



**GREEN CENTRAL BANKING
IN EMERGING MARKET
AND DEVELOPING
COUNTRY ECONOMIES**

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EXECUTIVE SUMMARY

Central banks have played an increasingly prominent role in advanced economies over the last decade. They have created new money on a huge scale with quantitative easing programmes, forced banks to hold more capital, and begun constraining credit to certain sectors of the economy. Yet none of these policies have taken in to account the urgent challenge of climate change and the need to shift our economies to a low-carbon trajectory. This is despite the accepted fact that there is still a huge carbon-finance gap to be filled and that climate change poses major financial stability risks.

In emerging and developing countries (EMDCs), however, the story is different. Here, in many cases, central banks have begun to play an important role in addressing the risks posed by climate change and the need for green investment.

EMDCs are more exposed to the immediate challenges of climate change. Many face greater physical risks, including more frequent, climate-change-related, severe weather events. They also recognise the need to rapidly shift their economies on to a sustainable 'green growth' path for their future prosperity and energy security. Excluding China, around 70% of global projected sustainable infrastructure investment needs (\$3.5–4.0 trillion per year on average) will be required in EMDCs.ⁱ

This report examines the most significant green policies that EMDC central banks and related public financial institutions have adopted over the last ten years. We examine six different large EMDCs, covering almost half the world's population: Bangladesh, Brazil, China, India, Indonesia, and South Korea.

In contrast to advanced economies where central bank mandates are predominantly focused on price stability, many of the central banks in EMDCs have a wider remit to support sustainable development and the government's economic policy agenda. Three different categories of intervention are regularly used in these countries to address the challenge of green finance and climate change:

- Green credit allocation instruments that have the objective of allocating credit to green sectors.
- Green regulatory (prudential and macroprudential) instruments for safeguarding financial stability.

- Other green central banking activities, such as developing green finance guidelines or setting up green bond markets.

With regard to green growth and credit allocation, existing traditions of financial intervention shape the country's approach. Central banks that have in the past been engaged in centralised credit allocation policies – India and Bangladesh most obviously – have added categories to their existing priority loan programmes for green projects, in particular renewable energy projects. In Bangladesh, for example, it is estimated that around 10% of the population has been supported by the central bank's green refinancing programme in installing home-solar power systems.

In other countries, such as Korea, Brazil, and China, national development banks have played a more important role in supporting credit to green sectors with the central bank focusing more on suppressing credit to brown sectors. In Brazil, the central bank requires commercial banks to stress test their lending against environmental and social (E&S) risk criteria and hold additional capital against these risks. In most countries, however, green macroprudential policy is still in its infancy, although it is increasingly recognised that climate change poses systemic financial risks.

There are also a wide range of different policy initiatives in which not only the central bank, but also other financial regulatory institutions play a central role. Green guidelines of various types have been issued in nearly all EMDCs we examined. Green bonds are taking off in several countries, often with the support of the central bank, including China, India, and Korea. In general, the more successful green finance initiatives tend to address several aspects of the financial system,

including E&S risk management, green bond markets, retail banking, and insurance.

Inter-agency cooperation also appears to be an important factor. China's Green Credit Policy has involved collaboration between the central bank and the Ministry of Environmental Protection to create a national database which records the environmental compliance of non-financial firms. Banks are required to restrict loans to firms that violate environmental compliance rules. Countries where one agency alone has the responsibility for green financial policy, tend to have a weaker record of implementation.

Assessing the implementation and impact of green financial policy in the countries of interest has been challenging. In some countries, governmental institutions have issued comprehensive regulation, guidelines, or policy roadmaps, but have failed to present evidence of the implementation and impact of their green initiatives. Recent green initiatives have been mostly market-led and not policy-guided, with rather disappointing results, as private markets have remained risk averse in the face of policy uncertainty.

In other cases, however, central banks have taken action to improve things. For example, the Reserve Bank of India was criticised for its definition of renewable energy projects and the Chinese banking regulator was also criticised for shortcomings in its definition of green credit. In both instances, the institutions responded and implemented new measures as a result. This illustrates that green finance is likely to be an exploratory policymaking process – where policy platforms can be gradually built upon over time.

In general, central banks and other regulatory institutions in our case studies are seriously engaged in green finance issues to a greater extent than central banks in advanced economies. Now that is recognised that private markets in both advanced and EMDC economies are not investing sufficient financing in green infrastructure and green innovation, there may

be valuable lessons for advanced economies to learn from the early experiments in green central banking reviewed in our case studies. We hope that this report aids knowledge transfer and engagement both between EMDCs and between them and advanced economy monetary policymakers and financial regulators.

TABLE 1. SUMMARY OF CASE STUDY FINDINGS

Country	Green credit allocation policies	Green prudential and macroprudential policies	Other green financial interventions	Impact/lesson learned
Bangladesh (Bangladesh Bank, BB)	<ul style="list-style-type: none"> Commercial banks and non-bank financial institutions (NBFIs) are required to allocate 5% of their total loan portfolio to green sectors. There is a range of green re-financing lines subsidising green lending, including to renewable energy and energy-efficiency projects. 	<ul style="list-style-type: none"> There are lower equity margin requirements for Environmental & Social (E&S) favourable projects 	<ul style="list-style-type: none"> Issuance of E&S risk management guidelines to be incorporated in to credit risk assessment on banks' lending. Banks and NBFIs are required to issue 10% of CSR budgets to a Climate Risk Fund. Banks are also required to educate borrowers on environmental regulations. Banks' green management practices are part of assessment of supervisory evaluations. 	<p>CB intervention successful:</p> <ul style="list-style-type: none"> Around 10% of the population is supported by a green refinancing programme in regard to solar home systems. Banks employ mainstreamed E&S risk management practises in bank lending through guidelines. Less attention is given to macroprudential policy.
Brazil (Banco do Brazil, BCB)	<ul style="list-style-type: none"> Restrictions exist on lending in environmentally sensitive areas in the Amazon. National Development Bank (BNDES) is a major investor in green sectors. 	<ul style="list-style-type: none"> Banks are required to engage in E&S stress testing and incorporate E&S risk in to capital requirements in line with Internal Capital Adequacy Assessment Process (ICAAP)/Basel Accords Pillar 2. BCB sets a general framework for types of risk that should be included. Banks must submit an annual report to BCB outlining ICAAP for validation. 	<ul style="list-style-type: none"> Detailed guidelines in place for the implementation of the Social-Environmental Responsibility Policy (PRSA) by all financial institutions authorised to operate by the central bank. Banks are required to build this in to their governance structure and collect data on actual financial losses due to environmental damages for a period of 5 years. 	<ul style="list-style-type: none"> Macroprudential and prudential policies appear to have been largely effective. The majority of major banks are now incorporating E&S risk in to their reporting and risk management strategies. There is less evidence of whether this is affecting real economy lending.

Country	Green credit allocation policies	Green prudential and macroprudential policies	Other green financial interventions	Impact/lesson learned
<p>China (People's Bank of China, PBC)</p>	<ul style="list-style-type: none"> The Chinese Development bank is a major global lender for green energy. The China Green Finance taskforce recommends establishment of a China Ecological Development Bank partially funded by PBC. Preferential interest rates are provided on green loans in Fujian Province. The central bank is considering green refinancing lines for commercial banks. 	<ul style="list-style-type: none"> E&S risk management is assessed on prudential, individual bank- and loan-based levels The China Banking Regulatory Commission (CBRC) has issued guidelines seeking to repress credit to carbon- and energy-intensive industries and encourage lending to green projects. 	<ul style="list-style-type: none"> Chinese green credit policy has been adopted by all relevant agencies, including the central bank, the banking regulator, the securities regulator, the insurance regulator, and the Ministry of Environmental Protection (MEP). PBC has collaborated with the MEP to create a national database for disclosed information on credit, administrative penalties, and information on environmental compliance of non-financial firms. Banks are required to restrict loans to firms that violate environmental compliance rules. Voluntary green credit guidelines have been issued by the CBRC to encourage banks to build E&S risk governance standards and to identify areas for green credit PBC is also working on the development of green bond markets to attract long-term capital to green investment – it has issued criteria for projects that should qualify. 	<ul style="list-style-type: none"> Evidence says that by 2010 banks had begun to reduce loans to polluting and dirty energy projects and to increase loans to energy-efficiency following green credit policies and inter-agency coordination. Evidence also says that not all banks have adopted the guidelines and that at a local level the focus remains on growth over environmental concerns. A better definition of green credit in the 2013 guidelines may have improved the situation – by 2015 most commercial banks appeared to have adopted E&S risk management policies.
<p>India (Reserve Bank of India, RBI)</p>	<ul style="list-style-type: none"> Loans to renewable energy companies have been included in the RBI's Priority Sector Loans scheme; 40% of net commercial bank credit must support priority sectors. 	<ul style="list-style-type: none"> RBI is considering including environmental risks in the assessment of agricultural price developments when assessing financial and monetary stability. 	<ul style="list-style-type: none"> Industry-led voluntary green lending guidelines mainly used. Green bonds have been issued to support green energy since 2015. 	<ul style="list-style-type: none"> Lending to renewable energy projects has grown at a higher rate than overall credit growth in the 2009–2014 period. However, the impact of the RBI's PSL has been mixed because many banks fall short of their annual PSL targets and there has also been several non-performing loans.

Country	Green credit allocation policies	Green prudential and macroprudential policies	Other green financial interventions	Impact/lesson learned
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<p>South Korea (Bank of Korea, BOK)</p>	<ul style="list-style-type: none"> • Fiscal policy is mainly used to support green finance including subsidies for low-interest-rate loans for energy-efficiency projects and renewable energy. 	<ul style="list-style-type: none"> • The BOK has had no public discussions or engagement with green financial policy or E&S risk management in general or on a systemic level. • The BOK has applied E&S risk assessments to its loans. 	<ul style="list-style-type: none"> • The state-owned Korea Development Bank (KDB) began to invest in green industries in 2009 and has recently started to promote green bonds. • The government is providing various subsidies for green investment, including green export credits. • The public Export-Import Bank of Korea is the first financial institution in Asia to issue green bonds. 	<ul style="list-style-type: none"> • Financial regulation and the greening of the financial system are currently not at the centre of Korea’s still ambitious green growth strategy, perhaps because the central bank has not been involved. • Fiscal policy and state development banks have played a dominant role.

ⁱ Bhattacharya, A., Oppenheim, J., Stern, N., Meltzer, J.P. & Qureshi, Z. (2016). *Delivering on sustainable infrastructure for better development and better climate*, Brookings global working paper series. Brookings Institution, Washington DC.

1. INTRODUCTION

Since the 2007/2008 financial crisis, central banks in advanced economies have played an increasingly influential macroeconomic role. This has involved major interventions in financial markets – via quantitative easing – to achieve monetary policy objectives and in credit markets via Macroprudential Policy to achieve financial stability objectives. However, the need to transition to a low-carbon economy – formalised in the signing of the Paris Treaty on Climate Change in February 2016 – has not played a part in these policy developments.

There is a variety of explanations as to why central banks in advanced economies have not done more. The most apparent is that it not viewed as part of their mandate, which generally focuses on price and financial stability, with support for specific sectors viewed as the job of government. The operational independence of advanced economy central banks to pursue their mandates – which became the norm in the 1990s – shields them from short-term political influence.

But it has become increasingly clear that much of the investment needed for a low-carbon transition will need to come from private financial sources, including capital markets but also the banking sector, which is responsible for the creation of new money and credit via lending.^{1,2} Central banks, with their regulatory oversight over money, credit, and the financial system, are in a powerful position to green the financial system and thereby growth by incentivising or directing resources from traditional carbon-intensive sectors towards green investment.

