

# **Report on The Roles of ASEAN Central Banks in Managing Climate and Environment-related Risks**

*The Report is a collaborative effort among the ASEAN central banks and monetary authorities, namely Autoriti Monetari Brunei Darussalam (AMBD), National Bank of Cambodia (NBC), Bank Indonesia (BI), Bank of the Lao PDR (BOL), Bank Negara Malaysia (BNM), Monetary Authority of Singapore (MAS), Bank of Thailand (BOT), Bangko Sentral ng Pilipinas (BSP) and State Bank of Vietnam (SBV).*



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## List of Acronyms and Abbreviations

Abbreviations/ Acronyms	Description
ABC	Association of Banks in Cambodia
ACDM	ASEAN Central Bank Deputies' Meeting
ACGM	ASEAN Central Bank Governors' Meeting
ACMF	ASEAN Capital Markets Forum
ADRFI	ASEAN Disaster Risk Financing and Insurance
AEC	ASEAN Economic Community
AIB	Association of International Banks
AMBD	Autoriti Monetari Brunei Darussalam
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
ASCC	ASEAN Socio-Cultural Community
ASEAN	Association of Southeast Asian Nations
ASPEN	ASEAN Strategic Plan on Environment
ACBs	ASEAN central banks and monetary authorities
AMS	ASEAN Member States
AUM	Asset Under Management
BI	Bank Indonesia
BIS	Bank for International Settlements
BNM	Bank Negara Malaysia
BOE	Bank of England
BOJ	Bank of Japan
BOL	Bank of the Lao P.D.R.
BOT	Bank of Thailand
BSP	Bangko Sentral ng Pilipinas
CBM	Central Bank of Myanmar
CBRC	China Banking Regulatory Commission
CG	Corporate Governance
COP	Community of Practitioners
CSFI	Cambodian Sustainable Finance Initiative
DNB	De Nederlandsche Bank
E&S	Environmental and Social
ESG	Environment, Social and Governance
ESRM	Environmental and Social Risk Management
EU	European Union
GBI	Green Building Index

Abbreviations/ Acronyms	Description
GBP	Green Bond Principles
GHG	Greenhouse Gas
GIFF	Global Islamic Finance Forum
GRI	Global Reporting Initiative
ICMA	International Capital Markets Association
IFC	International Finance Corporation
IFIs	Islamic financial institutions
IPCC	Intergovernmental Panel on Climate Change
LTV	loan-to-value
MAS	Monetary Authority of Singapore
MTM	Monetary Transmission Mechanism
NBC	National Bank of Cambodia
NGFS	Network for Greening the Financial System
NGOs	Non-Government Organizations
OJK	Otoritas Jasa Keuangan
PBOC	People's Bank of China
RBI	Reserve Bank of India
RCP	Representative Concentration Pathways
ROI	Returns on Investment
SBN	Sustainable Banking Network
SBV	State Bank of Vietnam
SCCB	Steering Committee on Capacity Building
SDGs	Sustainable Development Goals
SIF	Sustainable Insurance Forum
SLC	Senior Level Committee
SRI	Sustainable and Responsible Investing
SRR	Statutory Reserve Requirement
TBA	The Thai Bankers Association
TCFD	Taskforce on Climate-related Financial Disclosures
TFP	Total Factor Productivity
The Equator Principles	Green credit loan criteria proposed by the World Bank's International Financial Cooperation (IFC) and the Bank of Holland
The Fed	The US Federal Reserve
The Report	Report on roles of ASEAN central banks in managing climate and environmental-related risks
The Task Force	Task Force on the Roles of Central Banks in Managing Climate and Environment-related Risks

Abbreviations/ Acronyms	Description
UNFCCC	United Nations Framework Convention on Climate Change
UN	United Nations
UNEP-FI	United Nations' Environment Programme Finance Initiative Principles for Responsible Banking
US	United States
VBI	Value Based Intermediation
VBIAF	VBI Financing and Investment Impact Assessment Framework
VGGS	Vietnam Green Growth Strategy
WWF	The World Wide Fund for Nature

# Foreword by the Co-chairs of the Task Force on the Roles of ASEAN Central Banks in Managing Climate and Environment-related Risks (the Task Force)

Global warming and recurring extreme weather events have in recent years served as important reminders on the urgency for all levels of society globally, to stand in solidarity to mitigate climate change.

As an area of common concern, governors of the Association of Southeast Asian Nations (ASEAN) central banks and monetary authorities (hereinafter referred to as ACBs) unanimously concurred that the region should come together to better understand what climate and environment-related risks mean for the region and translate this understanding into actions that can be taken up individually and collectively. Central banks should be in a state of readiness to manage the risks stemming from climate change and environment-related events more proactively to ensure ASEAN continues to grow and prosper in a sustainable manner, into the far future and for the generations to come.

This Report assesses the implications of climate and environment-related risks on both financial and monetary stability, the roles and limits of central banks and puts forward a set of non-binding recommendations that can be considered by fellow central banks. The Report is mindful of the ASEAN context, perspectives and state of readiness.

This Report is a testimony of ASEAN solidarity and only the beginning of our journey to manage climate and environment-related risks collaboratively as a region. There is a lot to learn to deepen our understanding and concrete actions to be taken. In addition, as the current health pandemic changes the world order in unprecedented ways, it also serves as a good inflection point on the vulnerabilities of our societies and presents us with opportunities to rethink economic growth that is sustainable, including from the aspects of climate resilience. Nevertheless, it is our hope that this Report will steer more thoughts and discussions among ACBs on the way forward.

We are very appreciative of the tireless efforts and exemplary commitment demonstrated by the Task Force members and all authors involved in the research, discussions and production of this Report<sup>1</sup>. The Task Force members and relevant officials met three times in Kuala Lumpur between August 2019 and February 2020 and had countless virtual engagements. We must say, it has been an enriching, enjoyable and meaningful learning journey for all of us. To all members of the Task Force – Thank You!

Raja Syamsul Anwar

Madelena Mohamed

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<sup>1</sup> The Report acknowledges the constructive feedback and comments received from Professor Dr. Tom Kompas of the University of Melbourne, Dr. Ulrich Volz of the School of Oriental and African Studies (SOAS) University of London, Dr. Kamiar Mohaddes of the University of Cambridge and and Dr. Simon Dikau of the London School of Economics.



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## Executive Summary

Global warming has accelerated since 1960 and is likely to intensify. While the relationship between climate change and weather events is still a frontier in science, the increase in global temperatures have been associated with increased frequency and severity of weather events globally. Climate change, if unmitigated, may worsen, with global temperatures projected to rise as high as 1.5 degrees Celsius between 2030 and 2052<sup>2</sup> (IPCC, 2018).

Climate change and the associated challenges, such as extreme weathers and possible disruptive environment policies have far-reaching implications for the macroeconomy and the financial system. The impact permeates all levels of society, from households to businesses and to policy makers, including central banks and governments. The prevailing COVID-19 health crisis is likely to be a fraction of the possible magnitude, reach and indiscriminate impact on society and activity of the climate crisis.

This Report focuses on climate and environment-related risks from the perspective of central banks, specifically the ACBs. The Report aims to better understand implications of these risks on the ASEAN financial sector and overall economy. Such understanding is crucial for ACBs to formulate the way forward, individually and collectively, to continue safeguarding financial and monetary stability, while supporting the transition to a low carbon region. This Report places emphasis on the ASEAN context and perspectives, as well as the economic and financial sector development needs. It complements ASEAN's existing efforts to manage climate change and the related risks in the capital market and insurance sectors<sup>3</sup>.

### *ASEAN and climate change*

**ASEAN faces increase in temperatures and rising greenhouse gas (GHG) emissions.** Since the 1960s, ASEAN experienced a cumulative temperature increase of between 0.3 – 1.1 degrees Celsius<sup>4</sup>. Its geographical and demographic factors, as well as dependence on the agricultural sector, natural resources and forestry for growth, make ASEAN extremely vulnerable to climate change and extreme weather events. ASEAN is a climate change hot spot, situated in the Asia Pacific region, which had experienced 217 storms and cyclones, and 236 cases of severe flooding between 2014 and 2017, according to the United Nations (UN) data. The economic and human losses were significant.

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<sup>2</sup> This is beyond the commitment stipulated under the Paris Agreement in 2015 to limit global warming to 1.5 degrees Celsius above pre-industrial levels.

<sup>3</sup> Other similar sustainable finance initiatives that are complementary under the ASEAN Finance Cooperation include the Roadmap on ASEAN Sustainable Capital Markets developed by the ASEAN Capital Markets Forum (ACMF) and Report on Promoting Sustainable Finance in ASEAN by the ASEAN Working Committee on Capital Market Development (WC-CMD)

<sup>4</sup> Author's analysis based on data from Kahn, Mohaddes, Ng, Pesaran, Raissi and Yang (2019).

**The economic impact to ASEAN can be profound.** If climate change continues unmitigated, ASEAN countries face possible GDP per capita losses between 0.7 – 8.5 per cent by 2100<sup>5</sup>. The costs could be higher with international spillover effects.

#### *Climate and environment-related risks disrupt financial and monetary stability*

**The negative implications for macroeconomic and financial stability manifest through physical risks, transition risks and liability risks<sup>6</sup>.** Physical risks arise from the direct impact of weather events such as floods to properties, infrastructure and agriculture crops. Transition risks are risks arising from the adjustments to a low carbon economy because of climate change policies, technological breakthroughs and changing consumer preferences. Liability risks refer to compensation claims and litigation by the public or businesses on financial institutions corporations or their directors, leading to financial costs.

**Climate and environment-related risks affect financial stability through financial system balance sheets and financial performance.** Shocks to household income and business profitability impact financial institutions and the financial system through rising loan delinquencies and impairment in investment assets. This may have adverse consequences on banks' profitability and quality of assets which in turn constrain their ability to raise funding given the dampened asset values and return prospects. Rising credit risk may also result in tightening credit conditions as financial institutions protect their balance sheets. Access to liquidity from the money market may also be constrained as some banks may be perceived to have higher counterparty risks. Central banks may need to step in by providing liquidity to preserve stability and through measures to support financial sector and non-financial balance sheets. On the part of Governments, the extra spending for emergency assistance and rebuilding infrastructure following climate change or environment-related disaster can strain their balance sheets and reduce fiscal policy space. Transition risks also affect financial sector and central bank balance sheets in similar manner given the diminishing asset values as well as exposure to stranded assets.

**The impact of climate and environment-related risks to monetary stability and its monetary policy implications is a subject of on-going research.** Weather events and climate policies affect monetary stability through supply and demand shocks, both negative and positive (Batten, 2018). Extreme weather events generally reduce economic growth in the short-run (Batten, 2018; Batten, Sowerbutts and Tanaka, 2019; and Cavallo and Noy, 2009). The costs of such events can significantly impact communities, business operations and the economic environment causing loss of livelihood, lower productivity and financial losses. While subsequent investment and consumption to rebuild

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<sup>5</sup> Author's analysis based on data from Kahn *et al.* (2019).

<sup>6</sup> See Carney (2015) and NGFS (2019).

infrastructure and restore productive capacity are positive on economic activity, the uncertain timing creates considerable uncertainty for consumption and investment decisions, as well as for the path of monetary policy. The medium and long-term impact is less clear (Batten, 2018 and Batten *et al.*, 2019; and Cavallo and Noy, 2009). Growth could improve through ‘creative destruction’, return to trend or do not recover to levels prior to the shock<sup>7</sup>. Global warming also affects economic performance through effects on total factor productivity (TFP). Not taking these effects into account could lead central banks to misjudge the output gap and inflationary pressure (Batten, Sowerbutts and Tanaka, 2016 and Batten *et al.*, 2019). In terms of transition risks, climate policies to price carbon may have a temporary effect on inflation, but likely to lead to permanently higher price for carbon-intensive goods, and lower output level in the medium and long-term (McKibbin, Morris, Panton and Wilcoxon, 2017). Climate change adaptation and mitigation divert resources away from current innovative sectors, leading to potentially lower growth rate of TFP. The net impact of climate policies depends on various factors, including how revenue and profits from carbon taxes are used (McKibbin *et al.*, 2017), the time horizon (Batten, 2018; and Batten *et al.*, 2019) and the strategy employed to move to a low carbon economy (Batten *et al.*, 2016).

*Central banks have started to factor in climate change, focusing on safeguarding financial stability*

**More central banks are managing climate risks, although varying in approaches, with more focusing on financial stability.** Central bank approaches and policy tools to manage risks arising from climate change have been to incorporate climate risks into core policy frameworks; and/or to mainstream green finance, which can be for risk management purposes as well as to achieve longer term goals such as economic development, growth and greening.

**ACBs have also started to take steps to address climate and environment-related risks, particularly to safeguard financial stability.** Six ACBs<sup>8</sup> are members of the Central Banks and Supervisors Network for Greening the Financial System (NGFS) and three are members of the Sustainable Banking Network<sup>9</sup> (SBN). A number of ACBs have issued directives and guidelines that require financial institutions to integrate environmental and social (E&S) risks into their risk management practices and lending activities.

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<sup>7</sup> This depends on how efficiently capital is reallocated.

<sup>8</sup> National Bank of Cambodia (NBC), Bank Indonesia (BI), Bank Negara Malaysia (BNM), Bangko Sentral ng Pilipinas (BSP), Monetary Authority of Singapore (MAS) and Bank of Thailand (BOT).

<sup>9</sup> Bank of Lao PDR (BOL), Bangko Sentral ng Pilipinas (BSP) and State Bank of Vietnam (SBV).

*Central bank's actions are broadly defined by mandates*

**No central bank, including ACBs, have specific written mandates to manage climate and environment-related risks.** These risks are addressed as part of central banks' integral roles to maintain price and financial stability. With broad mandates<sup>10</sup>, ACBs can generally pursue developmental initiatives including greening the financial system. In doing so, ACBs should be mindful of policy trade-offs and risks (e.g. the creation of market distortionary effects and disincentives, overburdening mandates and undermining independence and the principles of market-neutrality).

**ASEAN has its own context.** ACBs have a history of being pragmatic in balancing their stability mandates and broader developmental needs of the economy. There is precedent of ACBs pursuing broader objectives such as development of electronic payments and Islamic banking for greater financial inclusion. ACBs typically have strong institutional standing in the respective economies that enable them to be catalysts to shape national level policy outcomes. Nevertheless, central bank actions cannot substitute for structural policies. It must also be supported by clear communication and articulation to stakeholders to create the legitimacy of its involvement in mitigating climate change; and clarity on accountability vis-à-vis other ministries/agencies, among others.

**The roles of central banks in financial stability is clear.** The relationship between climate and environment-related risks and financial stability has been established. The NGFS, a coalition of 69 central banks and supervisors<sup>11</sup>, have acknowledged that “climate-related risks are a source of financial risk. It is therefore within the mandates of central banks and supervisors to ensure the financial system is resilient to these risks” (NGFS, 2018).

**The role of monetary policy is less straightforward.** Certainly, monetary policy can play a role to mitigate the impact of shocks to economic activity and inflation, which is well-within the remit of central bank mandates. There is less clarity on whether monetary policy has a more direct role to play, and on the implications on monetary policy frameworks, formulation and operations.

**Despite diverse monetary policy frameworks in ASEAN<sup>12</sup>, a broader climate mandate for monetary policy may not be necessary, effective nor credible<sup>13</sup>.** ACBs can address climate and

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<sup>10</sup> To support wider economic policy objectives.

<sup>11</sup> Members as of July 2020 .

<sup>12</sup> Three central banks (BI, BSP and BOT) are inflation targeting; four (AMBD, NBC, MAS and SBV) have exchange rate anchor; one (CBM) has a monetary aggregate framework and two (BNM and BOL) are classified as other monetary framework (IMF ARREAR, 2018).

<sup>13</sup> It should be highlighted that this assertion is in the context of existing conventional monetary policy frameworks, with monetary policy as a demand management tool that works through influencing final expenditure (investment and

environment-related risks with existing price stability and sustainable growth mandates. Being a blunt instrument, monetary policy cannot affect the efficiency or composition of energy usage. More targeted policies (such as credit guidance)<sup>14</sup> can be more efficient. While monetary policy can affect overall carbon emissions by influencing demand conditions, it is likely to be contractionary. It also precludes the use of monetary policy in a countercyclical manner as monetary easing generates economic activity and more carbon. Such policy may not be credible and is likely inconsistent with primary mandates.

**Some degree of monetary policy flexibility is desirable to respond to climate and environment-related risks.** Flexibility in turn requires credibility as ACBs may persistently deviate from announced targets or historical behavioural norms.

**ACBs need better understanding of monetary policy implications.** Climate and environment-related risks affect all variables commonly used for monetary policy decision-making in ways not fully understood by central banks. Greater understanding on how climate and environment-related risks affect key variables affecting monetary policy decisions and the monetary transmission mechanism may help to avoid policy missteps.

**There is scope for ACBs to consider incorporating climate objectives in central bank policy instruments.** The concept is not foreign to ASEAN<sup>15</sup>. While proposals such as green asset purchases or differentiated reserve requirements should be assessed based on their merits, it should be clear that it is not for the purpose of monetary policy.

*ASEAN central banks have some way to go*

**ACBs are generally at early stages of efforts to understand the impact of climate and environment-related risks on the economy and financial sector, as well as to explore appropriate approaches to advance the climate change agenda.** ACBs have room to catch up to central banks that are at the forefront in managing climate and environment-related risks (frontrunners). The good practices include alignment to national policies; issuance of regulatory measures and guidelines to set expectations, introduction of best practices, including disclosure and risk assessment practices; adoption of incentive schemes; good data collection and taxonomy; and lead by example.

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consumption). Use of monetary policy beyond what it is designed to achieve requires a major rethink and redesign of the framework and how it works.

<sup>14</sup> As highlighted by Monnin and Barkawi (2015), central banks globally have used various instruments to steer credit into certain parts of the economy. An example is the Bank of England's Funding for Lending Scheme.

<sup>15</sup> For example, there are parallels with Islamic monetary operations in Malaysia, whereby BNM sets the Overnight Policy Rate, and conduct conventional money market operations in the usual manner. In parallel, monetary operations are also conducted to manage liquidity conditions in the Islamic interbank market (though not to target a specific rate).

**ACBs face various gaps and challenges.** First, ACBs would require further information to guide incorporating climate and environmental considerations in the design and implementation of policies. Second, socio-economic considerations matter, as most ASEAN members are emerging economies reliant on fossil-fuelled power generation to meet energy and developmental needs. Transition to sustainable energy and climate-resilient infrastructure could potentially force the already-limited resources/funding away from other productive and growth-enhancing projects, possibly damaging near-term growth prospects<sup>16</sup>. Third, while all ASEAN Member States (AMS) have national strategies in place to tackle climate change, ACBs are less involved in the development of these strategies and thus face the challenge to translate broader national environmental and sustainability objectives into financial policy frameworks. Lower general public awareness in ASEAN on the need for climate action compared to developed economies also limits progress.

**Similar to ACBs, ASEAN financial institutions are generally at the early stages of adopting sustainability practices.** While majority of financial institutions are still acquiring the knowledge and building capacity, there are several ASEAN financial institutions that have taken the lead in integrating sustainability in all or many facets of their operations. Challenges in incorporating climate change considerations into practice include lack of a common taxonomy for classifying green activities, absence of ASEAN-specific standards or principles for originating green lending instruments, lack of technical expertise in assessing such risks, as well as unavailable, inaccessible or inconsistent data for analysing the impact of climate and environment-related risks and in structuring appropriate financial solutions for businesses and households.

**To address gaps, ACBs must take into account the social and economic structure, as well as level of development of each AMS.** These considerations suggest a differentiated approach for ACBs in promoting and facilitating the transition towards a low carbon and climate resilient economy. ACBs may need to chart their own path and exercise flexibility, in moving forward. For example, the development of taxonomy for ACBs need not follow the path of the frontrunners. A principle-based taxonomy provides greater flexibility to ACBs and financial institutions in adopting a progressive transition to a more sustainable economy given the developing nature of most ASEAN economies.

#### *ACBs' individual and collective actions are necessary*

**The Report recommends a set of non-binding recommendations, grouped into seven (7) strategic themes.** The themes reflect the balance between a unified ASEAN approach towards managing climate and environment-related risks; the transitional needs of each AMS; and the deepening of regional economic and financial integration agenda. These themes include (1) Capacity

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<sup>16</sup> We note however that research by the Global Commission on the Economy and Climate posits that bold climate action could generate more than 65 million new low-carbon jobs globally by 2030.

building and awareness; (2) Central bank leadership; (3) Regulatory and supervisory framework; (4) ASEAN Green Map; (5) ASEAN voice; (6) Surveillance and assessment framework; and (7) Communication strategy, as tabulated below.

### Summary of non-binding recommendations

Themes	Recommendations
<b>1. Capacity Building and Awareness</b>	<ul style="list-style-type: none"> <li>• Leverage the ASEAN Steering Committee on Capacity Building (SCCB), for the matching of demands and supplies of central bank training programmes and courses relating to climate change.</li> <li>• Collaborate and build partnerships with other central banks, multilateral or foreign development partners, climate scientists, or academia on increasing capacity and technical expertise in the industry.</li> <li>• Join international coalitions established with the objective of advancing sustainability in the financial sector.</li> <li>• Collaborate with key government agencies and non-governmental organisations.</li> <li>• Further understand how climate risks affect both cyclical and structural monetary policy variables.</li> <li>• Develop a network of ASEAN supervisors to exchange experiences in implementing the relevant recommendations by international bodies, such as the five recommendations of the NGFS Guide for Supervisors – Integrating climate-related and environmental risks into prudential supervision</li> </ul>
<b>2. Central Bank Leadership</b>	<ul style="list-style-type: none"> <li>• Embed sustainability principles including environmental, social and governance (ESG) standards into central bank operations and strategies.</li> <li>• Take the lead in working with other domestic government agencies to grow the supply of green or sustainable finance.</li> <li>• Consider providing incentives to financial institutions, where appropriate.</li> </ul>
<b>3. Regulatory and Supervisory Framework</b>	<ul style="list-style-type: none"> <li>• Study feasibility of adopting a principles-based ASEAN-wide taxonomy for green and transitional activities.</li> <li>• Develop ASEAN green lending principles or guidelines.</li> <li>• Facilitate information collection and monitoring of climate and environment-related risks by enhancing existing reporting requirements.</li> <li>• Integrate climate and environment-related risks in the supervisory assessment framework.</li> </ul>



Themes	Recommendations
<b>4. ASEAN Green Map</b>	<ul style="list-style-type: none"> <li>Consider the development of a roadmap or an “ASEAN Green Map” to ensure comprehensive development and unified efforts across banking and insurance, capital market and ancillary services (e.g. green certification, advisory services, etc.).</li> </ul>
<b>5. ASEAN Voice</b>	<ul style="list-style-type: none"> <li>Communicate ASEAN’s common interest and unique circumstances, where appropriate, at international platforms.</li> </ul>
<b>6. Surveillance and Assessment Framework</b>	<ul style="list-style-type: none"> <li>Study the possibility of developing a common data collection framework.</li> </ul>
<b>7. Communication Strategy</b>	<ul style="list-style-type: none"> <li>Develop a clear communication strategy to support and build central bank’s legitimacy and credibility, respectively, in the journey to manage climate change; to guide the financial industry; and to signal commitment towards greening the financial systems.</li> </ul>

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# Chapter 1: Background

## Key highlights:

- There is a strong and continuous commitment by ASEAN Leaders to combat climate change. The ASEAN Strategic Plan on Environment (ASPEN) 2016 – 2025 guides the cooperation on environment towards a sustainable development in the region.
  - ACBs recognise the urgent and pressing need to effectively manage the effects of climate change, given the wider ramifications on the financial sector and economy. Already, ACBs and financial regulators in the region have embarked on initiatives towards raising understanding in this area and advancing to formulate appropriate policy responses. This led the ASEAN Senior Level Committee (SLC) on Financial Integration to propose for a study to be undertaken on the roles of ACBs in advancing the sustainability agenda, focusing on climate and environment-related risks.
  - A Task Force was then established to explore the case for, and the limits of ACBs' involvement in the transition to low-carbon economy; profile current initiatives by the ACBs; and highlight potential non-binding recommendations to create and continuously support a sustainable ASEAN.
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## 1.1. The Climate and Environment Agenda in ASEAN

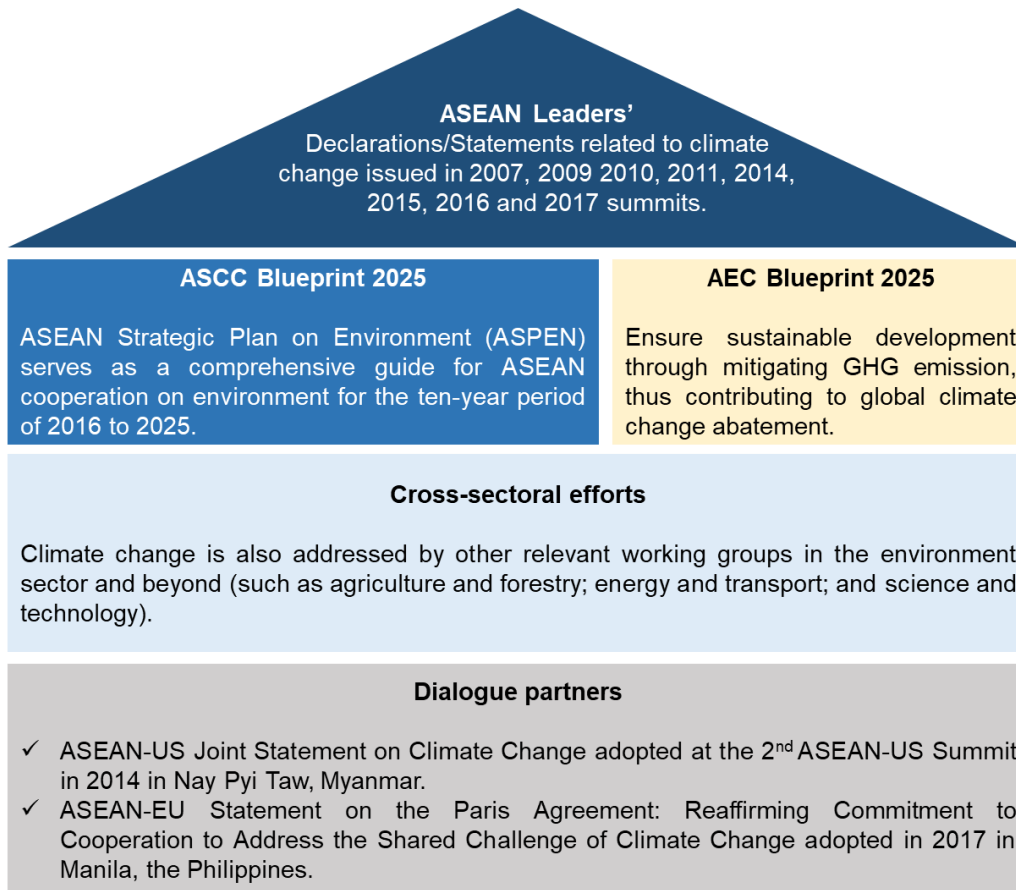
- 1.1.1. ASEAN has always placed emphasis on sustainable development. Adopted in November 2007, the ASEAN Charter clearly illustrates the region's commitment in promoting sustainable development, with the aim to protect the region's environment, natural resources, quality of life and cultural heritage for the present and future well-being.
- 1.1.2. Guided by the ASEAN Leaders' common aspirations, the efforts and key initiatives to safeguard the environment are primarily outlined under the ASEAN Socio-Cultural Community (ASCC) Blueprint 2025. This includes strengthening regional cooperation to protect, restore and promote sustainable use of resources, strengthen institutional capacity in climate mitigation and adaptation; and mainstream climate change risk management.
- 1.1.3. In order to support the implementation of the ASCC Blueprint 2025, ASPEN 2016 – 2025 was developed to serve as a comprehensive guide of ASEAN cooperation on environment that aims to contribute to the promotion of sustainable development in the region. ASEAN has pledged to intensify parallel but inter-related efforts in areas that complement the implementation of AEC Vision 2025 and the UN 2030 Agenda for Sustainable Development<sup>17</sup>.

