

Greening the financial system

Tilting the playing field The role of central banks

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Climate Bonds INITIATIVE

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Introduction

"4°C warming makes the world uninsurable"

Thomas Buberl,
Axa CEO¹

This briefing paper looks at the role central banks and micro-prudential financial regulators (CBFR) could play in greening the financial system. Central banks are concerned with regulating macro-economic goals like stable inflation and output growth, availability of credit to sectors and the overall stability of the financial system. Micro-prudential regulators are more concerned with the stability and conduct of individual financial institutions. This paper lumps together central banks and micro-prudential regulators even though in many countries responsibilities are spread over multiple organisations with the precise demarcation varying between countries.

Section 1 provides a background of how the CBFR's have been adopting the climate change risk agenda. Section 2 of the paper discusses the current roles played by CBFRs and reviews the instruments in current use (though not necessarily for 'green' purposes). Section 3 covers current policies for reducing climate risk. Section 4 talks about possible actions they could take to reduce climate risk.

The discourse around central bank action has advanced markedly over the past few years. Mark Carney's Tragedy of Horizons speech,² given to an audience of insurers at Lloyds, marked an important point: a senior central banker, the then chair of the Financial Stability Board, articulated the risks and opportunities stemming from climate change. He spoke about the "current and prospective financial stability risks from climate change" and the role financial policy-makers need to play "in ensuring the financial system is made resilient to any transition hastened by those decisions, and that it can finance the transition efficiently." His message was clear: climate change was a risk to the financial system and financial policy makers needed to act.

In 2016, the influential Taskforce on Climate Related Financial Disclosures (TCFD)³ was established by the Financial Stability Board (FSB) and chaired by Michael Bloomberg. Its 2017 report has played a significant role in steering the direction of the current debate on transparency. The most recent status report says that 785 organisations, of which 374 are in the financial sector,

Box 1:

Summary of recommendations from TCFD and NGFS reports

Task Force on Climate-related Financial Disclosures – June 2017

TCFD made recommendations to G20 about the disclosures all organisations should make to their stakeholders to facilitate the market's understanding of climate related risks.

- **Governance:** Board and managements role in assessing and managing climate risks
- **Strategy:** Where material, disclose short, medium and long-term risks and opportunities including resilience to different climate scenarios
- **Risk management:** How organization will manage climate related risks
- **Metrics and targets:** Disclose the organisations' direct and indirect emissions and targets

There were supplemental recommendations to the finance sector (lender, underwriter, investor and asset manager) of the role it plays in capital allocation and the leverage this provides to lead best practice.

NGFS – comprehensive report – April 2019

Recommendations to CBs:

- Integrate climate-risks into monitoring and supervision activities.
- Implement them in portfolio management.
- Bridge data gaps
- Supply technical assistance and share knowledge within the central banking community.

For the policy makers and the private sector, it calls for:

- Robust and consistent disclosure of environmental risks, and;
- A taxonomy of green and brown assets.

have committed to support the TCFD recommendations;⁴ though investors say disclosure is still insufficient with only 25% of companies reporting on five or more of the 11 recommended disclosures.

Fast forward two more years, to April 2019, central banks assembled into a coalition-of-the-willing, the Network for Greening the Financial System (NGFS), published its first "comprehensive report". It outlined six actions that should to be taken by central banks, governments and industry (see Box 1).⁵ In essence, the report suggests that CBFRs implement climate-risk thinking in their own actions, provide technical assistance to financial institutions (FIs) and recommend that FIs collect and disclose more data to the market. Box 1 summarises the main recommendations by the NGFS and the TCFD.

The securities and exchanges regulators (IOSCO) have also established a sustainable finance network. This has already published a short explanatory paper.⁶ The network is kicking off work by undertaking a stock take on current actions by members especially on standards for ESG disclosures recommended by regulators.

This paper frequently refers to the bond market and speaks to the use of green bonds. CBFR's remit covers the entire financial system and many of the points being made apply equally to other financial instruments, especially loans. That said, the bond market is critically important: around half of all financial assets, roughly USD 100 trillion,⁷ are held as bonds, especially by long-term investors like pension funds.⁸ Bonds issued by developed market sovereigns and high-quality corporates, because of their low risk of default and liquidity, play an important role in financial regulation. They are used by banks and insurers to comply with supervisors' requirements to hold High-Quality Liquid Assets to fulfil Basel III's pillar 1 requirements. This has created a situation where there is a ready market for highly rated sovereign bonds *even if they pay negative interest rates*.⁹

As prudential supervisors and monetary authorities, CBFRs have a huge impact on the bond market, including by (a) deciding whether or not particular bonds may serve as collateral, (b) determining and validating any adjustments made to allow for their riskiness, and (c) proscribing which sorts of bonds to purchase for own-account reasons.

What do CBFRs do and what should they do?

"With great power comes great responsibility."

Uncle Ben
(Spiderman's uncle)

CBFRs roles include the following:

1. limiting inflation through setting interest rates and reserve requirements, influencing the supply of money and the allocation of credit in the economy (monetary policy)
2. promoting financial system stability (macro-prudential regulation)
3. supervising banks and other financial institutions (micro-prudential regulation)
4. fostering payment safety and consumer protection.

