price and monetary stability may be hampered.

Finally, analysts have called for the engagement of central banks and financial supervisory authorities in green development because climate risk can pose challenges to the effectiveness of monetary policy. The irreversibility of climate change and its long-term economic impact can influence monetary policy effectiveness through different channels (Bolton and others, 2020). First, climate change can cause “stagflationary” supply shocks (low economic growth and high inflation), which monetary policy may be unable to fully reverse because climate change is likely to persist for a long period of time. Second, tackling climate change requires coordination across countries, thus potentially undermining the effectiveness and relevance of monetary policy actions introduced by individual central banks and financial supervisory authorities. Third, there are concerns over these institutions’ ability to take pre-emptive measures to mitigate “green swan” events, which can be described as rare, unexpected events with wide-ranging or extreme impacts.

2.2. Arguments cautioning the engagement of central banks and financial supervisory authorities

Some analysts have argued that central banks and financial supervisory authorities are not omnipotent and should not go beyond their core mandates. For example, Issing (2019) notes that the responsibility of addressing climate change should be assumed by publicly elected entities, such as governments. In addition, in counterarguing that climate change poses a systemic risk to financial stability, some point out that many other events, such as social unrest and territorial wars, could pose similar risk, but it is not possible to justify these institutions’ active engagements in all these events. In this vein, central banks and financial supervisory authorities should focus effectively on a specific important goal, rather than a wide range of goals that are considered good for social development and the environment (Viner, 1964). Nonetheless, this argument may be weakened by recent evidence that climate change can jeopardize price stability, which is the core mandate of central banks.

It may also be undesirable to allocate much authority and broad mandates to unelected institutions. For example, central banks and financial supervisory authorities have been criticized for implementing unconventional policies by acting as the lender of last resort for the financial system during the 2007–2008 global financial crisis (Volz, 2017). A quasi-fiscal role of these institutions, such as buying government securities in the secondary market, also raises concerns, as such actions do not have political legitimacy in a strict sense. Meanwhile, in countries where these institutions strongly focus on price stability and policy independence, they tend to be less involved in developmental financial policy (Dikau and Ryan-Collins, 2017). For example, the Korea Development Bank began investing in green industries in 2009, while the Export-Import Bank of Korea is the first Asian financial institution to issue green bonds. More broadly, Sindreu (2021) notes that deviations of central banks and financial supervisory authorities from their key mandates have been minor historically. Although central banks in countries, such as Japan and the Republic of Korea, had channelled credit to favoured business sectors, this was always carried out as supplements to government policy.

III. TO WHAT EXTENT ARE ASIA-PACIFIC CENTRAL BANKS AND FINANCIAL SUPERVISORY AUTHORITIES COMMITTED TO GREEN DEVELOPMENT?

This section provides an assessment of the extent that Asia-Pacific central banks and financial supervisory authorities are committed to and engage in green monetary and financial policies. This can be proxied by reviewing their mandates, policy actions and survey-based perspectives (section 3.1) and memberships in international initiatives that call for a greener financial system (section 3.2).

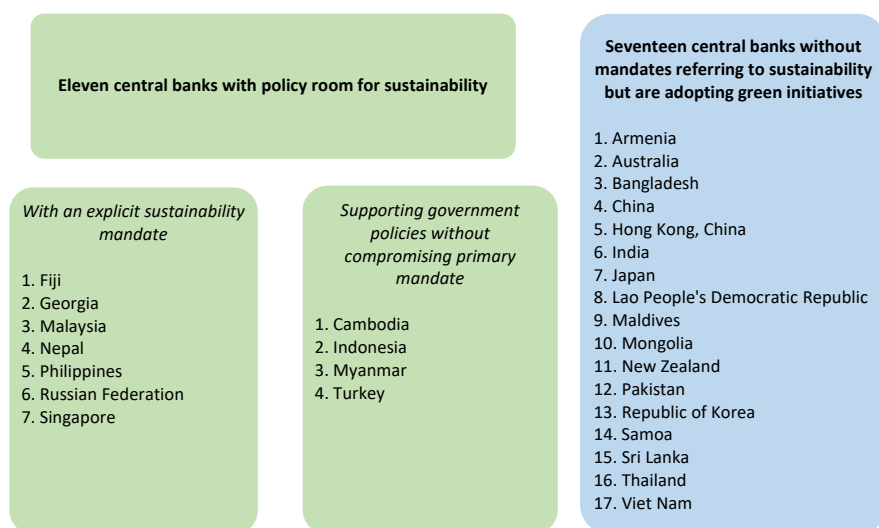
3.1. Mandates and policy initiatives

The extent of a central bank's commitment to green finance can be gauged from its mandate and objectives. According to Dikau and Volz (2020), a central bank is deemed to have policy room to accommodate green development if its mandate or one of its objectives is to (a) enhance, promote or support "sustainability" or "sustainable development/growth", or (b) support government's economic objectives or policy goals, which may comprise sustainability elements. This contrasts with central banks with mandates to promote only "sustained" growth or development.

Approximately half of the central banks in Asia and the Pacific either have room within their mandates or have introduced green monetary policy tools. At the global level, 70 out of 135 central banks are given mandates to enhance sustainability or

economic growth/development (Dikau and Volz, 2020).² Out of these 70 central banks, 11 are from the Asia-Pacific region. These 11 central banks can be further grouped into seven central banks with an explicit sustainability mandate, and the remaining four as those supporting government policies if their actions do not compromise their primary mandate of maintaining price stability (figure 2). Table 1 shows how “sustainability” is referred to by the seven central banks with explicit sustainability mandates. Meanwhile, there are also many central banks around the world whose mandates do not refer to sustainability but have introduced initiatives to promote green development, including being members in international forums on green finance. In the Asia-Pacific region, 15 central banks belong to this group (figure 2). Table 2 shows examples of green policies carried out by these central banks that go beyond forum membership. Some of these policy examples are discussed in more detail in section V.

Figure 2. Asia-Pacific central banks that have policy room for or are already engaged in sustainable central banking



Source: Authors, based on Dikau and Volz (2020).

Note: Armenia and Maldives are added as those adopting green initiatives as the central banks joined the Network for Greening the Financial System in late 2020 and 2021, respectively.

² The analysis is based on the Central Bank Legislation Database of the International Monetary Fund (IMF), which covers 126 central banks. Dikau and Volz (2020) supplemented this with an additional nine central banks that have adopted green finance policies, namely the central banks of Australia, Bangladesh, India, Lebanon, Mongolia, Nigeria, Pakistan, Samoa and Singapore.

Table 1. Sustainability objective statements of Asia-Pacific central banks with explicit mandates on sustainability

Country	Sustainability statements
Fiji	“...to protect the value of the currency in the interest of balanced and sustainable economic growth...”
Georgia	“...shall ensure stability and transparency of the financial system and facilitate sustainable economic growth...”
Malaysia	“...to promote monetary stability and financial stability conducive to the sustainable growth...”
Nepal	“...to maintain the stability of price and balance of payment for sustainable development of economy...”
Philippines	“...to maintain price stability conducive to a balanced and sustainable growth...”
Russian Federation	“...to protect and ensure stability of the rouble by way of maintaining price stability, including for the creation of conditions for balanced and sustainable economic development.”
Singapore	“...to maintain price stability conducive to sustainable growth...”

Source: Authors, based on Dikau and Volz (2020).