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<sup>17</sup> Complementarities between the ASEAN Community Vision 2025 and the UN 2030 Agenda for Sustainable Development: A Framework for Action (2017).

1.1.4. The issue of climate change has garnered increasing attention. Given the cross-sectoral nature of climate change, the issue is currently deliberated across relevant ASEAN working groups, including the ASEAN economic pillar. Active collaboration with dialogue partners has also been forged. Some of these efforts and commitments by ASEAN, which have continued to evolve to address emerging climate change concerns, are illustrated in Figure 1.

**Figure 1: ASEAN’s commitments towards climate change**



Source: Compiled by author.

1.1.5. All AMS are parties to the Paris Agreement since 2016. The Agreement aims to strengthen collective responses to climate change by ensuring that the rise in global temperature is lower than 2 degrees Celcius in the second half of the 21<sup>st</sup> century. To-date, 189 countries have ratified the Agreement and subsequently, showed their support towards this initiative by embarking on various initiatives to manage climate change.

1.1.6. ASEAN as a region has made progress in the financial sector. To promote the issuance of green bonds in the region, the ASEAN Capital Markets Forum (ACMF) has developed the ASEAN Green Bond Standard in 2017, in collaboration with the International Capital Markets Association (ICMA), based on ICMA’s Green Bond Principles. Since then, ASEAN standards for social and sustainability bonds have also been developed.

- 1.1.7. Aside from capital market development, ASEAN has also embarked on initiatives in the insurance sector. The ASEAN Disaster Risk Financing and Insurance (ADRFI) programme was established in 2016 as the central platform to coordinate ASEAN-wide efforts in developing and implementing disaster risk financing strategies.
- 1.1.8. Initiatives in the financial sector have thus far been undertaken by individual ACBs and financial regulators. ACBs recognise the urgent and pressing need to effectively manage the effects of climate change given the wider ramifications on the financial sector and economy. In view of this, ACBs and financial regulators in the region have also embarked on initiatives towards raising understanding in this area and advancing to formulate appropriate policy responses.
- 1.1.9. Eight ACBs are currently members of international coalitions established towards advancing sustainability in the financial sector, namely the NGFS and SBN (Table 1). Members of these groups exchange information and best practices on climate and environment-related risk management, as well as mobilise capital towards a sustainable economy.
- 1.1.10. In their respective countries, ACBs are at different and somewhat early stages of managing climate and environment-related risks. These range from building understanding of the risks and their impact to financial system; to enhancing awareness across relevant stakeholders; to building capacity and to issuing guidelines and incorporating the risks into macroprudential and supervisory frameworks. This is further elaborated in Chapter 4 of the Report.

**Table 1: ACBs’ participation in international initiatives  
on climate and environment-related risks**

<b>Coalitions</b>	<b>Purpose</b>	<b>Members</b>
<b>Central Banks and Supervisors Network for Greening the Financial System (NGFS)</b>	<ol style="list-style-type: none"> <li>1. Strengthen the global response required to meet the goals of the Paris Agreement.</li> <li>2. Enhance the role of the financial system to manage risks.</li> <li>3. Mobilise capital for green and low-carbon investments in the broader context of environmentally sustainable development.</li> </ol>	NBC, BI, BNM, BSP, MAS and BOT
<b>Sustainable Banking Network (SBN)*</b>	<ol style="list-style-type: none"> <li>1. Move financial sectors towards sustainability, with the twin goals of improved ESG risk management (including disclosure of climate risks) and increased capital flows to activities with positive climate impact.</li> </ol>	BOL, BSP and SBV

\*Other notable members include the Otoritas Jasa Keuangan (OJK) of Indonesia.

Source: Compiled by author.

- 1.1.11. Against this background, in February 2019, the ASEAN SLC proposed to undertake a study on the roles of ACBs in advancing the sustainability agenda, focusing on climate and environment-related risks. The proposal was further deliberated at the ASEAN Central Bank Deputies' Meeting (ACDM) on 3 April 2019 and subsequently endorsed at the ASEAN Central Bank Governors' Meeting (ACGM) on 5 April 2019.
- 1.1.12. A Task Force was then established to explore the case for, and limits of ACBs' involvement in the transition to low-carbon economy; profile current initiatives by the ACBs; and highlight potential non-binding recommendations to create and continuously support a sustainable ASEAN.
- 1.1.13. The Report aims to illustrate the roles of central banks in managing climate and environment-related risks, to the extent applicable for ACBs; and is structured as follows:
- a) [Chapter 1](#): Background of the Report;
  - b) [Chapter 2](#): Climate risks and ASEAN's experience with climate change;
  - c) [Chapter 3](#): Establishing the case for, and limits of, ACBs in managing climate and environment-related risks. This includes exploring the mandate of ACBs and the potential risks impacting areas under the purview of central banks; i.e. financial stability and monetary stability;
  - d) [Chapter 4](#): Current approaches by ACBs in managing the effects of climate change, highlighting the developmental gaps relative to central banks that are considered frontrunners, worldwide;
  - e) [Chapter 5](#): Challenges facing ACBs and financial institutions in managing climate and environment-related risks; and
  - f) [Chapter 6](#): Non-binding recommendations.

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## Box 1: Sustainability and the UN Sustainable Development Goals (SDGs)

The term sustainable development has evolved over time. The UN's 1987 Brundtland Report describes sustainable development broadly as developments that meet the needs and aspirations of the present without compromising the ability to meet those of the future. The emphasis then turned to John Elkington's 'triple bottom line' concept in 1994. This allowed for a country to be considered as sustainable if it fulfils three criteria – showcasing environmental stewardship, provides for social equity and checked against the economic needs of business. Later, the term Environment, Social and Governance (ESG) was coined in December 2004 in a landmark study entitled "Who Cares Wins." The report was the result of a joint initiative of financial institutions under the auspices of the then-UN Secretary-General Kofi Annan to develop guidelines and recommendations on how to better integrate environmental, social and corporate governance issues in asset management, securities brokerage services and associated research functions. More recently in 2015, the UN introduced the Sustainable Development Goals (SDGs). The SDGs serve as the blueprint to achieve a better and more sustainable future by 2030. The 17 SDGs are intended to address the global challenges on poverty, inequality, climate change, environmental degradation, peace and justice. A number of the goals are related to areas under the purview of central banks. These are, Goal 1, Goal 8, Goal 10, Goal 13 and Goal 17 (Figure 2).

Figure 2 : The UN SDGs and central banks' mandate



**Goal 1:** Ensure equal rights to economic resources, including financial services.

**Goal 8:** Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all.

**Goal 10:** Improve the regulation and monitoring of global financial markets and institutions.

**Goal 13:** Integrate climate change measures into national policies, strategies and planning.

**Goal 17:** Enhance global macroeconomic stability, including through policy coordination and policy coherence.

Source: The UN, 2015

## Chapter 2: Climate risks and ASEAN's experience with climate change

- The acceleration of global warming is due to human activities, especially the burning of fossil fuels.
  - Climate change will intensify, with negative effects on economic activities globally unless concrete measures are deployed and well-executed.
  - Climate and environment-related risks can manifest in three forms namely physical risks, transition risks and liability risks, which in turn affect financial stability, society and the broader macroeconomy.
  - Under a simulated scenario of 4 degrees Celcius global warming, ASEAN potentially faces severe damage with loss estimated at USD4.16 trillion per year up to the year 2100 (Kompas, Pham, and Che., 2018).
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### 2.1 Understanding Climate Risks

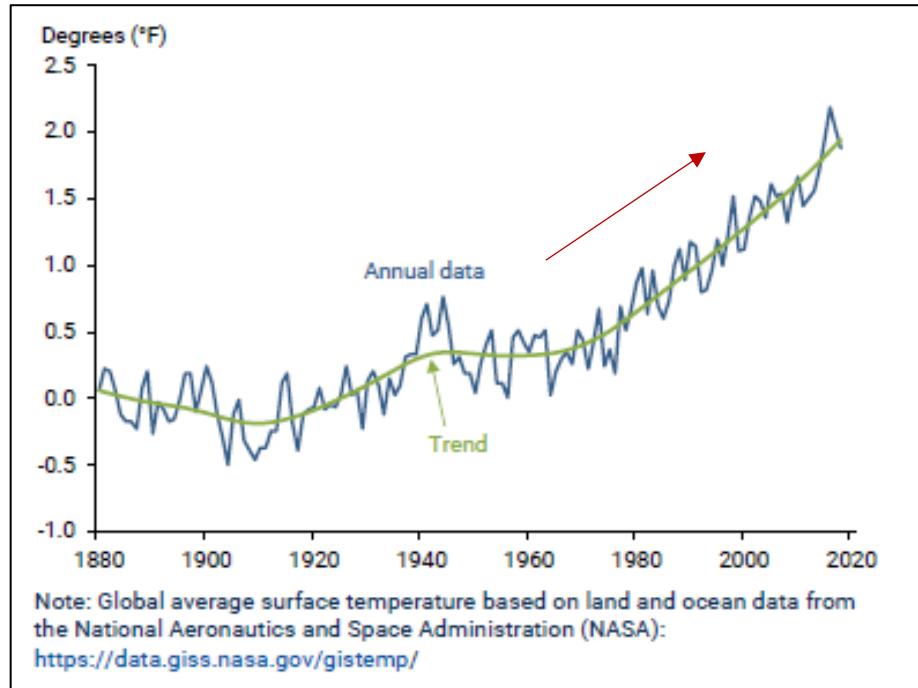
2.1.1. Climate-related risks are caused by global warming (also known as climate change) and weather events. In this regard, there is a wide consensus among climate scientists that human activities, mainly through the burning of fossil fuels, are the major contributors to temperature increases (NASA, 2019; IPCC, 2019)<sup>18</sup>. The burning of fossil fuels releases various greenhouse gas (GHG) into the atmosphere (e.g. carbon dioxide, methane, nitrous oxide), where its high concentration and accumulation would trap and re-radiate the heat back to earth, keeping the land and sea surface temperatures warm. Since 1960, there has been a steady increase in the global average temperature (Figure 3). Hence, while climate change has long occurred naturally, the concern is the rapid acceleration due to human activity<sup>19</sup>.

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<sup>18</sup> The IPCC, 2019; and NASA, 2019) indicated that there is a 95 per cent certainty that human activities are the main cause of climate change.

<sup>19</sup> Similarly, natural geological processes such as earthquakes (due to movement of tectonic plate), tsunamis (due to seafloor disturbance) and cyclones (due to difference in atmospheric wind speed), have long been a source of shock to economic and financial activity. Global warming, nevertheless, may exacerbate and amplify the frequency and severity of the extreme events (NASA, 2019).

**Figure 3: Change in global average temperature relative to 1880-2020**



Source: Rudebusch (2019)

- 2.1.2. Rising temperatures in turn have important implications for the environment. Continued GHG emissions and global warming adversely affect the ecosystem, translating to environmental shifts in terms of rising temperature, sea level and rainfall. While the relationship between climate change and weather events is still a frontier in science, various researches indicate that these factors amplify the frequency and severity of weather events, causing persistent and more intense floods, wildfires and heatwaves<sup>20</sup>. The American Meteorological Society (2018) reported that in 2017, the droughts in the US Northern Plains and East Africa, the floods in South America, China and Bangladesh; and the heatwaves in China and the Mediterranean were caused more likely by human-induced climate change.
- 2.1.3. Climate change will intensify. Scientific projection by IPCC (2018) suggest that climate change will continue to worsen, with the global temperature rising as much as 1.5 degrees Celcius between 2030 and 2052, if no action is taken. The situation would violate the target of limiting global warming to 1.5 degrees Celcius above preindustrial levels, as stipulated in the Paris Agreement, secured at the 21<sup>st</sup> United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in 2015.

<sup>20</sup> Committee on Extreme Weather Events and Climate Change Attribution (2016), as cited in Global Climate Related Index (2019).



## 2.2 Environment-related Risks

2.2.1. Environment-related risks stem from environmental degradation. Like climate risks, human activities are the major contributor. For example, poor farming techniques lead to land degradation; uncontrolled deforestation leads to soil erosion and flash floods; and open burning causes haze and air pollution.

## 2.3 Implications to the Economy and Financial System

2.3.1. Climate and environment-related risks are among the major risks said to be affecting central banks' objectives in safeguarding monetary stability and financial stability<sup>21</sup>. Central banks must thus understand these risks, how they transmit and impact the financial sector as well as the broader economy. It is important to note that this is an emerging and on-going area of work, hence readily available research in this area is limited. Nonetheless, there is agreement on the negative impact of climate change on economic activity, and the broad channels of how climate and environment-related risks affect the economy and financial system. The Report considers each in turn.

2.3.2. Numerous studies have shown that persistent changes in climate have negative impacts to the economy. Kahn *et al.* (2019) found that a persistent increase in average global temperature by 0.04 degrees Celcius per year, in the absence of mitigation policies, reduces world real GDP per capita by more than 7 per cent by 2100. A study by Kompas *et al.* (2018) estimated potential loss of approximately USD23 trillion per year globally for 4 degrees Celcius global warming. The Southeast Asian region potentially faces severe damage, with losses estimated at USD4.16 trillion per year (18 per cent of global share) up to the year 2100 (Sub-Saharan Africa: 35 per cent; India: 19 per cent)<sup>22</sup>.

2.3.3. The negative implications on economic activity and growth can manifest through physical risks, transition risks and liability risks (Carney, 2015; and NGFS, 2019) (Figure 4). Further details on how these risks impact macroeconomic and financial stability are deliberated as follows:

- a) **Physical risks:** The direct impact of weather events such as floods and drought to physical assets such as damage to or loss of properties, infrastructure and agricultural products. Declining revenues and escalating costs may gradually deteriorate the financial strength of firms, leading to incidences of default in

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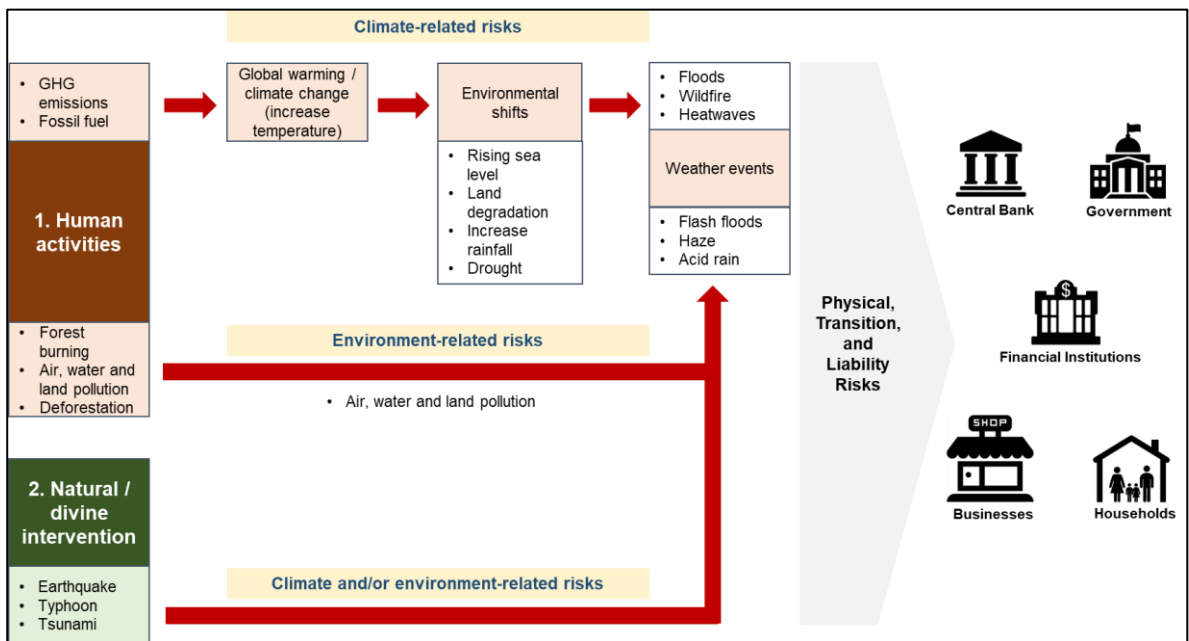
<sup>21</sup> See for example remarks by Luiz Awazu Pereira da Silva, Deputy General Manager of the BIS, at the NGFS Conference in, Paris, 17 April 2019; and IMF Quarterly Bulletin (page 26), December 2019.

<sup>22</sup> Kahn *et al.* (2019) acknowledged that a number of researchers found that the effect of rising temperatures is not uniform across countries (see Sachs and Warner (1997), Jones and Olken (2010), Dell *et al.* (2012), International Monetary Fund (2017) and Mejia *et al.* (2018)). Productivity is likely to suffer in hot climate countries, like those from ASEAN. However, those in cooler climates may benefit from rising temperatures as conditions become more conducive for economic activity. In contrast to the existing literature, Kahn *et al.* (2019) found a universal negative impact of climate change to all countries, regardless of the climate (i.e. hot or cold), as economic growth is affected by higher temperature as well as the degree of climate variability.

payments that could harm financial institutions, and thus pose systemic repercussions.

- b) **Transition risks:** The impact of adjusting to a low-carbon economy as a result of climate change policies, technological breakthroughs and change in consumer preferences may result in higher costs for doing business. Poorly designed policies can also result in premature devaluation of assets and investments (stranded assets) with repercussions to financial stability.
- c) **Liability risks:** Refers to compensation claims and litigation by public or businesses on financial institutions, corporations or their directors, including legal claims for failing to manage climate risks or for supporting firms that are deemed to be operating in a manner that is detrimental to the the environment<sup>23</sup>. This may also create negative repercussions for the insurance sector and hence, for financial institutions that provide third-party liability insurance.

**Figure 4: Transmission of climate and environment-related risks**



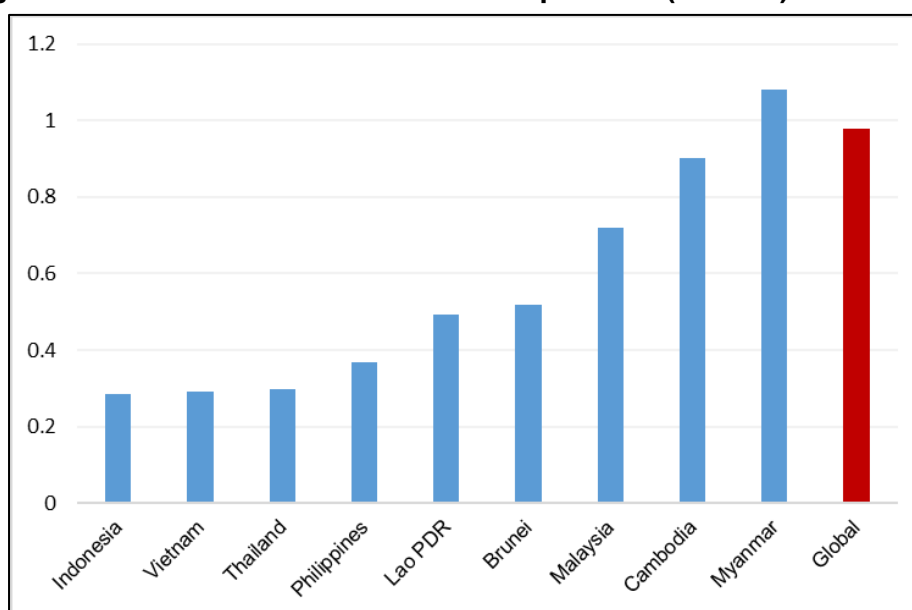
Source: Compiled by author.

<sup>23</sup> For the purpose of the Report, liability risks would be subsumed under physical risks, as the former is typically consequential to the latter.

## 2.4 ASEAN's Experience with Climate Change

2.4.1. Similar warming trend has been observed in ASEAN. Since the 1960s, ASEAN countries experienced cumulative temperature increase between 0.2 – 1.1 degrees Celsius<sup>24</sup> (Figure 5). ASEAN countries generally experienced a slower temperature increase than the global average except for Myanmar<sup>25</sup>. Consistent with global trends, anthropogenic GHG emissions in ASEAN have increased since the pre-industrial period. GHG emissions in ASEAN peaked during the rapid industrialisation period preceding the Asian Financial Crisis 1997 (Figure 6). A study by the World Resources Institute (2017) showed that Indonesia, Thailand, Vietnam, Myanmar and Malaysia accounted for 90 per cent of the GHG emissions in Southeast Asia (Figure 7).

**Figure 5: ASEAN's cumulative rise in temperature (Celsius) in 1960-2014**



Source: Kahn *et al.*, 2019<sup>26</sup>

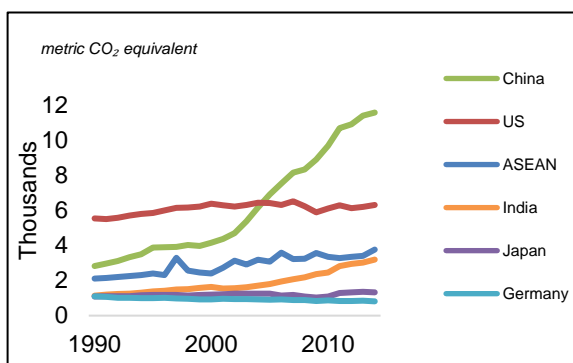
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<sup>24</sup> Author's analysis based on data from Kahn *et al.* (2019).

<sup>25</sup> This is an interesting observation as an increase in temperature is generally associated with rising GHG emission from industrialisation. However, Myanmar experienced decades of isolation until recently in 2011, and yet the temperature had risen the highest in ASEAN and was higher than the global level. Other forces may be at work here. Nevertheless, this is beyond the scope of this Report.

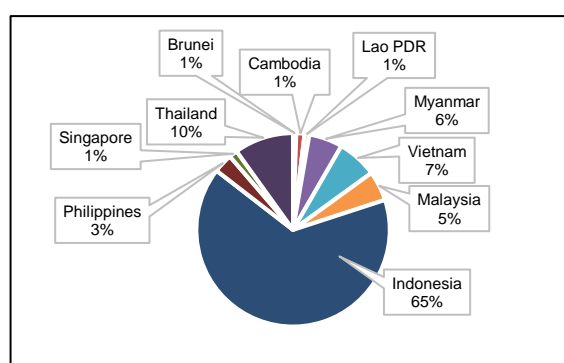
<sup>26</sup> Author's analysis based on data from Kahn *et al.* (2019). Data for Singapore is not available in the paper.