These duties are often split between the central bank and specialist sector regulators for insurance companies, pension companies, etc.

In addition to these primary roles, CBFRs may also have responsibilities for wider government priorities like employment, economic growth or economic sustainability. In a review of the mandates of 133 central bank mandates, Dikau and Volz find that 12% have specific sustainability mandates, generally coached in terms of *sustainable growth of the economy* e.g. Philippines, Malaysia and Iraq and on occasion for sustainable development: Nepal - "to maintain the stability of price and balance of payment for sustainable development of economy". Altogether 29% are mandated to support government priorities which usually include sustainability. While the primary responsibility of central banks includes creating and maintaining price stability, some mandates also give equal weight to other economic objectives, including sustainable growth, full employment and in the case of several emerging markets anchoring the exchange rate.¹⁰

A hierarchy of goals is seen in the Europe System of Central Banks (ESCB): "without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union *with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union*."¹¹

It is important to understand the range of duties that are already given to central banks and financial regulators since these will set the boundaries for the sorts of measures

they can use and will effect the range of existing skills and competencies. Their roles in overseeing conduct, supervising, investigating and remedying infractions and complaints will occupy much of staff time, and determine the skill sets of the staff.

Box 2 gives a summary of CBFR's roles and instruments. The underlined items are discussed further as possible instruments to green financial systems.

This means that within their current legal frameworks central banks' focus is on economic goals such as price stability, economic growth and safe-guarding the stability of the financial system. That said central banks have considerable latitude to be inventive in the actions taken to support financial stability – witness the development

of QE first in Japan then US and Europe in response to deflationary pressures.

Increasingly central banks speak about climate change as a threat to financial systems, framing their initiatives as a response to the market's under-pricing of climate risk. In an open letter three central bankers comment:¹² "...We recognise that the challenges we face are unprecedented, urgent and analytically difficult. As long as temperatures and sea levels continue to rise and with them climate-related financial risks, central banks, supervisors and financial institutions will continue to raise the bar to address these climate-related risks and to "green" the financial system."

In terms of concrete actions – the response is still muted. Members of the NGFS are still

Box 2:

Role of the central banks and financial regulators

Monetary policy

Central banks (CB) are required to maintain inflation within specified levels. The instruments they use include

1. Open market operations – purchasing / selling financial assets to stabilise exchange rate
2. Standing facilities to provide banks with liquidity – using the collateral framework
3. Minimum reserves – regulated banks must hold a share of net deposits with the CB (US deposit taking banks must hold at least 10% of deposits with the Fed)
4. Non-standard monetary policy/QE – purchasing of assets to counter deflation

Prudential regulation

CBFRs ensure banks, insurance companies and other FIs are robust against market risks. These are internationally agreed and (will) follow the Basel III agreement. The objective of the requirements is to ensure financial institutions have sufficient capital reserves to ensure solvency & ready access to cash if the market conditions change.

1. Eligible capital (mainly from equity and retained earnings)/(credit + market positions + risk weighted assets) greater than 7% (in UK)
2. Leverage ratio = Capital measure / Exposure measure. Both numerator and denominator are based on their non-risk weighted values

3. Short term liquidity = High Quality Liquid Assets/ Net Cash Outflows

4. Longer-term liquidity (1 year) = Available stable funding/Required stable funding

Under Pillar 2 central banks require supervised banks to stress test their solvency and liquidity using a standardised combination of unfavourable market and climate assumptions.

Other roles

CBFRs may perform other duties varying between countries

1. Maintaining currency peg/Managing foreign reserves
2. Investment management – e.g. staff pension schemes
3. Credit guidance
4. Consumer protection through the regulation of the conduct of banks, insurers, financial advisers and other intermediaries
5. Promotion of competition between financial service providers
6. Regulating exchanges
7. Regulating disclosures of market sensitive information

in data collection mode. In the UK, the UK Prudential Regulation Authority has issued supervisory notes essentially asking FIs to implement TCFD's recommendations on a voluntary basis. Such actions are useful, requiring forward looking disclosures of climate risks by FIs. But their ultimate success still assumes that self-interested long-term investors armed with better data will reassess their investment decisions. This belief that better information will make market participants correctly price climate risk more efficiently is mishearing Carney's more fundamental "tragedy of the horizons" critique. What if investors prioritise *animal spirits* over the *greater good*?

The UK PRA has gone further than other central banks and announced a consultation on a climate stress test to be undertaken in autumn 2019, followed by introduction of the stress test itself in 2022. It also issued climate stress test scenarios for the life insurance sector, but these leave the key parameters for the test unspecified and for the firms to choose for themselves based on recommended sources.¹³ The three scenarios are a down-grading of fossil intense assets by 2022, an orderly transition broadly in line with the Paris Agreement so to achieve carbon neutrality by 2050, and a physical risks scenario of a 4°C temperature rise by 2100.