It is also the case that climate change and environmental policies pose substantial threats to financial stability and economic growth. In particular, the transition to a low-carbon economy may not be a smooth one and could involve, for example, a potential rapid fall in the value of carbon-intensive assets. The central bank, with responsibility for financial stability, is uniquely positioned to implement green macroprudential instruments to mitigate such risks.^{3,4}

Nevertheless, most national and international initiatives in the 'green finance' sector have overlooked the potential role of central banks, focusing mainly on mobilising existing private capital from institutional investors, predominantly via market-led initiatives, such as subsidies or attempts to create carbon markets. So

far, the results have been disappointing and a huge low-carbon investment gap remains.⁵⁻⁷

There are signs emerging that some advanced economy central banks, in particular the Bank of England^{8,9} and the Dutch National Bank,¹⁰ are beginning to consider incorporating climate change risks into their policies. However, most of these initiatives – for example, the international Financial Stability Board (FSB) – are focused on voluntary disclosure of businesses' exposure to carbon-intensive assets to support better capital allocation.¹¹

In emerging market and developing country (EMDC) economies, however, the story is different. Here, in many cases, central banks have begun to play an increasingly important role in addressing the challenges of climate change and environmental sustainability more generally. Central bank independence is not as strongly enshrined and central banks play a broader role in supporting economic development and industrial policy generally, usually cooperating closely with ministries of finance and other relevant government departments. This was the model that also applied in advanced economies for much of the 1935–1980 period, until the fashion for inflation targeting emerged.¹²

It is also the case that EMDCs are more exposed to the immediate challenges of climate change, facing both greater physical risks – more frequent, climate-change-related, severe weather events. These countries also recognise the need to rapidly adjust their economies on to a sustainable green-growth path for their future prosperity and energy security. A recent estimate found that, excluding China, around 70% of global projected sustainable infrastructure investment needs (\$3.5–4.0 trillion per year on average) will be required in EMDCs.¹³

The purpose of this report is to examine in greater depth the most significant green policies that EMDC central banks have adopted, mainly focusing on the last decade. The report brings together existing research on green activities in EMDC central banks, usually set within the broader frame of green finance. It also brings to light new policy interventions that previously had received little, if any, international coverage outside their own country and language.

Our definition of green finance is based on that used by the United Nations Environment Programme⁶ and includes financing of sustainable investments that has a positive environmental impact. In addition, we also examine the way in which EMDC central banks have dealt with emerging environmental risk at both the prudential level (risks to individual financial institutions) and the macroprudential level (systemic financial and economic risk across the whole domestic economy).

A summary of our case studies is provided in Table 1.

The rest of the report is laid out as follows. Section 2 introduces a taxonomy for green central banking policies and embeds them within a historical and theoretical context. The main body of the report, Section 3, analyses case studies of green central banking in some of the most important developing and emerging market economies: Bangladesh, Brazil, China, India, Indonesia, and South Korea (covering just under half of the world's population). For each country, we examine the role of the central bank and related public agencies in boosting green growth and mitigating environmental and social (E&S) risks. In each case study, a concluding section assesses the effectiveness of the policies in achieving change. Finally,

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China (continued)	<ul style="list-style-type: none"> • Preferential interest rates are provided on green loans in Fujian Province. • The central bank is considering green refinancing lines for commercial banks. 		<ul style="list-style-type: none"> • PBC has collaborated with the MEP to create a national database for disclosed information on credit, administrative penalties, and information on environmental compliance of non-financial firms. Banks are required to restrict loans to firms that violate environmental compliance rules. • Voluntary green credit guidelines have been issued by the CBRC to encourage banks to build E&S risk governance standards and to identify areas for green credit • PBC is also working on the development of green bond markets to attract long-term capital to green investment – it has issued criteria for projects that should qualify. 	<ul style="list-style-type: none"> • Evidence also says that not all banks have adopted the guidelines and that at a local level the focus remains on growth over environmental concerns. • A better definition of green credit in the 2013 guidelines may have improved the situation – by 2015 most commercial banks appeared to have adopted E&S risk management policies.
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in the conclusion, we reflect on the achievements and challenges of these policies.

This report focuses on the activities of agencies with a remit to manage price stability, financial stability, and credit creation and allocation by the commercial banking sector. For the most part we do not analyse the role

of other state agencies, including national investment banks, ministries of finance, or environmental agencies except where doing so provides a useful historical context for the role of central banks. Neither does this report examine the emerging role of capital markets in EMDCs, other than when the central bank is directly involved in influencing their development. In

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South Korea (Bank of Korea, BOK)	<ul style="list-style-type: none"> • Fiscal policy is mainly used to support green finance including subsidies for low-interest-rate loans for energy-efficiency projects and renewable energy. 	<ul style="list-style-type: none"> • The BOK has had no public discussions or engagement with green financial policy or E&S risk management in general or on a systemic level. • The BOK has applied E&S risk assessments to its loans. 	<ul style="list-style-type: none"> • The state-owned Korea Development Bank (KDB) began to invest in green industries in 2009 and has recently started to promote green bonds. • The government is providing various subsidies for green investment, including green export credits. • The public Export-Import Bank of Korea is the first financial institution in Asia to issue green bonds. 	<ul style="list-style-type: none"> • Financial regulation and the greening of the financial system are currently not at the centre of Korea’s still ambitious green growth strategy, perhaps because the central bank has not been involved. • Fiscal policy and state development banks have played a dominant role.

general, more attention has been given to these institutions in the academic and policy literature. In contrast, most of the studies of central banks are of single countries or are set in the broader context of green finance more generally.

This purpose of this report is to aid knowledge transfer between EMDC central banks, ministries of finance, and other relevant bodies regarding green finance and environmental financial risk and to share some of the lessons learned from EMDC central banks with advanced economy central banks. Whilst many of the types of policies discussed in this report – such as credit guidance and sectoral-specific capital and liquidity requirements – have fallen

out of fashion in advanced economies, the financial crisis made it clear that a simple laissez-faire approach to credit and capital allocation could lead to the build-up of systemic risk with disastrous consequences. The embracing of interventions in credit markets in advanced economies – via macroprudential policy in particular – demonstrates that policy is opening up to new approaches. Given the current failure of market-driven solutions to generate sufficient investment to meet the challenge of climate change, as well as the financial stability risks posed by climate change, the activities of EMDC central banks could provide useful insights for how to better align the financial system with a low-carbon transition.

2. GREEN CENTRAL BANKING POLICY: A TAXONOMY

Central banks in EMDCs have been active in their response to the calls to green the financial system and growth. In many cases, the policy instruments they have used to green the financial system and respond to systemic environmental risks are adaptations of tools that have been present in developing countries for at least the last 60 years. These tools have been recalibrated with a green focus, as well as new instruments in the area of macroprudential regulation.

In developing our taxonomy of green instruments, we distinguish between three different areas of central bank activity:

- Green credit allocation instruments that have the objective of allocating credit to green sectors.
- Green macroprudential instruments for safeguarding financial stability.
- Other green central banking activities, such as developing green finance guidelines or setting up green bond markets.

2.1 GREEN CREDIT ALLOCATION POLICY INSTRUMENTS

Credit allocation or credit guidance policies have historically played an important role in developing and emerging economies, especially in the 1950s, 1960s, and 1970s. They remain, to a lesser extent, a widespread form of financial control – or financial repression as it is termed in the mainstream economics literature – exercised by central banks to guide lending to prioritised sectors deemed essential for economic development. More recently, these policies have been designed to help achieve sustainable and green growth. We outline four different policy instruments that involve the explicit direction of credit.

Targeted refinancing lines

Targeted refinancing lines offer refinance for commercial banks at preferred terms for specified asset classes. By creating what is effectively an ongoing subsidised loan rate, the central bank incentivises lending into these prioritised sectors. Targeted refinancing lines have been a common policy tool used by many central banks in EMDC economies since the 1950s,¹⁴ but they have become less prevalent since the 1980s. This policy tool has mostly been used in countries

with underdeveloped secondary bond markets and where there is a lack of other refinancing options for commercial banks.

The main criticism of targeted refinancing lines and related loan-pricing instruments is the potential loss of control over the cash base,¹⁵ as well as historical experience that differential interest rates can lead to distortions in the financial system in the long run.¹⁶ A benefit, on the other hand, is that by implementing preferential refinancing windows, the process of loan origination stays with commercial banks. Through refinancing lines, credit is extended at preferred terms but commercial banks still decide which projects to lend to, as the default risk remains with them.

Differential reserve requirements

Compulsory reserve requirements – the share of deposits that commercial banks must hold vis-à-vis their assets – have been completely abolished in many advanced economies today, but are still part of the policy framework in EMDC economies. A green reserve requirement policy would allow banks to hold fewer reserves – which bear zero or low interest – against green loans. Again, the result would be to align the profitability of their lending activities with the policy target of greening finance and growth. This instrument lacks a strongly repressive attribute for which other forms of credit allocation were criticised in the 1980s.¹⁶

Minimum and maximum credit quotas

Mandatory or minimum credit quotas require banks to allocate a fixed percentage of their loan portfolio to a specified sector, area, or cause. They are also called credit floors, lending requirements, and window guidance. They are most often implemented in the form of a priority sector lending programme, with the central bank

determining minimum credit quotas that have the objective of greening growth by requiring commercial banks to lend a specific percentage of their overall lending to green projects.

In contrast to other credit guidance instruments where incentives are set to guide lending to prioritised cause, in the case of minimum credit quotas the central bank sets 'hard' quotas, thereby potentially creating stronger market distortions than by creating incentives for banks to allocate their lending. Priority sector lending programmes have a long history in developing and emerging economies. General lending quotas used by the Bank of Japan and other Easter Asian economies proved very successful^{17,18} in promoting economic development, but in other cases there were more mixed results.¹⁶

In contrast, maximum credit ceilings or quotas are used to limit bank lending to less economically desirable sectors or industries of the economy. Thus, in contrast to minimum credit quotas for lending to renewable energy projects, maximum credit quotas would limit lending to carbon-intensive sectors. Currently this instrument is commonly used in advanced economies to suppress credit to certain sectors (in particular, the real estate sector) following the financial crisis of 2007/2008; it is more commonly referred to as macroprudential policy. It is less often used in developing economies where the need for growth is stronger.

Central bank assistance to development banks

In developing and emerging economies, especially in Latin America,¹⁴ central banks have traditionally supported the proliferation of specialised financial institutions by subscribing to their equity, buying their bonds, or creating markets for their bonds. Development banks to help finance the green transition of the

economy and to overcome the absence of long-term patient capital in the sector have been widely advocated¹⁹ and the role of central banks in supporting development banks in this task has been discussed by, among others Stern²⁰ and the UNEP Inquiry.²¹ It is argued that the presence of development banks in EMDC markets reduces risk and helps leverage private capital. Furthermore, they can play a market-shaping role by implementing green finance standards and by issuing green bonds that can be traded in newly established markets. With sufficient capital from governments, these institutions can play an important role alone, but with central bank financing their lending capacity and legitimacy could be significantly increased.

2.2 GREEN MACROPRUDENTIAL POLICY INSTRUMENTS

Increasing environmental risk stemming from more frequent severe weather events has important implications for financial markets, especially for the insurance sector and therefore for overall financial stability. In addition, more challenging carbon emission targets, as well as expected stringent environmental regulations will necessitate tighter restrictions on carbon-intensive sectors and thereby lead to a re-pricing of certain carbon-intensive assets. The potential burst of this so-called asset-price carbon bubble is expected to generate systemic risks and therefore has important implications for macroprudential policy (Bank of England's response to climate change). The term macroprudential in this context refers to the role of regulators to address and reduce systemic risk to prevent the macroeconomic costs associated with financial instability.

Furthermore, some macroprudential policy tools also have allocative consequences that can be utilised by

central banks and regulators to guide credit and more actively promote green growth and finance. To inform the case studies which follow in Section 3, we draw on Schoenemaker and Tilburg³ to present a brief overview of macroprudential policy instruments as part of our taxonomy of green central banking policy.

Stress testing

A first step to evaluate and calibrate green macroprudential policy instruments is to stress test various financial instability scenarios based on, for example, a sudden re-pricing of carbon-intensive assets. So-called carbon stress tests can be used to identify and quantify the exposure of financial institutions to carbon-intensive assets. Based on the identified vulnerabilities, capital buffers, risk weights, and caps could then be set accordingly to mitigate systemic risk and reduce the threat to financial instability.

Counter-cyclical capital buffers

Counter-cyclical capital buffers are designed to reduce the financial cycle and feedback loops in times of boom and bust. Regarding environmental risk, counter-cyclical capital buffers could be used to mitigate potentially adverse effects of the seemingly inevitable pricing-in of the so-called carbon bubble in the wake of stricter emission targets and environmental policy. Increasing capital requirements to respond to credit growth for carbon investment seems justified, if a systemic impact were expected.