**Figure 6: Total GHG emissions in 1990-2014**



Source: CAIT Climate Data Explorer. 2017. Washington, DC: World Resources Institute. Available online at: <http://cait.wri.org>

**Figure 7: ASEAN's GHG emission in 2014**



Source: CAIT Climate Data Explorer. 2017. Washington, DC: World Resources Institute. Available online at: <http://cait.wri.org>

2.4.2. Rising temperatures, rainfall and sea level have profound implications to ASEAN economies, given its long coastlines, large and growing population and high concentration of human and economic activities in coastal areas. Importance of the agriculture sector, and dependence on natural resources and the forestry sector for growth and development are also contributing factors to ASEAN's vulnerability (ADB, 2009). The region has been identified as a climate change hot spot, with numerous weather-related disasters, causing significant economic and human losses. More generally, the Asia-Pacific region, where ASEAN is located, has been affected by 217 storms and cyclones and 236 cases of severe flooding between 2014 and 2017 according to UN data.

- a) Thailand's Great Flood in 2011 affected over 13 million people and damaged 1.9 million houses, costing the country USD46.5 billion (World Bank, 2012), with insured losses of about USD16 billion (Swiss Re, 2015). Similarly, the 2018 flood costed Lao P.D.R USD371 million, or 2.3 per cent of the country's projected economic output for the year (World Bank, 2018).
- b) The impact of climate and environment-related risks is not limited to national boundaries. ASEAN experienced repeated transboundary haze arising from seasonal open burning for land clearing and vegetation purposes. The transboundary haze pollution was so severe that it led to the establishment of the Haze Technical Task Force under the ASEAN Senior Officials on the Environment in 1995 (Sunchindah, 2015). The severe haze in 2015 had material economic

impact on several ASEAN countries. Estimates suggest economic costs<sup>27</sup> to Indonesia of more than USD16.1 billion, which is equivalent to 1.9 per cent of its GDP in 2015 (World Bank, 2016). For Singapore, the cost was estimated to be USD1.83 billion or 0.45 per cent of its GDP in 2015<sup>28</sup>.

2.4.3. Temperatures will continue to rise rapidly if unmitigated. Without climate action, the IPCC predicts that temperature rises in the ASEAN region will be much higher in the future, up to an increase of 3 – 5 degrees Celcius by the end of the 21<sup>st</sup> century. Similar trend is observed for the annual rainfall, which has increased by 22 millimeter per decade, while rainfall from extreme rain days has increased by 10 millimeter per decade.

2.4.4. The impact of climate change to ASEAN economies can be severe. Kahn et al. (2019) concluded that there is a universal negative long-run relationship between persistent changes in temperature and GDP per capita growth for all countries, including ASEAN (Figure 8). This is estimated under two climate scenarios, namely the Representative Concentration Pathways (RCP) 2.6 and RCP 8.5<sup>29</sup>. Under the unmitigated climate scenario of RCP 8.5, all ASEAN countries are expected to incur severe dents to their GDP per capita in year 2100, with effects of losses ranging from 0.7 – 8.5 per cent. Indonesia and Philippines are expected to incur the highest losses, beyond the global estimates.

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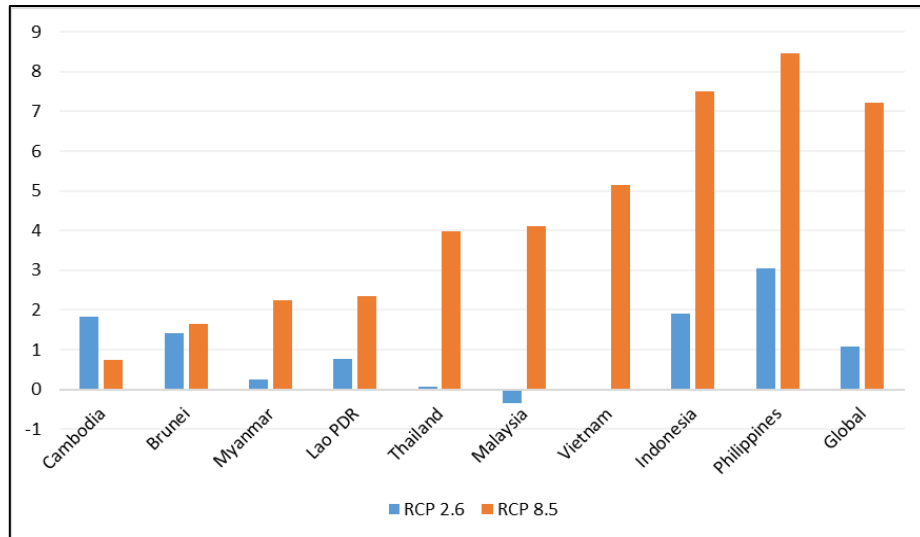
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<sup>27</sup> Refers to economic losses resulting from the disruption of air, land and sea travel due to the haze. It includes losses to agriculture, forestry, transport, trade, industry, tourism, and other sectors. Some of these costs are direct damage and losses to crops, forests, houses and infrastructure, as well as the cost of responding to the fires (World Bank, 2016).

<sup>28</sup> Economic Impact of Transboundary Haze in 2015: The Experience of Singapore.

<sup>29</sup> The RCPs are scenarios of greenhouse gas concentrations, constructed by the IPCC. RCP 2.6 corresponds to the Paris Agreement which aims to hold the increase in the global average temperature to below 2 degrees Celsius above pre-industrial levels. RCP 8.5 is an unmitigated scenario in which emissions continue to rise throughout the 21<sup>st</sup> century (Kahn et al., 2019).

**Figure 8: ASEAN loss in GDP per capita (%) in 2100<sup>f</sup>**



Source: Author's analysis based on data from Kahn *et al.* (2019)<sup>30</sup>.

2.4.5. Should ASEAN or other countries adhere to the pledges stipulated in the Paris Agreement, the impact of climate change may be less severe as illustrated under RCP 2.6. It should be noted that these results do not include international spill over effects. The results may hence be more severe as the real negative costs could be higher with spill over effects. Additionally, it is worth highlighting that ongoing efforts by policymakers serve to mitigate the growth of carbon into the atmosphere. This is not the same as reducing the level of carbon already in the atmosphere.

2.4.6. It is clear from the preceding discussion that global warming will persist and climate and environment-related events can have adverse implications to ASEAN and the entire ecosystem. The next chapter discusses the case for, and limits of central bank's involvement in managing climate and environment-related risks in safeguarding financial and monetary stability.

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<sup>30</sup> Data for Singapore is not available in the paper.

# Chapter 3: Establishing the Case for, and Limits of, Central Bank's Involvement

## Key highlights:

- No central bank globally has specific written mandates to manage climate and environment-related risks. These risks are currently being managed as part of central banks' integral roles in maintaining price and financial stability.
  - Like global counterparts, ACBs generally have the ability to pursue climate related objectives, primarily relating to its primary mandates to safeguard monetary and financial stability. In addition to the core stability mandate, ACBs can rely on their broad secondary objectives to support wider economic policy considerations (Dikau and Volz, 2020). Hence, ACBs have the flexibility within their mandate to adopt relevant policy tools to pursue developmental initiatives to green the economy.
  - The roles of central banks in financial stability is clear, reflecting the established relationship between climate and environment-related risks and financial stability. The role of monetary policy, however, is not straight forward. While monetary policy can play a role to mitigate the impact of shocks to economic activity and inflation, there is less clarity on a more direct role for monetary policy. This could be due to the still nascent understanding of the link between climate and environment-related risks and monetary policy.
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## 3.1 Market Failures as Sources of Climate and Environment-related Risks

- 3.1.1. Climate change has been described by some economists as the greatest market failure of all times (Stern, 2007). There is over-production and over-consumption of carbon-intensive goods as those responsible for GHG emissions do not internalise the social costs of doing so. The World Bank (2018) claims that because market prices do not reflect these negative externalities, polluters are not paying the full costs of emitting GHGs and therefore, have invested less to reduce their emissions than what would have been optimal. Additionally, climate change can also be seen as a market failure through the under-production of climate mitigation efforts.

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3.1.2. Within an economy, market failures can occur at various levels, exacerbating the problem of climate change (Figure 9):

- a) **Public Sector:** There is coordination failure at the international level. A country can free ride and benefit from the low carbon emissions environment arising from strict carbon policies set by neighbouring countries. In this situation, countries will arrive at an equilibrium of not doing anything to limit carbon emission as there is no first-mover advantage of doing so. Separately, adherence to the principle of market neutrality by regulators, including central banks, has contributed to an implicit bias in favour of carbon-intensive industry. This also perpetuates the status quo and slows down the transition to a low-carbon economy.
- b) **Financial sector:** With returns on investment (ROI) as the main consideration of businesses, the situation has been that green investments are undermined by the traditional investments, exposing the society to lasting negative externality. Profit-maximising behaviour may favour investments in the traditional sector rather than the green sector as green bonds trade at lower yields in comparison to the non-green bonds (Ehlers and Packer, 2017)<sup>31</sup>. Lending to traditional sectors tend to be preferred over green sectors given the lower cost of arranging.
- c) **Non-financial sector:** The fundamental theory of firm indicated that any business strives for maximum profits. Hence, firms may use the cheapest means of production even if it is the most hazardous to the environment. There is also limited incentives for individuals to pursue a more environment friendly lifestyle. The free rider problem emerges as one could reap the benefits of clean air if others in the neighbourhood protect the environment, thus creating the opportunity to free ride.

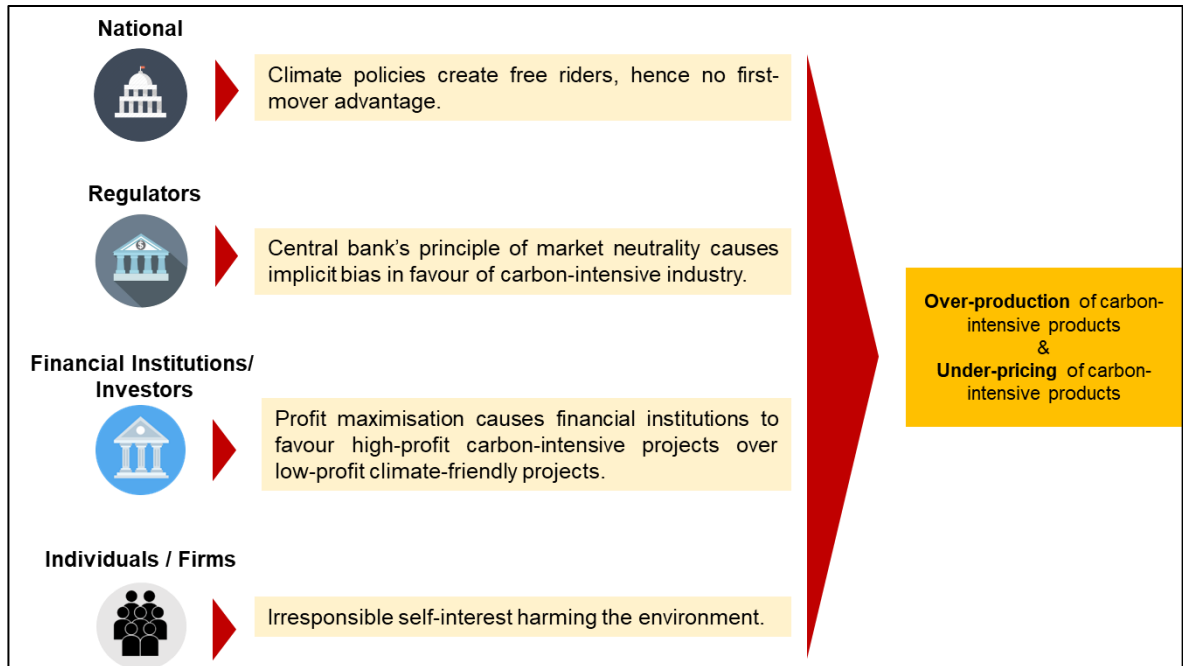
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<sup>31</sup> Ehlers and Packer (2017) found that green bond issuers on average have borrowed at lower spreads (around 18 basis point) than they have through conventional bonds. The reason for this is because of high demands for green bonds relative to supply, confirming the results from other recent studies such as Zerbib (2017) and Barclays (2015). Nevertheless, this may not always be so. Over time (36 months), however, performance of green bond indices have been similar to that of global bond indices of comparable credit rating composition.



**Figure 9: Market failures hinder the transition to low-carbon economy**



Source: Author's own compilation, adapted from Cole and Ostrom (2012).

## 3.2 Central Banks' Response to Climate Change

3.2.1. Against the backdrop of increasing awareness on climate change-related risks, and the Paris Agreement commitment, several central banks have risen to the challenge. Three observations can be made to describe the responses thus far:

- a) A growing number of central banks are taking steps to manage climate and environment-related risks;
- b) Central banks vary in their approaches and actions; and
- c) More is being done on financial stability compared to monetary stability.

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**Observation 1: A growing number of central banks are taking steps to manage climate and environment-related risks**

3.2.2. To the extent that climate change and environment-related risks complicate central banks' assessments of future economic and financial vulnerabilities, central banks have started managing these risks to ensure that they can continue to effectively meet their mandates of maintaining price and financial stability (Dikau and Volz, 2019; and Volz, 2019). In this regard, many central banks have begun incorporating aspects of climate-related risks into financial stability monitoring and prudential supervision or adopted green finance policies. With a common objective of managing risks in the financial system and mobilising capital for green and low-carbon investments, eight central banks and financial supervisors created the NGFS in December 2017. As of July 2020, the NGFS has grown into 69 members and 13 observers, including six central banks from ASEAN.

**Observation 2: Central banks vary in their approaches and actions**

3.2.3. Climate change has had different implications for the roles, actions and responses of central banks. The lack of uniformity in managing climate and environment-related risks is not surprising given varying national circumstances. Despite the differences, as suggested by Krogstrup and Oman (2019), central banks' approaches and relevant policy tools to manage climate change can be broadly categorised into two types (Table 2):

- a) **Incorporating climate risks into core policy frameworks (i.e. focus on managing climate-risk).** The aim is to correct the limited accounting of climate risks by financial institutions and the financial system, and support mitigation by influencing the demand for green and low carbon-intensive investments; and the relative prices.
- b) **Mainstreaming green finance (i.e. focus on developing climate finance).** This aims to influence credit allocation and investment behaviours towards green, as well as address longer term goals such as economic development, growth and greening.

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**Table 2: Financial and monetary tools**

<b>Policy Area</b>	<b>Financial Policy Tools</b>	<b>Monetary Policy/Operations Tools</b>
<b>Incorporating climate risks into core policy frameworks (i.e. focus on managing climate-risk)</b>	Gathering climate-related financial data, climate-related risk disclosures, taxonomy of green assets, climate-related stress tests, macroprudential tools, development of platforms, information and active issuance for green bonds.	Developing central banks' own climate risk assessments, ensuring climate risks are appropriately reflected in central bank asset portfolio (including the management of official foreign reserves).
<b>Mainstreaming green finance (i.e. focus on developing climate finance)</b>	Green supporting and brown penalising factors in capital requirements, requiring minimum amount of green assets on balance sheets, notional carbon prices.	Central bank credit allocation operations; adapting monetary policy frameworks.
	Incentives or policies to spur issuance of green bonds and promote green lending and green credit.	ESG integration into investment operations.

Source: Adapted from Krogstrup and Oman (2019).

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### **Observation 3: More is being done on financial stability compared to monetary stability**

3.2.4. To date, central banks' efforts to manage climate and environment-related risks have been centred on safeguarding financial stability. The increasing focus on risks to financial stability can be attributed to several factors. The Paris Agreement includes strong expectations regarding finance and in turn the financial sector, with one of its core objectives being to “make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development”<sup>32</sup>. NGFS (2019) advocates that climate-related risks are a source of financial risk and therefore, falls squarely within the mandates of central banks and supervisors to ensure the financial system is resilient to these risks.

3.2.5. There has been limited attention on the role of monetary policy in managing climate and environment-related risks. This could be due to the nascent understanding of the link between climate and environment-related risks and monetary stability. Policymakers may not yet be convinced that monetary policy has a role to play:

- a) Central banks view that the horizon of climate change is beyond the horizon relevant of monetary policy (3 – 5 years) whilst weather-related shocks have generally been short-lived and contained (Coeure, 2018). In the long term, most of the effects of climate change will materialise past the usual policy forecast horizon (Rudebusch, 2019).
- b) There is a policy trade-off between stabilising inflation and output fluctuations as climate induced supply shocks pull inflation and output in opposite directions. (Coeure, 2018; Debelle, 2019). Managing demand shocks through monetary policy is more straightforward because output and inflation move in the same direction.
- c) The difficulty to coordinate monetary policy between countries to manage climate change is a global problem (Bolton, Despres, Da Silva, Samama and Svartzman, 2020).
- d) Lack of clarity whether central banks have the mandate to use monetary policy or monetary tools to manage climate and environment-related risks, or if they are going against the principle of ‘market-neutrality’ of monetary policy when pursuing climate related goals (Weidmann, 2019; and Mauderer, 2020).
- e) There is a lack of consensus on the urgency. The ECB President has identified climate change as ‘mission critical’, whereas the US Federal Reserve indicates that it is a “longer-term” issue<sup>33</sup>.

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<sup>32</sup> International Development Finance Club. Retrieved from <https://www.idfc.org/paris-agreement/>.

<sup>33</sup> See transcripts of Committee on Economic And Monetary Affairs Monetary Dialogue with Christine Lagarde on 2 December 2019 and Jerome Powell's press conference on 29 January 2020.

### 3.3. Central Bank Mandates

#### **Central bank actions have been broadly defined by their mandates**

- 3.3.1. While central banks generally do not have specific written mandates to manage climate and environment-related risks, these risks are currently being managed as part of central banks' core mandates<sup>34</sup> to maintain price and financial stability. In this regard, central banks have undertaken actions that mostly fall under the category of 'focus on managing climate risk', as mentioned earlier.
- 3.3.2. The mandate to undertake actions beyond risk management purposes is less clear and has been a subject of on-going debate and interpretation. On one hand, central banks pursue some degree of finance mainstreaming, promotional or advocacy activities, including through the management of its own balance sheets to influence the demand for green investments, integral to their core financial and monetary stability mandates.
- 3.3.3. Others have relied on the interpretation of their stated secondary objectives or mandates to support their country's broader economic activities, which are the promotion of, or support for, 'sustainability' or 'sustainable development/growth'; or the support of Government's economic policies or goals (both known as sustainability mandates), without compromising their core or primary mandates. According to Dikau and Volz, (2020), 70 central banks globally have some degree of these secondary objectives.

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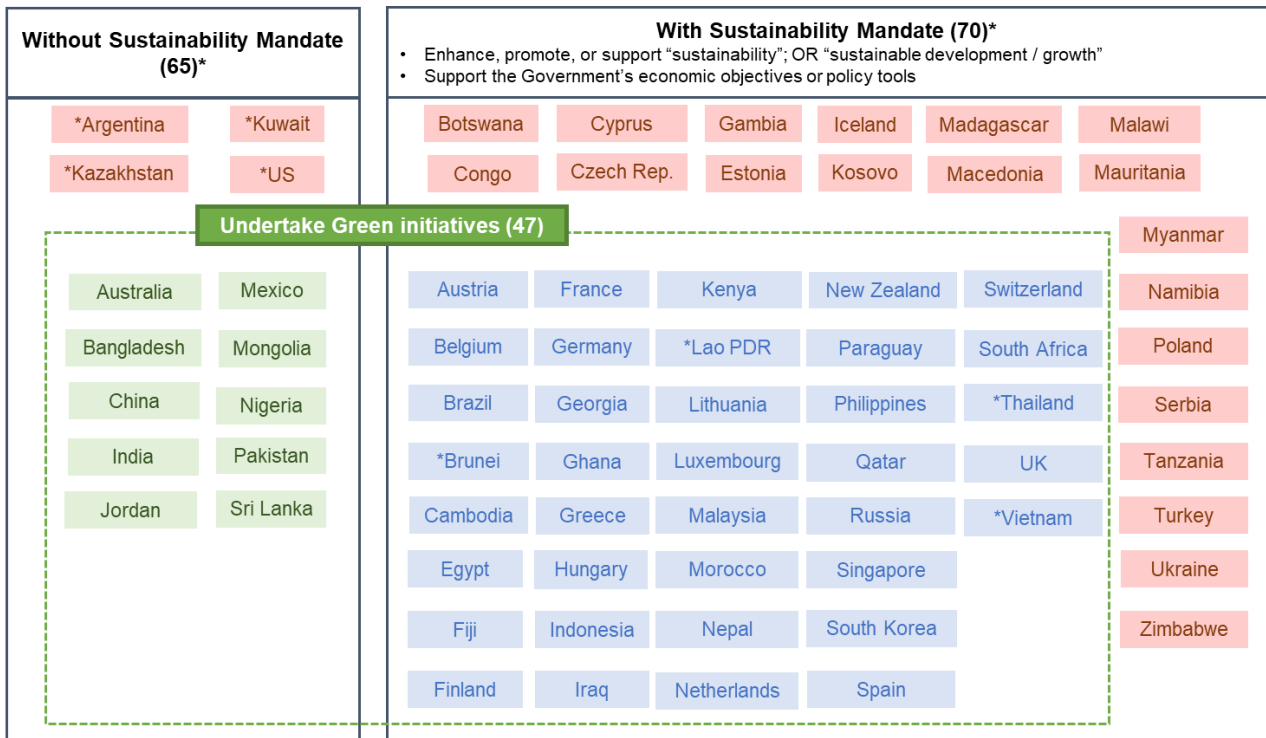
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<sup>34</sup> Dikau and Volz (2020) argue that some central banks are charged with mandates that include an explicit objective for the promotion or support of "sustainable economic growth or development", and that this requires the central banks to mitigate potential climate and environment-related risks. Others have another mandate to support the government's policy priorities, which in most cases include sustainability goals. However, given that climate risks can directly affect central banks' traditional core responsibilities, most notably monetary and financial stability, even central banks without explicit or implicit sustainability objectives ought to incorporate climate-related risks into their core policy implementation frameworks in order to efficiently and successfully safeguard macro-financial stability.

3.3.4. Figure 10 provides an overview of central banks with and without sustainability mandates based on a study by Dikau and Volz (2020). Building on their work, the Report categorises central banks into three categories:

- a) **Category 1: Central banks without sustainability mandates and have undertaken green initiatives, including some degree of green finance mainstreaming/advocacy.** This corresponds to central banks mentioned in paragraph 3.3.2. The People’s Bank of China (PBOC) and Reserve Bank of India (RBI) are among the central banks that have embarked on mainstreaming/advocacy activities, such as through their macro prudential policy frameworks and regulations on priority sector lending, respectively, in the absence of explicit sustainability mandates. Like many other central banks that have joined the NGFS, these central banks regard climate change as a source of financial risks, hence have concluded that ensuring financial resilience towards these risks lie within their stability mandates.
- b) **Category 2: Central banks with sustainability mandates to support their country’s broader economic activities, and have undertaken green incentives.** This corresponds to central banks mentioned in paragraph 3.3.3. The Bank of England (BOE) for example, is obliged by law to support national level economic policy, including the “sustainable and balance growth” objective, whereas the De Nederlandsche Bank (DNB), which forms part of the European System Central Bank (ESCB), has the mandate to support European Union’s objective of “sustainable development of Europe based on balanced economic growth.....and improvement of the quality of the environment” (Dikau and Volz, 2020).
- c) **Category 3: These are central banks that have not undertaken measures to manage climate and environment-related risks notwithstanding the stated mandates to safeguard monetary and financial stability and/or to support the country’s economic activities.** This shows that even with monetary and financial stability mandates, not all central banks have incorporated climate risks into their policy frameworks. This can be due to various reasons, including different policy priorities, existing low exposure to climate risks and political considerations.

**Figure 10: Central bank mandates**



\*Figure 10 illustrates several examples from Dikau and Volz (2020), who indicated that from 135 central banks investigated, 70 central banks have sustainability mandates, whereas 65 central banks are without the sustainability mandates.

- Category 1** Central banks without sustainability mandate but have undertaken green initiatives, including some degree of green finance mainstreaming/advocacy.
- Category 2** Central banks with sustainability mandate (e.g. to support their country's broader economic activities) and have undertaken green incentives.
- Category 3** Central banks that have not undertaken measures to manage climate and environment-related risks, notwithstanding the stated mandates to safeguard monetary and financial stability and/or to support the country's economic activities.

\*Additional central banks included in this Report, which was not covered by Dikau and Volz (2020).

Source: Adapted from Dikau and Volz (2020); and author's own compilation from ACBs' publications.