Despite numerous speeches and reports about the under-pricing of climate risks by FIs, CBs have not so far applied their powers from prudential regulation or monetary policy to oblige FIs to reduce climate risk exposure. FIs remain free to lend to, underwrite, or acquire assets even if regulators fear they are mispriced. CBFRs argue democratically elected governments need to take the lead, using instruments like carbon pricing to reign in carbon emissions reductions.

But Governments have so far failed to decisively tackle emissions. Despite 30 years of climate policy, global emissions are still rising. Government's difficulty in creating and maintaining an effective policy is evidenced by the EU-Emission Trading Scheme's (ETS) major shortcomings. This, the world's largest carbon market, has seen the price of carbon fluctuate from a peak of €30/tCO₂ in June 2009, to a nadir of €3/tCO₂ in April 2013, and back to €27/tCO₂ in April 2019, as a result of EU policies aiming to remove the oversupply of credits from Phase III of the EU-ETS.

The volatility of carbon price has deterred the "brown to green" shift in investment activity. In 2018, the oil and gas majors, including European companies like BP and

Equinor, collectively spent just 1.3% of their CAPEX on low carbon investments such as renewables or CCS.¹⁴ Since the Paris Agreement was signed in 2015 eight European banks have provided \$16bn of coal finance chiefly outside Europe.¹⁵ Axa, now divesting from coal, doubled its holdings in coal assets since the Paris Agreement was signed, and owns around 200 tonnes of coal per mil USD AUM.¹⁶

There are legal and jurisdictional reasons why central banks, working through capital markets, might be better placed to mitigate global carbon emissions than governments. National climate change policy operates on territorial emissions as defined by the nation's geographic boundaries and pays no heed to the fact that managerial control and financial benefits might reside elsewhere. EU governments' efforts to combat climate change have not sought to inhibit the production or financing of fossil assets by their oil majors or banks and insurers. Indeed, the global operations of banks and oil companies are important sources of national income. While European governments have succeeded in reducing their UN-FCCC defined emissions, European oil companies continue to undertake worldwide investment in new fields, and European FIs continue to hold assets in global oil and coal. It is worth emphasising this point. Though many of the richer economies have reduced emissions within their territories, they continue to reap the income streams by being the beneficial owners of assets. Put bluntly they have off-shored their carbon emissions to the rest of the world.

But the OECD economies remain exposed, via the finance sector, to physical and transition risks. In theory, CBFRs should be concerned with the balance sheets of banks and insurance companies they supervise no matter *where their assets are located*. This means they are well placed to think *internationally across the world's capital markets*. In reality central banks will be answerable to their governors and national finance ministries. The days of the Governor of the Bank of England intimidating UK banks with the might of his eyebrow are probably over, but central banks are more powerful than energy and environment ministries, and better equipped to undertake the complex modelling of risks and benefits than other public institutions. Uniquely for public bodies they are outside the normal political process and have independent boards that make publicly published decisions and are led by governors whose job tenures extend much longer than many politicians.

Using CBFR's toolkit for reducing climate risk and greening the financial system

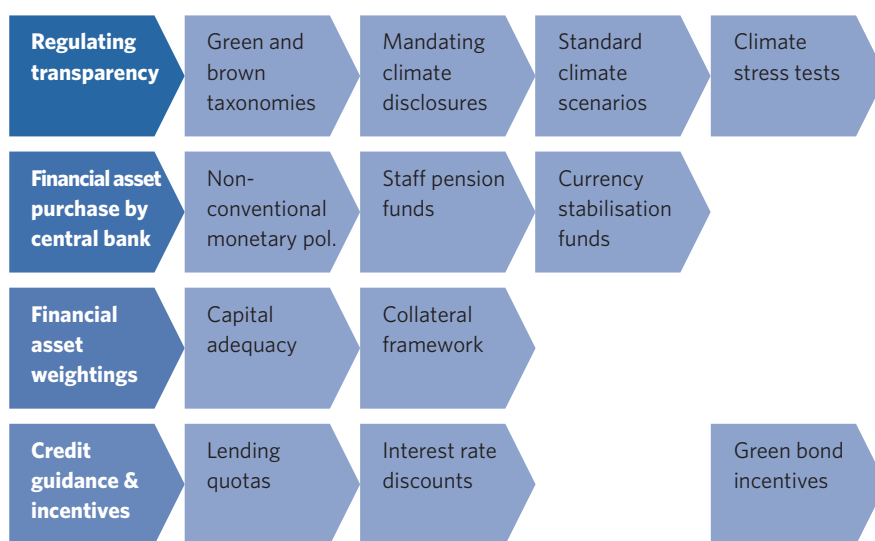
CBFR's have a wide array of instruments to change FI behaviour. Figure 1 sets out a selection of instruments that CBFR's could repurpose to help the financial system aid the transition to a climate change friendly economy. These are discussed further below.

Regulating transparency

Green and brown taxonomies

An organisation's exposure to climate risk depends on the carbon-dependency, location and physical resilience of their assets. Since "brown" assets, like oil refineries or coal mines are tied to fossil fuel use, they risk becoming stranded if global carbon prices discourage fossil fuel use. Similarly, if assets are located in areas vulnerable to climate change then worsening climatic conditions make the assets less insurable. "Green" assets like renewable energy facilities or highly energy efficient buildings mitigate GHG emissions and are resilient to climate change. "Brown" assets give rise to GHG emissions or are vulnerable to worsening climate conditions. There are many assets, for instance railways, transmission and distribution grids that are neither "brown"

Figure 1: Toolkit of policies at central banks disposal



nor "green" and can be used with sustainable or non-sustainably sourced energy.