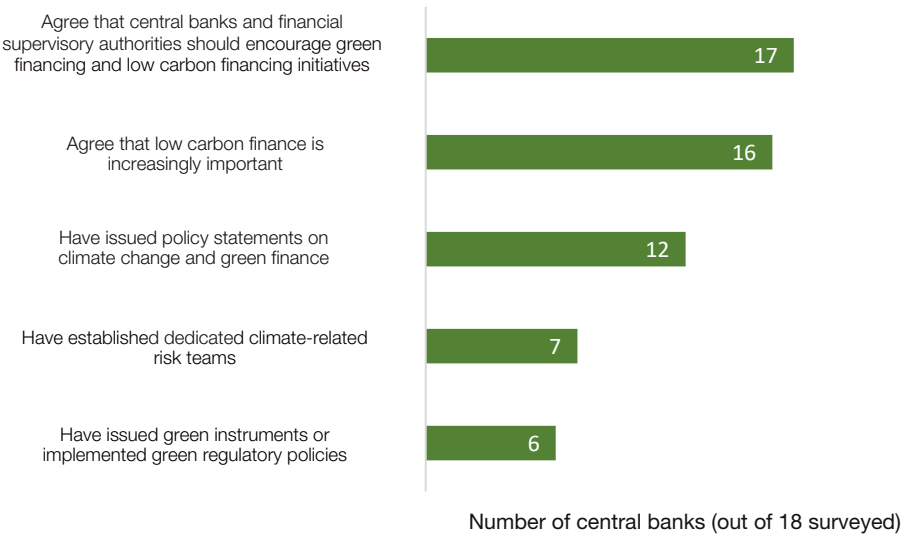
While Asia-Pacific central banks generally value green development, only a few of them have introduced tangible measures to achieve this. In a recent survey of 18 Asia-Pacific central banks (mostly in East and North-East Asia, and South-East Asia), virtually all of them agree that central banks and financial supervisory authorities should encourage green financing and that low-carbon finance is increasingly important (Durrani, Volz and Rosmin, 2020) (figure 3). Two thirds of the respondents note that they have issued policy statements on green finance. Such statements take various forms, such as announcements on sustainable finance frameworks and guidelines to incorporate positive climate actions and speeches by central bank governors. Meanwhile, implementing tangible actions on green finance is less common. Only about one third of the respondents have set up dedicated teams or special task forces to work on mainstreaming climate issues into monetary policy. Their host units are also diverse, ranging from units working on banking supervision, financial inclusion, and risk management to those working on corporate social responsibility and the environment. Finally, approximately one third of the respondents have issued green financial instruments or implemented regulatory policies that encourage private financing for green investments. This includes green-supporting and brown-penalizing factors to enhance the Basel regulatory framework.

Table 2. Examples of green initiatives taken by Asia-Pacific central banks without mandates referring to sustainability

Economy	Examples of initiatives
Australia	2019: Began discussion on incorporating climate models into economic modelling
Bangladesh	2017: Issued Guidelines on Environmental and Social Risk Management for Financial Institutions 2019: Expanded the Green Transformation Fund to include all export-oriented sectors
China	2017: Incorporated green finance into macroprudential assessment system; issued Financial Industry Standardization System Construction Development Plan
Hong Kong, China	2019: Established Centre for Green Finance; announced green finance development measures
India	2019: Revised guidelines for Priority Sectors Lending programme, including renewable energy
Mongolia	2014: Issued Sustainable Finance Principles and Sector Guidelines
New Zealand	2019: Reviewed Act to consider how climate risks could affect financial stability
Pakistan	2017: Issued Green Banking Guidelines; outlined Environmental Risk Management Guidelines
Thailand	2019: Launched Guidelines for Responsible Lending Institutions
Viet Nam	2016: Issued circular on environment, social and governance factors; required lending to take into account the environment 2017: Renewed commitment to implement Green Growth Programme

Source: Authors, based on Dikau and Volz (2020).

Figure 3. Survey results on perspectives and actions on green central banking



Source: Authors, based on Durrani, Volz and Rosmin (2020).

3.2. Participation in multilateral initiatives on green finance

The Network for Greening the Financial System facilitates discussions on how best to address climate risks and scale up sustainable finance. Asia-Pacific central banks and financial supervisory authorities can benefit from lessons learned from more experienced peers to effectively implement new mandates or adapt existing policies to support green development. In particular, the six workstreams of the Network encourage its members to (a) integrate climate risks into financial stability monitoring and microsupervision; (b) integrate sustainability factors into own-portfolio management; (c) bridge data gaps; (d) build awareness and intellectual capacity and encourage technical assistance and knowledge-sharing; (e) achieve robust and internationally consistent climate and environment-related disclosure; and (f) support the development of a taxonomy of economic activities (Network for Greening the Financial System, 2019a). Moreover, the Network for Greening the Financial System conducts periodic surveys to gauge members’ progress on green initiatives. These surveys could motivate Asia-Pacific central banks and financial supervisory authorities to benchmark themselves against peers. As of June 2021, of the 95 members of the Network, 19 are from the Asia-Pacific region (table 3). All these central banks and financial supervisory authorities are in developed and emerging economies, except for the central bank of Cambodia.

Table 3. Asia-Pacific central banks and financial supervisory authorities that are members of the Network for Greening the Financial System and/or the Sustainable Banking Network

	Network for Greening the Financial System	Sustainable Banking Network
Australia	•	
Armenia	•	
Bangladesh		•
Cambodia	•	•
China	•	•
Fiji		•
Georgia	•	•
Hong Kong, China	•	
India	•	•
Indonesia*	•	•
Japan*	•	
Kazakhstan		•
Kyrgyzstan		•
Lao People's Democratic Republic		•
Maldives		•
Malaysia	•	
Mongolia		•
Nepal		•
New Zealand	•	
Pakistan		•
Philippines	•	•
Republic of Korea*	•	
Russian Federation	•	
Samoa		•
Singapore	•	
Sri Lanka		•
Thailand	•	•
Turkey		•
Viet Nam		•
Total	19	20

Source: Authors, based on Network for Greening the Financial System (2021b) and IFC (2021b).

Note: *Denotes a country where both the central bank and a financial supervisory authority are members of the Network for Greening the Financial System. These authorities are the Financial Services Authority of Indonesia, the Financial Services Agency of Japan and the Financial Services Commission of the Republic of Korea.

The Sustainable Banking Network promotes the transition of financial sectors towards environmental sustainability. It is a community of financial sector regulatory agencies and banking associations from developing countries that are committed to advancing sustainable finance (IFC, 2021a). The twin goals are to improve risk management that takes into account environmental, social and governance (ESG) factors, and to mobilize additional capital flows for activities with positive climate impacts. With support from the International Finance Corporation (IFC), the Network aims to (a) provide technical assistance to members in developing and implementing national sustainable finance frameworks; (b) convene a global platform for practitioners to benefit from best practices and collective learning; and (c) provide capacity-building and knowledge-sharing that focus on peer-to-peer exchanges among the members. Of the 43 member countries, 20 are from Asia and the Pacific, including four least developed countries (Bangladesh, Cambodia, the Lao People's Democratic Republic and Nepal) (table 3).

The United Nations Principles for Responsible Investments urges central banks to employ responsible investment strategies for official reserves management. While safeguarding investment returns, central banks can also help foster sustainability by establishing responsible investment frameworks for reserves management at the strategy, policy and asset-class levels (Gerritsen, 2019). Signatories of the United Nations Principle for Responsible Investments are committed to six core principles, namely (a) incorporating ESG issues into investment analyses and decisions; (b) integrating ESG issues into ownership policies and practices; (c) seeking appropriate disclosure on ESG issues by investee entities; (d) promoting acceptance and implementation of the Principles within the investment industry; (e) working together to enhance effectiveness in implementing the Principles; and (f) reporting on activities and progress towards implementing the Principles (United Nations Principles for Responsible Investments, 2021). As of June 2021, the Hong Kong Monetary Authority is the only Asia-Pacific central bank and financial supervisory authority signatory of the Principles. Generally, central banks in the region are reluctant to become signatories due to the sensitivity for disclosing the breakdown of and management processes for public assets.