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### 3.4. ACBs' Mandates and Limits

#### **ACBs have broad mandate for climate and environment-related risks**

- 3.4.1. ACBs are at different stages in managing climate and environmental-related risks and mainstreaming green finance. The focus has been on managing risks to financial stability and not monetary stability. Several ACBs have started transitioning their strategies and policies to enhance their internal monitoring of these risks in the financial sector and to increase banks' awareness of climate and environmental related risks. A few central banks have started to implement green financial policies. As mentioned in Chapter 1, three ACBs are members of the SBN and six are members of the NGFS. Details of ACBs' initiatives will be further elaborated in Chapter 4 and Chapter 5 of this Report.
- 3.4.2. Notwithstanding the weather events that have hit the region, ACBs' responses to economic shocks have been primarily to ensure the continuity of financial intermediation and payments systems, and to support business resumptions. The experiences of supply shocks have been temporary and localised, and hence been looked through monetary policy horizons. Climate and environmental considerations are taken into account in monetary policy only in so far as they affect the prospects of inflation and growth.
- 3.4.3. ACBs do not have specific climate and environment-related risks mandates but are managing climate change to the extent that it is part of their core mandates in delivering monetary and/or financial stability. Beyond these core mandates, ACBs can also rely on the interpretation of the secondary objectives to support wider economic policy objectives (Table 3).
- 3.4.4. The question that is more pertinent to ACBs is how far these mandates and objectives support climate mitigation efforts? We attempt to address this in the next sub-section.

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**Table 3: Compilation of ACBs' primary mandates  
and secondary objectives**

<b>Central Bank</b>	<b>Primary Mandate(s)</b>	<b>Secondary Objectives</b>
<b>AMBD</b>	Price and financial stability	"(2)... the Authority shall support the general economic policies of the Government to the extent that it considers to be appropriate."
<b>NBC</b>	Price stability	"The principal mission of the Central Bank is to determine and direct the monetary policy aimed at maintaining price stability in order to facilitate economic development within the framework of the Kingdom's economic and financial policy."
<b>BI</b>	Price stability	"(2) To achieve the goal referred to in paragraph (1), Bank Indonesia shall conduct monetary policy on a sustained, consistent, and transparent basis, taking into account the general economic policies of the government."
<b>BOL</b>	Monetary and financial stability	"maintaining monetary stability, financial stability and smooth functioning of payment system, be able to integrate with regional and international markets, contributing to the national socioeconomic development."
<b>BNM</b>	Monetary and financial stability	"(1) The principal objects of the Bank shall be to promote monetary stability and financial stability conducive to the sustainable growth of the Malaysian economy."
<b>CBM</b>	Price stability	"The Central Bank shall, in accordance with its aim, also endeavor to attain the following objectives: [...] (d) to support the general economic policy of the Government conducive to the sustained economic development."

Central Bank	Primary Mandate(s)	Secondary Objectives
<b>BSP</b>	Price and financial stability	<p>“The primary objective of the Bangko Sentral is to maintain price stability conducive to a balanced and sustainable growth of the economy and employment. It shall also promote and maintain monetary stability and the convertibility of the peso.”</p> <p>“The Bangko Sentral shall promote financial stability and closely work with the National Government, including, but not limited to, the Department of Finance, Securities and Exchange Commission, the Insurance Commission and the Philippine Deposit Insurance Corporation.”</p>
<b>MAS</b>	Price and financial stability	<p>“To maintain price stability conducive to sustainable growth of the economy, to foster a sound and reputable financial centre and to promote financial stability;”</p>
<b>BOT</b>	Monetary and financial stability	<p>“The BOT’s objectives are to carry on such tasks as pertain to central banking in order to maintain monetary stability, financial institution system stability and payment systems stability. To undertake the tasks in paragraph one, the implementation of economic policy of the government shall be taken into consideration.”</p>
<b>SBV</b>	Monetary and financial stability	<p>“(1) To conduct operations for the purpose of currency value stability; to assure the safety for banking operations and the system of credit institutions; to assure the safety and effectiveness of the national payment system; and to contribute to accelerating socio-economic development along the socialist orientation.”</p>

Central Bank	Primary Mandate(s)	Secondary Objectives
		“(2) To participate in the elaboration of national socio-economic development strategies and plans.”

Source: Adapted from Dikau and Volz (2020) and ACBs’ individual websites.

### Limits of involvement depends on assessment of trade-offs and risks

- 3.4.5. Globally, there are expectations for central banks’ intervention and involvement to correct market failure by pursuing developmental initiatives and directly spurring and financing the transition to a low carbon economy (e.g. green Quantitative Easing). This has raised scrutiny on whether central banks are stretching or going beyond their mandates.
- 3.4.6. The first-best solution to correct market failure is through carbon pricing policies. However, as the problem of climate change is highly complex involving various market interactions and interdependencies. This therefore underscores the importance of financial and monetary policy tools to complement fiscal tools (Krogstrup and Oman, 2019).
- 3.4.7. ACBs typically have strong institutional standing that enable them to be catalysts to shape national level policy outcomes. In many ASEAN countries, while the central banks are part of inter-agency cooperation on climate change, central banks have forged ahead together with other financial regulators to institutionalise the call for action to support an orderly transition to a low carbon economy (e.g. BOT’s working group on sustainable finance and BNM’s JC3)<sup>36</sup>. In the case of the Philippines, coordination efforts led by the BSP and the Department of Finance with relevant government agencies have already started.
- 3.4.8. However, ACBs need to be mindful of the policy trade-offs and risks. Mainstreaming green finance for developmental purposes, if not well-designed, can:
- a) Create market distortionary effects and disincentives;
  - b) Undermine the principles of market-neutrality (i.e. central banks should not interfere in markets resource allocation function); and
  - c) Overburden the central banks and undermine central banks independence. As it is, whether central banks pursue a single or multiple objectives is the subject of intense debate (Monnin and Barkawi, 2015). Post the global financial crisis, central banks have undertaken unconventional monetary policies and faced increased criticism

<sup>36</sup> Joint Committee on Climate Change (JC3) was set up in September 2019 as a collaborative platform between regulators and the financial sector in responding to climate change. JC3 is co-chaired by BNM and Securities Commission Malaysia, with participation from Bursa Malaysia (the stock exchange) and 19 financial institutions. The objectives include to serve as a platform to propel financial institutions’ readiness in managing climate risks, and in developing new solutions to drive the transition to a low carbon economy. There are four sub-committees formed under JC3, namely on Risk Management, governance and disclosure, product and innovation and engagement and capacity building.

for taking policy decisions that critics say go beyond their mandate (Dikau and Volz, 2020). While the scope and scale of central bank activities have expanded post the global financial crisis, understanding the limits of what central banks can do is important as a means of preserving central bank independence. This is because the biggest risk to central bank independence could come from criticisms on their inability to deliver on unreasonable expectations (Groepe, 2016).

- 3.4.9. Notwithstanding the debate on how far central banks should go in managing climate change vis-à-vis the adherence to the principle of market-neutrality, ACBs have their own experiences and contexts. ACBs have always taken a pragmatic approach in balancing developmental and stability needs of the economy and the financial sector. For example, ACBs have promoted certain industries, such as the end-to-end development of Islamic banking systems<sup>37</sup>. Central banks are also currently pushing for the adoption of electronic payments to advance efficiency and safety objectives, which involves various rewards, incentives and promotional measures (e.g. capping of payment cards' interchange fee). ACBs could take a similar approach in mitigating climate risks, albeit within their mandates.
- 3.4.10. Should this be the path ACBs decide to take, it is important to recognise that central bank actions are not substitutes for structural policies by governments and public institutions. Central banks cannot be 'the only game in town'. Central banks' roles must be supported by, among others:
- a) Clarity on national priorities/targets on climate and socio-economic objectives.;
  - b) Strong inter-governmental and regulators coordination, with a clear line of accountability among central banks and other ministries/regulators; and
  - c) Clear communication and articulation to stakeholders, particularly the public, to establish the legitimacy of central banks' involvement and remit in managing climate change.
- 3.4.11. To conclude, ACBs have the ability to pursue climate related objectives within the context of its primary mandates to safeguard monetary and financial stability, or as part of ACBs' secondary objectives relating to supporting broader macroeconomic objectives. The next two sections discuss the rationale for central banks' involvement in managing climate and environment-related risks to financial stability and monetary stability.

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<sup>37</sup> Brunei, Indonesia and Malaysia have middle- to long-term national-level strategies/roadmap on Islamic finance, which contribute to nurturing and developing their respective Islamic finance sector. In the case of Malaysia, the development of a parallel Islamic banking system was driven by Bank Negara Malaysia, with a strong support from the Malaysian Government.

### **3.5. Climate and Environment-related Risks and Financial Stability**

- 3.5.1. The literature on the relationship between climate and environment-related risks and financial stability is rather well-established. Most notable is the work by the NGFS<sup>38</sup>, as a coalition of global central banks in explaining the relationship between these risks and the financial sector. Essentially, climate and environment-related risks are considered as a source of financial risk that can adversely affect macroeconomic conditions with system-wide impacts on financial stability.
- 3.5.2. Weather events and natural disasters have devastating impact on the economy. An abrupt and severe weather event typically causes a negative supply shock. If prolonged and persistent, the situation poses financial stability risk to the economy as shocks to economic activity begin to translate into credit and investment losses, eroding financial institutions' capital thus affecting institutional and financial system-wide health more broadly. In such an environment, central banks need to act. Mitigating the impact would require further understanding in terms of identifying the vulnerabilities early enough and the transmission channels.
- 3.5.3. Generally, climate and environment-related risks affect financial stability through the financial system balance sheets and financial performance. To see the relationship between the economy and financial system more clearly, it is useful to look at how climate risks or policies are transmitted across the various balance sheets in the economy.
- 3.5.4. Balance sheets reflect the stock of assets and liabilities of its economic agents at a certain point in time<sup>39</sup>. Allen, Rosenberg, Keller, Setser and Roubini (2002) grouped economic agents into three sectors – the non-financial sector (corporations and households), financial sector (mainly financial institutions) and government sector (sovereign government and central bank)<sup>40</sup>. The balance sheet analysis in Figure 11 illustrates the impact of climate and environment-related risks to each economic agent (i.e. non-financial sector, financial sector and government sector), when it materialises.
- 3.5.5. Shocks to household income and business profitability from climate events translate to lower loan repayment ability, hence an increase in the loan impairment and default rate. In a more extreme scenario, rising credit risk makes banks more cautious to extend new loans and may result in credit crunch as banks strive to protect their balance sheets. Governments have to spend substantially for emergency assistance (e.g. search and rescue missions, evacuation and refuge camps and financial assistance) and subsequently for rebuilding infrastructure and even restarting the economy. This adds strain to government's balance sheets and may reduce fiscal space for future shocks. The central bank may have to step in to support the economy and prevent the situation from snowballing. This includes providing liquidity to ensure market stability and functioning, being the lender of last resort to systemically important institutions and coordinating with the government on financial sector resolutions to prevent broader impact to the financial system<sup>41</sup>.

3.5.6. In the case of transition risks, a sudden and poorly planned shift in carbon policy may also expose households and corporates to diminishing asset value and stranded assets, worsening their balance sheets. This in turn worsens the asset quality of financial institutions. Central banks are also exposed to stranded assets in its own portfolio management, or in some cases portfolio of other organisations it manages<sup>42</sup>, risking a deterioration in its balance sheet.

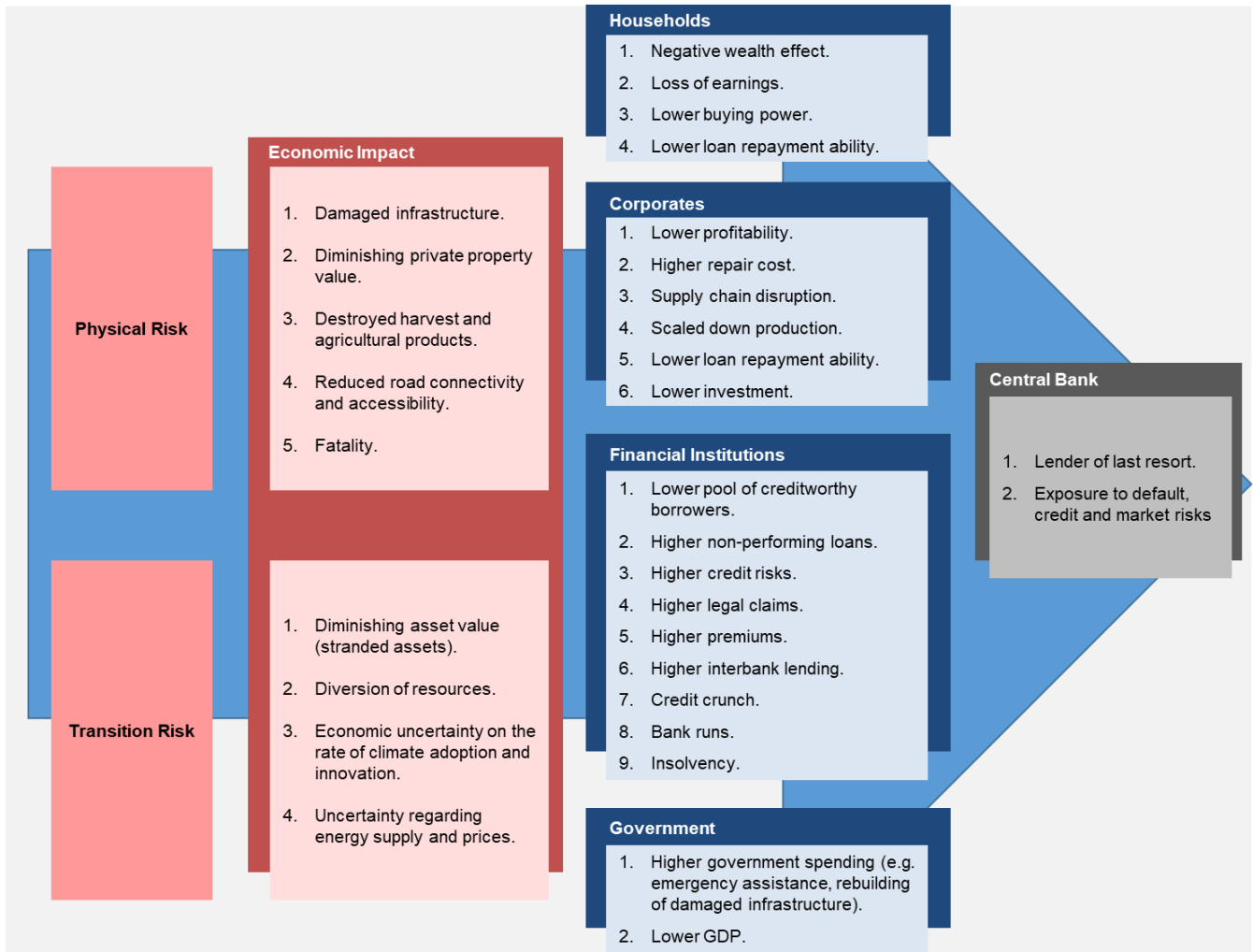
3.5.7. Sizeable impact from these risks would translate to a system-wide shock, which in the extreme could trigger a financial crisis as financial health of economic agents deteriorates. Collectively, the authorities (fiscal and monetary) are responsible to anticipate, mitigate and prevent the climate and environment-related risks from materialising into a bigger economic impact. This suggests that central banks should plan for the eventuality and ensure financial institutions and the financial system are well-prepared.

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<sup>42</sup> For example, the Norges Bank, via the Norges Bank Investment Management (NBIM), has been tasked with the operational management of the Norway's Government Pension Fund Global.

**Figure 11: Impact of weather events to the economy and economic agents**



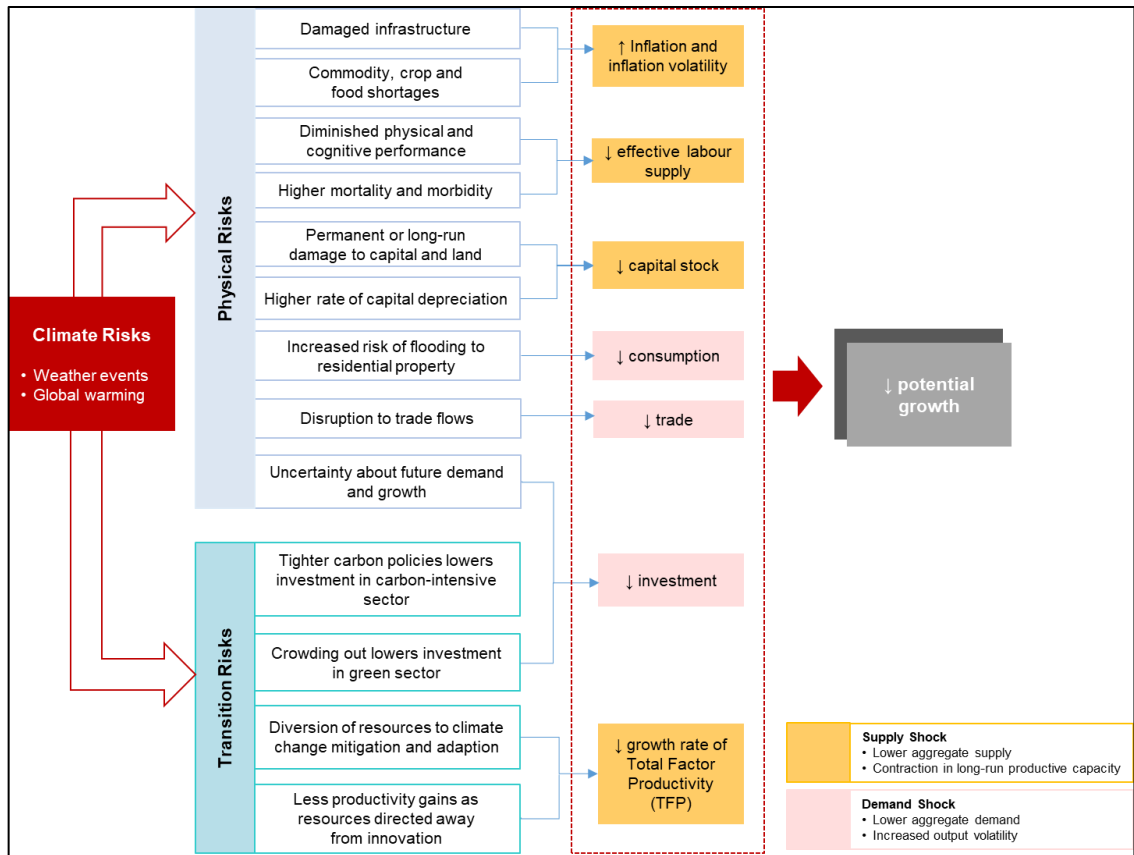
Source: NGFS (2019); IMF (2019); Batten *et al.*, (2018 and 2019) and compiled by author.

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### 3.6. Climate Risks and Monetary Stability

3.6.1. The previous section established the direct link between climate and environment-related risks to the financial system and the role of central banks in safeguarding financial stability. The relationship between climate risks and monetary stability is a subject of on-going discussions. Nevertheless, there is some agreement in the literature that weather events and climate policies have an impact on monetary stability through supply and demand shocks, both negative and positive (Figure 12).

**Figure 12: Transmission of climate risks to monetary stability**



Source: Author's own compilation. Adaptation from Batten (2018) and Batten *et al.*, (2019); IMF (2019) and NGFS (2019).

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## Physical Risks and Monetary Stability

- 3.6.2. Empirical evidence suggests, extreme weather events are likely to reduce economic growth in the short-run (Cavallo and Noy, 2009; Batten, 2018; and Batten *et al.*, 2019). Potential output can also be affected with the destruction of productive capacity and infrastructure, as well as reduced availability of natural capital (e.g. arable land).
- 3.6.3. Although the initial impact on demand is negative, a positive demand shock could arise from subsequent investment and consumption to rebuild infrastructure and restore productive capacity. There are two points worth highlighting:
- a) The timing is uncertain. For example, the 2011 flood in Thailand took eight months to recede (July 2011 – February 2012), whilst the transboundary haze affecting ASEAN in 2015 took five months to clear, from June – October 2015. As the period between the adverse weather shock and when the effects recede is not known at the outset, this creates considerable uncertainty for investment and consumption decisions, as well as for the path of monetary policy.
  - b) The impact on medium and long-term growth is also less clear. Batten (2018) and Batten *et al.*, (2019) suggested three scenarios. First, output could improve through ‘creative destruction’, whereby replaced capital is more innovative and productive. Second, it could recover to the trend level prior to the shock. Third, it may not recover to levels prior to the shock if reallocation of resources does not compensate for the initial negative impact to the resources. This uncertainty creates a challenge for monetary policy.
- 3.6.4. Global warming itself has important physical effects on economic performance. According to Batten *et al.* (2016 and 2019) and Batten (2018), extremely hot temperatures are likely to affect productive capacity by diverting capital to climate adaptation from more productive investments, reducing effectiveness of human capital and affecting Total Factor Productivity (TFP) as less resources are devoted to research and development in favor of climate adaptation. Not taking these effects into account could potentially lead central banks to misjudge the evolution of output gap and inflation (Batten *et al.*, 2016 and 2019).

## Transition Risks and Monetary Stability

- 3.6.5. Batten *et al.* (2019) noted that from a monetary policy perspective, price-based climate policy can be considered a negative supply-side shock. For example, McKibbin *et al.* (2017) concluded that while the introduction of a carbon price would have only a temporary effect on inflation, there are lasting macroeconomic consequences. A one-off increase in carbon price typically has a temporary effect on the inflation rate if agents recognise it is a one-off

change. However, in the medium-run, the policy would result in permanently higher price level for carbon-intensive goods and lower output level.

- 3.6.6. Potential output and productive efficiency may also be affected. Climate change adaptation and mitigation divert resources away from productive capital accumulation (Batten *et al.*, 2016). Resources are also diverted from research and development in currently efficient and innovative sectors and activities, leading to lower growth rate of TFP<sup>43</sup>.
- 3.6.7. The net effect of climate policies on the economy can be ambiguous given there are many moving parts. For example, higher production cost for brown sectors reduces their profitability and total output. On the other hand, if revenue from the tax is used to lower other distortionary taxes, that component of the policy would be a supply shock in the other direction, lowering costs and increasing potential output (McKibbin *et al.*, 2017).
- 3.6.8. The impact also depends on the time horizon. While the net impact in the short to medium-term may well be negative, the overall impact of such climate mitigation policies may be positive in the long-term. According to Batten (2018), the near term economic cost depends on the timing of transition. Batten argued that a gradual transition allows adequate time for the economy to adjust while more aggressive climate policy could result in inefficient mitigation and more severe impact on near term growth<sup>44</sup>. This time dimension raises the issue of appropriate monetary policy horizon.
- 3.6.9. The strategy employed to move to a low carbon economy matters. As noted by Batten *et al.* (2016), transition to a low/zero carbon economy can be achieved either by lowering energy use or increasing energy efficiency. Reducing carbon emissions solely via reduction in energy use will result in substantial reduction in output. The economic impact will be less under the alternative of increasing energy efficiency and shift to cost effective low carbon energy. Even then, the energy composition matters. Raising the share of bioenergy could increase inflation volatility as both energy and food prices may be affected by the same weather-related shocks (Batten *et al.*, 2016).
- 3.6.10. While the effects of climate and environment-related risks on the economy and financial system affect monetary stability, the role of monetary policy in this case is not straightforward. Certainly, monetary policy can play a role to mitigate the impact of shocks to economic activity and inflation<sup>45</sup>. This is well within the remit of central bank mandates. For example, the BOT eased monetary policy to alleviate the impact of the 2011 flood on the Thai economy. The question is whether there is a more direct role for monetary policy

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<sup>43</sup> For the developing economies in ASEAN, foreign direct investment (FDI) plays an important role in increasing TFP growth and subsequently potential output. There may hence be opportunities for higher FDIs into the region given the changing appetite among multinational corporations (MNCs) to transition their operations into 'green' and sustainable investments.

<sup>44</sup> Gradual does not necessarily mean slow. Batten (2018) recognised that there is the risk that the transition comes "too late and too sudden".

<sup>45</sup> It should be noted that while monetary policy can play a role when effects on the economy is broad based, it is more challenging to use monetary policy in reaction to localised adverse climate events.

to play. In considering the role of monetary policy, it is useful to consider the different aspects of monetary policy, namely the framework, formulation and operations.

### Monetary Policy Framework

3.6.11. ACBs generally have mandates for price stability and sustainable growth. While the end is similar, the means to achieve them vary across countries. Monetary policy and exchange rate frameworks in ASEAN are quite diverse. According to the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) 2018, three central banks (BI, BSP, BOT) are inflation targeting, four (AMBD, NBC, MAS, SBV) have exchange rate anchors, one (CBM) has a monetary aggregate framework and two (BNM and BOL) are classified as having other monetary framework (Table 4).