In China the People's Bank of China (PBOC) has developed the green catalogue. In Europe, the European Commission has tasked the Technical Expert Group on Sustainable Finance (TEG) to advise it on the definition of green assets as recommended

by the High-Level Expert Group.^{17,18} The TEG published their report on the "green" taxonomy in June 2019. An agreed definition of "green" economic activities gives investors wishing to invest in sustainable economic activities protection against false greenwashing claims. But the European Parliament shied away from the original proposals on also defining brown assets.¹⁹

Taxonomies could be an important component in creating a *widely accepted and standardised* climate credit risk assessment. Indeed the NGFS report called for an understanding of the risk differentials between green & non-green and *brown & non-brown* assets.²⁰ These can be used as the basis for banks to "tag" individual loans and assets according to whether they are green, brown or neutral, in much the same way that a loan for a mortgage will have information about the loan-to-value ratio. This data is later used at the portfolio level to risk adjust the overall value of the mortgage book. Tagged assets can be traced through the balance sheets of intermediaries, asset managers and the end investors.

Why should CBFRs, not governments, develop brown taxonomies?

CBFRs are tasked with safeguarding financial stability, in this capacity they are *primarily* concerned with brown assets since these directly embody the aforementioned climate risks to the financial system. The Governor of the Banque de France has called for brown penalising factors and noted "13% of French banks' total net credit exposure is to sectors vulnerable to transition risks".²¹ Indeed,



the NGFS's work stream on supervision advocates: "Considering the extent to which a financial risk differential exists between 'green' and 'brown' assets".

CRFR's will be sensitive to ensure they have appropriate scientific expertise to create the classification and ensure that it evolves keeping abreast of the scientific and technical progress in the different sectors.

CBFRs can provide the market with definitions and eligibility criteria for brown assets to help identify assets posing systemic risks to FI by extending existing green taxonomies such as those being developed in Europe and China to include brown thresholds or criteria.

Mandatory climate disclosures, scenario tests and stress tests

The TCFD recommends that FIs like investors, banks and insurers establish governance, strategic and analytic processes to provide forward-looking, decision-useful information for their own boards and external audiences. Several CBFRs and the NGFS as a body, have signalled their intention to initially encourage, and in the future mandate such disclosures.²² Basel II's Pillar 2 also asks supervisors to evaluate whether banks' capital requirements are adequate for their activities and risk profiles.

Mandatory disclosures by FIs are required in Brazil and France. In Brazil, the banking association, FEBRABAN, adopted voluntary Green Protocols in 2008. In 2014, the Central Bank of Brazil (BCB) published a mandatory Resolution 4,327 on Social and Environmental Responsibility for Financial Institutions²³ as part of their Internal Capital Adequacy Assessment Program (ICAAP). It forms part of the Basel III pillar 2 risk assessment framework and increasing the capital charge for the bank if it cannot demonstrate adequate capacity to manage environmental risks.

In 2015, France adopted the "energy transition for green growth" law. Article 173 of this text is devoted to improving transparency on the part of investors, predating TCFD's recommendations for disclosure of decision relevant information on climate change risks on financial markets. In the EU, the Capital Requirement Regulation requires banks to publish their ESG-related financial risks as from 2022.

Forward looking exercises depend on organisations making assumptions about future mitigation policy and climate impacts. To make these disclosures useful to regulators and stakeholders, scenarios and stress tests need to be repeatable, systematic, and consistent. NGFS's work-stream 2 is

considering what role CBFRs should play to assist FIs. The debate is whether rules should be prescriptive and give precise guidelines about how forward-looking assessments be performed, for instance specifying the trajectories of future carbon prices or the severity of climate impacts at different points in the future, or whether FIs develop their own scenarios. Central banks also need to provide guidance on how to analyse longer term scenarios (10-15 years into future) which are inevitably more speculative but need a set of assumptions on growth and low discount rates to ensure that the longer-term interests of society are being considered. Perhaps a two-tier system be used analysing the balance sheets on conventional time frames (3-5 years) and long-term time frames (10-15 years).

The Dutch Central Bank (DNB) has published a paper on the transition risk²⁴ based on a macro-economic modelling of a carbon price shock. It also undertook a survey²⁵ of major banks, insurers and pension funds asking about their exposure to fossil fuel producers. Pension funds had a 5% exposure to fossil fuel companies mainly in the form of commodities, equities and bonds. Banks' exposure was 2% almost all in the form of loans. Banks' exposure was short term: 68% less than a year, a further 23% between 1 and 5 years before the loan was refinanced. The duration of banks' exposure to risks through lending to brown projects are far shorter than the useful life of the underlying physical assets. This might protect shield individual FIs – their own liability to the risk of stranded assets end as soon their financial position unwinds – but the economic risk of the stranding still lies dormant somewhere in the financial system – either with long term investors, the oil company (and ultimately its shareholders), or perhaps with the tax-payer if the magnitude of disruption requires a future bail-out. The longer-term analysis of risks, perhaps a top-down analysis by central banks, needs to look at the system wide risks, and not the risks to individual FIs who might have only short duration exposures.