The Sustainable Insurance Forum helps countries to integrate sustainability factors into the regulation and supervision of insurance companies. Partly based on the United Nations Environment Programme (UNEP) Principles for Sustainable Insurance, the Forum aims to equip its members with practices in climate risks in the insurability of assets, sustainability beyond climate change (such as habitat loss and biodiversity changes), and incorporation of climate risks into actuarial processes. Together with the International Association for Insurance Supervisor, the Forum has

set out broad principles on various areas, such as roles of supervisory agencies and corporate senior management, specific climate risk considerations to enhance corporate governance's control functions (such as pricing and underwriting of risks), asset and liability management, investment risk assessment, and public disclosure (Sustainable Insurance Forum, 2021a). In this regard, Asia-Pacific central banks and financial supervisory authorities can adapt some of these principles to existing insurance regulatory and supervisory frameworks and influence a common industry policy. As of June 2021, however, only 4 out of 30 Sustainable Insurance Forum members are from Asia and the Pacific (Sustainable Insurance Forum, 2021b). All of them represent more developed countries of the region, namely, the central banks in New Zealand and Singapore and financial supervisory authorities in Australia and Japan.

IV. HOW CAN CENTRAL BANKS AND FINANCIAL SUPERVISORY AUTHORITIES PROMOTE GREEN DEVELOPMENT? – SELECTED PRINCIPLES AND FRAMEWORKS

This section presents some principles and conceptual frameworks that have been proposed to facilitate central banks and financial supervisory authorities' effort in incorporating climate risk mitigation measures into their policy conduct. These include broad principles and guidance (section 4.1) and a specific sustainability-enhanced toolbox (section 4.2). While these measures may not be sufficient to address climate transition risks, they can be tailored to complement existing fiscal tools in each country.

4.1. Broad principles and guidance

Climate-related risks are distinct from the risks that central banks and financial supervisory authorities are typically exposed to, measure, control and manage. These risks can be characterized by a deep or radical level of uncertainty (Bolton and others, 2020) intertwined with multiple and interacting dynamics that could lead to unexpected, uneven and possibly unlimited downside liability on damage (Weitzman, 2011). This could potentially translate into extreme events with systemic impacts. Accordingly, conventional approaches taken by central banks and financial supervisory authorities to manage financial risks may not be able to effectively deal with the complexity and uncertainty associated with climate risks. This may be partly because existing frameworks are generally based on current estimation of risk likelihood and stress testing using backward-looking scenarios. On balance, forward-looking risk assessments that incorporate climate risks should be considered to manage financial stability.

There are various ways that central banks and financial supervisory authorities can integrate climate issues into their operations and policy conducts. For example, these institutions can incorporate climate risks into regulatory frameworks, adopt prudential policies that recognize systemic climate risk and introduce monetary policy tools to address climate change within the limits of existing mandates (Grippa, Schmittmann and Suntheim, 2019). To support this, the International Monetary Fund (IMF) has conducted studies to enhance understanding of risks, vulnerabilities and the transmission mechanism arising from climate change along with initiatives to close data gaps. For instance, one of its recent policy guidance discusses emerging climate risks, exposure to brown assets, policy options to diversify carbon-intensive economies, and approaches to mitigate the adverse social impact of a transition to a low-carbon economy (IMF, 2021). Meanwhile, the Bank for International Settlements (BIS) proposes that central banks and financial supervisory authorities serve as coordinating agents and advocates to combat climate risks (Bolton and others, 2020). Possible considerations for them are to integrate climate risks into prudential regulation and financial stability monitoring; integrate the ESG principles into reserves management; explore potential impacts of green policy measures on financial stability; and examine approaches to better capture the complex and uncertain interactions between climate and socioeconomic systems.

Asia-Pacific central banks and financial supervisory authorities can also learn from actions taken by multilateral financial organizations to tackle climate change. Among other initiatives, IMF has started to integrate climate issues and risks into its economic assessment and financial sector surveillance and scale up capacity development programmes on climate issues (Georgieva, 2021). Meanwhile, the Basel Committee on Banking Supervision (BCBS) has established the Task Force on Climate-related Financial Risks, which is tasked to study the transmission channels of climate risk and methodologies to measure and assess climate risks (Stiroh, 2020). Based on its inaugural reports released in April 2021, BCBS plans to further examine which climate-related financial risks can be addressed within the existing Basel Framework and identify potential gaps in the current framework (BIS, 2021).

4.2. Sustainability-enhanced toolbox

Dikau, Robins and Volz (2020) have proposed a specific toolbox to guide the incorporation of sustainability factors into the operations of central banks and financial supervisory authorities. The following is suggested in the toolbox: (a) ensuring that climate risks are accurately reflected in central banks' balance sheets and operations; (b) reducing climate risks faced by regulated financial institutions through prudential supervision; (c) avoiding the build-up of climate risks at the level of the financial

system; and (d) supporting governments' efforts to scale up sustainable finance. To implement these principles, a toolbox groups different types of policy tools into monetary policy, prudential measures, and other means, shown in table 4.

Table 4. Sustainability-enhanced toolbox

Central banks and financial supervisory authorities tools	Potential sustainability-oriented measures
A. Monetary policy	
Collateral frameworks	<ul style="list-style-type: none"> • Instead of solely relying on credit quality, collateral frameworks can be tailored to be carbon neutral, take climate- and other sustainability-related financial risks into account and apply haircuts to account for these risks. • Exclude asset classes that do not align with the Paris Agreement.
Indirect monetary policy instruments	<ul style="list-style-type: none"> • Recalibrate standard instruments to include climate-related considerations, with differentiated reserve requirements and risk weights to account for climate-related financial risk. • Align refinancing operations to account for haircuts and/or negative exclusion criteria. • Differentiated interest rates on financial instruments based on climate-related criteria.
Non-standard instruments	<ul style="list-style-type: none"> • Asset-purchase programme to exclude carbon-intensive assets. • Direct short-term credit to government to support sustainable fiscal policies, possibly with limits on the scope and scale of the fund. • Purchase of green sovereign bonds, issued by the government, in the secondary market.
Direct monetary policy instruments	<ul style="list-style-type: none"> • Interest rate ceilings for sustainable priority sectors, asset classes, or corporations. • Minimum/maximum allocation of credit through credit ceilings or quotas to restrict/promote lending to carbon intensive/sustainable sectors. • Targeted refinancing lines to promote credit for green sectors. • Window guidance/moral suasion to promote lending to sustainable sectors.
B. Prudential measures	
Microprudential instruments	<ul style="list-style-type: none"> • Stress testing frameworks that acknowledge climate risks and help firms consider longer-term risks. • Mandatory disclosure requirements for climate-related financial risks. • Supervisory review process that highlights management of climate-related financial risks. • Climate risk-sensitive calibration of other Basel III instruments, distinguishing between low-carbon and carbon intensive/high-exposure assets to create buffers against climate-related losses.^a

Table 4. (continued)

Central banks and financial supervisory authorities tools	Potential sustainability-oriented measures
	<ul style="list-style-type: none">• System-wide stress testing that acknowledges and assesses systemic climate-related financial risks.• Pro-cyclical instruments calibrated to account for and mitigate systemic risk implications of climate change and restrain build-up of risk-taking activities.^b• Cross-sectional instruments calibrated to account for and mitigate systemic risk implications of climate change and to mitigate individual institutions' contribution to systemic risk.^c
C. Other policy tools ^d	
Financing schemes and other initiatives	<ul style="list-style-type: none">• Financing or loan guarantees with conditions for reduction of carbon emissions or other sustainability elements.• Incorporation of climate-related considerations into bail-out packages.• Funding sustainable lending/investment schemes through refinancing credit lines via development finance institutions or purchase of bonds in the secondary market or direct refinancing operations.• Tailoring supervisory frameworks for development banks that are regulated by financial supervisory agencies to enhance their public policy capacity to assume more risk and promote economic transformation.
Management of central banks' portfolio	<ul style="list-style-type: none">• Disclosure of climate-related financial risks in own portfolios or adopting sustainable and responsible investment principles for portfolio management.^e
Supporting sustainable finance	<ul style="list-style-type: none">• Sustainable finance taxonomy/roadmaps/guidance for financial institutions.• Advice and dialogue with other parts of the government.• Research and publication of handbooks and resources, such as reference scenarios, risk assessment methodologies.• Capacity-building programmes in sustainable finance for the financial sector.