**Table 4: ACBs' monetary policy and exchange rate framework**

Central Bank	Exchange Rate Regime	Monetary Policy Framework	Monetary Policy Objective
AMBD	Currency board	Exchange rate anchor	Price and financial stability
NBC	Other managed arrangement	Exchange rate anchor	Price stability
BI	Stabilised arrangement	Inflation-targeting framework	Price stability
BOL	Crawl-like arrangement	Other monetary framework	Monetary and financial stability
BNM	Floating	Other monetary framework	Monetary and financial stability
CBM	Stabilised arrangement	Monetary aggregate target	Price stability
BSP	Floating	Inflation-targeting framework	Price and financial stability
MAS	Stabilised arrangement	Exchange rate anchor	Monetary and financial stability
BOT	Floating	Inflation-targeting framework	Monetary and financial stability

Central Bank	Exchange Rate Regime	Monetary Policy Framework	Monetary Policy Objective
SBV	Stabilised arrangement	Exchange rate anchor	Monetary and financial stability

Source: IMF AREAER 2018; and ACBs' individual websites.

3.6.12. Monetary policy mandates of the ACBs are generally adequate to address climate and environment-related risks. There is no compelling reason to broaden the monetary policy mandate. There are three reasons for this, namely credibility, efficiency and necessity:

- a) Using monetary policy for climate objectives may not be credible. As noted by Batten *et al.* (2016), a substantial reduction in carbon emissions can be achieved without a large sacrifice in GDP growth if it is possible to increase energy efficiency and/or reduce carbon intensity of energy<sup>46</sup>. As monetary policy is a blunt instrument, it cannot affect the efficiency or composition of energy usage. It affects different sectors and geographical locations the same. As a demand management tool, monetary policy can be used to influence economic activity consistent with some target level/growth of carbon emissions. Such a policy however is likely to be contractionary. It may also preclude the use of monetary policy in a countercyclical manner as loosening monetary conditions to support economic activity also increases carbon emissions. Hence, there is an issue of policy inconsistency with growth and inflation objectives.
- b) It is not efficient to use monetary policy for climate objectives. The Tinbergen rule says we need at least one instrument for each policy objective (Mundell, 1968). Mundell's principle of effective market classification adds that we should use the policy instrument that exerts the most influence over a particular objective (Mundell, 1968; and Boughton, 2003). As mentioned earlier, monetary policy in a conventional sense is a blunt tool. In this regard, it affects brown and green lending/investments equally and cannot be used in a targeted manner. Other policy tools (e.g. credit guidance)<sup>47</sup> may be better placed to influence objectives such as improving energy efficiency and encouraging the transition to low/zero carbon<sup>48</sup>.

<sup>46</sup> This is based on the identity:  $Carbon\ Emissions = Population \times \frac{GDP}{Population} \times \frac{Energy\ Used}{GDP} \times \frac{Carbon}{Energy\ Used}$

<sup>47</sup> As highlighted by Monnin and Barkawi (2015), central banks globally have used various instruments to steer credit into certain parts of the economy. An example is the Bank of England's Funding for Lending Scheme.

<sup>48</sup> Macroprudential tools such as 'sectoral/targeted' countercyclical capital buffers; or microprudential tools such as adjusting risk weights for certain sectors/activities can also be used to influence capital allocation and may be more effective than monetary policy.

Monetary policy is hence best deployed to manage overall demand conditions for broader monetary stability.

- c) A climate objective is not necessary as climate and environment-related risks are simply another set of risks that affect inflation and economic activity. Such risks can hence be managed under existing objectives of price stability and sustainable growth. A broadening of the monetary policy is not necessary. Instead, as discussed above, it may be mandate-inconsistent.

**3.6.13.** Some degree of monetary policy flexibility could be desirable given the manner climate and environment-related risks affect the economy and financial system. This applies equally in managing both physical and transition risks:

- a) Climate disruptions may create price pressure and severely affect economic activity. Under normal circumstances, a central bank would consider tightening monetary policy when faced with a positive output gap and upward pressure on inflation. This may make the situation worse. Rather than tightening, a central bank may need to instead act promptly to alleviate the impact on growth. Batten *et al.* (2019) suggested flexible inflation targeting accords such flexibility.
- b) Climate policies also affect both inflation and output. A strict focus on inflation prevents policy action to minimise adverse effects on economic activity. In assessing the responses of different monetary policy regimes to climate policy, McKibbin *et al.* (2017) concluded that a narrow focus on inflation leads to larger output losses compared to a framework that focuses on both inflation and output<sup>49</sup>.

**3.6.14.** Policy flexibility in turn requires central bank credibility to ensure inflation expectations remain anchored in the face of climate risks. What the central bank is doing must be clear to investors and the public at large. This may be challenging for central bank communications, even for those with rules-based frameworks (like inflation or exchange rate targeting), as a monetary policy action may appear to persistently deviate from stated targets or historical behavioural norms. In this regard, central banks may also have to reassess the measure of inflation or price stability used for policy and by extension for communications<sup>50</sup>.

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<sup>49</sup> McKibbin *et al.* (2017) argue in favour of national income targeting as it avoids creating public expectations of higher future inflation, and because it does not require the central bank to understand the precise nature of the climate policy shock.

<sup>50</sup> This is because the measure of core or underlying inflation used for monetary policy may be changing in ways that are yet to be known.

- 3.6.15. ACBs have varying degrees of monetary policy flexibility. The exception is AMBD, which is on a currency board arrangement. This may prevent adjustments to weather-related shocks that affect Brunei Darussalam but not the anchor currency country (Singapore). As with any fixed exchange rate arrangement, the key is to have compensating adjustment mechanisms, such as adequate fiscal space, price flexibility and factor mobility. A climate disruption can be managed if there is sufficient flexibility elsewhere.
- 3.6.16. The discussion thus far assumes monetary policy operates in the conventional sense as a demand management tool that works through influencing final expenditure (investment and consumption). To use monetary policy beyond what it is designed to achieve (such as broadening the scope to include climate objectives), requires a major rethinking and redesigning of the framework and how it works. There is also a need to understand the possible unintended consequences it may create, including changes in the dynamics between the different policies deployed.

### Monetary Policy Formulation

- 3.6.17. The earlier discussion on the impact of climate and environment-related risks on key variables affecting monetary stability, though not exhaustive, gives greater visibility on the challenges for monetary policy. To see this more clearly, we illustrate the challenge for monetary policy using a simple Taylor Rule framework<sup>51</sup>. The Taylor Rule expresses the policy interest rate as a function of the natural rate of interest, the gap between actual and desired/target inflation and the output gap.

$$r = \pi + gy + h(\pi - \pi^*) + r^f$$

- 3.6.18. Following Taylor (1999), the Report defines  $r$  as the nominal policy rate,  $\pi$  as the inflation rate,  $\pi^*$  as the target or desired rate of inflation, and  $y$  as the percentage deviation of real output from trend. The term  $r^f$  is the central bank estimate of the equilibrium real interest rate. The parameters  $g$  and  $h$  reflect the relative weights central banks attach to output or inflation stabilisation. Greater focus on inflation entails higher value of  $h$  relative to  $g$ . In this regard, this decision rule can apply to various monetary policy objectives.<sup>52</sup>

<sup>51</sup> The original rule suggested by Taylor (1993) was  $r = \pi + 0.5y + 0.5(\pi - 2) + 2$ , whereby  $r$  is the federal funds rate. The target inflation rate and the "equilibrium" real rate are both 2 per cent.

<sup>52</sup> For example, for strict inflation targeting  $g$  is zero. For flexible inflation targeting or those with growth and inflation objectives, the values for  $h$  and  $g$  are positive. Similar policy rules also underpin those with managed exchange rate regime (see Khor, Robinson and Lee (2004), which discussed a similar exchange rate policy rule for the case of MAS). Those with fixed exchange rate regime will mirror the monetary policy of currency of the anchor country.

- 3.6.19. This Report's interest in the Taylor Rule is merely to show the challenges for monetary policy.<sup>53</sup> It is noted from the earlier discussion that climate and environment-related risks affect all variables in the monetary policy decision rule above. Output and inflation will be affected, and their volatility may increase. Inflation processes and potential output may be shifting in ways not fully understood by central banks. Forecasting inflation and growth will be more difficult in the face of both physical and transition risks, especially when different climate policies have different implications<sup>54</sup>.
- 3.6.20. Another moving part is the natural rate of interest<sup>55</sup>, which may change due to shifts in trend growth and productivity from global warming. All these suggests, at the very least, more needs to be done to understand how climate and environment-related risks affect key variables affecting monetary policy decisions. Not doing so greatly increases the risk of policy error.
- 3.6.21. Another aspect of policy formulation that needs greater understanding is how monetary policy action affects the financial system and ultimately the economy. Monetary policy works through the monetary transmission mechanism (MTM).<sup>56</sup> Monetary policy works with long and variable lags (Friedman, 1961), and it works differently across countries (Havranek and Rusnak, 2012). The question is how climate and weather-related risks/events affect the MTM:
- a) Climate related disruptions can weaken the interest rate channel as uncertainty may delay investment decisions even if borrowing costs are lowered. Asset price and credit channel can also be affected as property and stock prices, as well as household and corporate balance sheets are negatively affected by extreme weather events. These may in turn affect inflation expectations.

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<sup>53</sup> While central banks may not necessarily behave in a mechanical rule-based fashion, the variables entering the Taylor Rule are important to varying degrees in setting monetary policy.

<sup>54</sup> McKibbin *et al.* (2017) noted that the design of climate policy can significantly affect how easily central banks can respond to the direct and indirect effects of the policy.

<sup>55</sup> Laubach and Williams (2001) defined the natural rate as the real interest rate consistent with output equalling potential and stable inflation. Factors affecting the natural rate include shifts in demography, trend productivity growth and global factors, among others (see for example Holston, Laubach and Williams, 2016).

<sup>56</sup> Mishkin (1996) discussed three broad transmission channels, namely interest rate, asset price and credit (balance sheet and bank lending). Subsequent literature focuses on the role of expectations (Garcia-Herrero and Remolona, 2008) and risk-taking (Borio and Zhu, 2009 and Adrian and Shin, 2009). Generally, reduction in the short-term interest rate reduces cost of funds and encourages borrowing. Expectations about the future path of monetary policy drives other interest rates along the yield curve (Sellon, 2004). Monetary policy also affects asset prices such as the exchange rate, equity and property. Lowering domestic interest rates relative to the rest of the world makes foreign deposits and assets more attractive, leading to fund outflows. The resultant exchange rate depreciation encourages exports and hence raise aggregate demand. In contrast, lower interest rates raise equity and property prices making it more attractive to undertake new investment, as well as encourage consumption through wealth effects. The credit channel centers on the important role of bank lending in economic activity. Monetary policy expansion increases bank reserves and deposits thereby increasing the quantity of bank loans available. Banks are also willing to lend more following monetary expansion given the positive effects of higher asset prices on corporate and household sectors balance sheets or net worth, and cash flows from lower interest payments. There is greater focus on the role of monetary policy in influencing banks' perception or attitudes towards risk following the 2007-2008 global financial crisis (Gambacorta, 2009). As rates of return on risk-free investments fall, banks, asset managers and insurance companies may take more risk to generate returns while improving valuations, income and cash flows in a low interest rate environment also affect risk perception by banks.

- b) Climate policy may affect the credit channel where exposures to balance sheets of companies are perceived to be brown (e.g. equities of companies in carbon intensive industries). Concerns over the health of balance sheets and default risks can affect availability of credit regardless of the cost of funds. The asset price channel is also likely to weaken if climate policies result in adverse reaction to prices of brown assets. If such assets are prevalent in the financial system, a lower interest rate will not necessarily lead to higher asset prices such that the replacement cost of capital remains high (i.e. need to issue more shares for each unit of investment).

3.6.22. It appears that in the extreme, there may be instances whereby monetary policy may be less effective. Knowing under what circumstances it can be effective, and through which channels, are key to policy decisions. This may vary across ASEAN countries given differences in economic and financial system development. As the level of ASEAN financial integration increases, and the degree of cross-border balance sheet exposure increases, it is also useful to contemplate how climate events can affect the MTM of other countries through spillovers. Similar to preceding discussion, more needs to be done to understand how climate and environment-related risks affect the MTM in each AMS.

### **Monetary Operations**

3.6.23. Central banks typically implement monetary policy through open market operations (OMO). Put simply, when the policy interest rate is changed, the central bank enters the money market to offer to buy (borrow) or sell (lend) short-term funds to financial institutions at the new rate. The market will settle at the new rate because financial institutions can always go to the central bank and transact at the new rate.<sup>57,58</sup> The change in the short-term interest rate then affects interest rates at longer maturities along the yield curve<sup>59</sup>, as well as retail lending and borrowing rates. This process also influences the overall liquidity or funds available in the financial system. The focus of monetary policy operations is thus very narrow.

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<sup>57</sup> If Bank A offers a higher rate than the central bank, Bank B would rather go to the central bank for funds. Eventually, Bank A would have to lower the interest rate at which it is willing to lend.

<sup>58</sup> Another tool is standing facilities, whereby financial institutions can always transact at the rate set by the central bank.

<sup>59</sup> As long-term interest rates are the sum of short-term rates, a change in the short-term rate should in theory transmit to long-term interest rates.



3.6.24. Reserve requirements can also be used to influence availability of liquidity<sup>60,61</sup>. Central banks determine the type of deposits subject to reserve requirements (i.e. the eligible liabilities). The effect of reserve requirements is more permanent relative to open market operations, which must be done on a continuous basis<sup>62</sup>.

3.6.25. There has been a lot of discussions on using central bank monetary operations, specifically asset purchases, to steer investments into green assets (see for example Monnin and Barkawi, 2015; and Dafermos, Nikolaidi and Galanis, 2018). It is argued that buying bonds issued by firms or governments to fund environmentally friendly investments, can reduce the costs of borrowing for such investments. This will in turn induce more green investments by firms and governments.

- a) Dafermos *et al.* (2018) argued that such an asset purchase program does not require a change in central bank mandate if it is implemented as part of their financial stability objective. It can also be implemented independent of quantitative easing policies<sup>63</sup>. Furthermore, central bank operations need not be limited to only buying and selling of green bonds (Jourdan and Kalinowski, 2019)<sup>64</sup>.
- b) Monnin and Barkawi (2015) argued that the decisions to favor green assets over others may have significant impact, as in the case of the purchase of mortgage backed securities in the US. Nevertheless, based on model simulations, Dafermos *et al.* (2018) find such an asset purchase program only has a modest effect in managing global warming more generally. Certainly, the consistent message is that such policies are not substitutes for government-led policies (Dafermos *et al.*, 2018; and Dikau and Volz, 2020).

3.6.26. The concept itself is not foreign to ASEAN. There are parallels with Islamic monetary operations. In Malaysia, BNM sets the policy interest rate, (i.e. the Overnight Policy Rate), and conduct conventional money market operations in the usual manner. Given the dual banking system (i.e. conventional and Islamic banking systems), monetary operations are

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<sup>60</sup> Historically, reserve requirements have been used as a financial stability tool (to ensure sufficient liquid assets) and as an instrument for monetary control (Feinman, 1993).

<sup>61</sup> There are opposing views to the role of reserve requirements in influencing the availability of credit. As noted by Monnin and Barkawi (2015), the traditional view is that reserve requirements affect the growth of credit by banks through the money multiplier. The alternative view suggests that reserve requirements do not impose constraints on bank lending as central banks will always support them with the reserves they need.

<sup>62</sup> Under OMO, once central bank's lending or borrowing matures, the central bank must repeat the operation to maintain liquidity at the existing level.

<sup>63</sup> This addresses a common criticism of such policies, namely that such asset purchases must be unwound as QE is scaled back.

<sup>64</sup> This is another common criticism, namely that the size of green assets is currently small and central bank purchases will quickly exhaust the supply. This is a circular problem as it will remain small unless there is a catalyst to develop the market and increase supply of such instruments.

also conducted to manage liquidity conditions in the Islamic interbank market (though not to target a specific rate)<sup>65</sup>. The degree of pass through from the conventional market to the Islamic one is high given the high interlinkages between the two systems.

- 3.6.27. Differentiated reserve requirements have also been used to favor lending for climate-friendly purposes. Monnin and Barkawi (2015) highlighted that Banque du Liban (Central Bank of Lebanon) reduced reserve requirements for banks that provide loans under its scheme to fund renewable energy products.
- 3.6.28. There is certainly scope for central banks to consider incorporating climate objectives in instruments under the control of the central bank. It should be made clear, however, that while proposals such as green asset purchases or differentiated reserve requirements should be assessed on their merits, they are not for the purpose of monetary policy.
- 3.6.29. The next chapter considers the extent of ACBs' involvement in adapting to the aforementioned challenges and supporting the overall objective of transitioning to a low-carbon economy.

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<sup>65</sup> There is no separate monetary policy for Islamic financial system.

# Chapter 4: Scanning of Global, Regional and Individual Country Efforts

## Key highlights:

- The good practices employed by central banks that are considered frontrunners in managing climate and environment-related risks include alignment to national policies; issuance of regulatory measures and guidelines to set expectations and induce behavioural change; introduction of best practices, including disclosure and risk assessment practices; adoption of incentive schemes; good data collection and taxonomy; and leading by example.
  - Against these identified practices, ACBs have room to consider the adoption of most of them. While all ACBs acknowledge that climate change poses an increasing threat to financial stability, their knowledge and capacity to understand and manage these risks, are relatively nascent. In order to address gaps, consideration must be given to account for the socio-economic structure and level of development of each AMS.
  - It is imperative that ACBs continue to adopt a gradual and/or phased approach in promoting and facilitating the transition towards a low carbon and climate resilient economy; and exercising flexibility when adopting international best practices.
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## 4.1 Overview

- 4.1.1. Chapter 4 assesses the extent of work by ACBs to integrate climate and environment-related risk considerations into their financial sector, promote green finance and manage global climate challenges. The information gathered is based on a survey conducted among Task Force members in the second half of 2019, as well as additional information available through scanning of existing literature.
- 4.1.2. The extent of the work by ACBs is then assessed against the practices of central banks that are considered frontrunners in managing climate and environment-related risks (hereafter referred to as “frontrunners”). These include alignment to national policies; issuance of regulatory measures and guidelines to set expectations and induce behavioural change; introduction of best practices, including disclosure and risk assessment practices; incentive schemes; data collection and taxonomy; and leading by example.
- 4.1.3. The next section compares the experiences of ACBs against the frontrunners on different good practices that support integration of sustainability in central banks’ work. This exercise helps ACBs to understand the areas for further development, taking into account ASEAN’s specific circumstances.

## 4.2 National policy alignment

4.2.1 On the global front, frontrunner central banks have policies that are aligned with the national policies on climate and environment. For these countries, national level policies are clear and well-coordinated across government machineries, including central banks. Many central banks are also involved in taking active roles as part of multi-agency collaborations to tackle overall climate challenges. Experience from the European Union (EU) member countries and China exemplify these points.

4.2.2 Each EU member country aligns its climate-related policy direction with the SDGs and the Paris Agreement. Several key deliverables introduced do have a direct impact on the work of central banks and financial regulators, including developing classification of sustainable activities and creating support structures for financial institutions to incorporate climate risks into their risk management policies. In 2019, the European Commission launched the European Green Deal, committing the EU to become the world's first climate-neutral continent by 2050 (European Commission, 2019).

4.2.3 Meanwhile, to address the nation-wide pollution problem in China and facilitate the transition to a low carbon economy, the Chinese government proposed the development of green finance under the 13<sup>th</sup> Five-Year Plan for Economic and Social Development in 2016. Several agencies, including the PBOC were tasked with developing a green finance system to support the government's policy direction, leading to the introduction of various policies such as the development of green finance taxonomy and introduction of interest subsidies for green loans (National Development and Reform Commission, PRC, 2016).

4.2.4 Given that ASEAN is vulnerable to the effects of climate change, with three out of ten ASEAN countries (i.e. Vietnam, Myanmar and Philippines) identified as part of the top ten most vulnerable countries based on record of climate incidents over the past twenty years (Eckstein, Hutfils and Winges, 2019), climate and environmental considerations are innate to ASEAN countries' policymaking. Prior to the introduction of the Paris Agreement in 2015, many ASEAN governments have already incorporated environment, climate or disaster-related considerations in their national policy deliberations and formulations. In addition, majority of ACBs have begun adopting climate-related considerations in their policy deliberations and regulatory approaches, primarily in response to specific climate related events, such as the provision of refinancing schemes subsequent to major floods.

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## 4.3 Regulatory Measures and Guidelines

4.3.1 Regulatory measures and guidelines are generally adopted by frontrunners to set expectations and induce change in behaviour and mindset, introduce best practices or impose regulatory standards in support of advancing climate-related goals by stakeholders in the financial sector. These measures can be used to convey regulators' current thinking, such as through the publication of the Supervisory Statement by the BOE on its expectation with regards to the financial sector's role in climate challenge. Banco Central do Brasil, the central bank of Brazil, requires financial institutions to infuse environmental and social risks in their risk frameworks (Sustainable Banking Network, 2018). Moreover, a regulatory measure may also be employed specifically to help channel more capital towards environment-friendly or green projects. For instance, since 2016, the Bangladesh Bank requires financial institutions to allocate at least five per cent of total loan disbursements to green finance (Bangladesh Bank, 2019).

4.3.2 For ASEAN, four ACBs have issued regulatory measures. SBV issued a Directive requiring financial institutions to adopt E&S risks in their credit granting activities. Moreover, its Green Bank Development Scheme (the Scheme) sets out the objective of increasing the ratio of total lending to priority green industries and sectors. In Indonesia, where regulation and supervision of the financial institutions (microprudential) are not with the central bank, OJK requires financial institutions, credit issuers as well as publicly-listed companies to establish and publish sustainability action plans. For Malaysia, BNM issued the Strategy Paper on Value-based Intermediation (VBI) in 2017, which aims to deliver the intended outcomes of Shariah through practices, conduct and offerings that generate positive and sustainable impact to the economy, community and environment. The principle can be universally applied by conventional and Islamic financial institutions. (Box 4.1). For Philippines, the BSP approved the policy on Sustainable Finance Framework. This policy issuance sets out the expectations of the BSP on the integration of sustainability principles, including those covering environmental and social (E&S) risk areas, in the corporate governance and risk management frameworks as well as in the strategic objectives and operations of banks.

4.3.3 The ACBs are able to take these directive approaches because of the strong linkage between their policies and those of national governments. SBV's approach in sustainable finance strongly adheres with and contributes to the Vietnam Green Growth Strategy (VGGS) and National Action Plan on Green Growth for 2014-2020. SBV has developed a series of policies and action plans to encourage banks to gradually move towards the goals of supporting sustainable development and green growth. Meanwhile, BI, along with the OJK, works closely with different ministries to support Indonesia's Long-Term Development Plan/RPJP (2005 – 2025), specifically to help financial institutions to provide financial assistance to priority development sectors (OJK, 2014).

4.3.4 Meanwhile, some ACBs are in the midst of developing regulatory measures or supervisory guidance. For instance, MAS has developed guidelines on environmental risk management for financial institutions across banking, insurance and asset management sectors and will be issuing the guidelines in Q4 2020. The guidelines detail its supervisory expectations on governance, risk analysis, and disclosure of climate and environmental risks. BOT is also developing supervisory and monitoring tools as well as enhancing onsite examiners' capacity to ensure that Thai banks can implement the industry-led Sustainable Banking Guidelines. For BNM, there are increasing supervisory engagements by supervisors to drive more attention within financial institutions on the management of climate and environment-related risks. During the annual supervisory assessment update to Board and senior management of financial institutions, BNM included expectations on integration of climate-related risks into financial institutions' business operations, decision making and risk management practices. BNM is also developing reference guides on climate risk management and scenario analysis.

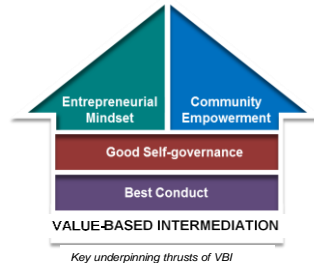
4.3.5 ACBs are starting to make progress in developing knowledge and technical capacity, including understanding financial institutions' approaches and practices in managing the risks as well as sizing the exposure. A few ACBs have taken a gradual approach to advancing climate initiatives within their financial sectors. Three ACBs, namely NBC, MAS and BOT have leveraged financial industry and banking associations in promoting the adoption of climate and environmentally sound banking practices. Such an approach has helped respective banking industries to gradually adopt sustainable practices and reduce the possibility for disruptive transitions.

4.3.6 Besides supporting an industry-led approach, other ACBs have employed a phased approach, aiming at first developing the necessary foundation for supervisors and supervised institutions, such as increasing awareness on the linkages of risks of climate change to the overall financial system, and deepening knowledge on the different approaches before exploring other regulatory tools. The BSP, for instance, started its sustainable finance journey by embarking on various capacity-building and awareness initiatives, followed by the development of regulatory issuances in phases.

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### Box 4.1: Value-Based Intermediation (VBI)

BNM, in collaboration with the Islamic financial institutions (IFIs) issued the Strategy Paper on VBI in 2017. VBI is defined as an intermediation function that aims to deliver the intended outcomes of Shariah through practices, conduct and offerings that generate positive and sustainable impact to the economy, community and environment, consistent with shareholders' sustainable returns and long-term interests.