Capital instruments: leverage ratio by sector

Assigning carbon-intensive assets higher risk weights to take into account the fact that future environmental policies might reduce their value is another risk-mitigating response measure. Assigning higher or lower

risk weights according to the carbon intensity of the sector would also give this instrument a credit-guiding element by setting incentives for investors to disinvest from carbon-intensive assets. Schoenmaker and Tilburg³ consider these instruments appropriate for pricing in additional carbon risk in the overall assessment of risk and return.

Loan-to-value (LTV)/loan-to-income (LTI) caps

Loan-to-value and loan-to-income caps limit the amount of financing extended to customers of commercial banks to specific levels based on the value of the asset being purchased or the borrower's earnings. Regarding greening the financial system and growth, caps could be used to limit lending to sectors or companies whose business models involve carbon-intensive activities likely to become unprofitable in the near future, given either new regulations or innovations in green technology.

Large exposure restrictions (by counterparty, sector, geographic)

Exposure restrictions based on the counterparty, the sector, or the geographic area are instruments that limit exposure to certain high-risk assets and therefore restrict lending by financial institutions. The main objective behind the implementation of this instrument in the context of green finance is to limit exposure to carbon-intensive assets that would lose value in the event of a shock such as the burst of a carbon bubble. In addition, there is an allocative aspect that is stressed in the literature and is comparable to the effect of maximum credit quotas. While creating caps might be rather arbitrary, Schoenmaker and Tilburg³ point out that this instrument would allow a certain amount of fine-tuning of lending restrictions.

Identification of systemically important financial institutions (SIFIs) and capital surcharges

SIFIs (e.g. very large universal banks) have been required to hold additional levels of capital given the increased systemic risk they pose to economies. Exposure to carbon-intensive assets could be added to the selection criteria used to identify SIFIs.

2.3 OTHER GREEN CENTRAL BANKING INITIATIVES AND ACTIVITIES

Green finance guidelines

In their capacity as financial market regulators at the centre of the financial system, central banks are in the position to develop green banking guidelines, such as mandatory or voluntary industry initiatives for green bond guidelines, E&S risk management, or general green banking finance guidelines, either by creating them or by supporting them. In most EMDC economies, there now exist either industry-led green finance guidelines or central-bank-led policy initiatives. The former tend to be voluntary standards, while the latter tend to be mandatory. There are also cases where central banks have supported industry-led initiatives by banking associations, thereby rendering them mandatory or quasi-mandatory.

Active development of green bond markets

Central banks can take several steps to support the development of financial markets and especially of bond markets.²² With regard to developing green bond markets and encouraging the issuance of these bonds as a means of financing green projects, central banks and other governmental agencies can issue green bond guidelines and define criteria for projects that qualify as green bonds, the use of proceeds, and

standards for disclosure. Policy-directed development banks have often been the first financial institutions to issue green bonds, thereby creating an initial market for green bonds.

Research on green growth and finance

Central banks are uniquely positioned to conduct research on green finance and growth. With well-established research departments and access to market data, publications by central banks have always played a central role in conducting research in green growth.

Offering capacity building workshop for bankers

Central banks can further support the greening of the financial system by offering workshops and seminars for bankers on environmental risk assessment and green finance. A lack in expertise for assessing E&S risk is especially seen as a general hurdle for the further proliferation of green lending.

Participation in the International Finance Corporation's Sustainable Banking Network

The Sustainable Banking Network (SBN) is a voluntary community of financial regulatory agencies and banking associations that promotes sustainable finance and is hosted by the International Finance Corporation (IFC).

3. GREEN CENTRAL BANKING IN PRACTICE: COUNTRY CASE STUDIES

In this section, we examine in greater depth the green financial policy initiatives of central banks and related financial authorities in six EMDCs – Bangladesh, Brazil, China, India, Indonesia, and South Korea – drawing on the taxonomy laid out in Section 2. Our selection has been driven by the country's size (all have populations over 50 million) and the availability of good quality information on the central bank's activities regarding green finance and climate change. The case studies draw on an update of existing research in some cases, whilst in others new material is presented.

For each case study, the mandate and objective of the central bank are first discussed to assess the policy space under which the central bank could develop measures for greening the financial system. Secondly, the major governmental actors in green financial policy are identified and inter-agency cooperation is explored. The analysis of the country case studies then moves on to investigate activities and initiatives in the three areas of green credit allocation policy, green macroprudential policy, and other green central banking policy. Initiatives in these three areas that do not originate from the central bank alone are also included. Finally, the implementation and impact of the described green policy initiatives are assessed.

3.1 BANGLADESH BANK

Bangladesh Bank, the central bank of Bangladesh, was founded in 1971 and has been known in its 45-year history to be one of the world's more interventionist central banks. The bank's green central banking activities focus on the three policy initiatives of green refinancing, green credit quotas for loans, and green banking guidelines.

Mandate and objectives

The main objectives of Bangladesh Bank are laid out by the Bangladesh Bank Order in 1972, mandating the central bank to maintain, first and foremost, price stability of the Bangladesh Taka (BDT), but also to support economic growth and development. The former governor of Bangladesh Bank, Atiur Rahman, has expressed that in his interpretation, it lies within the bank's mandate to support economic growth, poverty eradication, and employment generation. He has defended the bank's 'developmental approach to central banking'²³ and the significance

of environmental issues for the central bank.²⁴ Bangladesh Bank has also stated that it is within its mandate to green the financial system in an economy that is highly vulnerable to the physical effects of climate change; it has been engaged in climate mitigating policies since 2011.²⁵ The overall responsibility for banking regulation lies also with the central bank as stated by the mandate.

Inter-agency cooperation and shared responsibility for green policy

Overall, Bangladesh Bank has played a central role in taking the first steps to greening the financial system and supporting sustainable growth. Cooperation between Bangladesh Bank and other governmental agencies or regulators as well as with the financial and microfinance industry is limited and remains an area for further expansion.²³ Bangladesh's capital market regulator, the Securities and Exchange Commission, has not been publicly active in this area yet.

Green macroprudential policy

The central bank has not yet explicitly addressed the issues of green macroprudential policy as a response measure to systemic E&S risk. However, according to a report by the International Finance Corporation,²⁶ Bangladesh Bank *has* initiated macroprudential policy instruments, such as lower equity margin requirements for socially and environmentally favourable projects in order to incentivise green initiatives.

Green credit allocation policies

Bangladesh Bank has created refinancing lines at preferential terms for green loans and uses restrictive minimum green credit quotas. With regard to the latter, from January 2016 onward, commercial banks, as well as non-bank financial institutions (NBFIs),

are required to allocate 5% of their total loan disbursement/investment to green sectors.²⁷

The use of green refinancing has been in place for many years. Green refinancing lines were launched in 2009 as a revolving refinancing scheme to promote green finance amounting to BDT2 billion (US\$25 million) under which Bangladesh Bank refunds commercial banks at a reduced interest rate for loans extended in six specific products.²⁷ The initial focus of the refinancing lines has been on solar energy, biogas, and waste-treatment projects but has subsequently been expanded and covers 47 items today, which are eligible for preferential rediscounting at the central bank. These green refinancing lines are part of a broader re-financing policy initiative which includes priority sectors such as agriculture and garment exporters.ⁱⁱ

In September 2014, Bangladesh Bank initiated a further green credit-refinancing scheme funded through the excess liquidity of Sharia-based banks and non-banking financial institutions by identifying 50 items eligible for refinancing at preferred terms under this scheme.²⁹ In February 2015, the bank's overall refinancing scheme was extended with a BDT40 billion (US\$500 million) refinancing window of which BDT16 billion (US\$200 million) is earmarked for refinancing green initiatives, such as projects that aim at improving water and energy usage efficiency in the textiles industries.²³

The most recent sustainable finance initiative by Bangladesh Bank was the announcement of the Green Transformation Fund (GTF) in February 2016 under which it creates another long-term refinancing window worth BDT16 billion (US\$200 million). This fund is aimed at export-oriented textile

ⁱⁱ The Asian Development Bank (ADB) also offered another refinancing programme in Bangladesh in 2012 that refinances US\$50 million worth of loans and targets brick kilns with the aim of making them more sustainable and efficient.²⁸

and leather industries with the purpose of greening this part of the economy by providing access to funds in foreign currencies that can be used to import machineries for environmentally friendly projects.²⁷

Other green central banking policies

Greening the banking system became a central issue for Bangladesh Bank starting in 2010.³⁰ Bangladesh Bank issued *Policy Guidelines for Green Banking*²⁵ in February 2011 requiring commercial banks and NBFIs to take environmental considerations into account when providing new loans for projects or working capital. The comprehensive guidelines also address corporate social responsibility (CSR), and ask banks to implement CSR at their highest corporate level. NBFIs are also asked to consider environmental factors when engaging with borrowers, and particularly to evaluate the environmental or social impact of projects.

The *Policy Guidelines for Green Banking* included a three-phased implementation strategy. In the first phase, which had to be completed by the end of 2011, a central issue was the requirement for commercial banks to include E&S risk management into their existing credit risk assessment methodology for prospective borrowers. With the broader aim of mainstreaming E&S risk assessment, banks were asked to include environmental risk into all checklists, audit guidelines, and reporting formats. Furthermore, banks were required to initiate 'in-house environment management' and to issue a 'Green Office Guide' to reduce electricity and paper usage. Banks were also asked to preferentially extend loans to environmentally friendly businesses and energy-efficient industries.

A further initiative was concerned with the creation of Climate Risk Funds to be used in emergencies due to severe weather events. Banks and NBFIs were asked to allocate at least 10% of their CSR budget to the fund by either providing grants or lending at reduced interest rates.²⁷ Financial institutions were also asked to introduce green marketing practices and online banking, and to disclose all green banking activities on their websites.

The second phase, which was due to be completed by December 2012, focused on requiring banks to design policy strategies for environmentally sensitive sectors of the economy and to define specific green targets for green financing and reducing loans to carbon-intensive industries, as well as allocating a fixed percentage of loans to green projects and introducing green financial products. In addition, banks were required to introduce green branches, as well as to further improve in-house environmental management.

Banks were also required to develop specific E&S risk guidelines for the standardised assessment and management of general and working-capital loans. Educating bank clients on environmental regulation, as well as enhanced reporting and disclosure standards through mandatory publishing of independent Green Banking and Sustainability Reports, were also part of the second phase.

The third phase focused on the introduction of innovative green financial products and actively offering support for green projects and on further enhancing disclosure and reporting standards by requiring banks to publish independent Green Annual Reports to be verified by an independent agency.

Additional support is offered by the central bank through the publication of *Guidelines on Environmental Risk Management*, as well as *Environmental Due-diligence Checklists*, to enable commercial banks to appropriately assess risk and finance environmentally sensitive projects.²³ Throughout the implementation phase, banks were asked to report on a quarterly basis to Bangladesh Bank on their initiatives and activities.

Bangladesh Bank also designed a mechanism to incentivise banks' compliance with the implementation of these guidelines by offering them preferential treatment in three different regards. First, through taking green management practice into account when computing the annual Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, and Sensitivity to Market Risk (CAMELS) rating, a supervisory tool according to which banks are assigned a rating reflecting their compliance with regulation and overall 'soundness'.³¹ Second, by publicly announcing the ten banks that were most active in implementing green banking practices on an annual basis. And, third, by taking green banking activities into account when granting permission for new bank branches.

Implementation and impact

Bangladesh Bank's annual reports and independent research offer some insight into how successful the implementation of the different policy initiatives on green finance have been.