Source: Dikau, Robins and Volz (2020).

Notes: ^a Examples are differential risk-based capital requirements and lower required stable funding factor for green loans.

^b These include counter-cyclical and higher capital buffer to prevent prolonged periods of excessive carbon-intensive credit growth, and loan-to-value and loan-to-income ratios to limit credit provided to carbon-intensive industries.

^c Examples are restrictions to limit financial institutions' exposure to highly carbon-intensive sectors, and capital surcharges to financial institutions with high exposure to carbon-intensive assets.

^d Unlike monetary policy tools, these auxiliary tools are designed to meet developmental mandates, rather than to achieve financial stability.

^e The Network for Greening the Financial System has set out guidelines for a central bank's portfolio management to incorporate sustainability and responsible elements, including strategies, monitoring, and reporting.

4.2.1. Monetary policy

Collateral framework. At least two practical approaches can be used to develop climate-aligned collateral frameworks (Dafermos and others, 2021a). The first is a climate footprint approach, which applies different valuations or haircut adjustments to sustainability-oriented bonds, such as blue, brown and green bonds. The second method is a climate-risk approach to reflect the expected default rates of bond issuers under different climate-transition scenarios. Examples are exclusion or inclusion of financial instruments and assets based on sustainability assessments. These adjustments are operationally feasible, as past experiences point to some adaptability of central banks and financial supervisory authorities' collateral frameworks. For example, in response to the COVID-19 pandemic, approximately 55 central banks worldwide have amended their collateral frameworks (Dikau, Robins and Volz, 2020).

Indirect monetary policy operations. Central banks can consider differentiating reserve requirements and risk weights based on carbon footprint and climate-related financial risks. Among others, the objective for indirect monetary policy operations is to ensure adequate market liquidity and that effective interest rates are in line with policy interest rates. This can be executed through the buying and selling of central bank and government securities. Certain central banks also use standing facilities and reserves requirements to manage available market liquidity. Similar to collateral frameworks, central banks and financial supervisory authorities open market operations, standing facilities, reserve requirements and refinancing operations are often calibrated without sustainability considerations, and consequently leading to carbon bias (Dikau, Robins and Volz, 2020). This can be changed to support climate action.

Non-standard instruments. Unconventional monetary policy, particularly asset purchase programmes, can be geared towards green assets. Largely introduced after the 2007–2008 global financial crisis, these central banks' asset purchase programmes provide monetary stimulus by lowering financing costs on corporate and government bonds. The purchases can also stimulate portfolio rebalancing and spur new issuances (Bank of England, 2021). As such, central banks and financial supervisory authorities can consider green asset purchases that are aimed at subsidizing green assets, incentivizing investors to hold green assets without compromising financial stability and excluding carbon-intensive assets from asset purchases.

Direct monetary policy instruments. Central banks and financial supervisory authorities can offer subsidized lending rates for green sectors. One of the common direct monetary policy instruments is direct credit allocation, which aims to promote priority sectors by inducing lower financing rates or increased liquidity. To achieve

this, available policy tools are subsidized loan rates, differential rediscount rates, direct budgetary subsidies, credit floors and ceilings, and proliferation of specialized financial institutions (Fry, 1995). Among these instruments, the most conventional is subsidized loan rates for priority sectors (Volz, 2017).³ Moreover, central banks and financial supervisory authorities can accept sustainability-linked instruments, such as carbon certificates, as part of commercial banks' legal reserves, and introduce green refinancing lines with preferential terms for specified green assets to compensate financial institutions for lending to carbon-absorption projects (Dikau and Volz, 2020).

4.2.2. Prudential measures

Microprudential measures. Disclosure requirements, supervisory review and stress testing can be used as microprudential measures to support green development. As standardized methodologies for quantifying climate risks are still being developed, central banks and financial supervisory authorities can take a wide range of qualitative measures to assist regulated entities in mitigating climate risks (Network for Greening the Financial System, 2020). For example, central banks and financial supervisory authorities can issue disclosure requirements for climate-related financial risks, which include regulated entities' plans to integrate climate risks into their business strategy and risk management frameworks, as well as actions to mitigate any detected vulnerabilities. Central banks and financial supervisory authorities can also carry out a supervisory review process to identify climate risks being faced by regulated entities and evaluate how these risks may affect their business model, capital and liquidity. Meanwhile, stress testing to assess the implications of climate risks and effectiveness of mitigation measures should be carried out under different climate scenarios. Finally, moving from voluntary to mandatory environmental reporting strengthens the information base, which helps enhance the assessment of default likelihood and the design of prudential instruments (Dikau, Robins and Volz, 2020).

Macroprudential measures. Improving risk monitoring and developing a national green taxonomy can help reduce systemic risk. Central banks and financial supervisory authorities can amend existing risk monitoring and mitigation measures to avoid the build-up of transition risks on the balance sheets of financial institutions, which could translate into a system-wide vulnerability. They could also recalibrate regulatory tools to account for and mitigate systemic risk implications of climate change and restrain the accumulation of risk-taking in carbon-intensive sectors. Among other policy measures, these institutions could establish a common principle-based taxonomy for market participants as a guidance for stress testing and regulatory reporting.

³ To ensure its effectiveness, direct credit allocation may be subject to clearly defined and monitored performance targets.

This is especially relevant for the insurance sector, which is often most exposed to climate liability risks. Moreover, raising awareness among market participants about emerging climate risks could make regulated entities more proactive, as systemic risk could eventually hamper individual institutions. Finally, conducting a system-wide assessment and stress testing would prompt corporations to rethink their commitments to climate change and the impact of climate change on their business models (Beau, 2021).

4.2.3. Other policy tools

Targeted financing scheme. Existing financing schemes can be amended to include sustainability conditionality. Central banks and financial supervisory authorities can influence the broad financial sector to increase capital allocation to climate-related projects through conditional lending facilities, such as loan guarantees requiring reduction in carbon emissions, and targeted funding to promote climate-related economic transformation activities, such as asset purchase programmes in the secondary market and refinancing operations with sustainability conditionality. Central banks and financial supervisory authorities could also prioritize the financial sector's credit allocation and/or moral suasion to increase climate financing through direct decree via financial intermediaries.