Key building blocks to sustain industry's momentum on VBI implementation:

#### a) Nurturing potential champions

- (i) Issuance of guidance documents on implementations tools that further support VBI implementation:
  - o VBI Financing and Investment Impact Assessment Framework (VBIAF) in November 2019.
  - o Three VBI sectoral guides will be issued in 2020 as supplementary guide to VBIAF, focusing on identified sub-sectors namely Renewable Energy, Efficient Energy and Palm Oil.
- (ii) The Community of Practitioners (CoP) as a knowledge exchange platform among 12 participating IFIs in advocating VBI implementation.

#### b) Strategic networking

- (i) Increased VBI awareness and participation of CoP members in global sustainability movement:
  - o Global Islamic Finance Forum (GIFF) 2018 amplified international recognition of VBI through media interviews (e.g. UNEP-FI quoted VBI in the document of Principles for Responsible Banking)
  - o Participation of domestic financial institutions as members of the international network (i.e. UN's Environment Programme Finance Initiative Principles for Responsible Banking (UNEP-FI) and Global Alliance for Banking on Values (GABV))
- (ii) Capacity building:
  - o Series of Joint Technical Training Workshops from October 2018 until June 2019 – co-organised by BNM and The World Bank which focused on experiences and approaches in incorporating ESG criteria into banking and business consideration

#### c) Value-based products and offerings

Value-based financial solutions and offerings being introduced in the Malaysian market:

- o Issuance of the world's first SDG sukuk by a licensed foreign Islamic bank which references the UN's SDGs for the use of its proceeds
- o Preferential financing rates for the purchase of new hybrid vehicles and Green Building Index (GBI) certified residential properties.
- o Launch of working capital financing programme for women entrepreneurs. This facility is equipped with financial literacy sessions to assist entrepreneurs in managing and upscaling their businesses more efficiently.

## 4.4 Incentives

4.4.1 Another common policy tool is the use of incentives. Frontrunners with long track records of promoting sustainability have generally employed incentives to attract funds from financial institutions and investors to support development of green or sustainable projects. Incentives can be categorised into financial and non-financial schemes. Financial incentives are introduced to reduce or compensate for additional costs incurred by financial participants in ensuring that their practices are sustainable, such as green verification costs. Examples of financial incentives include low cost refinancing facilities for green and eco-friendly sectors offered by the Bangladesh Bank (Hossain, 2018) and the PBOC re-lending facility, which provides low cost funding to banks to lend to green projects (PBOC, 2016). Financial incentives have also been provided to support the development of green credit markets such as through subsidies for the verification fees in Hong Kong (Hong Kong Monetary Authority, 2018) or allowing the use of green bonds as a collateral for borrowing from the PBOC (Yao, 2018).

4.4.2 For ASEAN, a few ACBs have adopted incentive schemes. Similar to frontrunners, schemes are employed to support the development of green finance. For example, MAS supports the issuance of green, social and sustainability bonds by covering the costs incurred as a result of engaging independent external review or rating assessment to ascertain the bond status (MAS, 2019). BI imposes a more favourable regulation on loan-to-value (LTV) of green building loans to support transition to a low carbon economy.

## 4.5 Disclosure and risk assessment practices

4.5.1 Another important good practice is disclosure and risk assessment practices as these support transparency and ensure sufficient risk buffers. Globally, regulatory bodies and central banks are encouraging financial institutions to disclose and report their climate-related exposure. For instance, by 2022, all listed companies and major asset owners in the United Kingdom are expected to disclose climate-related risk exposures based on the Task Force on Climate-Related Financial Disclosures' (TCFD) recommendations. The BOE is also working on its own disclosure based on such recommendations (The United Kingdom Government, 2019). Another example is from China where the China Banking Regulatory Commission (CBRC) mandates the banks to collect and report data on green credits statistics (CBRC, 2013).



4.5.2 To support forward-looking risk quantification, several central banks have begun developing models and scenarios to stress test financial institutions on their exposure to climate and transition risks. For instance, DNB has conducted a stress test on its financial sector's vulnerability to energy transition risk. The exercise resulted in potentially sizable but manageable losses, suggesting the need for financial institutions to include energy transition risk in their risk management (Vermeulen, Schets, Lohuis, Kölbl Jansen and Heeringa, 2018). The BOE has issued a consultation paper on exploratory scenario on climate change. It proposes to assess potential physical and transition risks for a 30-year horizon and using three climate scenarios. It is expected to report on the stress test exercise in 2021 (BOE, 2019).

4.5.3 While ACBs have recognised that climate risks may translate into financial risks through physical and transition risk channels, many ACBs are still at the early stage of studying the climate and environment-related risk exposure of their respective financial sectors as well as understanding the linkages of these risks to financial and price stability. Few ACBs have required regulated entities to have climate risk disclosure, such as the requirement by the SBV for financial institutions to report on activities that support green development ("green transaction"). Some ACBs such as BNM and MAS have encouraged financial institutions to disclose their climate risk exposures based on international best practices.

4.5.4 Similarly, on risk assessment practices, a majority of ACBs have not conducted climate-related risk assessment. MAS has included financial institutions' sustainability practices in its supervisory assessments, while some ACBs are exploring ways to integrate climate scenarios into stress testing practices. However, the lack of data is likely to hamper a meaningful stress test exercise<sup>66</sup>. Thus far, only BNM and MAS have conducted climate-related stress testing exercises focusing on the insurance sector.

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<sup>66</sup> A meaningful stress test exercise would require data that can capture physical risks arising from damage to properties and transition risk arising from changes in policies and technologies, which can provide assessments of the potential impact of such risks on financial stability and economic growth (IMF, 2020).

## 4.6 Data Collection and Taxonomy

4.6.1 Green taxonomy is defined as a “guide to climate aligned assets and projects. It is a tool for issuers, investors, governments and municipalities to help them understand what the key investments are that will deliver a low carbon economy” (Climate Bonds, 2019). It may be developed at the institution, national or regional levels and/or international as a commonly used standard or principles.

4.6.2 Developing a common taxonomy is encouraged to identify, assess and manage the risk associated to the organisation or its activities, help to understand risk differentials between assets, to mobilise capital for low-carbon investment and enhance transparency of an economy’s stage of transition to a low-carbon economy (WWF, 2019; NGFS, 2019).

4.6.3 Specifically, a common taxonomy aims to:

- a) Standardise the definition of eligible green or sustainable economic activities across different markets;
- b) Limit market fragmentation of green finance;
- c) Safeguard against green-washing that would mislead the claim of environmental benefits;
- d) Provide the foundation for further initiatives, for example, disclosures and reporting standards, incentives, stress-testing, or risk assessment framework;
- e) Facilitate quantification of exposures of financial institutions;
- f) Formulate regulatory policy (re)calibration; and
- g) Enable the financial sector to identify and respond to financial opportunities that contribute to environmental objectives.

Some countries’ experiences on taxonomy are worth mentioning.

4.6.4 China has developed three sets of green finance definitions to support its pollution control and energy saving objectives:

- a) Green loan definition by the CBRC issued in 2014. The publication sets a broad scope for loans to 12 sectors to be qualified as green loans, paving the way for green data collection and subsequently mandatory reporting of green credit activities by financial institutions.
- b) Green Bond Endorsed Project Catalogue by China Green Finance Committee issued in 2015, with the purpose of promoting the China green bond market. This Catalogue provides a more comprehensive classification of green activities than the previous green loan definition<sup>67</sup>.

- c) Green Industry Catalogue drafted with the collaboration of seven Chinese ministries<sup>68</sup>. This Catalogue aims to be an umbrella taxonomy and to harmonise different standards among Chinese ministries to support formulation of incentives and measures for green industry development (Sustainable Banking Network, 2018b).

4.6.5 The EU published its taxonomy in 2019, with the aim to enable investors and the capital markets to identify investment opportunities that can make positive contribution to climate goals and related SDGs. To qualify for EU taxonomy, activities must contribute to at least one of six environmental objectives, namely: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, waste prevention and recycling, pollution prevention control, and protection of healthy ecosystems.

4.6.6 In corollary, according to the EU taxonomy, activities must do no significant harm to other environmental objectives. Moreover, the taxonomy also specifies detailed technical screening criteria for different activities, including quantitative as well as qualitative metrics which activities must possess in order to be eligible (European Commission, 2019).

4.6.7 Overall, the approaches for green classification by global frontrunners vary greatly, depending on their main objectives, country-specific standards and national level transition agenda. Given that currently only a few ACBs require reporting on green activities, lack of data presents a big challenge for ACBs. Developing individual taxonomies may help address data gap; however, consideration must be taken on the readiness for ASEAN to transition to low carbon economy and achieving a common language across ASEAN.

4.6.8 While all ACBs acknowledge the need for having a taxonomy and standard classification, a sudden requirement of classifying assets related to carbon-intensive industries as "brown" in ASEAN countries can lead to a large amount of assets to become "stranded" as they unexpectedly become devalued and need to be written down due to incompatibility with the transition. A sudden deteriorating market valuation of key assets and debt servicing capacity could potentially translate into credit and market risks to financial institutions in ASEAN countries and create a major setback to economic growth and development.

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<sup>67</sup> It covers six environment objectives including: (1) Energy Saving; (2) Pollution Prevention and Control; (3) Resource Conservation and Recycling; (4) Clean Transportation; (5) Clean Energy; and (6) Ecological Protection and Climate Change Adaptation.

<sup>68</sup> National Development and Reform Commission, Ministry of Industry and Information Technology, Ministry of Natural Resources, Ministry of Ecology and Environment, Ministry of Housing and Urban-Rural Development, People's Bank of China, and the National Energy Administration.

4.6.9 Despite these concerns, some ACBs have already developed a broad set of definitions or are exploring use of taxonomy. For instance, in Indonesia the OJK has defined 11 broad sectors, such as Renewable Energy and Energy Efficiency, as environmentally sound economic activities (OJK, 2017). The SBV in 2017 has released a Green Project Catalogue which defines green sector, including green banking, sustainable forestry, green industry, renewable energy, clean energy, recycling and reusing of natural resources, among others<sup>69</sup>. MAS is working with the financial industry to study the feasibility of developing a taxonomy which financial institutions can refer to as they look to serve and mainstream green finance in Singapore and the region.

4.6.10 Besides these, BNM is exploring the use of a principle-based taxonomy. The Discussion Paper on Climate Change and Principle-based Taxonomy, issued in December 2019 for consultation, provides a principle-based guidance for financial institutions in identifying and classifying activities, which may potentially contribute in meeting climate goals. With the taxonomy, financial institutions are encouraged to set their risk appetite and perform climate and environmental risk assessment and scenario analysis for effective risk management. The guidance will then require financial institutions to report their exposures to climate related risks to BNM for data collection purposes. Next, BNM is looking at integrating this initiative into prudential supervision.

4.6.11 While individual experiences of ACBs vary in terms of the development of taxonomies, ASEAN collectively has issued the ASEAN Green Bond Standards based on the International Capital Market Association's (ICMA) Green Bond Principles (GBP) in 2017. The ASEAN standards provide a starting point for green activity classification, as it specifies a list of ten broad categories for green project eligibility<sup>70</sup>. According to the ASEAN Capital Markets Forum (2018), to be eligible for ASEAN Green Bond label, eligible projects would also have to comply with the GBP's four core components to:

- a) Identify the use of proceeds;
- b) Have the process for evaluation and selection;
- c) Have the process to manage bond proceeds; and
- d) Report on use of proceeds and impacts.

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<sup>69</sup> Other green sectors defined by SBV include waste treatment and pollution prevention, environmental and ecosystems protection, natural disaster prevention, sustainable water management in urban and rural areas, green building, sustainable transportation, and provision of environmental protection and energy saving.

<sup>70</sup> These categories are not exclusive; projects that fall outside of these categories may still be considered eligible.

4.6.12 Next, ACBs may need to look at whether there is a need to develop a collective ASEAN taxonomy for the banking sector or perhaps to leverage other available taxonomies, including the viability of leveraging on the ASEAN Green Bond Standards' ten broad categories. While further research in this area is required, it is beyond the scope of this Report.

## 4.7 Lead by Example

4.7.1 With growing awareness of the need to manage climate challenge, many central banks show strong commitment by being at the helm of embracing the principles of sustainability. The most notable action is from the call by the NGFS for “Integrating sustainability factors into own-portfolio management” (NGFS, 2019a) by central banks, as doing so would unlock massive amount of capital into environment-friendly companies and projects as well as limit potential ESG and reputation risks from holding assets with large climate exposure<sup>71</sup>. In fact, a survey conducted on NGFS members in 2019 found that most of the respondents are already adopting Sustainable and Responsible Investment (SRI) strategy, and almost half of the respondents have disclosed at least a part of their SRI approach (NGFS, 2019b).

4.7.2 Turning to ASEAN's experience, a few ACBs have embedded greening activities in their investment processes. NBC and BSP started investing in green bonds through funds managed by the BIS. NBC also invests its foreign reserves in green bonds. MAS works closely with its external fund managers to ensure that ESG considerations are incorporated into their investment process. In November 2019, MAS launched a USD2 billion Green Investment Programme which will be deployed into green or ESG-integrated funds with a strong environmental focus managed by asset managers. BNM too, has integrated ESG factors in investment strategy for its portfolio (equity and bonds). While a few ACBs have begun investing in green assets, most ACBs have not disclosed their own portfolio climate exposure or assessed potential climate risk exposure.

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<sup>71</sup> As noted by Fender, McMorro, Sahakya and Zulaica (2019), sustainability as a reserve management objective should be balanced against the traditional objectives of liquidity, safety and return. In this regard, they find that sustainability objectives can be integrated into reserve management frameworks without forgoing safety and returns. In fact, adding green bonds can generate diversification benefits and improve risk-adjusted returns of traditional government bond portfolios. Nevertheless, the relatively small size of green bond markets currently limits accessibility and liquidity.

**4.7.3** Aside from the investment process, at this juncture, most ACBs focus on adopting greening activities to reduce waste and lower carbon footprint. For instance, BI upgraded its building infrastructure to meet new green building and energy standards. BI and BSP also issued a “no single-use plastic zone” policy in its office complex and discouraged the use of plastic bottles. BSP implemented paper reduction measures through digitalisation, installation of solar panels and adoption of ecologically responsive building designs. Moreover, BSP has adopted Sustainable Central Banking as one of its strategic objectives. BSP commits to embedding sustainability principles and ESG aspects in its corporate strategy and key operations to the greatest extent possible. This would translate into integrating the same in its mandates, enterprise-wide risk management system, investment portfolio management, currency production and procurement, among others. Meanwhile, MAS has focused its green efforts on upgrading its building to green standards, introducing water and paper saving measures, reducing plastic use and currency note printing (e.g. introducing “Good as New” notes). BNM has started, for a number of years now, watering its grounds using rainwater harvested from its roofing systems; printing fewer brand new notes; using durable polymer banknotes to prolong circulation lifespan; embarking on a digitalisation strategy to significantly reduce the internal usage of paper; charging for the use of plastics and banning the use of plastic straws.

## **4.8 How do ACBs fare?**

**4.8.1** ACBs are generally at the early stages of efforts to understand the impact of climate and environment-related risks on the economy and financial sector, as well as to explore appropriate approaches to advance climate change agenda within their jurisdiction. There is room to catch up across most of the good practices by frontrunner central banks (Table 5 compares ACB’s efforts and progress vis-à-vis practices by frontrunners). While progress is evident in the ‘lead by example’ category through central bank own operations and investments, gaps are notable in the ‘alignment to national policies’ category, as existing alignments (where available) are in relation to the management of weather-related events (e.g. flood); the disclosure and risk management practices; and data collection and taxonomy categories. Some ACBs appear to be more advanced than their regional peers across selected good practices, such as BI, MAS, SBV, primarily due to the clear national policies or whole-of-government approach.

- 4.8.2 Gaps in different dimensions of sustainability practices can likely be attributed to a number of factors and challenges. Among others, is the lack of information to guide ACBs' decision making in incorporating climate and environment-related risks in setting monetary policies. There is also a lack of expertise and capabilities in assessing such risks. Socio-economic considerations also play a role as most AMS are emerging economies that depend on fossil-fuelled power generation to meet their energy and developmental needs. The transition to sustainable energy and climate-resilient infrastructure therefore can potentially force the already-limited resources/funding to be channelled away from other productive and growth-enhancing projects, damaging near-term growth prospects. Developments are also hampered by the low awareness of the ASEAN general public on the need to address climate action compared with those of developed economies<sup>72</sup>. Lastly, is the lack of quality and meaningful data. These challenges are elaborated in Chapter 5.
- 4.8.3 Similar to ACBs, most ASEAN financial institutions are generally at the early stages of adopting sustainability practices, with the majority of the financial institutions at the capacity building stage, through active participation in forums or conferences. Several ASEAN financial institutions have taken the lead in integrating sustainability in all or many facets of their operations – from introducing environmental and social risk management (ESRM) system to adopting international best practices, including in disclosure standards.
- 4.8.4 In Indonesia, eight banks accounting for 46 per cent of the total banking assets supported and participated in the Indonesia Sustainable Finance Initiative launched in 2018. Recognised as the “First Movers on Sustainable Banking”, these banks expressed their commitment in promoting sustainable finance practices. In particular, these eight banks have adopted an E&S policy while five have incorporated E&S consideration in their loan agreements.
- 4.8.5 Likewise, several large banks in the Philippines, have demonstrated first move initiatives by developing and implementing their respective Sustainability Strategy Frameworks and/or Green Finance Frameworks which integrate sustainability principles in its corporate strategy and business operations in the context of contributing in the national Sustainable Development Goals.
- 4.8.6 In order to address gaps, consideration must be placed to carefully account for the economic structure and developments as well as the social status of each AMS. These considerations underline ACB's gradual and/or phased approach in promoting and facilitating the transition towards a low carbon and climate resilient economy. ACBs may need to chart their own path and exercise flexibility when adopting the good practices discussed earlier. For example, in developing a taxonomy, ACBs need not follow the path of the frontrunners. A principle-based taxonomy provides greater flexibility to ACBs and to financial institutions in adopting a progressive transition to a more sustainable economy given the developing nature of most ASEAN economies.

4.8.7 In the meantime, ACBs can continue their current efforts towards building their knowledge and capacity as well as those of their supervised institutions. In doing this, ACBs as well as their supervised institutions have partnered with prominent international organisations, to support capacity building and advance policy developments. Many ACBs also conduct knowledge-sharing sessions, awareness raising campaigns, forums, trainings and/or seminars – often in collaboration with experts, academia and development partners. A few ACBs have hosted annual conferences, targeting banking industry leaders, to encourage the industry to take part in country's overall sustainability journey. In addition, ACBs also support green product and financing, promote disclosure and exploring data collection. Box 4.2 highlights efforts made by some ACBs on capacity building and partnerships.

4.8.8 The next chapter highlights the challenges faced by ASEAN financial sector in greening the economy.

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#### **Box 4.2: ACBs capacity building and partnerships**

**MAS** engages environmental specialists in financial institutions and Non-Government Organisations (NGOs) to leverage their experiences on climate and environmental risk assessment and disclosures. For example, MAS is working with local and international partners such as World Wide Fund (WWF)'s Asia Sustainable Finance Initiative, and has signed a memorandum of understanding with the International Finance Corporation (IFC) to accelerate the growth of green bond market in Asia through capacity building courses. MAS also actively participates in the Sustainable Insurance Forum (SIF), which is a network for insurance supervisors working to strengthen their understanding of and responses to sustainability issues for the insurance sector.

**BNM**, in collaboration with other regulators, relevant ministries and agencies and multilateral organisations, organised the first Regional Conference on Climate Change in September 2019 to create greater awareness and understanding of climate and environment-related risks and its impact on the financial industry. BNM and Securities Commission Malaysia co-chair the Joint Committee on Climate Change (JC3), which serves as a regulator-industry platform to accelerate industry readiness in supporting the transition to low-carbon economy.

**BOT** hosts the Bangkok Sustainable Banking Forum annually since 2018, targeting the banks' board of directors and top executives. It also holds a series of workshop on sustainable banking on a quarterly basis with the support from both domestic (e.g. TBA) and international (e.g. WWF) organisations. The BOT is collaborating with IFC on developing sustainable finance road map for the Thai financial sector.

**BSP** has forged a partnership with the IFC to promote and support capacity-building of BSP supervisors, supervised financial institutions and stakeholders in the adoption of ESG and corporate governance practices in banking operations. It has also partnered with the banking associations, academia, and other interest groups for the conduct of several fora and training programs on relevant subjects.

**Table 5: Comparison of Frontrunners' initiatives and ACBs**

	Alignment to National Policy	Regulatory Measures and Guidelines	Incentives	Disclosure and Risk Assessment Practices	Data Collection and Taxonomy	Lead by Example
<b>Frontrunners</b>	<p><b>China:</b> PBOC was tasked to develop green finance system, such as the taxonomy and introduction of interest subsidies for green loans.</p> <p><b>EU:</b> European Green Deal.</p>	<p><b>Banco Central do Brazil:</b> FIs to internalise environment and social risks into risk framework.</p> <p><b>Bangladesh Bank:</b> FIs to allocate 5% of loan disbursement to green financing.</p>	<p><b>Bangladesh Bank:</b> Low-cost refinancing facilities for green and eco-friendly sectors.</p> <p><b>HKMA:</b> Subsidy to green verification fees.</p> <p><b>MAS:</b> Issued Sustainable Bond Grant Scheme to cover cost of independent external review/rating of green, social and sustainable bonds</p> <p><b>PBOC:</b> Low cost funding to banks to lend to green projects via re-lending facility.</p>	<p><b>Disclosure</b> <b>BOE:</b> Developing climate disclosure based on TCFD's recommendations; and</p> <p><b>CBIRC:</b> Banks to collect and report data on green credits statistics.</p> <p><b>Risk Management</b> <b>BOE:</b> Issued consultation paper on stress test methodology.</p> <p><b>DNB:</b> Conducted stress test on financial sector's vulnerability to energy transition.</p>	<p><b>CBIRC:</b> Green loan definition.</p> <p><b>China Green Finance Committee:</b> Green Bond Endorsed Project Catalogue.</p> <p><b>EU:</b> Taxonomy.</p>	<p><b>MAS:</b> Launched a USD2 billion Green Investment Programme, which will be deployed into green or ESG-integrated funds with a strong environmental focus managed by asset managers.</p> <p><b>NGFS:</b> Central banks to integrate sustainability factors into own-portfolio management.</p>
<p><b>ASEAN central banks</b> (including initiatives by the Otoritas Jasa Keuangan (OJK))</p> <p><b>[Closer to the frontrunner]</b></p>	<p><b>BI:</b> Indonesia's Long-Term Development Plan/RPJP (2005-2025).</p> <p><b>MAS:</b> MAS: Singapore's Long-Term Low Emissions Development Strategy</p> <p><b>SBV:</b> Vietnam Green Growth Strategy (VGGs) and National Action Plan on Green Growth for 2014-2020.</p>	<p><b>BI and OJK:</b> FIs to provide financial assistance to priority development sectors.</p> <p><b>BSP:</b> Guidelines for banks on the adoption of sustainable finance principles including ESRM and disclosure requirements. To issue granular expectations in managing climate and E&amp;R risks in relation to credit, market, liquidity and operational risks.</p> <p><b>MAS:</b> To issue guidelines on environmental risk management for FIs across banking, insurance and asset management sectors in Q4 2020. MAS also has included FIs' sustainability practices in its supervisory assessments.</p> <p><b>SBV:</b> Directive for FIs to adopt environment and social risks into credit granting activities; introduced Green Bank Development Scheme.</p>	<p><b>BI:</b> Relaxed regulation on loan-to-value of green building loans.</p>	<p><b>Disclosure</b> <b>BNM and MAS:</b> Encourage FIs to disclose climate risk exposure; and conduct climate-related testing exercise for insurance sector.</p> <p><b>SBV:</b> FIs to report activities supporting green development.</p> <p><b>Risk Management</b> <b>MAS:</b> Include sustainability practice into supervisory assessment framework.</p> <p><b>BNM and MAS:</b> Conduct climate-related testing exercise for insurance sector.</p>	<p><b>BNM:</b> Issued discussion paper to explore principle-based taxonomy.</p> <p><b>OJK:</b> Identified 11 broad environmentally sound economic activities.</p> <p><b>SBV:</b> Defined six priority projects for green growth development.</p>	<p><b>BI:</b> Upgrade building infrastructure to meet new green building and energy standards; no single-use plastic zone policy.</p> <p><b>BNM:</b> Harvest rainwater for watering plants; print fewer brand new notes; and use durable polymer banknotes to prolong circulation lifespan.</p> <p><b>BSP:</b> Invest in BIS green bonds; no single-use plastic zone policy; paper reduction measures, installation of solar panels and adoption of ecologically responsive building designs.</p> <p><b>NBC:</b> Invest foreign reserves in green bonds and BIS green bonds.</p>
<b>[Early or at the nascent stage]</b>	<p>Most central banks' alignment to national policy are limited to managing weather-related events (e.g. floods).</p>	<p><b>Gradual approach</b> <b>BOT:</b> Support the Sustainable Banking Guidelines – Responsible Lending by the banking association.</p> <p><b>NBC:</b> Endorse the Sustainable Finance Principles by the banking association.</p> <p><b>Phased approach</b> <b>BNM:</b> Adopt a phased approach aiming at first to develop the necessary foundation, then integrating sustainable finance principles and environmental and social risk management guidelines in the supervisory activities and regulatory framework</p>		<p>Majority of ACBs are at early stage of disclosure and have not conducted climate related risk assessment.</p>	<p><b>MAS:</b> Working with industry to study feasibility of developing a taxonomy.</p>	

Source: Author's analysis based on survey results from ACBs.