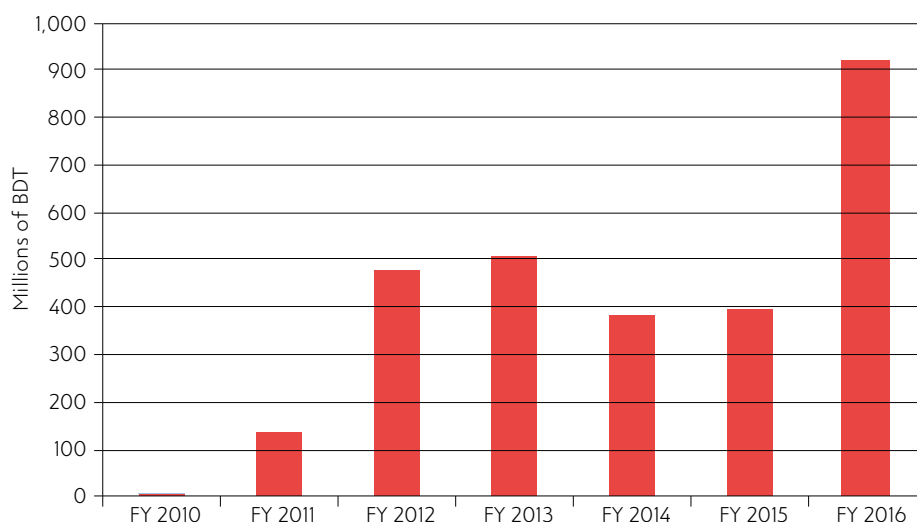
With regard to the preferential green refinancing scheme, the 2015 annual report provides a dedicated chapter on sustainable banking, and updates on the cumulative amount that was refinanced annually under the scheme initiated in 2009. The amount refinanced in the financial year (FY)

2010 stood at BDT5 million (US\$62 000) and rapidly increased to BDT506.1 million (US\$6.29 million) by 2013³² (Figure 1).

At the time, 9 different categories were eligible for refinancing, covering renewable energy, energy efficiency, solid waste management, liquid waste management, alternative energy, fire burnt brick, non-fire block brick, recycling and recyclable product, and miscellaneous. From FY 2015 (BDT393.5 million (US\$4.89 million)) to FY 2016, total annual refinancing increased strongly by over 130% to BDT919.7 million (US\$11.4 million) due to the introduction of a new category eligible under the scheme called Green Industry that alone received BDT400 million (US\$5 million) in refinanced funds.²⁷ The cumulative amount refinanced at preferential rates under the green refinancing scheme up to June 2016 stood at BDT2.8117 billion (US\$35 million).²⁷

Regarding the composition of the underlying projects for which loans are refinanced under the scheme, data from FY 2012 and FY 2016 show growing diversification of project categories over time. In FY 2012, 52% of refinanced loans financed solar assembly plants and 27%, the second-largest share, went into biogas. Today (FY 2016), through a gradual shift over the years and the introduction of a new category, Green Industries make up the biggest share at 43%, financing efficiency improvements in brick-kiln technology make up the second-largest share with 19% and Solar Home Systems is third largest at 12%.

Exploring the question of how many banks had implemented the green guidelines in 2013,³¹ we found that out of 56 banks, 45 banks had formulated policy for green banking, 46 had formed a green banking unit, and 41

FIGURE 1. TAKE-UP OF BANGLADESH BANK'S GREEN REFINANCING LINES

Source: Bangladesh Bank Annual reports.

had introduced a *Green Office Guide*. On E&S risk management and compliance with green banking guidelines, almost all banks had established green banking units and policies by 2015.²³ Bangladesh Bank announced in 2016 that all banks were conducting environmental risk rating.²⁷

Environmental risk rating standards require banks to disclose environmental due diligence carried out in the loan origination process for environmentally sensitive sectors. In FY 2014, banks financed 30,540 projects worth BDT 1,580 billion (US\$19.6 billion) after assessing an environmental risk rating.³² In FY 2016, these numbers increased to 52,776 rated projects of a combined disbursed value of BDT 2,243 billion (US\$27.9 billion).²⁷

In regard to assessing the actual impact on greening the economy, UNEP Inquiry (2015) attests the green financing efforts 'considerable' success and stresses that by the end of 2014, 15.5 million people or around 10% of the population had been reached by the programme for refinancing solar home systems.

Conclusion

Bangladesh Bank has clearly played a major role in helping to green the Bangladeshi banking system and therefore the financial system overall. Its green refinancing policy has been successful and its involvement in several green policy initiatives goes well beyond rhetoric as it monitors their implementation and publicly announces results regularly in the annual reports, where it has introduced a dedicated chapter on sustainable banking. While the central bank has put strong allocative measures in place to ensure that green projects are sufficiently financed, it has also helped mainstream E&S risk management practices through the green banking guidelines. The only area where the central bank appears to have paid less attention is green macroprudential policy and the extent to which there are systemic risks to financial stability posed by climate change.

3.2 BANCO CENTRAL DO BRASIL

Historically, the central bank of Brazil, Banco Central do Brasil (BCB), has been engaged in a variety of interventionist policies to support economic growth. Today, regarding greening the financial system, the bank's approach is less interventionist and strategies for greening growth and finance are industry-led in some policy areas and policy-supported in others. However, the central bank has been very active in the field of green prudential and macroprudential policy, playing a key role in getting commercial banks to address E&S risk via guidelines and sectoral capital requirements.

Mandate and objectives

The central bank was established as an independent federal body in 1964, under Law no. 4,595.³³ In Brazil, the tri-partite National Monetary Council (NMC) – consisting of the Minister of Finance; the Minister of Planning, Development and Management; and the Governor of the Central Bank of Brazil – is responsible for designing overall monetary and credit policy aimed at monetary stability and the promotion of economic and social development. The central bank is Executive-Secretary of the NMC and organises and advises the sessions.

The Constitution of the Federative Republic of Brazil (2010) states that the financial system, which the central bank regulates and supervises, should promote the balanced development of the country, and serve the collective interest, thereby implying a sustainability objective for the central bank.

Inter-agency cooperation and shared responsibility for green policy

Most green banking policy originates from BCB, which is also the main regulatory agency for the banking

system and shares responsibility with the Brazilian Securities Commission. The Brazilian Monetary Council, together with BCB, is responsible for implementing the Basel Accord and detailed regulation.

Green macroprudential policy

BCB is among the first central banks to issue regulation that addresses E&S risk on a systemic level and requires commercial banks to act accordingly in the process of assessing and calculating capital needs.³⁴

In July 2011, BCB issued a document³⁵ establishing procedures on commercial banks' Internal Capital Adequacy Assessment Process (ICAAP) and requiring them to take risk of exposure to environmental damage into account. ICAAP, a result of Pillar 2 of the Basel II accords, was established in June 2011³⁶ and became part of the mandatory banking regulation, requiring banks to assess the sufficiency of capital held by the institution.

Building on this, BCB³⁵ requires a bank to evaluate and consider risks to which the bank is exposed during the year, via stress testing, and to demonstrate, in the process of assessing its capital needs, that it has covered the risk arising from exposure to social and environmental damages, alongside other types of risk. The BCB sets the general framework, listing the types of risks that a bank has to consider when deciding itself how much additional capital to hold after submitting its ICAAP for independent validation. Banks subject to ICAAP regulation are also required to submit an annual report to BCB, outlining how they assess and calculate risks, explore implications for capital adequacy, and furthermore, consider the exposure to social and environmental damages generated by the institution's activities.³⁷

Green credit allocation policies

Directly allocating resources to green projects has not been part of BCB's approach to promoting green finance and growth. However, through environmental regulation, the central bank is repressing funding for some specified industries and areas. Starting in 2008, it issued regulation restricting lending, as well as all other kinds of support to companies that operate in certain environmentally vulnerable geographic areas such as the *Amazonas* region (Resolution 3,545/2008, Resolution 3,813 Resolution 3,896/2010 and Resolution 4,008/2011).

It should also be noted that Brazil has a major publicly owned investment Bank – the *Banco Nacional de Desenvolvimento Economico e Social* (BNDES; National Bank of Social and Economic Development), which has become a major funder of green sectors. According to the Bank, its disbursements for the green economy and climate and environmental protection sectors had increased 10-fold between 2000 and 2013, amounting to over \$US7 billion, of which half was supporting renewable energy projects.¹⁹

Other green central banking policies

The second key policy initiative of BCB aiming at greening the financial system and growth is the promotion of green banking guidelines. This started as a voluntary market-led initiative by the Brazilian Banking Association (FEBRABAN), which was first adopted in 2008 by five Brazilian state-owned banks and then in 2009 by commercial banks. In 2014, BCB then issued the mandatory guidelines *Social and Environmental Responsibility for Financial Institutions*, thereby announcing the National Monetary Council's decision to require institutions to incorporate E&S risk factors into their governance frameworks.³⁸

This publication establishes detailed guidelines for the implementation of the Social-Environmental Responsibility Policy (PRSA) by all financial institutions authorised to operate by the central bank. Furthermore, it requires listed institutions to take into account the degree of exposure to E&S risk of the activities and operations of their institutions.³⁸

The resolution specifies the key points that must be part of the PRSA for each financial institution. Institutions are required to establish guidelines on strategic actions related to their governance, including for socio-environmental risk management. Regarding internal governance, the resolution calls on banks to set up structures to monitor the compliance with rules established under the PRSA, to evaluate the effectiveness of the applied measures, to check whether E&S risk management practices are appropriate, and to identify potential deficiencies in the applied measures.

With regard to the specifics of managing E&S risk, the resolution defines E&S risk as the 'possibility of occurrence of losses for financial institutions due to environmental and social damages', and requires banks to embed this notion of risk into their broader risk assessment framework and to evaluate E&S risk and potential negative environmental impact of new financial products and services, as well as to collect data on actual financial losses due to environmental damages for a period of 5 years.³⁸

Regulated institutions were required to implement ICAAP by February 2015 and all other institutions by July 2015. They were furthermore asked to appoint a director responsible for compliance with the PRSA, to formalise internal and external disclosure in regard to PRSA, and to make the documentation of the process available to BCB.³⁸

Implementation and impact

The Brazilian banking federation, FEBRABAN³⁴ reports that most Brazilian banks have developed comprehensive policies for incorporating E&S risk for new clients, including a credit limit evaluation, as well as with regard to the loan origination and monitoring process. Banks ask their customers for documentation in regard to environmental and social aspects, such as environmental licencing, and scrutinise projects in regard to so-called slave labour black lists.³⁴ On banks' compliance with regulation based on Resolution 4,327/2014, the report notes that all institution investigated for a survey have an E&S risk analysis approach in place.³⁴

The study furthermore estimates that in 2013, out of the BRL2,715 billion (US\$859 billion) that form the balance of credit operations in the Brazilian financial system, BRL170.98 billion (US\$54.13 billion) were subject to E&S risk policies and processes. On a micro level, the survey shows that BRL37.347 billion (US\$12 billion) in contracted amounts and BRL31.396 billion (US\$10 billion) in disbursed amounts were allocated to renewable energy, energy efficiency and sustainable transport, but also states that collected data does not represent the total industry and that these are therefore conservative estimates.

While the BCB's Annual Report does not feature any specific information on green finance, E&S risk management, or compliance with green banking guidelines, the *Financial Stability Report 2017*³⁷ includes a chapter researching the disclosure and reporting practices of commercial banks in regard to the implementation of the PRSA and E&S risk in general.ⁱⁱⁱ The report analyses

disclosure levels in regard to PRSA of the nine largest banks in the Brazilian financial system and investigates whether there are differences in the level of disclosure depending on the type of listing of the financial institution. The report concludes that 70% of financial institutions include information on the PRSA subcategory and that E&S risk management practices were present as a subcategory in 58.33% of reports. There was no significant difference in reporting on these categories, whether institutions were private or publicly controlled or listed.

Conclusion

BCB would appear to be at the international forefront of green prudential and macroprudential policy implementation. It has successfully mainstreamed E&S risk management through binding regulation and by requiring banks to conduct stress tests, simulating the impact of environmental damages on their balance sheets, and then assessing capital adequacy based on E&S risk exposure. Whilst the dangers of relying on banks' own assessment of risk in the implementation of capital requirements was strongly illustrated during the financial crisis, BCB is now in a much stronger position to see the emergence of systemic risks across the economy resulting from exposures to brown sectors than most other central banks.

In the case of BCB's initiatives for greening the financial system, it remains difficult to assess the impact these policies have had on lending practices and the real economy. An obvious step in rectifying this would be for BCB to report on green lending and credit flows in its annual report, as do some of the other central banks in this review.

ⁱⁱⁱ. Resolution 4,327, BCB requires banks that are subject to ICAAP and whose assets and balance sheet is therefore larger than BRL100 billion to disclose PRSA practices.