But what is needed is a more granular analysis of how individual FIs would be impacted based on a portfolio level analysis of their assets. Two preliminary analyses were piloted by 16 European banks with UNEP-FI on the physical risk²⁶ and transition risks and opportunities.²⁷ These highlight the need for a co-ordinated enhancement in the underlying data about the assets being financed (their location, and other physical attributes) held by FIs especially with regards to their exposure to climate risks. The physical risks looked at two

climate scenarios (a 2°C and 4°C world in 2020s and 2040s) and at the impact on FIs' agriculture, energy and real estate sector portfolios. In May 2019, UNEP-FI and 20 institutional investors published a major report with comprehensive investor guidance to help assess climate risks for investors and align with the TCFD recommendations. It finds that investors face as much as 13.16% of risk from the required transition to a low-carbon economy (using the IPCC 1.5°C scenario); the report refers to 18 providers of physical and transition risk assessment tools for investment portfolios.²⁸

The three European Supervisory Authorities, through the 'ESAs package', have been required early 2019 to develop "common methodologies for assessing the effect of environmental risks on the financial stability of institutions" and to put in place a monitoring system to assess material ESG-related risks, taking into account the COP 21 Paris agreement.

There is no need to wait for these scenarios to be perfectly aligned to climate science. Economic stress tests are currently performed to assess FIs' vulnerability to representative synchronised shocks. The Bank of England's stress test of UK's seven largest banks and building societies, for instance, specifies several parameters including: "30% depreciation of GBP to USD".²⁹ This is in no way a forecast – it is an assumption used to assess the resilience of the FI to assure the regulator that the FIs are making adequate provision against the risk.

CBFRs are already drawing on IPCC data but they might consider formally working with relevant IPCC working groups, in designing the data collection and scenarios needed for FIs to use and share with their borrowers.

Financial asset purchases by central bank

Central banks are major purchasers of bonds and equities. They are acquired for purposes like non-conventional monetary policy, reserve management and exchange rate targeting. The current practice varies between different uses and CBFs, but in general the preference is to use 'market neutrality' principles to decide what assets to buy.

The EU Technical Expert Group recommended that CBFs consider promoting greening the financial system by expressing and implementing a preference for EU Green Bonds (i.e. green bonds consistent with the EU Green Bond Standard) when purchasing green bonds.

Non-conventional monetary policy

Non-conventional monetary policy (QE) has resulted in vast purchases of assets by monetary authorities. The Eurosystem's (the ECB and Eurozone countries' central banks) Asset Purchasing Programme (APP) has bought over €2.6tr of securities.³⁰ This vast holding represents over 10% of the Eurozone countries' combined GDP. Purchases under the APP include government bonds (around €2.2tr of purchases) and €300bn of high-quality corporate bonds, covered bonds and asset backed securities (ABS). Even though the programme has now stopped acquiring new net assets it will continue purchasing assets to replenish redemptions.

The APP has purchased €18bn green bonds (€6bn corporate and €12bn public sector³¹) which accounts for less than 1% of APP purchases. The tight eligibility criteria set by ECB restrict asset selection to secondary market purchases of highly rated, and highly liquid bonds. With the rise of sovereign green bonds starting in late 2016 the proportion of green bonds purchased is likely to rise. The EUR4.5bn sovereign issuance from Belgium, saw a high share of central banks in the deal: 26%, compared to only 20% for a comparable deal in January. By 2016, the Bank of England, which is outside the Eurozone, purchased £435 billion of assets through its QE programme. However, it does not publish data showing the magnitude of green bond purchases.

QE by the Bank of England and ECB targets high quality, liquid assets. The universe of assets allowed by their criteria favour incumbent fossil fuel business issuances which have many decades of history in issuance in debt capital markets. Their strong balance sheets are based on their historic performance which may not be a good indicator of their

fitness for the low carbon economy. QE has ostensibly sought to make market neutral purchases gradually acquiring assets through the secondary market (monetary financing by ESCB institutions is prohibited) to avoid dominating or tilting the market. But through their steady and persisting demand they are actually lowering the cost of capital for incumbents, in contradiction to the government's emissions targets.³² This discriminates against new business models and smaller companies that could play an important part in decarbonising our economy.

Central banks could explore options like setting aside credit ratings agencies assessments. These do not yet properly incorporate long-term climate risk into their assessments and are focussed just three years ahead on credit risks of individual issuers. Allowance if not made of the system wide risk that fossil fuel issuers would experience *en masse* if lack of progress in the brown to green transition triggers a robust public policy response against emissions. The authors of the LSE paper are wary about central banks increasing their purchases of green bonds because of the still small scale of the European green bond market. They argue substantial purchases might cause a mispricing in this nascent market. They do however see merit in the purchase of bonds from public development agencies like the EIB and removing prohibitions from purchasing off the primary market. Programmes like KfW's funding for green building renovation projects, or EIB's green financing and lending

programmes are directly creating new green assets and policies by CBs that reduce the cost of finance could increase the size of the programmes.