# Chapter 5: Challenges Faced in Greening the Financial System

## Key highlights:

- ACBs need to balance between climate targets and socio-economic objectives, and enhance coordination with broader governmental climate efforts when developing policies for the financial sector.
  - ACBs need to work together with various stakeholders, including academia, scientists, financial regulators, industry and other governmental agencies in driving the national climate agenda, as challenges extend beyond the banking sector.
  - Key challenges impeding the ASEAN financial industry in incorporating climate change considerations include lack of common taxonomy, standards or principles; lack of data and technical expertise, and existing structural barriers in obtaining capital for green projects.
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## 5.1. Overview

5.1.1. Notwithstanding the progress made thus far, a more widespread adoption of green finance in the region remains challenging. A survey was conducted among Task Force members on the challenges facing the different ACBs in their efforts to green the financial system. Based on the responses, the Task Force has categorised the challenges into two broad sections:

- a) Challenges facing the ACBs in introducing policies to manage climate change. This section elaborates on the extent of actions that can be taken by ACBs based on their mandates, how ACBs need to balance between climate targets and socio-economic objectives, and the need for greater coordination with broader governmental climate efforts when developing policies for the financial sector;
- b) Challenges facing the industry in incorporating climate change considerations. This section touches on issues preventing the flow of capital towards areas that complement climate efforts, such as the lack of a common taxonomy for classifying green activities, the need for ASEAN-specific standards or principles for originating green lending instruments, unavailable, inaccessible or inconsistent data for analysing climate and environment-related risk, lack of technical expertise in assessing such risks, as well as existing structural barriers preventing businesses from accessing capital resources.

The subsequent paragraphs will elaborate on these challenges.

## 5.2. Challenges faced by ACBs in introducing policies to manage climate change

5.2.1. The survey findings highlighted three main challenges facing the ACBs in introducing policies to green the financial system:

- a) Clarity of mandate of central banks in managing climate and environment-related opportunities and risks;
- b) Finding the appropriate balance between meeting climate objectives and socio-economic priorities; and
- c) Central banks are typically less involved in the development of a national climate strategy, and might not be as informed on the implications of a national climate strategy on policies developed for the financial sector.

### **Clarity of mandate of central banks in managing climate and environment-related opportunities and risks**

5.2.2. While central banks play an integral role in maintaining financial and monetary stability, they have not traditionally dealt with climate change and environment-related risks. In addition, the different interpretation of mandates among ACBs have also contributed to the varied progress on green finance in the region.

5.2.3. Most ACBs acknowledge the impact of climate change on financial stability and some have started to implement initiatives in this regard. Against a growing body of literature describing the impact of climate and environment-related risks on financial stability, several ACBs have started to enhance their internal monitoring of these risks, and to increase financial institutions' awareness of climate and environment-related risks<sup>73</sup>.

5.2.4. For ACBs to consider incorporating climate and environmental considerations in setting monetary policies, the survey found that the ACBs would require further information to guide their decision making in this regard. These include information on:

- a) Whether and how green securities can be considered eligible securities for monetary operations, since they may not be of the same liquidity or risk level as government securities and other traditionally accepted liquidity instruments; and
- b) How to reliably forecast the impact of climate shocks to the macro-economy over the long term.

5.2.5. Lastly, most ACBs do not have a developmental agenda to promote the greening of the financial sector. MAS has gone beyond introducing risk management policies to developing incentive schemes to encourage green growth efforts. Some other ACBs, such as AMBD,

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<sup>73</sup> For example, BOL and CBM are currently studying the potential financial stability risks and transmission channels associated with environmental issues.

BSP and NBC, have elected to instead work with other governmental agencies and industry players to coordinate efforts in developing the green finance market.

### **Balancing between climate targets and socio-economic objectives**

5.2.6. Majority of AMS are still urbanising with populations in the process of moving from lower to middle-income. Majority of ACBs indicated that they face the challenge in balancing national climate targets and socio-economic objectives, considering that ACBs are less involved in the development of a national climate strategy. ACBs also face the challenge in developing feasible policies that balance between green and growth objectives for the financial sector due to the long payback period of green projects. Two examples of the tensions between national climate targets and socio-economic objectives were cited by ACBs:

- a) AMS' energy needs are traditionally met through fossil-fuelled power generation, and energy demands are expected to rise across ASEAN. While there has been a progressive shift to more renewable energy sources with ASEAN setting targets to secure 23 per cent of its primary energy sources from renewables by 2025 (from only 10 per cent in 2015), a sudden phasing out of financing to fossil fuel assets to meet climate targets would have adverse consequences on AMS' economic growth and social well-being; and
- b) Another example includes activities where a broader impact to the environment and society needs to be balanced. For example, while dams serve as an important renewable energy source in the region and financing the construction of dams could help meet climate goals, their construction have often been associated with biodiversity loss, natural habitat destructions and involuntary resettlement.

### **Challenges in translating broader national environmental and sustainability objectives into financial policy frameworks**

5.2.7. All AMS have national strategies in place to tackle climate change. As signatories to the Paris Climate Agreement, all 10 AMS have developed a national strategy on climate change, which sets out the pathway to achieve low carbon and climate resilient economic development. Most AMS have set out specific quantifiable targets across sectors to be achieved under the national climate strategy, while others are in the process of doing so. The Ministry of Environment (or equivalent agency which has the responsibility of managing national environmental issues) generally has primary responsibility for developing and implementing the targets under the national climate strategy, in coordination with other governmental agencies that have an environmental target mandate.

- 5.2.8. However, ACBs are less involved in the development of the national climate strategy, as tackling climate-related risks do not form part of their primary mandate of ensuring price and financial stability. A report by DBS and the United Nations Environmental Programme (2017) found that there had been limited progress in terms of translating the broader national environmental and sustainability objectives into coherent financial policy frameworks.
- 5.2.9. This in turn prevents the financial system from being effectively aligned with the nation's climate goals. Some ACBs had also received feedback from financial institutions that specific guidance on their role in the national climate strategy, such as nationally identified categories of environmentally-sustainable activities or indicators on loan lending limits to greenhouse gas emitting sectors, would be helpful in ensuring more targeted action towards climate change.
- 5.2.10. Nonetheless, there has been some positive progress to date. As the linkages between climate and environmental risks and financial stability become more apparent, most ACBs have started supporting the broader governmental climate objectives. These include the development of roadmaps<sup>74</sup> and the introduction of policies to enhance the awareness and capabilities of financial institutions to climate-related risks and spur the channelling of capital into environmentally friendly activities. Some ACBs have also formed partnerships with other financial regulators<sup>75</sup> and governmental agencies<sup>76</sup> to better coordinate policies developed across the financial sector.

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<sup>74</sup> For example, MAS announced a Green Finance Action Plan in November 2019 to make green finance a defining feature of the financial sector, by taking actions across three key thrusts: (a) build financial system resilience to environmental risks; (b) develop green finance solutions and markets, and leverage innovation and technology.

<sup>75</sup> For example, Malaysia has recently established a JC3 to pursue collaborative actions for building climate resilience within the Malaysian financial sector with the focus in the initial phase being on risk management, governance and disclosure, product and innovation, and engagement and capacity building initiatives. Co-chaired by BNM and the Securities Commission Malaysia (SC), the JC3 comprises senior officials from BNM, SC, Bursa Malaysia and 19 financial industry players. To coordinate policies to encourage the channelling of funds towards green credit, Thailand has also set up a Working Group on Sustainable Finance in October 2019 to coordinate policies to encourage the channelling of funds towards green credit, with members consisting of the BOT, the Ministry of Finance, the Securities Exchange Commission, the Office of Insurance Commission and the Stock Exchange of Thailand.

<sup>76</sup> In this respect, BSP is involved in the creation of an inter-agency governmental council to institutionalise the implementation of a roadmap for sustainable finance, facilitate investment in public infrastructure, and mobilise funds to finance sustainable development projects that are consistent with the nation's climate goals.

### 5.3. Challenges facing financial sector in incorporating climate change considerations

5.3.1. As a whole, there is a high level of awareness and receptiveness among ACBs of the national climate agenda. ACBs have taken action in support of the national climate agenda to enhance the practices and capabilities of the ASEAN financial sector in dealing with climate change. However, there remain gaps in individual financial institutions' adoption of best practices. Key challenges impeding the industry in incorporating climate change considerations highlighted by the survey findings are:

- a) Lack of a common taxonomy to define and classify green and transitional economic activities;
- b) Lack of a common set of standards or principles tailored to an ASEAN context for green lending instruments;
- c) Unavailable, inaccessible or inconsistent data for climate and environmental risk analysis;
- d) Lack of technical expertise to integrate climate and environment-related considerations into business and risk management functions; and
- e) Existing structural barriers impeding businesses access to capital for green projects.

#### **Lack of a common taxonomy for green and transitional activities**

5.3.2. While efforts have been made by a number of international organisations and governments to develop common taxonomies in recent years, there has been a lack of convergence of these taxonomies into a common global definition for economic activities that are deemed environmentally-friendly or supporting the transition to a low-carbon economy. Against this backdrop, some financial institutions have turned to defining green and transitional activities in-house based on their own standards<sup>77</sup> while taking reference from the spectrum of taxonomies available. These definitions often vary in scope and detail depending on the respective needs of each financial institution.

5.3.3. ACBs highlighted the absence of a common taxonomy as a key challenge impeding the flow of capital towards green and transitional activities. Adopting existing taxonomies may not be applicable in the ASEAN context, given ASEAN-specific circumstances, which would require broader principles. In comparison with other regional blocs such as the EU, ASEAN is not a supranational entity and hence does not have legislative powers over its member states.

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<sup>77</sup> For example, some global financial institutions have introduced a list of climate change or related projects/activities, commonly referred to as climate finance; while others have offered broader definitions that encompass environmental and social issues.

- 5.3.4. There are two implications for ASEAN financial institutions: (1) an unwillingness to lend to such activities given the higher costs incurred for project identification and potential reputational concerns over green washing; and (2) difficulties in identifying and assessing the risk impact of green and non-green lending and investments to their existing portfolios.
- 5.3.5. ACBs have received feedback from their financial institutions on difficulties in identifying green projects, which results in a decreased willingness to lend or invest in such projects as higher search costs for project identification would be incurred. Financial institutions have expressed concerns over the potential reputational risks associated with green washing that they might face, due to the lack of a common understanding on what constitutes green or transitional. Project due diligence would also likely to be poorly performed without a common classification framework.
- 5.3.6. ASEAN financial institutions also face challenges in evaluating climate change risk in their balance sheet or portfolios, or both, due to the lack of a consistent green and non-green asset classification within their country. Some ACBs have started work on developing national taxonomies to better identify and classify such activities<sup>78</sup>. Given the close economic and financial linkages among AMS, ACBs agreed on the importance of a common taxonomy for the ASEAN financial sector, to prevent fragmentation in the classification of green and transitional activities across ASEAN. A more common language will also facilitate capital allocation within ASEAN.

#### **Lack of ASEAN specific standards/principles for origination of green financing products**

- 5.3.7. Standards or guidelines for the issuance of green financing products can help to improve the transparency, consistency and uniformity of such issuances for companies and investors, while also providing financial institutions with guidance on best market practices during the issuance process.
- 5.3.8. ACBs highlighted the lack of standards or principles guiding the origination of green lending instruments in an ASEAN context as another challenge impeding the mainstreaming of such instruments. There are currently standards in place for the issuance of green, social and sustainability bonds in ASEAN since 2018 (the ASEAN Green Bonds Standards). In contrast to bonds, there are no corresponding ASEAN standards for green and sustainability-linked loans. Instead, most financial institutions in ASEAN place reliance on international standards

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<sup>78</sup> For example, BNM is currently developing a principle-based taxonomy to provide guidance to financial institutions in identifying and classifying economic activities that could contribute to climate change objectives. In Vietnam, the SBV has issued green credit reporting guidelines for twelve sectors deemed to be environmentally friendly. The Ministry of Natural Resources and Environment of Vietnam has also issued a list of green projects and projects with high environmental pollution risk as a reference for financial institutions.



and principles, such as the Loan Market Association’s Green and Sustainability Linked Loan Principles, to guide the origination of green and sustainability-linked loans.

5.3.9. To promote the growth of green lending, some ACBs have begun putting in place more detailed principles specific to a national and broader ASEAN context. Similar to the ASEAN green, social and sustainability bond standards, a set of ASEAN-specific principles or guidelines for green and sustainability linked loans could help accelerate the take-up rate of such instruments.

**Unavailable, inaccessible or inconsistent climate and environmental data to guide business decisions and risk management**

5.3.10. Having robust climate and environment-related data is crucial for financial institutions to incorporate climate and environment-related considerations into their business and risk management functions. For instance, data is needed for a bottom-up and quantitative analysis of the macroeconomic impact of climate and environment-related risks, as well as assessment of viability of business opportunities. Similar to findings from international literature, ACBs observed that data is a significant impediment for both financial institutions and central banks. The known issues with data are set out in the Table 6 below:

**Table 6: Known issues with data**

Issue Related to Data	Description
<p><b>Unavailable</b></p> <p><i>Not available in a manner that ACBs/financial institutions can translate into current models</i></p>	<ol style="list-style-type: none"> <li>1. The field of research on climate and environmental-related issues, particularly from the financial and regulatory perspective, remains nascent.</li> <li>2. A major reason is the lack of data available that is useful to facilitate such research..</li> <li>3. For instance, AMBD cited lack of data to monitor and measure the impact of climate and environment related risks on the portfolios of financial institutions.</li> </ol>
<p><b>Inaccessible</b></p>	<ol style="list-style-type: none"> <li>1. In the current landscape, data is collected and published by multiple parties that include specialised agencies, such as environmental ministries and non-governmental organisations. The financial industry may not have access to such data collected by these parties.</li> </ol>

Issue Related to Data	Description
	2. Accessibility to data is also limited by a lack of a data collection framework (i.e. data is available, but not collected in a format that can be meaningfully utilised, or data that is available, but lacking in frequency or timeliness).
<b>Inconsistent</b>	1. Data and information collected by various parties may adopt different definitions or is captured differently which complicates or impedes their use by regulators or financial institutions for risk assessment and policy analysis.  2. With the lack of standards/guidelines on data collection, the data collected may also be unreliable.

### **Lack of technical expertise to support integration of climate and environment-related considerations into business and risk management functions**

#### Climate and environmental risk management

- 5.3.11. Technical capabilities are required in assessing and monitoring climate and environment-related risk, and in supporting the incorporation of these considerations into existing risk management functions.
- 5.3.12. Most financial institutions in the region have begun integrating climate and environment-related considerations into their risk management framework under categories such as credit, operational and reputational risk. However, the extent to which financial institutions have done so varies across countries, with some players still in the early stages. In general, it has been observed that larger financial institutions appear more advanced in integrating these considerations into their operations, with smaller players lacking the expertise to do so. Without technical capabilities, financial institutions struggle to translate climate and environment-related parameters into financial and economic impact. This can hinder more effective risk management, and potentially lead to financing of environmentally harmful projects.
- 5.3.13. While there are existing guidelines and methodologies available, technical expertise is still required to interpret and implement these guidelines and methodologies. For instance, regionalised standard and specific guidelines for implementing the environmental management process in lending activities, such as the Equator Principles<sup>79</sup>, can be used by

<sup>79</sup> In 2002, the World Bank's International Financial Cooperation (IFC) and the De Nederlandsche Bank proposed green credit loan criteria (now called the Equator Principles). The Equator Principles are a risk management framework, adopted by financial institutions, for determining, assessing, and managing environmental and social risk in projects. The Principles are

financial institutions in terms of helping them apply risk management mechanisms at various stages of the lending process to identify, measure, monitor and mitigate environmental and social risks. Other tools and methodologies, i.e. the footprint methodology, have also been developed to help measure the impact on the environment. Nonetheless, financial institutions, as well as regulatory authorities, will still require the technical capabilities to implement the risk management mechanisms effectively, as well as to analyse information and data covering climate-related risks in order to work towards achieving both economic development and environmental protection.

#### Identification and assessment of green opportunities

5.3.14. Green investment opportunities exist in the region. However, the lack of sufficient technical capabilities for project identification and pricing has resulted in financial institutions being incapable or unwilling to capture these opportunities. The survey findings demonstrated that a key reason why financial institutions express reluctance to invest in green sectors is due to the limited understanding of the risks, such as credit and market risks, at various stages of the investment cycle. This could in turn lead to an overestimation of risks vis-a-vis the climate contribution arising from investing in green projects hence leading to the belief that the pricing of green products would not be as competitive as, or on par with, non-green products. For banks, such opportunities may entail riskier activities that may not be compatible with deposit funding. As a result, ASEAN financial institutions offer limited financial products designed specifically to finance environment-friendly projects, with substantial technical assistance needed from multilateral organisations to develop such products.

#### Implementation of TCFD recommendations

5.3.15. Lack of technical capabilities is also a reason commonly cited by financial institutions for not implementing the TCFD recommendations. Some of the bigger financial institutions in ASEAN<sup>80</sup> have started experimenting on climate-related risks and scenario analysis. However, the willing institutions still face the capacity and knowledge challenges to

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primarily intended to provide a minimum standard for due diligence and monitoring to support responsible risk decision-making. As of mid-2018, 92 financial institutions in 37 countries are members of Equator Principles. At present, the Equator Principles have become the standard for international banks in implementing green credit policy.

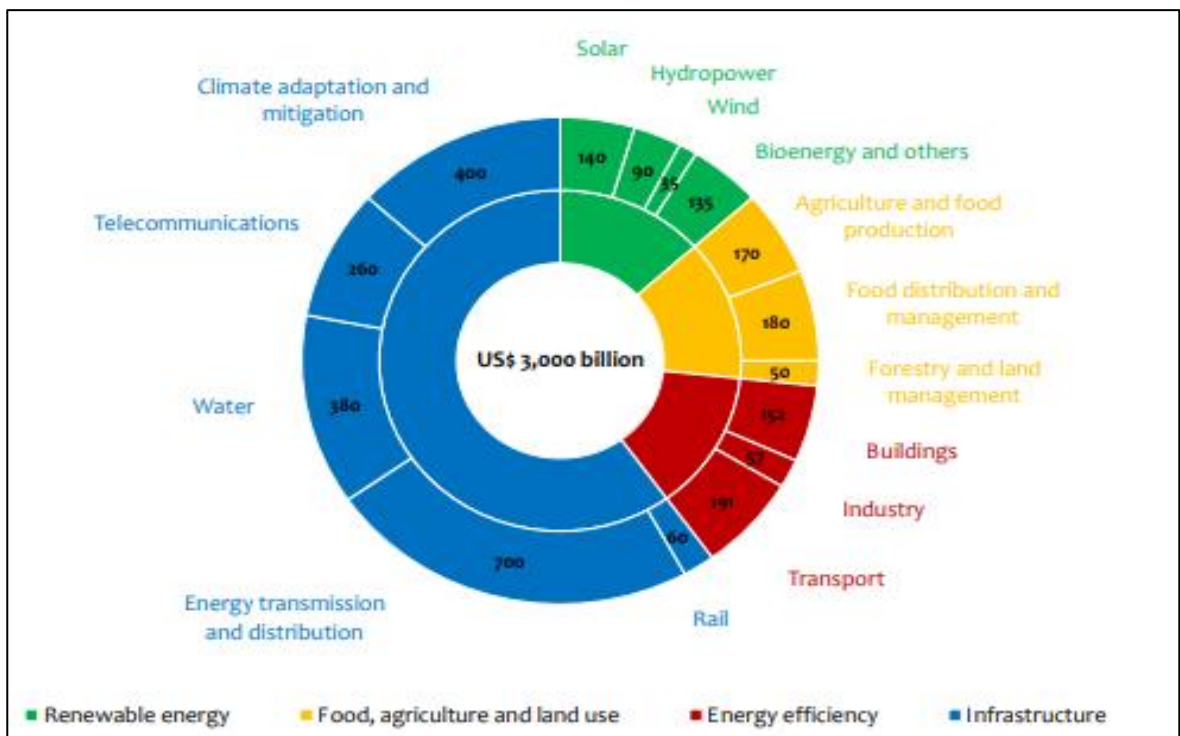
<sup>80</sup> In DBS Group Holdings Ltd's Sustainability Report 2019, the bank analysed the transition risk impact on selected customers from carbon-related regulations using scenarios reflecting three different carbon prices. Credit risk models were used to evaluate the potential credit deterioration arising from the impact of higher carbon cost on cash flows. Kasikornbank, as covered in its Climate-Related Scenario Analysis Summary Report 2018, conducted its first internal climate-related scenario analysis with focus on selected high-risk sectors – automotive and parts, industrial agriculture, petroleum and petrochemical products; and utilities (gas and coals). The purpose was to identify risks and opportunities arising from the scenarios and what actions Kasikornbank may need to take to mitigate the risks.

appropriately integrate climate-related issues in their business operations and risk management.

**Existing structural barriers impeding access to capital for green projects**

5.3.16. The financing needs to support the sustainable development of ASEAN economies are expected to be huge. According to a joint DBS and UNEP 2017 report, it is estimated that ASEAN will need an average of USD200 billion per annum in green investments from 2016 to 2030. These immense needs cannot be borne by public finances alone and private capital from a variety of sources will have to be crowded in. However, current annual average supply of green finance in ASEAN is estimated at only USD40 billion with private sector financing contributing only around 25 per cent of current flows.

**Figure 13: ASEAN green finance opportunities - sectoral breakdown (in USD billion)**



Source: Joint report by DBS and UNEP (2017)

5.3.17. While there has been strong interest from investors and lenders in providing financing for green activities, there are existing structural barriers in ASEAN which impede the flow of capital to such activities on top of the challenges highlighted in the above sub-sections. Two key barriers are tabulated below (Table 7):

**Table 7: Key barriers**

Issue	Description
<b>SME access to Financing</b>	<ol style="list-style-type: none"> <li>1. Access to finance for SMEs has historically been highlighted as a material problem for ASEAN due to factors such as a lack of credit history, a reliance on collateralised lending with high collateral requirements and high interest rates (DBS and UNEP, 2017).</li> <li>2. The issue is compounded in the green financing space where the high search and verification costs for green projects due to a lack of a common definition of environmentally friendly projects, and inadequate disclosures from firms on their environmental footprint, has impeded the flow of funds towards green activities.</li> </ol>
<b>Maturity Mismatch</b>	<ol style="list-style-type: none"> <li>1. Many environmentally friendly projects tend to be long term in nature with high levels of capital expenditure. This can result in some banks being constrained in their ability to extend long-term loans to such projects due to the shorter maturity of their depositor base and the need to avoid excessive maturity transformation (G20 Green Finance Synthesis Report, 2016).  Maturity mismatch challenges are particularly pertinent in ASEAN where loans serve as an important component in the financing mix of corporates.</li> </ol>

5.3.18. In this respect, capital market instruments with longer durations, such as green bonds, can serve to resolve structural barriers in bank lending such as maturity mismatches between deposit and lending tenures. For example, banks can tap on the green bonds market as a source for long term funds to finance environmentally friendly projects. Green bonds can also serve as a complement to bank lending for corporates and have become an effective means of directing investment capital towards long term climate mitigation, resilience and adaptation projects.

5.3.19. As some of the challenges identified extend beyond the banking sector, there is a need for ACBs to work together with various stakeholders, including academia, financial regulators, industry, scientists and climate specialists and other governmental agencies driving the national climate agenda to encourage the widespread adoption of green finance in ASEAN. The next part of this Report will cover the key recommendations for ACBs in greening the financial system.

## Chapter 6: Non-binding Recommendations

### 6.1. Overview

6.1.1. The ACBs recognise the implications of climate and environment-related risks for financial and price stability. This is indicated by ACBs' efforts in integrating climate and environment-related risks into their regulatory and supervisory frameworks and own central bank operations and efforts in upscaling green or sustainable finance. The varying levels of advancement among ACBs and the development gaps between the frontrunners and the ACBs' reflect the unique circumstances and challenges faced by ACBs.

6.1.2. To address gaps, ACBs must take account of the social and economic structures, as well as level of development of each AMS. These considerations underline ACB's gradual and/or phased approach in promoting and facilitating the transition towards a low carbon and climate resilient economy.

6.1.3. Against these gaps and challenges, the Task Force puts forth the following non-binding recommendations, which are grouped into seven strategic themes that reflect the desire for a unified ASEAN approach towards managing climate and environment-related risks; the transitional needs of each AMS; and the deepening of regional economic and financial integration. These themes are:

- a) Capacity Building and Awareness;
- b) Central Bank Leadership;
- c) Regulatory and Supervisory Framework;
- d) Develop an ASEAN Green Map;
- e) ASEAN Voice;
- f) Surveillance and Assessment Framework; and
- g) Communication Strategy.