Management of central bank's portfolio. Central banks' portfolio management could benefit from ESG integration. The Network for Greening the Financial System outlines two sustainable and responsible investment objectives for the portfolio management of central banks and financial supervisory authorities. The first is to deal with the impact of climate risks on the portfolio, while the second objective aims to address the impact of the portfolio on the environment and society alongside financial returns (Network for Greening the Financial System, 2019b). In this regard, the Network for the Greening the Financial System proposes five strategies: (a) negative screening excluding undesired exposure; (b) best-in-class or positive screening and/or index-adjusted weighting to account for climate impacts; (c) ESG integration into investment process to improve the risk-return profile of the portfolio; (d) impact investing to generate an intentional and quantifiable positive climate impact alongside financial returns; and (e) voting and engagement, which involves exercising ownership rights with an intention of influencing a company's behavior.⁴ Meanwhile, when central banks and financial supervisory authorities outsource their

⁴ Negative screening and green bond investments are currently the two most common strategies largely because both activities do not require significant adjustment to the asset allocation or investment process.

portfolio management function to external fund managers, they can also introduce internal ESG guidelines encompassing the selection process, appointment, and performance monitoring.

Supporting sustainable finance. A variety of policy tools are available for promoting sustainable finance. Among others, central banks and financial supervisory authorities can consider auxiliary measures, such as introducing a sustainable finance road map as guidance for financial institutions, holding regular policy dialogues with government agencies and offering training on sustainable finance for financial sector participants. Central banks and financial supervisory authorities can also provide fund managers with seed capital to support an issuance of climate funds and innovation funds that seek to enhance green technologies. By attracting additional capital, this initial capital is expected to enhance the quality of green infrastructure and boost green economic activities over time.

V. HOW HAVE CENTRAL BANKS AND FINANCIAL SUPERVISORY AUTHORITIES PROMOTED GREEN DEVELOPMENT? – SELECTED CASE EXAMPLES

This section contains examples of green monetary and financial policy tools that have been introduced in the Asia-Pacific region and beyond. Based on the toolbox proposed by Dikau, Robins and Volz (2020), which is discussed in the preceding section, these examples are grouped into monetary policy (section 5.1), prudential measures (section 5.2), and other policy tools (section 5.3). Fifteen cases are discussed, including 12 from the Asia-Pacific region.

5.1. Monetary policy

Collateral framework: The collateral framework of the European Central Bank. In July 2021, the European Central Bank published a road map on integrating climate change into its monetary policy (table 5) (European Central Bank, 2021), which includes a collateral plan to consider climate risks when reviewing the valuation and risk control for assets mobilized as counterparties' collateral for the Eurosystem credit operations.⁵ It also intends to introduce green disclosure requirements for private assets as new eligibility criterion or as a basis for differential treatments for collateral. Meanwhile, the European Central Bank announced in September 2020 that it would accept sustainability-linked bonds as collateral for Eurosystem credit

⁵ Amendments to collateral framework account for three out of the nine measures outlined by the European Central Bank detailed road map of climate change-related actions.

operations (European Central Bank, 2020). These instruments may also be eligible for asset purchases programmes. Such bonds have coupons linked to sustainability performance targets with reference to the European Union Taxonomy Regulation or the Sustainable Development Goals relating to climate change and environmental degradation.

Table 5. The European Central Bank road map to incorporate sustainability elements into collateral framework

Climate-related Measures	2021	2022	2023	2024
Disclosures in line with European Union policies as an eligibility requirement in collateral framework and asset purchases	-	Design policies and conduct legal and operational preparations	Adaptation period for issuers	In force
Climate change risks in credit ratings for collateral and asset purchases	- Assess rating agencies' disclosures - Understand how rating agencies incorporate climate risk in ratings - Develop minimum standards for internal credit rating		- Introduce requirements into the Eurosystem Credit Assessment Framework targeted to climate change risk	
Climate change risks in the collateral framework	- Review collateral valuation and risk control framework to ensure incorporation of climate risks - Assess financial innovation related to environmental sustainability		- Monitor the adequacy of the collateral valuation and risk control framework to ensure that climate change risks are properly reflected	

Source: European Central Bank (2021).

Indirect monetary policy operations: market liquidity management facilities in China. The People's Bank of China announced in 2018 that plans to broaden the asset classes being accepted as collateral for the medium-term lending facility (MLF), which offers 3-, 6-, and 12-month lending facilities to financial institutions. In effect, this set forth a green refinancing policy, as the enhanced the medium-term lending facility allows commercial banks to use green loans and bonds as well as bonds issued to finance micro and small enterprises and agricultural corporations as collaterals

for borrowing from the Bank at discounted rates (Durrani, Volz and Rosmin, 2020). Moreover, to encourage financial institutions to increase support to green economy and small and medium-sized enterprises (SMEs), the Bank has also prioritized green and SME bonds over other financial bonds (People's Bank of China, 2018).⁶

Non-standard instruments: corporate asset purchase programmes in Sweden.

The Sveriges Riksbank implemented a norm-based negative screening for its corporate bond purchase programme in January 2021. This screening limits the corporate asset purchases of the Riksbank to only bonds issued by companies that comply with international standards and norms for sustainability (Andersson and Stenström, 2021). The exclusion is largely based on the assumption that climate risks are insufficiently incorporated into the existing asset purchase framework. In particular, measuring climate-related financial risks is challenging because of the unavailability of standardized methods and, financial information on climate risks faced by companies is either inadequate, incomplete or inconsistent. In cases in which the Riksbank already has exposure to bonds issued by companies that do not meet this norm, it might sell the bonds and refrain from making further purchases. Meanwhile, beyond corporate asset purchases, the Riksbank also applies negative screening to manage government funds based on certain core values, such as human rights, environment and anti-corruption.

Direct monetary policy instruments (1): green refinancing scheme in Bangladesh.

Over the past few years, Bangladesh Bank has offered several refinancing schemes for green projects. One example is the revolving relending facility, introduced in 2014, to promote environment friendly brick kilns by reducing carbon emissions and refining particulate pollution from brick kilns (Bangladesh Bank, 2020b). This \$50 million facility was fully disbursed and funded by excess liquidity of locally incorporated Islamic banks, thus promoting Islamic banks' contribution to green finance. Another initiative is the Green Transformation Fund, introduced in 2016. This long-term refinancing scheme initially aimed to make export-oriented textile, leather and jute sectors more sustainable (Bangladesh Bank, 2020a). In 2019, the scope of the fund was broadened to cover all export-oriented sectors, while the fund size also increased from \$200 million to 200 million euro (€) (\$225 million) in 2020. The fund covers projects that promote more efficient water use, sustainable waste management and efficient temperature management. Despite the low financing rate, however, the uptake rate was at a relatively low level of 21 per cent at end-2020. This

⁶ Macaire and Naef (2021) note that this policy measure has helped reduce the yields of green financial bonds by 46 basis points relative to non-green financial bonds, with a pass-through effect to the primary market and a reduction in spread at issuance by 53.8 basis points.

can be partly attributed to insufficient industry's technical knowledge/competencies related to it and strict fund requirements (Hossain, 2021).

Direct monetary policy instruments (2): green direct lending scheme in Japan.

The Bank of Japan announced in July 2021 that it would provide no-interest loans to commercial banks to support green lending activities (Fujikawa, 2021). Eligible instruments are green and sustainability-linked loans and bonds with performance targets related to climate change and transition finance (Bank of Japan, 2021a). The decision to lend to commercial banks, rather than directly to corporations, stems from market neutrality considerations that aim to avoid resource allocation at a micro level (Bank of Japan, 2021b). The target duration of the fund is one year in principle, with options for counterparties to unlimited rollovers subject to the amount outstanding. The scheme also allows financial institutions to reduce the amount of deposits with the Bank of Japan, which currently earn a negative interest rate, on the condition that they disclose specific information on their efforts to address climate change.