3.3 PEOPLE'S BANK OF CHINA

Established in 1948, the People's Bank of China (PBC) has become a central agent in mainstreaming green finance in China by working together with other governmental organisations on various measures to develop comprehensive green banking guidelines, as well as internationally through the cooperation with the UNEP Inquiry and with other governments under the G20.

Mandate and objectives

The PBC draws its legal status as China's central bank from the Law of the People's Republic of China on the People's Bank of China,³⁹ adopted in 1995 and amended in 2003. The law includes, as a first objective, financial stability and enhanced macroeconomic management, in addition to preventing and mitigating financial risk and thirdly, the overarching objective to maintain price stability and thereby promote economic growth. The strong emphasis on financial stability and risk would appear to provide policy space for the inclusion of E&S risk.

The PBC is required to implement the orders of the State Council,³⁹ a paragraph that is widely interpreted as enabling the government to issue legislation with far-reaching policy initiatives that can also involve the central bank,⁴⁰ which is formally independent of government intervention in performing its functions. Regarding policy implementation instruments, the PBC is mandated to use reserve requirements, the central bank base interest rate, rediscounting, lending, and open market operations, as well as other instruments that are specified by the State Council. It therefore has a wide range of tools at its disposal. The PBC is also the financial system's main regulator.

Inter-agency cooperation and shared responsibility for green policy

In China, initiatives for greening the financial system and growth are subject to close dialogue between different governmental institutions. Prior to the cooperation between different governmental agencies, which started around 2007, individual departments or ministries, such as the PBC or the Ministry of Environmental Protection (MEP), launched relevant green policy initiatives. The joint publication of the *Opinions on Implementing Environmental Protection Policies and Rules and Preventing Credit Risk*, by the PBC, the MEP and the China Banking Regulatory Commission (CBRC) in July 2007 marks the starting point of wider inter-agency cooperation. The multi-agency cooperation involved in the document gave it powerful impact and authority.⁴¹

As outlined by Aizawa and Yang,⁴² the three agencies worked together on the green credit initiative by taking formal responsibility for their individual fields and by augmenting their individual tasks through close cooperation among each other. The PBC took on the role of developing green financial information systems and took the lead in developing new green financial products. The focus of the MEP has been on the development of information on the environmental performance of firms. The CBRC is responsible for guiding banks towards complying with environmental standards of firms as a separate criterion in the loan origination process and credit review process. It is also tasked with enhancing E&S risk management practices by encouraging training for bankers and by helping to establish E&S risk assessment organisations.

Responsibility for financial regulation in China lies with the PBC as the overall financial regulator, the China Securities Regulatory Commission (CSRC) that serves as main regulator for the securities industries, the CBRC, and the China Insurance Regulatory Commission (CIRC) that oversees the insurance sector. The relation between these four agencies and their close working relationship was further formalised in 2014 by the State Council General Office, stating that the PBC, the CBRC, the CSRC, and the CIRC should work closely together with other relevant government agencies to develop in coordination environmental policy.⁴¹

International initiatives, in which especially the PBC has taken part, include the Green Finance Task Force that was set up by the central bank in cooperation with UNEP Inquiry to develop a plan for the promotion of green finance in China and the Green Finance Study Group that was launched under China's Presidency of the G20 and works in cooperation the United Kingdom and UN Environment.

Green macroprudential policy

While the PBC has a strong mandate for maintaining financial stability, most green finance initiatives thus far approach the issue of E&S risk management on prudential, individual bank- and loan-based levels. Having said this, according to Volz⁴³ the Green Finance Committee established by the PBC in 2015 also developed environmental stress testing for the banking sector to engage with the issue of climate or green policy-related systemic risks.

Furthermore, the PBC is considering adding 'banks' qualified green credit into collateral for monetary policy operations and to include institutions' green credit performance in the central bank's macroprudential assessment'.⁴⁴

Green credit allocation policies

Direct intervention and the guidance of credit has not been at the centre of the PBC's green finance and growth strategy. However, the China Green Finance Taskforce's recommends the creation of a China Ecological Development Bank which would issue green bonds and asset-backed securities on a large enough scale to initiate trading in green finance markets.⁴⁵ The report recommends that the PBC could provide initial low-interest equity funding.⁴⁵ It has also been reported that the PBC is already investing into policy-directed investment vehicles.^{40,46}

The Chinese Development Bank (CDB) has also been playing a major role in supporting green credit, making available almost CNY >>>>> (\$50 billion) in credit lines for Chinese wind and solar energy companies and another CNY >>>> (\$US30 billion) for clean energy activities¹⁹

Further initiatives on credit allocation are the CBRC's *Guidance on Credit Provision to Energy Saving and Emission Reduction*, launched in 2007. This seeks to repress credit to carbon- and energy-intensive industries and encourage lending to green projects. On a local level, the *Guidelines on Financial Support for Energy Conservation and Emission Reduction* in Fujian involved preferential interest rates and prioritised credit support measures to reduce carbon emissions.⁴⁷ According to Alexander,⁴⁸ the PBC is also considering using its financing operations to make short-term liquidity available to commercial banks for green projects.

Other green central banking policies

The first initiatives engaging with the issue on environmental protection and credit in China were launched in the 1980s by the MEP and the PBC.⁴⁹ However, the most comprehensive green finance initiative to this day

has been the Green Credit Policy, launched in 2007 addressing all three sectors of the financial system, including banking, securities, and insurance. In 2006, in a first step, the PBC created a countrywide credit database for disclosing information on credit, administrative penalties, as well as information on environmental compliance of firms. In July 2007, against the background of rising energy intensity and pollution in the industrial sector, the PBC, the MEP (SEPA, at the time) and the CBRC jointly issued *Opinions on Implementing Environmental Protection Policies and Rules and Preventing Credit Risk*, thereby formally launching China's Green Credit Policy.

With the overall aim of reducing credit to high-polluting, energy-intensive firms and towards greener projects, the document recommended banks to include environmental compliance, as well as E&S risk assessment as criteria to be considered in the loan origination process.⁴⁷ The initiative furthermore prohibits banks from lending to firms blacklisted by the MEP for environmental violations, as well as to projects that violate other green regulation,⁵⁰ thereby strengthening cooperation between environmental protection and the allocation of credit.

To enhance the disclosure and availability of environmental information, the PBC collects information on environmental violations in the corporate sector and provides Local Environmental Protection Bureaus. This information is integrated into the credit record system and the CBRC is tasked with overseeing commercial banks' practice in applying the information to restrict loans to violators.⁴²

In 2012, the CBRC issued *Green Credit Guidelines*⁵¹ along with a monitoring framework for their implementation.

These voluntary recommendations encourage banks to adopt E&S risk governance standards and to increase support for green and low-carbon projects by asking banks to identify priority areas for green credit. The document asks banks to customise the credit granting process and to develop criteria for the dynamic assessment and classification of client E&S risk and to use this information for, among other areas, credit ratings.⁵¹ A shortcoming of the guidelines is the lack of a clear definition of green credit.⁴⁷

The PBC has also been involved in the development of a green bond market. Following the recommendation of the Green Finance Task Force (PBC & UNEP 2015), which encourages the PBC, the CBRC, and the CSRC to issue industry guidelines on green bonds, the PBC established the Green Finance Committee (GFC) to investigate how to promote green bond finance in China.⁵² In accordance with the recommendations of the GFC, the PBC issued a notice in December 2015 introducing the first official green bond guidelines in China, providing financial institutions with channels for debt financing to support green projects.⁵³ The notice also includes a catalogue of projects supported by green bonds, outlining criteria for projects and loans to qualify as green bonds, as well as guidelines for the management structure and the disclosure of proceeds.

In January 2016, the National Development and Reform Commission (NDRC) issued its own less-detailed green bond guidelines because it lies within the agency's responsibility to regulate corporate bond issuance.⁵² The corporate bond market is substantially smaller than the interbank bond market, which is regulated by the PBC and accounts for 93% of outstanding bonds in China.

A further area where the central bank has been active is the organisation of capacity-building workshops as well as conducting further research. The MEP, the PBC, and the CBRC, starting in autumn 2007, began to offer green finance training workshops for the staff of governmental agencies, as well as for bankers, thereby also involving foreign consultancy firms and experts from the IFC.⁴²

Implementation and impact

The collaboration between the PCB and the MEP to share information on the environmental performance of companies and make it accessible to commercial banks would appear to have been a success. By 2010, the database included 40,000 entries on environmental violation and, by 2012, the database had information on penalties for 600 million individuals and 16 million firms in China, with information provided and added to the database by the MEP.⁵⁰ Aizawa and Yang⁴² reported that banks are actively using the system to restrict loans to certain enterprises.

The overall positive response of the financial sector to the Green Credit Policy is perhaps unsurprising given the involvement of central, provincial, and all major regulatory agencies, such as the MEP, the CBRC, and the PBC. These agencies took steps to coordinate the implementation with cities and provinces, leaving the financial sector no other choice than to accept the plans. Aizawa and Yang⁴² observe that the early response measures by the financial industries focused in particular on the two areas of internal systems, data collection on instances of loan restriction and the allocation of credit to environmentally friendly green projects. Several banks also announced that they had begun to set up internal units to oversee the implementation of the green policy measures.

Overall, by 2010, banks had begun to reduce loans to high-pollution and high-energy projects and increase investment into energy-efficient and environmentally friendly projects. These activities were already reflected in quantitative terms in the *Social Responsibility Report of China's Banking Sector*, which was published by the China Banking Association in 2008.⁴² In 2007, 2.7% of the total bank loans of the 53 banks reporting their lending to the China Banking Association were allocated to 2,715 green projects, amounting to CNY341.1 billion (US\$51.3 billion). In 2008, the same sample of banks had allocated CNY371 billion (US\$55.8) or 3.11% of their total lending, to 2,931 green projects.

By 2011, Aizawa⁵⁴ concluded that accessibility to environmental compliance data had been enhanced; local and provincial governments, as well as the financial sector, were actively participating in the implementation process; and partnerships with the international community, as well as collaboration with the media had been strengthened.

In a more critical account, Zadek and Chenghui⁴⁹ describe how adherence to the green credit guidelines varies within the banking community. Citing the Policy Research Center for Environment and Economy, an institution affiliated to the MEP, and referencing its 2013 *China Annual Green Credit Report*, it ranks the top 50 banks in China according to their adherence to the green policy measures and concludes that out of the 50 banks, only 12% had fully implemented the green credit guidelines. Furthermore, 42% did not sufficiently, or rather had only superficially, adopted green policy measures and 18% had not provided any data on green policy implementation at all.

The International Institute for Sustainable Development (IISD) and the Development Research Center of the State Council (FRI DRC)⁴⁷ report that the national strategy for greening growth and finance has not been effectively implemented in financial policies and that local governments still regard economic growth as more important than environmental compliance. The report claims that local governments pressure banks and regulatory agencies to disregard the environmental regulation compliance criterion when granting allowance for initial public offerings (IPOs). As proof, the report references data on the approval rate of IPOs by provincial environmental authorities, which was at 100% at the time.

A point of ongoing discussion had been the shortcoming of the 2012 CBRC's Green Credit Guidelines to define green credit.⁴⁷ However, in 2013 the CBRC issued the *Green Credit Statistics System* that outlines a comprehensive definition and classifies in its appendix green credit as loans extended to 12 different categories, among them matters of environmental protection, such as water saving and environmental protection, conservation, ecological restoration and disaster prevention, and waste treatment and pollution prevention, as well as categories for new green developments such as renewable and clean energy and green traffic and transportation⁴⁷.

Regarding the insurance sector and green insurance, the critique remains that the definition of green insurance in China is narrow in international comparison and falls short of including climate change and long-term E&S risk because it mainly focuses on environmental pollution liability insurance.

On a more general note, it would appear that most commercial banks had adopted E&S risk management practices by 2015⁴⁸ and that green finance has also been implemented into the overall environmental economic policy. With regard to the potential impact of the PBCs green bond guidelines, the Research Centre for Climate and Energy finance estimates that green bonds valued at CNY300 billion (US\$45 billion) will be issued annually in China by 2020.⁵²

Conclusion

In international comparison, China's approach to greening the financial system and the wider economy is one of the most comprehensive and ambitious of the six countries studied. Green finance has been promoted through impressive coordination of different government bodies that have each addressed their areas of responsibility but worked closely together on implementation, thereby initiating a broad approach that addresses both credit and capital markets and all levels of governance. Most green finance policy initiatives stress both the reduction of emissions through the restriction of funding for certain parts of the economy, and the provision of loans to finance the green infrastructure.