The recent speech from Lagarde, the new head of the ECB, stating that the ECB should 'gradually eliminate' carbon assets and prefer green bonds, will accelerate the discussion.³³

Central banks could reconsider their asset purchasing from FIs that lend to green projects and should reconsider rules that prohibit purchases from the primary markets. Concepts like market neutrality should not automatically trump policy considerations like reducing the cost of the green transition.

Currency reserve management

Central banks hold foreign currency assets for short term management of trade imbalances, or to fund currency management mandates. For instance, the Hong Kong Monetary Authority (HKMA) is responsible for pegging the HKD exchange rate to USD. It maintains a foreign currency reserve fund of liquid assets (the Exchange Fund). These are currently valued at USD 440bn³⁴ some 125% of Hong Kong's GDP. As the manager of the Exchange Fund, the HKMA has recently announced a set of measures to support and promote Hong Kong's green finance development: a principle that priority can be given to Green and ESG investments if the long term return is comparable to other investments on a risk-adjusted basis ; an increase of the Exchange Fund's green bond portfolio; participation in



ESG-themed public equities investments.³⁵ However, the HKMA could make even more ambitious use of its vast reserves. Looking at Norway's Sovereign Wealth Fund (SWF),³⁶ the HKMA could for instance establish an exclusion list with environmental criteria.³⁷ HKMA itself could inspire China, which – with the world's largest foreign exchange reserves – holds USD 3tr of assets.

Central banks could explore including green hard currency assets in their reserve management policy.

Perhaps only a proportion of the reserves need to be highly liquid to defend the currency. Bangladesh Bank became the first central bank to announce they would target some of their reserves for green bond investment in October 2015.

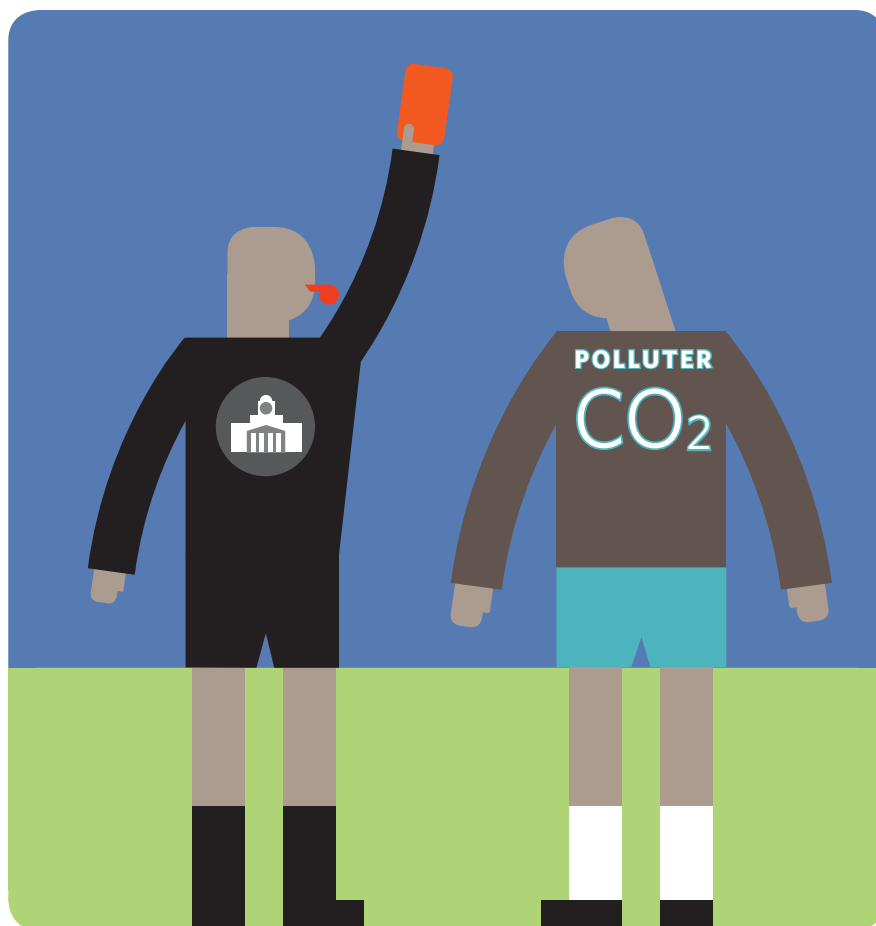
Pension schemes managed by Central Banks

Central banks may manage their staff pension schemes, and sometimes the pensions funds of a wider population (the national civil service). These are often managed conservatively focussing on government bonds.

Central banks could make long-term purchases of assets that will contribute to reducing carbon emissions and be better adapted to physical risks.

There are examples of central banks assigning their staff pension schemes with ethical mandates. The Banque de France's pension fund has €20bn of assets and its responsible investment charter excludes coal.³⁸ ECB has delegated proxy voting for equity investments to asset managers that have signed up to the Principles for Responsible Investment (PRI), requiring them to incorporate ESG factors in their voting policies.³⁹ The Bank of Italy recently announced its intention to purchase €8bn of green assets of which around €1bn will be green bonds. This is motivated by the desire for banks to reward companies taking action on climate change.