5.2. Prudential measures

Microprudential measures (1): framework guidance on climate-related financial risks in Australia. In April 2021, the Australian Prudential Regulation Authority released a draft guidance on assessing climate vulnerability for banks, insurers and superannuation trustees (Australian Prudential Regulation Authority, 2021). The draft lays out the Authority's expectations for the regulatory standards encompassing risk identification and monitoring, scenario analysis, risk management, reporting and disclosure. These standards are flexible and designed to allow each regulated entity to adopt an approach that fits its size, customer base, business strategy and complexity of operations. In cases in which financial institutions lack the data or expertise to conduct quantitative stress testing, they may consider narrative-driven scenarios that provide insights into their operations and channels of risk transmission. Meanwhile, the regulated entities are encouraged to work with customers, counterparties and organizations to improve their risk profile. When such stakeholder engagement is, however, deemed insufficient in addressing climate risks, the regulated entities should consider mitigation options, such as adopting risk-based pricing measures and applying limits on their exposure to such an entity or sector.

Microprudential measures (2): climate-risk assessment taxonomy for financial institutions in Malaysia. Bank Negara Malaysia issued, in April 2021, the Climate Change and Principle-Based Taxonomy as a guiding document for financial institutions to assess climate risks. The taxonomy specifically aims to (a) provide an overview of the economic impact of climate change; (b) introduce a taxonomy for financial institutions to assess and categorize activities, based on the extent that

these activities meet climate objectives and promote the low-carbon transition; and (c) facilitate standardized classification and reporting of climate-related exposures in order to support risk assessments, enhance transparency and encourage financial flows towards climate objectives (Bank Negara Malaysia, 2021). The taxonomy also provides an outline of a relevant national environmental policy agenda to assist financial institutions in aligning their actions with the government's transition pathway. To support an orderly transition, the taxonomy introduces a progressive system of transition categories, which classifies economic activities as climate supporting, in transition or on a watchlist. The classification is based on assessments on climate change adaptation and mitigation measures and remedial efforts to promote the low-carbon transition.

Macroprudential measures (1): relaxing macroprudential limits for green financing in Indonesia. In late 2019, Bank Indonesia allowed the cap on the loan-to-value ratio for green property loans to increase by 5 per cent and reduced the minimum down payment required to purchase electric vehicles by 5 to 10 per cent, depending on vehicle types. From October 2020, this minimum down payment was further reduced to zero per cent. To maintain financial stability, financial institutions are eligible to participate in the scheme if their non-performing loan ratios for total loans and automotive loans are below 5 per cent. These policy amendments were made to support green development and mitigate potential disruptions to financial stability resulting from environmental degradation (Bank Indonesia, 2021). More broadly, these policy adjustments are aligned with the national agenda for Indonesia to become a major producer of electric vehicles and complement favourable tax rates on locally manufactured electric vehicles.

Macroprudential measures (2): climate pilot exercise in France. In May 2021, the Autorité de Contrôle Prudentiel et de Résolution published the inaugural system-wide report that assesses the exposure and contemplated response to the transition and physical risks of climate change. The assessment covers a long 30-year time horizon, multiple scenario analyses with a breakdown by economic sector and an innovative hypothesis (Autorité de Contrôle Prudentiel et de Résolution, 2021). The assessment also identifies the most detrimental climate risk and/or transition sensitive factors, which go beyond carbon emissions and accounting for the negative demand shocks of carbon tax implementation. In addition to the objective of assessing the exposure and response to climate risks, this pilot exercise was designed to raise understanding among banks and insurance companies on the transmission channels of climate risks (Beau, 2021). A critical element of the assessment is the implementation of an innovative dynamic balance sheet assumption from 2025 to 2050, which complements standard static balance sheet assumptions applied for

the first five years of the exercise.⁷ Overall, this innovative approach helps inform participating institutions on how to mobilize a cross-disciplinary team to integrate a climate risk assessment and demonstrates the limits of the current models related to climate change.

5.3. Other policy tools

Targeted financing scheme (1): priority sector lending in India. The financing policy of the Reserve Bank of India is anchored around the priority sector lending guideline, which aims to harmonize various directives issued to financial institutions, ensure alignment with emerging national priorities and bring sharper focus on inclusive development (Reserve Bank of India, 2021a). According to this guideline, financial institutions should allocate 40 per cent of their lending to areas deemed socially important, such as agriculture and SMEs. In 2015, the Bank amended the priority sector lending guideline to include social infrastructure and small renewable energy projects in order to support green financing (Durrani, Volz and Rosmin, 2020). In the renewable energy segment, loans for solar- and biomass-based power generators, windmills and micro-hydel plants are considered within the priority sector lending requirements. Under this scheme, firms engaged in renewable energy sector are eligible for loans of up to 300 million Indian rupee (Rs) (\$4 million), which has been raised from 150 million rupee since September 2020 (Reserve Bank of India, 2021b). Households are also eligible for loans up to one million rupee for investing in renewables. As a result of these measures, the total outstanding bank credit to the unconventional energy sector was 7.9 per cent of outstanding bank credit to power generation as of March 2020, up from 5.4 per cent in March 2015 (Reserve Bank of India, 2021b).

Targeted financing scheme (2): moral suasion to promote green credits and capacity-building in Viet Nam. In 2015, the State Bank of Vietnam issued a directive requiring financial institutions to ensure sustainable development while providing loans and to review, adjust and complete their operation frameworks that are aligned with green growth (State Bank of Viet Nam, 2015). In late 2016, it explicitly required that all financing activities carried out by the regulated entities conform to environmental regulations (State Bank of Viet Nam, 2016). Moreover, following the 2017 launch of the Green Project Catalogue, under which the classification of green activities in Viet Nam is standardized, the Bank introduced the green banking development scheme in

⁷ Unlike the static capital structure approach, the dynamic balance sheet assumption considers how corporations can react to the materialization of climate-related risks. This approach also considers possible changes in corporate strategies and their impact on capital structure when complying with commitments to address climate change.

2018 (State Bank of Viet Nam, 2018). This scheme is intended to gradually increase lending to priority green projects; accelerate the application of green technologies and practices among the banks' clients, such as electronic financial transactions; and ensure that by 2025 all banks have internal frameworks to manage environmental and social risks for their lending activities.⁸ On its part, the Bank set out incentives and preferential mechanisms to support green lending activities and promote capacity-building on green banking. Partly driven by these policy changes, the balance of green loans in Viet Nam reached \$3.8 billion by mid-2019, up by 32 per cent from 2018 (Huong, 2021).

Management of central bank's portfolio (1): responsible portfolio investment in Hong Kong, China. In May 2019, the Hong Kong Monetary Authority introduced several key measures on sustainable banking and finance, including the establishment of a centre for green finance. One important measure was to adopt responsible investment principles for its Exchange Fund under which priority is given to ESG investment if the long-term return is comparable to other investments on a risk-adjusted basis (Hong Kong Monetary Authority, 2019). To support this, the Authority incorporated ESG factors into its credit risk analysis, required external managers to comply with the principles of responsible ownership promulgated by the Hong Kong Securities and Futures Commission, and planned to expand its green bond portfolio and participate in ESG-themed public equities investments. For private market investments, the Authority has invested in renewables since 2013 and included green accreditation as a predominant factor for real estate investments (Hong Kong Monetary Authority, 2021).

Management of central bank's portfolio (2): increasing central bank's investments into ESG assets in the Republic of Korea. As part of an effort to conduct sustainability-oriented central banking practices, the Bank of Korea has gradually expanded its investments in ESG assets. At end-2020, investment in ESG equities and fixed-income securities, including through the external fund management programme, was at \$5.46 billion or approximately 1.2 per cent of the foreign exchange reserve value (table 6). The Bank of Korea aims to increase its ESG investment further to strengthen the public accountability of official reserve management and enhance the overall investment performance (Bank of Korea, 2021).