Some concerns remain about the effectiveness of implementation of policies, in particular at local government level. It is encouraging that the CBRC issued the Green Credit Statistics System in response to shortcomings in the definition of green credit. This demonstrates that the transition to green finance is going to be somewhat of an 'exploratory process' that develops over time.

Another open question is whether the PBC, with its strong financial stability mandate, is considering E&S risk as a systemic threat to financial stability.

3.4 RESERVE BANK OF INDIA

Historically, the Reserve Bank of India (RBI), established in 1935, has taken an interventionist approach to credit allocation focusing on priority sectors but has also supported the development of capital markets for the provision of credit. Over the past decade and regarding greening finance and growth, the RBI has maintained a dual approach by guiding credit to priority sectors but also relying on industry-initiated initiatives for green finance guidelines.

Mandate and objectives

The Reserve Bank of India Act, issued in 1934, amended up until 2016, mandates the RBI with the objective of maintaining price stability while keeping in mind the objective of growth.⁵⁵ This is not dissimilar to many advanced economy mandates but the RBI has interpreted 'growth' as providing it with the policy space for much more interventionist policy stances. With regard to the environmental responsibility of the RBI, the deputy governor K.C. Chakrabarty, has voiced his opinion on environmental issues not being part of a central bank's primary concerns, which are primarily price stability, growth, and financial stability, but admitting that while there might not be a direct impact of such issues, indirectly and in the long term, environmental questions have an impact on a central bank's primary objectives.⁵⁶ Furthermore, the RBI has the regulatory responsibility for private sector banks and shares oversight over public banks with the Ministry of Finance.

Inter-agency cooperation and shared responsibility for green policy

In India, there have been numerous climate-change-related environmental initiatives by various governmental agencies addressing a wide range of issues.⁵⁷ However, with regard to greening the financial system, the RBI has taken the lead, especially through the allocation of credit to environmentally friendly or other green projects. Regarding green bond market initiatives, the RBI has worked in cooperation with the Securities and Exchange Board of India (SEBI), India's security regulator. There has also been cooperation between national development banks and international development agencies in the area of green finance, such as the cooperation between the Small Industries Development Bank of India (SIDBI) and the German Corporation for International Cooperation on developing National Voluntary Guidelines on Responsible Finance for financial institutions in India.

Green macroprudential policy

There has been no mention of green macroprudential policy initiatives in India thus far. However, the RBI is considering including environmental risks in the assessment of agricultural price developments when assessing financial and monetary stability.⁵⁸

Green credit allocation policies

The bank's Priority Sector Lending Programme (PSL) has the objective of allocating credit to vulnerable sections of society⁵⁹ and is based on the Banking Regulations Act from 1949, which gives the RBI the legal grounds to intervene in commercial banks' lending practices and the allocation of credit. The PSL has traditionally focused on enabling access to finance for agriculture, infrastructure, education and micro, small, and medium enterprises (MSMEs). Through different measures of banking regulation and guidelines,

and by setting sector-specific interest credit quotas, the RBI ensures that 40% of commercial bank lending flows to priority sectors.⁶⁰

In 2012, the RBI reviewed the priority sectors and concluded that access to clean energy, as a critical necessity for households, should be added. It mandated that loans for off-grid renewable energy solutions, including solar and other clean energy solutions, should be included in the PSL.⁶¹ The RBI concluded that doing so could contribute to sustainable economic development within local communities and improve income levels and the overall quality of life.

In 2015, the PSL was further extended to include two new categories and address sustainable development through one of the first green finance initiatives in India by giving priority to lending to social infrastructure and renewable energy projects.⁶⁰ The revised guidelines maintain the original structure of the PSL under which 40% of adjusted net bank credit or credit equivalent amount of off-balance sheet exposure, whichever is higher, has to be allocated under the PSL with 18% earmarked for the agricultural sector, 10% for 'advances to weaker sections', and 7.5% to micro enterprises.

In all, the updated PSL includes eight categories: agriculture, MSMEs, export credit, education, housing social infrastructure, renewable energy, and others. In regard to renewable energy, the new seventh category specifies bank loans not exceeding INR150 million (US\$2.35 million) per borrower, used to finance projects for 'solar based power generators, biomass based power generators, wind mills, micro-hydro plants and for non-conventional energy based public utilities viz. street lighting systems, and remote village electrification',⁶⁰ as credit that can be included in banks' PSL loans.

For individual household borrowers, the limit for eligible renewable energy loans has been set at INR1 million (US\$15,600). The revised guidelines also establish updated practices for monitoring the implementation of the PSL sectoral targets. The document promises more frequent checks of PSL compliance by introducing quarterly checks instead of the annual checks previously in place. The RBI furthermore introduced revised disclosure standards for the quarterly supply of data on banks' PSL operation

The RBI's greening of the PSL can be seen in the context of the Twelfth Five-Year Plan, titled *Faster, More Inclusive and Sustainable Growth*,⁶² which covers the period 2012–2017. It establishes a focus on sustainable development and addresses the threat of climate change and the necessity of supporting the transition to renewable energy sources. Widely referenced by central bankers in India,⁵⁶ the Twelfth Five-Year Plan played a substantial role in establishing the issue of sustainable green development.

One critique of the RBI's definition of renewable energy is that not all sustainable projects, such as energy efficiency and green building loans, are included in the PSL.⁵⁷ In a step to further establish market mechanisms into the PSL programme and to encourage lower interest rates and costs of loans originated under the PSL programme, the RBI recently introduced a market for trading priority sector obligations.⁶³

Other green central banking policies

General green lending guidelines in India, such as the *National Voluntary Guidelines for Responsible Financing*, launched in 2015 by the Indian Banking Association are industry-led initiatives and not central-bank-led. The RBI discusses green banking in two dimensions. First, the way in which

banking operations are conducted, whereby the central bank issues guidelines on e-banking and paperless banking; and secondly, the question of the selection criteria for loans, where the RBI is not issuing specific regulations or guidelines.⁵⁶

In the timeline of sustainability initiatives in the financial sector in India, the first initiative is the RBI's circular on *Corporate Social Responsibility, Sustainable Development and Non-Financial Reporting – Role of Banks* (Reserve Bank of India, 2007), issued in December 2007. The circular lacks any specific recommendations or guidelines on green finance and introduces the concepts of Corporate Social Responsibility (CSR), non-financial reporting and sustainable development.⁶⁴ Chakrabarty⁵⁶ suggests the aim of the circular has been to familiarise financial institutions with these issues and to encourage them to implement CSR measures on a voluntary basis.

In 2015, the working group of the Indian Banking Association issued the sector-specific *National Voluntary Guidelines for Responsible Financing*, thereby combining the best practice approach from existing national and international initiatives.²³ The guidelines comprise 8 core principles, including considering the issues of ethical conduct and E&S governance, integrating E&S risk management in business activities; minimising the environmental footprint in internal operations; developing environmentally friendly products, services and investment; enabling inclusive human and social development; engaging stakeholders, upholding a commitment to human rights, as well as employing disclosure.²³

Furthermore, the Small Industries Development Bank of India (SIDBI), in cooperation with the German Corporation for International Cooperation (GIZ), issued *National Voluntary Guidelines for Responsible Finance* for financial institutions in India. The guidelines aim to integrate environmental, social, and corporate governance (ESG) principles into lending and investment decisions by banks and are expected to further improve lending practices and environmental due diligence.²³

In 2015, the RBI and the Securities Board of India collaborated to help launch a green bond market. This initiative included Yes Bank, Export-Import Bank of India, CLP Wind Farms, and IDBI Bank and by 2016 had issued a combined US\$1.1 billion worth of green bonds.⁶³

Implementation and impact

The evaluations of the impact of the RBI's PSL have been mixed because many banks fall short of their annual PSL targets.⁵⁷ There has also been a number of non-performing loans under the PSL programme which has led to rising criticism of the targets.⁵⁷ Furthermore, including the category of loans for off-grid renewable energy projects in the PSL programme has not necessarily resulted in increased lending to this sector because whether banks choose to lend to a particular sector within the PSL, for example renewable energy or sustainable infrastructure, depends only on the bank's internal preferences and risk assessment policies and is not mandatory.⁶⁵

The RBI's annual report for 2016⁵⁹ confirms that bank lending to renewable energy projects has been uneven. However, reflecting some

success of the various green lending initiatives, lending to renewable energy projects has grown at a higher rate than overall credit growth during 2009 to 2014.⁵⁹

Regarding the share of credit that is provided by different bank groups, nationalised banks provided over 70% of overall renewable energy lending in 2014, with the State Bank of India seeing its share decrease from 27% in 2009 to 12% in 2014 as private sector banks emerged as the second biggest lender, financing 15%. In response to the inclusion of renewable energy in the PSL programme, the RBI reports an average growth of 21.8% in renewable energy bank credit, but stresses again that the overall share remains low.⁵⁹

With regard to the green bonds initiative, a recent report concludes that green bonds have emerged as a way to finance green and sustainable infrastructure.⁵⁷

Conclusion

The RBI's contribution to green finance has so far focused mainly on its PSL. To green its central instrument used to allocate credit to priority sectors, the RBI has added social infrastructure and renewable energy to its programme, yet has fallen short of implementing its full quotas for these two sectors.

Regarding spreading E&S risk management and addressing it on a systemic level, the central bank's approach has been muted and the issue has not been addressed in recent publications.

Green banking guidelines addressing E&S risk, such as the voluntary *Guidelines for Responsible Financing* have been industry-led initiatives. The first steps in to the Green Bond market look to have been successful.

3.5 BANK INDONESIA

Bank Indonesia, established in 1953, shares responsibility for the regulation of the financial system with the Financial Services Authority – Otoritas Jasa Keuangan (OJK) – and plays a secondary role to OJK in greening the financial system in Indonesia.

Mandate and objectives

The new Central Bank Act that established Bank Indonesia as a formally independent central bank in 1999 and amended in 2004, gives the central bank the single objective of achieving and maintaining price stability of the Indonesia Rupiah (IDR) against goods and services, as well as against other currencies.⁶⁶ To achieve this objective, the act tasks Bank Indonesia to conduct monetary policy, ensure payment system stability, and regulate and supervise banks. Furthermore, the Act also outlines the policy implementation tools to be used to achieve the monetary targets as open market operations, stipulation of the discount rate and reserve requirements, and the 'management of credit and financing' but does explicitly not limit the central banks toolbox to these instruments, thereby giving the central bank the freedom to potentially engage in a wide range of activities.⁶⁶

The amendment to the Central Bank Act in 2004 extended the central bank's single objective of price stability to also include the support of the general economic policies of the government, thereby creating policy space for the central bank to potentially justify a more developmental approach to greening the financial system.

Inter-agency cooperation and shared responsibility for green policy

While Bank Indonesia takes responsibility for monetary policy and macroprudential regulation, OJK, newly created in 2011, took over the responsibility of regulating and

supervising financial services, thereby replacing the function of the Capital Market and Financial Institutions Supervisory Agency. OJK's objective is sustainability regarding the growth of the financial system. It gives institutions the authority to regulate the banking sector, the capital markets, and the insurance, pension fund, and other financial institution sector (Republic of Indonesia, 2011).

With regard to inter-agency cooperation, Volz⁶⁷ highlights the Memorandum of Understanding signed by the Governor of Bank Indonesia and the State Minister of the Environment on the joint effort of strengthening green finance by increasing the role of banks in environmental conservation efforts, offering joint workshops for bankers on E&S risk assessment and the overall promotion of green finance. OJK's *Roadmap for Sustainable Finance in Indonesia 2015-2019* (2014) builds on the central banks previous work and also addresses inter-agency cooperation, stressing the cooperation between OJK and the Ministry of Environment – *Kementerian Lingkungan Hidup* (KLH) – and outlining the necessity for future cooperation with, among others, various ministries, the Indonesia Stock Exchange, and Law Enforcement Agencies.⁶⁸ Bank Indonesia and OJK are members of the IFC's Sustainable Banking Network, thereby also engaging in international green finance initiatives.