The Norges Bank Investment Management – technically a unit of the Norges Bank – but in reality, a sovereign wealth fund, goes much further. It manages the *Government Pension Fund Global* investing government earnings from exploiting the country's oil reserve. The fund is currently valued at NOK9tr (USD 1.1tr) making it one of the world's biggest asset managers. The management mandate is set by the Ministry of Finance and incorporates ESG principles. This includes a list of companies excluded or under observation for ethical reasons. This list includes firms producing coal, causing severe environmental damage, human rights violations, tobacco, nuclear weapons.⁴⁰



Financial assets weightings

Central banks require banks and insurance companies to hold reserves (capital adequacy and liquidity tests) to ensure FIs can sustain losses triggered by financial shocks and ensure the stability of system as a whole. CBFRs set weights / haircuts for the different classes of assets to reflect the probability that the realised value, in the event of a forced sale, will be lower than their face value. The requirements are described briefly in Box 2 (page 4).

CBs provide large banks liquidity against collateral, and act as lender of last resort as part of their monetary policy operations to set risk-free interest rates. The time frame over which the liquidity is provided ranges from within the day to three months.

Capital adequacy and liquidity

Capital adequacy rules ensure FIs hold sufficient loss-absorbing capital (shareholder equity and retained earnings) to finance any losses arising from adverse adjustments to FIs' assets (e.g. loans, mortgages, bonds and other asset classes e.g. property). Under Basel III loss absorbing capital rules are being made more stringent, the risk weights for different assets were made more granular and the accord standardises the approach to a greater degree with tables detailing weighting factors.⁴¹

Overall FIs are incentivised to hold assets like residential property loans with low loan-to-value (LTV) ratios and sovereign and corporate bonds with good credit ratings. These assets use up far less 'regulatory capital'.⁴² For instance, debt issued by a "AAA" rated corporation has a risk weighting of 10%, a below "BB" rated company has a risk weight of 150% discouraging FIs from holding such bonds. Mortgage weights have been made more granular: residential lending with an LTV ratio of less than 50% (i.e. the home-owner has a 50% equity stake) has a weighting of 20%, but a 100% mortgage has a risk weight of 50%.⁴³

These risk weights are calculated using backward looking assessments of default risk that take no account of long-term climate risks. The chances of widespread mortgage default following a major climatic event rendering an area temporarily uninhabitable would be materially increased despite the impeccable credit history no matter that the homes have a low loan to value ratios.

Basel III also sets one-month liquidity rules to ensure FIs have sufficient High-Quality Liquid Assets (like cash and highly liquid bonds). The purpose of this provision in the Basel III accord is to identify easily realised sources of cash.

For both the capital adequacy and the liquidity assessment, labelled *green* assets

(covered bonds, sovereign bonds) can be included within the asset being assessed but at present they are not separately identified. Different asset classes could be segmented to identify green and brown loans and bonds allowing these to be separately monitored.

The People's Bank of China (PBoC) has included consideration of green credit in its Macro Prudential Assessment (MPA), a scoring system that assesses banks' capital levels and monitors risks. The greater the amount of green assets a bank holds, the higher the score it receives in the MPA. Green credit accounts for around 9% of total outstanding loans. According to a survey conducted by China Banking Regulatory Commission, the green loans outstanding from 21 major domestic banks reached CNY 8.22 trillion (USD 1.2 trillion) by 2018.⁴⁴

Even within Europe, there is a precedent for support factors to be used to remedy socially undesirable outcomes in the way FIs allocate capital. In 2003 the EU Commission introduced a SME support factor for loans of less than €1.5mil made to SMEs to counter the tendency of banks to underserve SMEs. A 'green supporting factor', modelled on the European SME supporting factor, to lower capital risk requirements for green assets and 'brown penalising factors' was in the EU Commission's action plan of sustainable finance issued in March 2018⁴⁵ and supported by the French Banking Association. But this proposal has been criticised by many central bankers for undermining the risk-assessed basis of capital requirement regimes, since evidence does not support green assets as having a lower level of default.

In the review of the EU Capital Requirement Regulation, the European Banking Authority has been tasked to publish in two years a study on *"whether a dedicated prudential treatment of assets exposed to activities associated substantially with environmental and / or social objectives, in the form of different capital charges, would be justified from a prudential perspective"*.

Collateral framework

Central banks lend money to banks but require collateral of marketable financial securities like bonds and non-tradable assets. These are termed 'eligible assets'.⁴⁶ This creation of credit allows the central bank to expand or contract the supply of money in the economy and set the bank rate of interest, so is a vital part of monetary policy. Central banks assign and adjust haircuts to selectively downgrade the value of some assets accepted as collateral to reflect their perceived view of riskiness. The haircuts to collateral reflect the credit

risk models being used. CBs make use of ratings agency scores where they are available.