⁸ The State Bank of Viet Nam has also set a target of at least 10 banks to establish specialized units for managing social and environmental risks, and at least 60 per cent of all banks to have access to green capital resources and provide green credits.

Table 6. Investment in environmental, social and governance (ESG) assets by the Bank of Korea

Fund managers	Financial instruments	Market value (\$ billion)	Share of foreign exchange reserves (per cent)
Internal	Bonds	3.49	0.8
External	Bonds	0.89	0.2
	Equities	1.08	0.2
Total		5.46	1.2

Source: Bank of Korea (2021).

Supporting sustainable finance (1): supporting sustainable financial market development in Singapore. One of the goals of the Monetary Authority of Singapore is to support the financial sector in mitigating climate risks and promoting green projects to foster a diverse ecosystem of green financing capabilities and promote green development in Asia and the Pacific. To this end, the Authority set up the \$2 billion Green Investment Programme in 2019 to invest in sustainability-oriented public market investment strategies (Monetary Authority of Singapore, 2019). The first investment under the Programme is a \$100 million placement with the BIS Green Bond Investment Pool. As of June 2021, \$1.8 billion has been allocated to five asset managers who are tasked with establishing their sustainability hubs in Singapore and launching new ESG-thematic funds for the Asia-Pacific region (Menon, 2021). The Authority also expects these managers to exercise their shareholder rights to influence their investee companies to address climate risks and move towards more sustainable practices.

Supporting sustainable finance (2): coordinating financial sector initiatives in Thailand. In August 2021, the Working Group on Sustainable Finance, consisting of the Bank of Thailand, the Fiscal Policy Office, the Securities and Exchange Commission, the Office of Insurance Commission and the Stock Exchange of Thailand, jointly published an initiative on sustainable finance that sets the direction and framework for sustainable finance for the financial sector (Working Group on Sustainable Finance, 2021). The initiative has five key strategic objectives: (a) developing a practical economy, which serves as a common definition and classification system of economic activities; (b) improving data environment and quality for disclosure and transparency; (c) implementing effective incentives for fundraisers and investors; (d) creating demand-led sustainable financial products and services; and (e) building human capital to accelerate the sustainability transformation of the financial sector. On its part, the Bank of Thailand has incorporated sustainability into its strategic plan and organizational culture (Bank of Thailand, 2019a). Moreover, it is working with the

International Finance Corporation to develop a sustainability road map and tools that help strengthen ESG risk management practices among financial sector participants (Bank of Thailand, 2019b). This partnership will also facilitate knowledge-sharing with other central banks and financial supervisory authorities in the Association of Southeast Asian Nations (ASEAN) and Sustainable Banking Network members.

VI. GOING FORWARD: SELECTED POLICY AND IMPLEMENTATION ISSUES

While section V shows that several Asia-Pacific central banks and financial supervisory authorities have pioneered green policy initiatives, the conduct of green monetary and financial policies in the region remains in its infancy stage. The discussion in this section is on fundamental policy actions that Asia-Pacific central bank and financial supervisory authorities could take at this initial stage (section 6.1) and highlights several policy and operational issues that central banks and financial supervisory authorities should be mindful of as they further pursue green finance policies (section 6.2).

6.1. Desirable policy actions at the initial stage

Clear guiding principles and effective communications are critical for central bank and financial supervisory authorities to establish the legitimacy of their green actions. As these institutions pursue green development journey, they may face legal and operational challenges when considering existing mandates (Groepe, 2016). In addition to having in place clear guiding operating principles and solid climate risk assessments, an effective communication strategy with relevant stakeholders (such as government agencies, business sectors and the public at large) is important (Volz, 2017). A carefully planned communication strategy can shield central banks and financial supervisory authorities to some extent, from credibility risks that may arise from trying to pursue too many objectives with limited instruments. Such stakeholder consultations also promote transparency, which helps refrain these institutions' temptations to deviate from their primary policy commitments (Robinson, 2020). Moreover, effective communications also increase the predictability of actions taken by central banks and financial supervisory authorities, which, in turn, enhances the pass-through from their policy announcements to market expectations and reduce the magnitude of policy interventions required to achieve desired outcome.

Building technical capacity in integrating climate issues into policy conduct can be achieved through different mechanisms. First, internally, central banks and financial supervisory authorities could provide technical training to improve understanding of

best practices. Some examples are practices in designing disclosure requirements and using a common taxonomy to assess economic activities and financial instruments. Second, participation in multilateral initiatives and dialogues on green finance can be increased. As shown in section 3.2, the participation of Asia-Pacific central banks and financial supervisory authorities in these global forums remain generally limited and concentrated among richer economies of the region. Active engagement with these platforms and regular regional dialogues on climate trends, recent green initiatives and policy lessons would help in developing fresh policy ideas. Third, Asia-Pacific central banks and financial supervisory authorities can work bilaterally with their advanced counterparts. For example, the climate pilot exercise of the *Autorité de Contrôle Prudentiel et de Résolution* may be used as a benchmark to implement similar assessment in other countries.

Individual central bank and financial supervisory authorities should seek to achieve a practical and tailored approach in promoting green development. At a basic level, available guidelines on sustainable monetary and financial policies should help increase understanding on how to integrate climate risks into their operations. These institutions, however, are subject to diverse operational and governing principles, such as those relating to market neutrality, efficiency and risks. Technical capacity to carry out climate modelling also varies notably. At a broader level, there is great diversity in the direction of national environmental policies and the availability of national climate-related data. In this regard, each central bank and financial supervisory authority should (a) diligently consider both existing and potential policy tools in their specific context; (b) ensure consistency among national green fiscal, monetary and financial policies; and (c) carefully assess policy space to integrate climate initiatives.

Asia-Pacific central banks and financial supervisory authorities can collaborate further to create regional initiatives on green finance and central banking. A good example in this regard is the Green Bond Standards, which benefits from cooperation among these institutions in ASEAN member countries. This initiative aims to ensure cross-boundary consistency on certain areas of standards, such as eligibility of issuers and projects, use of proceeds, evaluation process, disclosure, and reporting frequency (ASEAN, 2018).⁹ Such comparability across green bond issuers helps attract global investors to increase green investment in the region.

⁹ ASEAN also established common standards for sustainability and social bonds, which are based on principles set out by the International Capital Markets Association.

6.2. Policy and operational issues as central banks and financial supervisory authorities move forward

Central banks and financial supervisory authorities should carefully consider the risk of overstressing their current mandates, particularly when certain objectives entail trade-offs (Volz, 2017). The extent to which each of these institutions can deploy tools to support green development and penalize environmentally harmful activities depends primarily on its existing mandates and willingness to act (Campiglio and others, 2018). Nonetheless, changes to the authorities' mandates are not uncommon, and their objectives have evolved over time. While initially some central banks were established to provide financing to support sovereigns during military conflicts,¹⁰ their responsibilities have evolved into more specific objectives of supporting payment systems and ensuring price and exchange rate stability and/or full employment. In countries in which government policies are clearly geared towards green development, the role of central banks and financial supervisory authorities can be enhanced by amending their legislative remits. This would equip them with new tools, such as green lending facilities or asset purchase programmes. For example, the mandate of the Bank of England was revised in March 2021 to reflect the government's strategy to achieve economic growth that is "environmentally sustainable and consistent with the transition to a net zero economy" (Sunak, 2021). Based on this revision, the Bank of England can avoid legal liabilities from pursuing green monetary policy objectives.