Green macroprudential policy

Regulatory financial institutions in Indonesia have not yet issued green macroprudential regulation, but are engaging with the issue on different levels. According to Volz,⁶⁷ there is general agreement among investors that the investments in environmentally damaging projects in Indonesia expose the financial system to E&S risks on a systemic

level. Yet, since initiatives on E&S risk assessment are not mandatory in Indonesia, financial institutions are not engaging with the issue of systemic E&S risk, forcing OJK to consider green weightings on capital requirements.⁶⁷ Furthermore, Bank Indonesia, as a macroprudential regulator in Indonesia, is considering, under the *Roadmap for Sustainable Finance*, to include E&S risk into its macroprudential framework in order to secure monetary and financial stability.⁶⁷

Green credit allocation policies

The OJK's *Roadmap* document declares sustainable growth as a central pillar for future economic development and promises to give priority to the development of renewable energy and energy conservation. However, it identifies only generally agriculture, manufacturing, infrastructure, SMEs, and energy as explicit priority sectors.

In its Master Plan for Indonesia's Financial Service Sector (MPSJKI) for the period 2015–2024, OJK promises increased funding through banking and capital markets for these sectors.⁶⁸ Furthermore, the Roadmap also discusses regulatory support for priority sectors and mentions the possibility of requiring banks to lend a fixed percentage of their portfolio. The document also outlines an implementation plan on Green Lending Models for Priority Sectors with the aim of providing funds, starting in 2015. OJK has conducted further research on the matter of channelling credit to priority sectors, identifying the sectors of agriculture, maritime, mining exploration, construction, and the processing industry as promising and dropping any reference to green sectors.⁶⁹

Nonetheless, until today, neither the OJK nor Bank Indonesia has publicly stated that they are involved in any green credit allocation policy initiatives.

The OJK, however, has started to support financing to the maritime and fishery sector⁷⁰ and introduced in 2013 regulation to increase bank lending to SMEs, requiring them to allocate 20% of their lending portfolio to SMEs.⁶⁷

Other green central banking policies

The broader political framework for green finance and growth policy initiatives was set in 2005 with Indonesia's National Long-Term Development Plan (RPJPN) 2005–2025, which addresses climate change and global warming as major challenges that require the government's intervention. Volz⁶⁷ outlines how, starting in the late 1990s, Bank Indonesia and later OJK have a long history of addressing environmental sustainability. With the Bank Indonesia Act 10/1998, Bank Indonesia issued a first policy initiative requiring banks to assess the environmental impact of large or risky loans. In 2005, with Regulation No. 7/2/PBI/2005, Bank Indonesia further enhanced environmental impact assessment practices by requiring banks to assess measure taken by potential clients to protect the environment. In 2012, it issued Regulation No. 14/15PBI/2012 requiring banks to take borrowers' environmental conservation efforts into account when their business prospects.

A first step in the direction of developing overall lending guidelines can be seen in Bank Indonesia's cooperation with USAID and the Ministry of Environment in 2013, based on which voluntary *Green Lending Model Guidelines for Mini Hydro Power Plant Projects* were issued in order to encourage banks to enhance green lending practices.⁶⁷

In taking the lead role on greening the financial system, OJK has since broadened its approach by addressing the financial services industry as a whole. In its *Roadmap*, OJK

addresses E&S risk management, the identification and promotion of sustainable priority sectors, ESG reporting standards, and capacity enhancement and human resources. OJK uses the document to define sustainable finance in the context of the financial services industry's effort to address climate change, move to a low-carbon economy and promote environmentally friendly investment. The objectives outlined in the *Roadmap*, are first, to improve the resilience of financial institutions and enhance the development of green financial products; second, to provide the financial resources for the National Long-Term Development Plan, and, third, to contribute to climate change mitigation. On the implementation side, OJK highlights the necessity of increasing the supply of green financing and products and increasing the supervision of green policy implementation by financial institutions.

An area where Bank Indonesia has shown some engagement with the issue of greening the financial system is capacity-building workshops for bankers that cover E&S risk assessment, risk mitigation of renewable energy investment, and green finance in general, which it organised in cooperation with the Ministry of the Environment in 2010.⁶⁷ Bank Indonesia organised further discussion groups and seminars in 2011 to raise awareness of environmental issues as well as capacity-building workshops for commercial bank personnel on E&S risk assessment in cooperation with the UNEP Financial Inquiry and together with USAID on renewable energy financing. Further capacity-enhancing events for bankers were organised jointly with the Ministry of Environmental Affairs and Forestry in 2013 and in collaboration with the Ministry of National Development Planning, the Ministry of

Environment, USAID, and the GIZ in 2014.⁶⁷ In collaboration with the IFC and USAID, OJK also published a *Clean Energy Handbook for Financial Service Institutions* in 2015.⁷¹

Implementation and impact

Assessing the most recent efforts by Bank Indonesia and OJK, to promote green finance and growth based on the institutions' annual flagship publications appears to be rather difficult. After releasing the *Roadmap* in December 2014, OJK did not engage with green finance in its annual report for 2015⁷⁰ and does not mention any green credit or bond initiatives, E&S risk management, or provide any data on any green finance. Furthermore, the report does not list any green or environmental regulatory initiative on the provided list of all initiatives for 2015.

Regarding the support for priority sectors, a topic that featured prominently in the *Roadmap*, the report mentions in its outlook for 2016 that in the context of promoting the maritime sector, OJK would support inter-bank working groups on renewable energy.

Bank Indonesia does not engage with the topic of green finance or related issues in its recent flagship reports. The central bank's *Financial Stability Review 2016*⁷² that discusses comprehensively various types of risk in the financial system, also falls short of mentioning E&S risk or climate change. Its annual report for 2016,⁷³ Bank Indonesia also does not engage with environmental issues, climate change, or green finance.

Volz⁶⁷ comes to the conclusion that the banking industry has thus far been insufficiently engaged with green finance. Based on research conducted by Bank Indonesia between 2011 and 2013, he finds the majority of financial institutions in Indonesia did not consider E&S factors in their lending and investment process.

In regard to flows of green finance, in 2011, banks were investing IDR6.⁴ trillion (US\$480 million) or 1.19% of their lending portfolio in green projects, slowly increasing the share to 1.29% and IDR9.3 trillion (US\$697 million) in 2012 and 1.37% and IDR10.2 trillion (US\$765 million) in 2013 and investing the biggest share in 2012 in renewable energy projects, with 26.1% in mini hydro projects and 26.7% in geothermal projects.⁶⁷

In a research project on green banking conducted by Bank Indonesia in cooperation with the German Development Institute in 2013, a survey found that 94% of banks had no unit responsible for green finance at the time, but also showed that most banks (49 out of 68) considered green finance a promising area for the future. Regarding E&S risk management, the survey showed that 77% of responding banks felt that they lacked the staff to conduct E&S risk assessment. Another survey conducted in 2015 showed that most institutions still did not consider E&S risk factors in their lending and investment decisions.

Conclusion

Overall, the *Roadmap for Sustainable Finance in Indonesia* has been judged as an innovative and comprehensive approach to greening the financial system. Yet, since its publication, there is little evidence of its objectives being implemented on the ground. The experience of Indonesia shows that voluntary initiatives and non-binding governmental roadmaps have their limits regarding their effect and implementation. The survey of Indonesian banks suggests they might welcome mandatory regulation on E&S risk management because it would level the playing field and not disadvantage those banks implementing voluntary guidelines first.

3.6 BANK OF KOREA

The Bank of Korea, created in 1950, has played an important role in South Korea's fast economic growth over the last 60 years by helping to manage the allocation of credit and supporting priority sectors for economic development.¹⁸ With regard to Korea's comprehensive Green Growth Strategy, which has been widely discussed and praised as the first initiative of its kind worldwide and has elevated the country to become a global leader in low-carbon economic growth, the central bank has played a surprisingly muted role. A possible explanation for this can be found in the design of the Green Growth Strategy, in which finance plays only a secondary role.

Mandate and objectives

The Bank of Korea Act⁷⁴ gives the central bank the objective of supporting economic development by pursuing price stability and to furthermore safeguard financial stability. The Act also addresses explicitly the independence of the central bank by stressing that its monetary and credit policy shall be formulated independently. While the development of the national economy is already mentioned in the first article of the Act, the Act also establishes the legal ground for the Bank of Korea's support of key government policy initiative by stating that monetary and credit policies should be carried out in coordination with the economic policy of the government, as long as such objectives would not conflict with the primary goal of price stability.⁷⁴ The Bank of Korea could therefore have the legal grounds to support the government's green growth policy initiatives.

Historical context

To understand green finance in Korea, it is necessary to first take a closer look at the bigger policy framework for greening the economy and at the reasons of why it was implemented. Over its 60-year history of fast economic development, South Korea has relied heavily on fossil fuels. The country entered a new era when President Lee Myung-Bak launched the national Green Growth Strategy in August 2008 by declaring low-carbon green growth as the central pillar of the country's future growth strategy. Following the publication of the broad framework, the government issued the *Five-Year Plan for Green Growth (2009–2013)*, as part of the *National Strategy for Green Growth (2009–2050)*, that outlines the government's commitment of 2% of the annual GDP to green growth, amounting to U\$D97 billion over the period 2009–2013.⁷⁵ The strategy addresses regulatory as well as fiscal and financial reforms and lists, among others key policy initiatives, the establishment of an emissions trading system, the promotion of investments in green industries, public guarantees for loans to green industries, the promotion of green bonds, and the creation of a green fund to support SME's access to credit.⁷⁶

However, Lee's successor, President Park Geun-hye, who took office in 2013, sought to distance herself from the Green Growth Strategy. She changed the language of the initiative that was closely associated with her predecessor, by replacing the term 'green growth' with 'sustainable development' and asking ministries to delete any reference to 'green growth' from websites and reports.⁷⁵ The Park government later returned to committing to green growth and was keen to promote its own Green Growth 2.0 strategy and distance itself from the previous administration.

Inter-agency cooperation and shared responsibility for green policy

The Bank of Korea and the Financial Services Commission (FSC) share authority for financial regulation and supervision in South Korea and oversee in cooperation the Financial Supervisory Service (FSS) that examines and supervises financial institutions directly. However, regarding greening the financial system, these institutions' approach has been rather muted. A fourth financial governmental agency, that plays a role in the promotion of green finance, is Korea Development Bank (KDB), a state-owned policy-directed investment vehicle that started to invest in green industries in 2009⁷⁷ and has recently started to promote green bonds.

Regarding international cooperation, South Korea is hosting the Green Climate Fund (GCF)^{iv} that launched in 2013. The GCF is a new global fund, mainly financed by advanced economies, that helps developing countries particularly vulnerable to climate change to limit or reduce their greenhouse gas (GHG) emissions and adapt to climate change. The Korean government developed a legal framework that allows the GCF to operate in South Korea and supported its establishment and operations through the creation of the GCF headquarters, by providing equipment and helping to cover operational costs.⁷⁸

Green macroprudential policy

With the mandated objective of safeguarding financial stability, the Bank of Korea has the responsibility for macroprudential policy yet has not publicly discussed any engagement with green financial policy or E&S risk management in general or on a systemic level.

Green credit allocation policies

The Bank of Korea has not publicly announced any engagement in green credit guiding activities through credit quotas or targeted refinancing lines. Policies aiming at allocating credit at preferential terms to priority sectors appear to be run by fiscal agencies through dedicated funds and not by the central bank through monetary operations. The government started using fiscal funds to enhance energy conservation following the second oil crisis in the late 1970s and subsequently established an Energy Use Rationalisation Fund in 1980 that was financing low-interest rate loans for energy saving projects.⁷⁹

With the launch of the Green Growth Strategy, the government created a renewable energy policy initiative aimed at supporting SMEs, non-profit organisations, and public institutions by providing them with low-interest loans to encourage investment in energy efficiency and conservation-enhancing equipment.⁷⁹ Financing was limited to new energy equipment and extended by commercial banks that would usually charge higher interest than targeted under the low-interest-rate programme. Commercial banks were then reimbursed through the government subsidy for the difference between the two interest rates. By 2015, 18 commercial banks were taking part in the initiative administered by the Korea Energy Management Corporation (KEMCO), which is tasked with verifying the implementation as well as with project supervision. Eligible loans under the government's policy loan scheme included investments into renewable energy, energy saving, agriculture, tourism, and environmental industries.⁷⁹

^{iv}<http://www.greenclimate.fund/who-we-are/about-the-fund>

The FSC's *Financial Policy Roadmap* 80 addressed the issue of allocating credit to productive industries, yet only stressed that channelling funds to innovative businesses working on new technologies would be essential and did not mention green industries or renewable energy. The FSC thereby falls in line with the recent trend of regulatory financial institutions in South Korea that do not mention or engage in any green finance activities.