### 6.2. Recommendation 1: Capacity Building and Awareness

6.2.1. There is a need to deepen knowledge and understanding of central bankers and supervisors on managing climate and environment-related risks. Some potential areas are as follows:

- a) Climate science;
- b) Taxonomy;
- c) Different types of green/sustainable finance products;
- d) Environmental and social risk management;
- e) Stress testing and scenario analysis; and
- f) Disclosure requirements.

- 6.2.2. At the regional level, ACBs can leverage the ASEAN Steering Committee on Capacity Building (SCCB)<sup>81</sup> to facilitate the matching of demand and supply of central bank training programmes and courses relating to climate change. This requires expanding the mandate of the SCCB to go beyond supporting regional financial integration; and institutionalising climate and environmental-related initiatives under the ASEAN central banks process.
- 6.2.3. Parallel to this, individual ACBs may collaborate with other central banks, multilateral or foreign development partners, climate scientists, or academia on increasing capacity and technical expertise in the industry. Individual ACBs also may join international coalitions established towards advancing sustainability in the financial sector, such as the NGFS and SBN to exchange information and best practices on climate and environment risk management. Moreover, individual ACBs can take a collaborative approach with key government agencies, academia and non-governmental organisations to facilitate the sharing of knowledge and expertise among these agencies.
- 6.2.4. To deepen supervisors' understanding on how to manage the vulnerabilities of the financial system to climate and environment-related risks, the ACBs should undertake training and forge closer engagements with environmental experts, international organisations, regulators, academia, non-governmental organisations, financial institutions as well as corporates. This can be done at national level or jointly at the ASEAN region. ACBs can also jointly initiate a network of supervisors to serve as a knowledge sharing platform to keep abreast with international and national developments, as well as exchange of views and experience.
- 6.2.5. In the area of monetary policy, ACBs can focus on deepening and understanding how climate risks affect key monetary policy variables, such as factors underlying the output and inflation gaps, as well as the monetary transmission mechanism. This is critical to improve forecasting ability and understand the impact of monetary policy, thereby minimising risk of policy missteps.

### 6.3. **Recommendation 2: Central Bank Leadership**

- 6.3.1. ACBs can publish regular updates<sup>82</sup> to show collective global leadership whilst incentivising individual ACBs to demonstrate meaningful efforts. Leading by example or adopting a culture that embodies sustainability will contribute to the shaping of the behavior of supervised financial institutions.

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<sup>81</sup> A working group under ASEAN Financial Integration initiative to facilitate meeting the capacity building needs of ASEAN central banks, co-chaired by the Asian Development Bank and the South East Asian Central Banks Research and Training Centre (SEACEN Centre).

<sup>82</sup> Such as a part of the permanent agenda in ASEAN Central Bank Governors' Meeting (ACGM)/ ASEAN Finance Ministers and Central Bank Governors' Meeting (AFMGM) and inclusion in the AFMGM joint statement.

6.3.2. While some ACBs have undertaken green activities such as reducing paper usage, complying with green building and energy standards and investing in green bond fund launched by the BIS, individual ACBs may consider embedding sustainability principles in their strategic direction, enterprise-wide risk management, currency production, reserve management, asset management and other operational activities. In this context, the ACBs may conduct self-assessment exercises to determine the potential impact of climate and environment-related risks in their respective operations.

6.3.3. Alongside this, the ACBs can contribute to increasing the availability of instruments to mobilise foreign and private sector investments for green finance activities by:

- a) Taking the lead in working with other domestic government agencies to grow the supply of green or sustainable finance. For instance, central banks can explore supporting their domestic government agencies' understanding in green instruments such as bonds, with a view to issue them under their agency's ambit; and
- b) Providing regulatory guidance and/or incentives, taking into account each ACB's mandate, to encourage financial institutions' participation in green or sustainable financing of eligible projects.

#### 6.4. **Recommendation 3: Regulatory and Supervisory Framework**

6.4.1. Generally, ACBs are in the early stages of formulating prudential regulations that incorporate climate and environment-related risks and developing the corresponding supervisory approach and tools.

6.4.2. To support the climate and environment-related risk management practices in the region, the ACBs may initiate a study on the development of a taxonomy. As a start, an overarching ASEAN level taxonomy may be developed, serving as a reference for national level taxonomy, taking reference from existing national taxonomies developed by AMS and other leading jurisdictions where available. Other than green activities, the common taxonomy should also take into consideration transitional activities, given that many AMS are making a progressive shift towards a low-carbon economy. In addition to the benefits of developing a common taxonomy, a principle-based ASEAN-level taxonomy could provide more flexibility to AMS and to financial institutions in adopting a progressive and orderly transition towards a more sustainable economy given varying stages of economic development. This taxonomy could be used to support the measuring and labeling of green or sustainable financial products.



6.4.3. Aside from the development of a taxonomy, a set of ASEAN-specific lending principles or guidelines may be developed and issued in order to standardise and provide clarity to both borrowers and lenders for the origination of green and sustainability linked loan instruments. This effort can facilitate the growth of green lending in the ASEAN region. It will be equivalent to the ASEAN Green, Social and Sustainable Bond Standards, which ASEAN has already established.

6.4.4. Consistent with the ACBs' mandate on safeguarding the financial system, there is a need to ensure that supervised financial institutions are managing climate risks like any other financial risks. In this respect, individual ACBs can initially issue high-level principles which set out the supervisory expectations on the integration of climate- and environment-related considerations in the corporate governance framework, risks management systems, and strategic direction or business model of supervised entities commensurate with their size, risk profile and complexity of operations. Such supervisory expectations may serve to:

- a) Encourage supervised financial institutions to conduct stress testing or scenario analysis to determine the potential impact of and level of vulnerability of the financial system to climate and other environment-related risks; and
- b) Incentivise disclosure of information on the risks that climate change pose to financial institutions' businesses and other qualitative information on governance, risk management and strategies.

6.4.5. There is also a need to bridge data gaps to properly analyse the impact of climate and environment-related risks. ACBs may consider initiatives to facilitate information collection and monitoring of climate and environment risks, such as enhancing existing reporting requirements.

6.4.6. ACBs should also consider climate and environment-related risks in their supervisory assessment framework.

## 6.5. **Recommendation 4: Develop an ASEAN Green Map**

6.5.1. Central banks and the financial sector operate within the broader financial system. To ensure end-to-end development of a green financial system in ASEAN, there is merit for ACBs and other sectoral committees and taskforces working on sustainability in ASEAN to consider the joint development of an ASEAN green financial system roadmap or an "ASEAN Green Map". This is to ensure comprehensive development and unified efforts across banking and insurance, the capital market and ancillary services (e.g. green certification, advisory services, etc.). A complete green financial ecosystem ensures a coherent (rather than piecemeal) approach to manage climate and environment-related risks and promote

sustainable finance. Lessons can be drawn from strategies to develop Islamic finance from the ground up in several ASEAN countries<sup>83</sup>.

- 6.5.2. The Green Map may leverage the various initiatives across the different sector-specific reports and roadmap(s) developed, whilst identifying common recommendations which cut across the financial sector, such as common taxonomies, which would require joint actions from the sectoral committees involved.

## 6.6. Recommendation 5: ASEAN Voice

- 6.6.1. ASEAN has unique socio-economic challenges and this must be reflected in the formulation of global standards and policies. ACBs should seek to present common interest and unique circumstances at international platforms (e.g., NGFS, IMF and BIS) to communicate regional views in climate and environment-related policy discussions that affect financial and monetary stability in ASEAN.

## 6.7. Recommendation 6: Surveillance and Assessment Framework

- 6.7.1. As the world transitions towards a green and low carbon economy, it has been challenging for regulators and supervisors to properly monitor risk exposures and assess the vulnerability of the financial sector towards climate and environmental risks. An obstacle towards creating an effective surveillance and assessment framework is the limited availability of data, as well as the limited guidance on the key data needed to provide a meaningful information and assessment of risks.
- 6.7.2. In this context, the ACBs may collectively initiate a study on the possibility of developing a common data collection framework. Such a framework can provide general guidance on the types and structure of data and information that should be gathered by ACBs to facilitate effective monitoring and assessment of climate and environment-related risks for financial stability and monetary policy purposes. This allows for some level of convergence across ACBs for regional level surveillance and risk assessment purposes. Nonetheless, given the differences in legislative frameworks and data collection regimes and maturity of each ACB, this may be best approached in phases starting with a feasibility study. The development of the framework should take into consideration the regulation, institutional arrangements, as well as stage of developments and readiness of each jurisdiction.

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<sup>83</sup> Brunei, Indonesia and Malaysia.

- 6.7.3. The framework may serve the following purposes:
- a) Provide broad guidance for individual ACBs in generating relevant national data.
  - b) Aid ACBs in providing data for surveillance by international organisations such as the IMF and the World Bank.

## 6.8. Recommendation 7: Communication Strategy

- 6.8.1. The ACBs broadly agree that the threat of climate and environment risks to financial and price stability is real. While some ACBs have undertaken efforts to manage the threats, there remains a question among various stakeholders, including the public on the need for central banks' involvement; and how far central banks should stretch their mandate.
- 6.8.2. Against this background, there is an urgent need for ACBs, individually and collectively, to develop a clear communication strategy to support and build central bank's legitimacy and credibility, respectively, in this journey to manage climate change.
- 6.8.3. At the national and institutional levels, clarity as to central banks' policy direction and approach to sustainability will help guide the financial industry, anchor public perception and more broadly help justify involvement in greening the financial system.
- 6.8.4. Given increasing global appetite for green investments, a clear communication strategy to show ACBs commitment to move towards a green financial system will promote confidence among foreign investors<sup>84</sup>. It is especially important to explain the challenges facing the region to manage expectations of global investors on the pace of transition.

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<sup>84</sup> The greater demand for green investments by international fund managers and financial institutions generally reflect the broader shift in the preferences of their investors and depositors.

**Table 8: Summary on list of recommendations**

Themes	Recommendations
<p><b>1. Capacity Building and Awareness</b></p>	<ul style="list-style-type: none"> <li>• Leverage the ASEAN Steering Committee on Capacity Building (SCCB), for the matching of demands and supplies of central bank training programmes and courses relating to climate change</li> <li>• Collaborate and build partnerships with other central banks, multilateral or foreign development partners, climate scientists, or academia on increasing capacity and technical expertise in the industry.</li> <li>• Join international coalitions established with the objective of advancing sustainability in the financial sector.</li> <li>• Collaborate with key government agencies and non-governmental organisations.</li> <li>• Further understand how climate risks affect both cyclical and structural monetary policy variables.</li> <li>• Develop a network of ASEAN supervisors to exchange experiences in implementing the relevant recommendations by international bodies, such as the five recommendations of the NGFS Guide for Supervisors – integrating climate-related and environmental risks into prudential supervision.</li> </ul>
<p><b>2. Central Bank Leadership</b></p>	<ul style="list-style-type: none"> <li>• Embed sustainability principles including environmental, social and governance (ESG) standards into central bank operations and strategies.</li> <li>• Take the lead in working with other domestic government agencies to grow the supply of green or sustainable finance.</li> <li>• Consider providing incentives to financial institutions, where appropriate.</li> </ul>
<p><b>3. Regulatory and Supervisory Framework</b></p>	<ul style="list-style-type: none"> <li>• Study feasibility of adopting principles-based ASEAN-wide taxonomy for green and transitional activities.</li> <li>• Develop ASEAN green lending principles or guidelines.</li> <li>• Facilitate information collection and monitoring of climate and environment-related risks by enhancing existing reporting requirements.</li> <li>• Integrate climate and environment-related risks in the supervisory assessment framework.</li> </ul>
<p><b>4. ASEAN Green Map</b></p>	<ul style="list-style-type: none"> <li>• Consider the development of a roadmap or an “ASEAN Green Map” to ensure a comprehensive development and unified efforts across banking and insurance, capital market and ancillary services (e.g. green certification, advisory services, etc.).</li> </ul>
<p><b>5. ASEAN Voice</b></p>	<ul style="list-style-type: none"> <li>• Communicate ASEAN’s common interests and unique circumstances, where appropriate, at international platforms.</li> </ul>
<p><b>6. Surveillance and Assessment Framework</b></p>	<ul style="list-style-type: none"> <li>• Study the possibility of developing a common data collection framework.</li> </ul>

Themes	Recommendations
<b>7. Communication Strategy</b>	<ul style="list-style-type: none"><li>• Develop a clear communication strategy to support and build central bank's legitimacy and credibility, respectively, in the journey to manage climate change; to guide the financial industry; and to signal commitment towards greening the financial systems.</li></ul>

## References

- Adrian, T. and Shin, H.S., 2009. Financial intermediaries and monetary economics. *Federal Reserve Bank of New York Staff Reports*, no. 398. Federal Reserve Bank of New York. New York.
- Allen, M., Rosenberg, C., Keller, C., Setser, B. and Roubini, N., 2002, A Balance Sheet Approach to Financial Crisis. *International Monetary Fund (IMF) Working Paper WP/02/210*. IMF. Washington, D.C.
- American Meteorological Society (2018). Explaining extreme events in 2017 from a climate perspective, *Bulletin of the American Meteorological Society*, 99(12).
- ASEAN Capital Markets Forum (ACMF), 2018. ASEAN Green Bond Standards. *ASEAN Capital Markets Forum*.
- Bangladesh Bank, 2019. Annual Report 2017/2018. Bangladesh Bank. Dhaka.
- Bank of England, 2019. Discussion Paper: The 2021 biennial exploratory scenario on the financial risks from climate change. Bank of England. London.
- Bank of England, 2019. Supervisory Statement | SS3/19 Enhancing banks' and insurers' approaches to managing the financial risks from climate change. Bank of England. London.
- Batten, S., 2018. Climate change and the macro-economy: a critical review. Bank of England working papers 706, Bank of England.
- Batten, S., Sowerbutts, R. and Tanaka, M., 2016. Let's talk about the weather: the impact of climate change on central banks. Bank of England working papers 603, Bank of England.
- Batten, S., Sowerbutts, R. and Tanaka, M., 2019. Climate change: Macroeconomic impact and implications for monetary policy. In *presentation at "2019 Economics of Climate Change Research Conference" hosted by Federal Reserve Bank of San Francisco, San Francisco, United States*.
- Bolton, P., Despres, M., Da Silva, L.A.P., Samama, F. and Svartzman, R., 2020. The green swan: Central banking and financial stability in the age of climate change. Bank for International Settlements.
- Borio, C. and Zhu, H., 2012. Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?. *Journal of Financial stability*, 8(4), pp.236-251.
- Boughton, J.M., 2003. On the origins of the Fleming-Mundell model. *IMF Staff Papers*, 50(1), pp.1-9.
- Carney, M., 2015. Breaking the Tragedy of the Horizon—climate change and financial stability. *Speech given at Lloyd's of London*.
- Cavallo, E. and Noy, I., 2009. The Economics of Natural Disasters: A Survey. *Inter-American Development Bank Publications (Working Papers no.1664)*, Inter-American Development Bank.
- China Banking Regulatory Commission, 2013. General Office of the China Banking Regulatory Commission Document: CBRC General Office (2013) No.185. China Banking Regulatory Commission. Beijing.
- Cœuré, B., 2018, November. Monetary policy and climate change. In *speech at "Scaling up Green Finance: The Role of Central Banks" conference hosted by Deutsche Bundesbank, Berlin, Germany, November (Vol. 8)*.
- Dafermos, Y., Nikolaidi, M. and Galanis, G., 2018. Climate change, financial stability and monetary policy. *Ecological Economics*, 152, pp.219-234.
- Dafermos, Y., Nikolaidi, M. and Galanis, G., 2018. Can Green Quantitative Easing (QE) Reduce Global Warming?. *Policy Brief*.

- DBS and UNEP, 2017. Green Finance Opportunities in ASEAN. Singapore.
- Debelle, G., 2019. Climate change and the economy. In *Public Forum hosted by the Centre for Policy Development, Sydney* (Vol. 12).
- Dikau, S. and Volz, U., 2019. Central banking, climate change and green finance. *Springer Handbook of Green Finance: Energy Security and Sustainable Development*. New York.
- Dikau, S. and Volz, U., 2020. Central bank mandates, sustainability objectives and the promotion of green finance. *SOAS Department of Economics, Working Paper, (232)*, London.
- Eckstein, D., Hutfils M., and Wings, M., 2019. Global Climate Risk Index 2019 “Who Suffers Most from Extreme Weather Events? Weather-related Loss Events in 2017 and 1998 to 2017”. Germanwatch. Bonn.
- Ehlers, T. and Packer, F., 2017. Green bond finance and certification. *BIS Quarterly Review September*.
- European Commission, 2019. EU taxonomy for sustainable activities. European Commission.
- European Commission, 2019. Green Finance. European Commission.
- Feinman, J.N., 1993. Reserve Requirements: History, Current Practice, and Potential Reform. *Federal Reserve Bulletin*, 79, page 569 - 589.
- Fender, I., McMorrow, M., Sahakyan, V. and Zulaica, O., 2019. Green bonds: the reserve management perspective. *BIS Quarterly Review, September 2019*.
- Garcia-Herrero, A. and Remolona, E.M., 2008. Managing expectations by words and deeds: monetary policy in Asia and the Pacific. Bank for International Settlements. Basel.
- Gambacorta, L., 2009. Monetary policy and the risk-taking channel. *BIS Quarterly Review, December 2009*.
- Global Survey on Sustainability and the SDGs., 2020. Results of the Global Survey on Sustainability and the SDGs. Global Survey. Hamburg.
- Groepe, F., 2016. The Changing Role of Central Banks. *Address by Mr François Groepe, Deputy Governor of the South African Reserve Bank, at the University of the Free State, Bloemfontein, 12*.
- Havranek, T. and Rusnak, M., 2012. Transmission lags of monetary policy: A meta-analysis. *International Journal of Central Banking*, vol. 9(4), page 39-76.
- Holston, K., Laubach, T. and Williams, J.C., 2017. Measuring the Natural Rate of Interest: International Trends and Determinants. *Journal of International Economics*, 108, page S59-S75.
- Hong Kong Monetary Authority, 2018. Pilot Bond Grant Scheme. Hong Kong Monetary Authority. Hong Kong.
- Hossain, Monzur, 2018. Green Finance in Bangladesh: Policies, Institutions, and Challenges. ASEAN Development Bank Institute.
- IMF, 2019. The Economics of Climate Change. *Quarterly Publication of the International Monetary Fund* (Volume 56, Number 4).
- Intergovernmental Panel on Climate Change (IPCC), 2018. Global Warming of 1.5° C: An IPCC Special Report on the Impacts of Global Warming of 1.5° C Above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty. Intergovernmental Panel on Climate Change.

- International Monetary Fund (IMF), 2015. Balance Sheet Analysis in Fund Surveillance. *Informal Session to Brief Executive Board*.
- Jourdan, S. and Kalinowski, W., 2019. Aligning Monetary Policy with the EU's Climate Targets. Veblen Institute for Economic Reforms and Positive Money Europe.
- Kahn, M.E., Mohaddes, K., Ng, R.N., Pesaran, M.H., Raissi, M. and Yang, J.C., 2019. Long-term macroeconomic effects of climate change: A cross-country analysis (No. w26167). National Bureau of Economic Research.
- Khor, H.E., Robinson, E.S. and Lee, J.B.Y., 2004. Managed floating and intermediate exchange rate systems: the Singapore experience. Economic Policy Department, Monetary Authority of Singapore.
- Kompas, T., Pham, V.H. and Che, T.N., 2018. The effects of climate change on GDP by country and the global economic gains from complying with the Paris climate accord. *Earth's Future*, 6(8), pp.1153-1173.
- Krogstrup, S. and Oman, W., 2019. Macroeconomic and financial policies for climate change mitigation: a review of the literature. International Monetary Fund.
- Laubach, T. and Williams, J.C., 2001. Measuring the Natural Rate of Interest. . Board of Governors of the Federal Reserve System.
- Mauderer, S., 2020. Monetary policy must play a role in the climate fight. Deutsche Bundesbank Eurosystem. Germany.
- McKibbin, W.J., Morris, A.C., Panton, A. and Wilcoxon, P., 2017. Climate change and monetary policy: Dealing with disruption. *CAMA Working Papers 2017-77*, Centre for Applied Macroeconomic Analysis, Crawford School of Public Policy, The Australian National University.
- Mishkin, F.S., 1996. The channels of monetary transmission: lessons for monetary policy (No. w5464). National Bureau of Economic Research.
- Monetary Authority of Singapore, 2019. Sustainable Bond Grant Scheme. Monetary Authority of Singapore. Singapore.
- Monnin, P. and Barkawi, A., 2015. Monetary policy and green finance: Exploring the links. Greening China's financial system. International Institute for Sustainable Development. Winnipeg.
- Mundell, R.A., 1968. The Nature of Policy Choices. *International Economics*. London.
- National Development and Reform Commission, People's Republic of China, 2016. The 13<sup>th</sup> Five-Year Plan for Economic and Social Development of the People's Republic of China (2016 – 2020). National Development and Reform Commission. Beijing.
- Network for Greening the Financial System (NGFS), 2019a. A call for action climate change as a source of financial risk. NGFS. Paris.
- NGFS, 2019b. A sustainable and responsible investment guide for central banks' portfolio management. Paris: NGFS.
- Oman, W., 2019. A Role for Financial and Monetary Policies in Climate Change Mitigation. *IMF Blog*.
- Otoritas Jasa Keuangan, 2014. Roadmap for Sustainable Finance in Indonesia (2015 – 2019). Otoritas Jasa Keuangan. Jakarta.
- Otoritas Jasa Keuangan, 2017. Technical Guidelines for Banks on the Implementation of OJK Regulation POJK Number 51/POJK.03/ 2017. Otoritas Jasa Keuangan. Jakarta.



People's Bank of China, 2016. Guidelines for Establishing the Green Financial System. People's Bank of China. China.

Preclaw, R. and Bakshi, A., 2015. The cost of being green. *Report, Barclays Credit Research*.

Rudebusch, G. D., 2019. Climate Change and the Federal Reserve. *Federal Reserve Bank of San Francisco Economic Letter* 2019-09 (March 25).

Sellon Jr, G.H., 2004. Expectations and the monetary policy transmission mechanism. *Federal Reserve Bank of Kansas City, Economic Review, Fourth Quarter*, pp.5-41.

Stern, N. and Stern, N.H., 2007. The economics of climate change: the Stern review. Cambridge University press.

Sunchindah, A., 2015. Transboundary haze pollution problem in Southeast Asia: Reframing ASEAN's response. Economic Research Institute for ASEAN and East Asia (ERIA) Discussion Paper Series DP-2015-82.

Sustainable Banking Network, 2018a. Country Progress Report: Brazil – Addendum to SBN Global Progress Report. International Finance Corporation. Washington, D.C.

Sustainable Banking Network, 2018b. Country Progress Report: China – Addendum to SBN Global Progress Report. International Finance Corporation. Washington, D.C.

Swiss Re, 2015. Risky Cities – Bangkok. *Mind the Risk Report*. Swiss Re. Zurich.

Taylor, J.B., 1993, December. Discretion versus policy rules in practice. In *Carnegie-Rochester conference series on public policy* (Vol. 39, pp. 195-214). North-Holland.

Taylor, J.B., 1999. A historical analysis of monetary policy rules. In *Monetary policy rules* (pp. 319-348). University of Chicago Press.

The United Kingdom Government, 2019. Green Finance Strategy: Transforming Finance for a Greener Future. Crown. London.

United Nations Office for the Coordination of Humanitarian Affairs (OCHA) Global Humanitarian Overview 2019 Report, 2018. United Nations. New York.

Vermeulen, R., Schets, E., Lohuis, M., Kölbl, B., Jansen, D., and Heeringa, W., 2018. An energy transition risk stress test for the financial system of the Netherlands. De Nederlandsche Bank. Amsterdam.

Volz, U., 2019. Fostering green finance for sustainable development in Asia. *Routledge Handbook of Banking and Finance in Asia*. London.

Weidmann, J., 2019. Climate change and central banks. In *Welcome address at the Deutsche Bundesbank's Second Financial Market Conference*, Frankfurt am Main.

World Bank, 2012. Thai Flood 2011: Rapid Assessment for Resilient Recovery and Reconstruction Planning. World Bank Group. Washington, D.C.

World Bank, 2016. The cost of fire: an economic analysis of Indonesia's 2015 fire crisis (English). *Indonesia sustainable landscapes knowledge note no. 1*. World Bank Group. Washington, D.C.

World Bank, 2018. Strategic Use of Climate Finance to Maximize Climate Action: A Guiding Framework. World Bank Group. Washington, D.C.

World Wide Fund (WWF), 2019. Sustainable Banking in ASEAN (update 2019). World Wide Fund for Nature. Switzerland.

Yao, W., 2018. China's green finance strategy: much achieved, further to go. The London School of Economics and Political Science. London.

Zerbib, O.D., 2017. Is there a green bond premium? The yield differential between green and conventional bonds. *Journal of Banking and Finance*, Elsevier, vol. 98(C), pages 39-60.