Central banks and financial supervisory authorities should not interfere with market neutrality. For example, they should only consider potential solutions for factoring climate risks without prejudice to the different interpretations of an institution's mandate (Oustry and others, 2020). Their principles should make a clear distinction between what they are required to do and what they could do. These principles could also consider the limits of the authorities' responsibility to address future development challenges, including climate change, in the context of their legislation (Elderson, 2021). In this regard, central banks and financial supervisory authorities should respect and implement legitimate decisions, as monetary policy effectiveness is bolstered when they abstain from making normative judgements on market morality (Mersch, 2018). For example, as deviations from market neutrality can expose these institutions to litigations, the European Central Bank clearly defined that it must act "in accordance with the principle of an open market economy with free competition, favouring an efficient allocation of resources".

¹⁰ The first central bank was established in Sweden in 1668 and was involved in financing a war against Denmark (Groepe, 2016). In this context, Sheng (2015) argues that if central banks and financial supervisory authorities were originally created to solve large-scale social needs, such as wars, then the most predominant task today is tackling climate change.

Central banks should be mindful of the possible impacts of their climate policies on the effectiveness of monetary policy. Such impacts can be in terms of lending and purchasing capacity by central banks, market distortion and institutional credibility. Among the several climate policy options that central banks can consider, Network for Greening the Financial System (2021a) notes that making access to lending facilities conditional on a counterparty's disclosure of climate information or on its green investment can have a "strongly negative" impact on monetary policy effectiveness. Other policy options that could reduce monetary policy effectiveness are charging a lower interest rate to counterparties that pledge a higher proportion of low-carbon assets as collateral and excluding some assets or issuers from asset purchases that fail to meet certain climate criteria. However, any assessment at this early stage remains tentative while central banking practices in the context of developing countries can be further taken into account (Couppey-Soubeyran and Kalinowski, 2021).

Central banks and financial supervisory authorities should not support "greenwashing". Amid growing demand for environmentally friendly products, many business entities market their products as green even though they fail to meet the required environmental standards. As a result, these institutions could be misled into investing in such assets, resulting in increased liability risks and weaker credibility. To mitigate greenwashing-related implications, various policy actions can be taken. Among them are establishing a transparent green taxonomy, ensuring timely and transparent disclosure by market participants and introducing punitive supervisory actions. The monitoring process conducted by central banks and financial supervisory authorities should also consider evolving market conditions and uncertainties, such as more complex financial instruments and more fragmented trading avenues. To address greenwashing, the Central Bank of Ireland is considering a regulatory change that would strengthen its ability to identify financial instruments that are truly eco-friendly (Central Bank of Ireland, 2021). This includes closely scrutinizing applications for issuing green funds and securities in cases in which prospectus approval is required. Meanwhile, the BIS Innovation Hub is developing tokenized green bonds that integrate real-time tracking and disclosure of green outputs to improve transparency (Carstens, 2021). Also of note, the voluntary European Green Bond Standard sets out high-quality ("gold") standards for eligible private and sovereign issuers (European Commission, 2021).

Central banks and financial supervisory authorities should avoid financial repression and/or crowding out private market participants from financing green projects (Schnabel, 2020). Financial repression may arise when green lending programmes offer heavily subsidized interest rates and crowding out can occur when a large part of a central bank's asset purchases or portfolio investment focus on green bonds and assets. By excessively suppressing rate of returns, central banks and financial supervisory

authorities could disincentivize commercial banks and other investors from financing green activities, and ultimately discourage engaging in green activities that do not meet their funding requirements. Similarly, corporations may be deterred from engaging with green activities unless they are able to obtain financing from central banks and financial supervisory authorities that tend to only consider specific instruments with minimum threshold requirements given liquidity consideration. More broadly, when public entities including central banks and financial supervisory authorities dominate a country's green assets, private investors may view these assets as unattractive due to lack of market-making activities and price discovery. To avoid financial repression and crowding out, central banks and financial supervisory authorities could take several policy actions, such as limiting the scale of subsidized lending programmes for green assets, placing a cap on holdings for each bonds' issue size and carrying out asset purchase programmes that consider market liquidity.

Excess policy interventions by central banks and financial supervisory authorities could also lead to a green asset bubble. This is especially the case for small, illiquid green financial markets with limited number of market participants. As more capital is channelled to green financing, artificially low interest rates could result in overvalued green assets and give rise to unsustainable rates of returns for green activities. Moreover, cheap financing could result in unreasonable expectations for equity gains, which are exposed to exuberant market speculations and severe revaluation following a sudden shock to the financing system. Meanwhile, reduced capital requirements and relaxation of other macroprudential measures for financing green activities may exacerbate risk-taking behaviour and compromise financial market stability. As such, central banks and financial supervisory authorities must be cognizant of the potential implications of their green actions. They should also ensure that capital is mobilized to green activities that translate directly to net-zero emissions initiatives. Failure to address these concerns could jeopardize the main objective of these authorities in promoting price and financial stability.¹¹

¹¹ For example, analysts pointed out that the collapse of the housing sector in the United States of America in 2008 was partly driven by financial sector deregulation and unregulated instruments. This includes regulatory changes in the 1990s that weakened mortgage standards and capital market interventions led by public enterprises (Hanke and Lepre, 2021).

VII. CONCLUDING REMARKS

The objective of this paper is to explain how central banks and financial supervisory authorities can foster green development in Asia and the Pacific. Overall, it is noted that while fiscal policy has received much attention, these institutions can certainly play a complementary role in accelerating the transition towards low-carbon, climate-resilient economies. Indeed, inadequate green actions by central banks and financial supervisory authorities can compromise their mandate on maintaining economic, price and financial stability because climate change poses an emerging risk to the financial system.

While the Asia-Pacific region remains at the early stage of sustainable monetary and financial policies, several central banks and financial supervisory authorities have introduced green initiatives. These include (a) monetary policy tools, such as varying reserve requirements and risk weights based on carbon footprint, and subsidized lending rates for green sectors; (b) prudential measures, such as green taxonomy of economic activities and sustainability-oriented disclosure requirements, and supervisory review; and (c) other tools, such as targeted financing schemes for green sectors, introducing ESG considerations for central bank's portfolio management, and broader initiatives to support sustainable finance. In essence, these initiatives can be viewed as complementary to government policies, enablers for climate action, prudential risk management and coordination platforms for sustainable financing.

In the Asia-Pacific region, central banks and financial supervisory authorities that begin to integrate climate issues into their policy conduct can consider various policy actions. At a broad level, clear guiding principles and effective communications can help establish the legitimacy of their green actions. These institutions should also examine available frameworks and toolkits on how to integrate climate issues, as the nature of climate risks is different from other risks that they are familiar with. At the same time, staff training and active participation in global initiatives on sustainable finance could enhance technical capacity, which, in turn, would boost their ability to customize their approach in promoting green development. As central banks and financial supervisory authorities move forward in implementing green initiatives, they should avoid interfering with market neutrality, supporting greenwashing, crowding out private investments in green activities and contributing to a green asset bubble.

Overall, pursuing sustainable monetary and financial policies requires a delicate balance. Currently, several Asia-Pacific central banks and financial supervisory authorities lack mandates that refer to sustainable development, but they have implemented green policy tools. The basis of their actions may be based on strategic focus areas or policy priorities, which tend to be reviewed every few years and

inevitably evolve more rapidly than the official mandates. In countries where central banks and financial supervisory authorities legislation and/or its interpretation is limitative, these institutions should not exploit available policy tools at their disposal, as this could jeopardize their reputation as an autonomous body. Even in countries where the legislation appears more flexible, they should keep in mind their primary objectives and competing priorities. Addressing climate issues should not compromise the operational ability these institutions to achieve existing monetary policy targets.

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