In the context of central bank engagement in supporting priority sectors, Volz⁴³ lists the Bank of Korea's *Bank Intermediate Lending Support Facility* that is aimed at allocating increased lending to the SME sector, yet does not include any green lending guidelines.

Other green central banking policies

The Bank of Korea also does not seem to be involved in any other green central banking policies. However, in its most recent annual report,⁸¹ it lists the goal of strengthening research on sustainable development in general, as well as investigating constraining factors that hold back sustainable growth. As mentioned before, after the Park government's initial distancing from the Green Growth Strategy, government agencies were also advised to use the term 'sustainable' rather than 'green' growth.

Nonetheless, it is worth reviewing some of the green finance initiatives by different financial governmental agencies in Korea. A report by the Global Green Growth Institute,⁷⁹ lists green commercial and policy loans (mentioned in the previous section), green policy guarantees, green policy funds, and green policy insurance as the four policy instruments through which the government is seeking to support green business activities. Against the background of the low-carbon green-growth strategy

announced in 2008, it is targeting green industries and is furthermore providing export credits for green corporations. Green policy guarantees were implemented by various, mostly governmental, financial institutions, such as the Export-Import Bank of Korea through the provision of guarantees at favourable terms for liabilities concerning investment in green projects by covering potential losses that could occur. These guarantees have been most relevant in the SME sector.⁷⁹

In a joint statement in 2009 with the Ministry of Strategy and Finance, the FSC addressed the government's plans to promote investment in green industries and announced a certification system to verify the eligibility of green projects and companies for funds under such a scheme.

In 2010, the government issued the Basic Act on Low Carbon Green Growth,⁸² outlining measures to enhance green finance. The Act is one of the few documents on green growth that explicitly addresses and proposes green financial policy by outlining the government's plan to raise funds to support the green economy, develop new green financial products, encourage private investment into green low carbon infrastructure, support a disclosure system for the implementation of companies' green management standards, and establish a carbon trading market.

The promotion of green bonds has been the second green finance area where there has been some policy activity. The public Export-Import Bank of Korea is the first financial institution in Asia to issue green bonds. It did so in 2013, issuing bonds worth USD500 million.⁵⁸ Today, the state-owned KDB has taken a leading role in the promotion of green bonds; it

issued green bonds in June 2017 that raised U\$D300 million.⁸³ The KDB has announced that the proceeds of the green bonds will be used to finance or refinance investments in renewable energy projects, low carbon emission technology and green transportation. It also announced that the review and project evaluation process starts with the assessment of E&S risk and that it will publish an annual investors newsletter with information on the amount that has been allocated to green projects, the details of the projects itself as well as the environmental impact and the reduction of CO2 emissions of the financed projects^{84,85}.

Furthermore, the KDB has developed an E&S risk assessment framework that it applies to its own project financing operations with the aim of avoiding a negative impact of its investments on the environment or society and to ensure that stakeholders take E&S risk into account.⁸⁵ The KDB has also played a central role in enhancing green finance in South Korea by, on an operational level, setting up a green finance programme to provide funds to green industries and low-carbon projects and by participating in the national emissions trading markets.

In summary, although the Korean central bank has not played a role in green finance, a range of other initiatives have been implemented. UNEP Inquiry's *Green Finance Progress Report* 6 groups these initiatives into three categories. First, the government is providing a strategic policy framework that helps reduce policy uncertainties. Second, the FSC has made efforts to develop a 'stewardship code' as an important step towards the promotion of voluntary green finance principles that rely on the market's own initiative to promote green finance under the absence of binding regulatory measures. And third, the

commitment to a Green Bond market as evidenced by the drawing up of green bond guidelines by the Ministry of Finance and the first issuances of green bonds by government-owned policy banks in Korea.

Implementation and impact

The implementation of green financial policy as part of Korea's overall green growth strategy appears to be modest. The first policy documents on green growth did not address the issue of green finance directly and most government initiatives fell short of mentioning the Bank of Korea and giving it a dedicated role. A search of the Bank of Korea's homepage reveals not a single English document mentioning the term 'green'. The non-engagement of the Bank of Korea with green finance in the broadest sense is also reflected in its annual reports, which in recent years have not mentioned any green activities by the bank.⁸¹ The UNEP Inquiry⁷⁶ comes to the conclusion that no explicit provisions for the financial sector were made under the Green Growth Strategy, yet the report is expected to have far-reaching consequences for financial industries based on the Green Growth Strategy.

Because the financial sectors' involvement in green finance activities is rather restrained, except for the KDB, available data for the flow of green funds is scarce and focuses mainly on the real economy. With regard to the early initiatives, following the government's Green Growth Strategy in 2008, early reports on the implementation were very positive and predicted a substantial impact.⁸⁶ In 2009, the government allocated 80%, totalling U\$D38.1 billion, of its post-crisis stimulus package at green growth related projects.⁷⁵ In 2011 South Korea spent 3% or about U\$D33 billion of its GDP on investments in green growth.⁷⁶

In general, green growth has been financed through companies and the government's own funds and not through the help of the banking sector, which remains conservative in its lending strategy.⁷⁶ In assessing the overall impact of Korea's green growth, several reports have a positive outlook of the future.^{75,76,86} However, Kim and Thurbon⁷⁵ also mention that despite the substantial investments, energy intensity increased between 2009 and 2012.

Conclusion

In summary, although the issuance of the Green Growth Strategy by the government was followed by substantial investment into energy conserving projects, financial regulation and the greening of the financial system are currently not at the centre of the strategy. The lack of green financial policy is also reflected in the reserved participation of the financial regulatory agencies in South Korea with the Bank of Korea seemingly not being involved at all. Whether the government chose not to engage with the Bank of Korea or the Bank of Korea did not wish to be involved in the strategy is unclear, but the outcome has been that other public institutions, not least the Korean Development Bank and government itself have done the heavy lifting in providing green investment. Korea's relatively healthy fiscal position (with a debt-to-GDP ratio under 40%) and concentration of public debt in long-term domestic investors place in a good position to continue to use fiscal policy and development bank funding to support a green transition.

4. CONCLUSIONS

This review has made clear the key role that central banks and related financial regulators' in EMDCs can play in promoting green finance and growth to protect the environment, mitigate climate-change, and safeguard financial stability. Our survey of six major EMDCs also shows that there are a variety of approaches to greening the financial system involving different policies and different forms of cooperation between governments, central banks, and commercial banks.

At one end of the spectrum, in countries such as India and Bangladesh, central banks are implementing mandatory credit quotas to require banks to finance renewable energy, green transportation, and overall sustainable development.

At the other end, regulatory financial institutions are abstaining from direct intervention into financial markets and instead offering voluntary guidelines on green banking or bond issuance with the aim of establishing the institutional framework within which financial institutions move on their own towards greener lending operations. The latter approach is clearly more aligned with current policy in advanced economies.

In the middle of this policy spectrum would be a third approach that focuses on setting incentives to make green lending and investment operations more profitable for financial institutions through binding regulatory guidelines and standards on topics including E&S risk management, green bonds, and the loan origination process.

Many of the central banks in EMDCs have an explicit mandate to support sustainable development or at least the government's economic policy agenda, thereby giving the central bank the legal grounds to engage more actively in green financial policy. In countries where central banks have a strong focus on the singular objective of price stability and its act stresses its policy independence, the central bank tends to be less involved in developmental and green financial or allocative policy: Korea and Indonesia would fall into this category.

The second issue of interest in the case studies has been the identification of other relevant financial regulatory institutions and the degree to which there has been inter-agency cooperation on a national and

international level on green policy initiatives. One conclusion from the case studies is that governments that give a higher priority to greening finance and growth tend to engage all relevant governmental actors by instructing them to issue guidelines or regulation in their own field of expertise and jurisdiction and by setting up inter-agency coordination to secure the far-reaching implementation of policy initiatives. China would be the prime candidate here although there was also evidence of sophisticated coordination in Brazil and India. The countries where one agency alone has the responsibility for green financial policy tend to have a weaker record of implementation.

Green macroprudential policy and the engagement with environmental and social risk on a systemic level are issues that seem fairly new to most central banks in our case studies. While some have discussed or acknowledged that there are systemic implications of increasing environmental risk against the background of climate-change, only a few – Brazil being the outstanding example – have translated this insight into policy measures. However, quite a few central banks with the responsibility for financial stability have not yet engaged with E&S risk at all and seem to be some way off addressing environmental systemic risk.

Regarding green growth and credit allocation, our case studies show how existing traditions of financial intervention shape the country's approach. Central banks that have in the past been engaged in centralised credit allocation policies – India and Bangladesh most obviously – have added categories to their existing priority loan programmes for green projects and, most often, renewable energy. In other countries, such as Korea, Brazil, and China, national

development banks have played a more important role in supporting credit to green sectors with the central bank playing more of a role in suppressing credit to 'brown' sectors. Regarding implementation and impact, results have been mixed and further research is needed to ascertain how successful credit guidance policies have been but there is certainly much to build on.

A closer look at other green central banking policies revealed a wide range of different policy initiatives in which not only the central bank, but also other financial regulatory institutions play a central role. In general, the more successful green finance initiatives tend to address several aspects of the financial system, including E&S risk management, green bond markets, retail banking as well as insurance.

Assessing the implementation and impact of green financial policy in the countries of interest has been challenging. In some countries, governmental institutions have issued comprehensive regulation, guidelines, or policy roadmaps, but have failed to present evidence on the implementation and impact of their green initiatives. With regard to the general implementation and impact of green finance initiatives, the UNEP Inquiry *Green Finance Progress Report*⁶ also comes to the conclusion that the measurement of green governance activities and their impact has been limited so far. The report argues that, while the overall understanding of the macroeconomic impact of green finance is still insufficient, recent green initiatives have been mostly market-led and not policy-guided, with rather disappointing results as private markets have remained risk averse in the face of policy uncertainty (the renewable energy sector may be an exception here however).

In other cases, however, central banks have acted to improve things. For example, the RBI was criticised for its definition of renewable energy projects and the CBRC was also criticised for short comings in its definition of green credit. In both instances, the central banks responded and implemented new measures as a result. This illustrates that green finance is likely to be an exploratory policy-making process, where policies platforms can be gradually built upon over-time.

In general, central banks and other regulatory institutions in our case studies are seriously engaged in green finance issues to a greater extent than central banks in advanced economies. One possible explanation for this is the broad acknowledgement that the poorest economies will be the ones first hit by the consequences of climate change, global warming, and more frequent, severe weather events. Central banks in developing and emerging economies therefore seem to be more committed to engaging with the topic of greening the financial system, specifically regarding incorporating E&S risk into loan origination, due diligence, and prudential policy.

A second possible explanation for why central banks in emerging economies are playing a leading role when it comes to greening economic growth, especially regarding credit guidance policies, is that in the absence of deep financial markets, central banks have traditionally engaged in more direct credit allocation policies, also in the conduct of routine liquidity management.

Having said this, it is also increasingly recognised that private markets in both advanced and EMDC economies are not investing sufficient financing in green infrastructure and green innovation to meet the challenge of keeping global temperatures from increasing above 2°C.¹³ Given this, there may be valuable lessons for advanced economies to learn from the early experiments in green central banking reviewed in our case studies.

Only 10 years ago, the idea of directing credit in to or away from certain sectors of mature capitalist economies might have been dismissed as a reversion to defunct socialist planning. Following the financial crisis, however, and the increasing use of macroprudential policy in advanced economies, the pendulum appears to be shifting. We hope therefore, that this report aids knowledge transfer and engagement not only between EMDCs but also between them and advanced economy monetary policymakers and financial regulators.

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