At its peak in 2012 around €1.2tr of assets were pledged as collateral to the ESCBs⁴⁷ which represents around 10% of banks' eligible collateral. The most important assets included covered bank bonds, asset backed securities and credit claims each representing a quarter of pledged assets. The preponderance of mortgage and loan products used as collateral reflects the balance sheets of banks i.e. the sorts of assets they hold.

In its first progress report, the NGFS highlighted that "climate- or environmental-related criteria are not yet sufficiently accounted for in internal credit assessments or in...credit agencies' models which many Central Banks rely on for their operations".

Collateral policy may have an impact on the asset portfolios held by commercial banks (and other central bank counterparties), as banks may prefer to hold more assets that are favourably treated as collateral. Therefore, it can encourage more bank financing through green bonds lending to priority sectors in the economy. The PBoC already includes green bonds in their collateral frameworks and give lending priority to banks holding green bonds. If other central banks followed suit this could incentivise banks to hold more green bonds on their balance sheets, encouraging more bank financing for low carbon sectors.

PBoC accepts lower rated (AA, AA+) green bonds and green loans as collateral for its Medium-Term Lending Facility (MLF). The MLF offers three, six and 12-month loans to commercial lenders with the aim of also guiding credit to underserved sectors. This is part of a broader strategy aiming to increase support for smaller firms, agriculture, and the green economy and to help "alleviate the shortage of highly-rated corporate bonds in some financial institutions".⁴⁸

Green bond subsidies

To stimulate green bond issuances and encourage good practices such as external reviews of the bond's environmental credentials, central banks could provide financial support to first time issuers and cover the associated extra costs of labelling the bond as green.

For example, the Monetary Authority of Singapore⁴⁹ has announced a Green Bond Grant Scheme to cover the additional costs of going green for issuers. The HKMA has a similar programme for compensating issuers the incremental costs of green bond issuance, like the verifier costs.

Credit guidance

Though no longer fashionable in developed economies, several developing economies still use credit guidance policies to direct private banks to fund specific sectors of the economy. The Reserve Bank of India (RBI) makes use of priority sector lending (PSL) quotas to direct 40% of bank lending to target sectors of the economy.⁵⁰ At present these priority sectors include agriculture (18%), micro-enterprises (8%), weaker sections of the community (10%). The 4% balance of the PSL quota must be spent on a group of different uses which include renewable energy and several other uses, like housing, social infrastructure and exports. This stipulation applies to all domestic banks, and also foreign banks with more than 20 branches. A criticism by banks is that it increases the general cost of finance in India, forcing commercially viable customers to cross-subsidise priority lending customers and increasing the overall operational costs since they either must open branches in rural areas or purchase PSL obligation certificates originated by other institutions with larger footprints in the rural community.

With a targeted refinancing line, Bangladesh Bank⁵¹ (BB) allows commercial banks to refund themselves at reduced interest rates for loans given to priority segments of the economy. In contrast to outright subsidies, they rely on the private sector as a gatekeeper in the allocation of capital. The default risk remains with the banking sector. BB recently announced a Green Transformation Fund of USD200mil for the export-oriented textile and leather sectors to set up environment friendly infrastructures.⁵² Banks can borrow from BB at LIBOR+2.5% and are expected to re-lend with a margin of between 1.00 and 2.5% of the cost of borrowing. The tenor of the loans would be 5 to 10 years.

In addition, in 2016 BB announced that every financial institution was obliged to allocate at least 5% of their loan portfolio to green finance.

Monetary Authority of Singapore's Green Bond Grant Scheme

Qualifying issuances will be able to offset 100% of the expenses for obtaining an external review for green bonds, up to a cap of SGD 100,000 (USD 71,450) per issuance.

Qualifying bonds can be denominated in any currency but must:

- be issued and listed in Singapore
- have a minimum size of S\$200 million
- have a tenure of at least three years.

What should central banks and financial regulators do?

"It is also part of our mandate for monetary policy because climate change affects price evolutions, affects the economic outlook...This is one of the most difficult shocks we central bankers have to deal with."

Francois Villeroy de Galhau, ECB Board member, speech to Amundi annual conference, June 2019

In a survey of central banks, 64% of respondents said that climate change is being handled as "a concern we are closely monitoring", but 27% of respondents also considered it an issue "that other institutions should be concerned about".⁵³ Questions were asked about the reserve purchases by the central banks: 69% said "there were societal benefits from reserve managers taking green credentials into account when deciding asset allocation". However just 26% of central banks use ESG factors when managing their reserves themselves, a mere 6% asked "commercial banks to disclose their climate related risks". Only one respondent currently includes climate-related risks in their stress tests. On a more promising note: 59% of the respondents said they are considering or already looking at including climate-related scenarios in stress testing.

More generally, CBFRs recognise the potential impact of climate risks on the financial sector. But they believe "the prime responsibility for climate policy will continue to sit with governments".⁵⁴ Within the NGFS, what CBFRs' precise role should be is still being debated. The NGFS agrees that CBFRs should ask FIs to better disclose their climate risks and present them in a format that stakeholders can readily digest and strategic decision-makers within the FIs can act upon. But this is simply asking banks to act at their own behest. CBs do not yet agree they should help resolve these issues using their regulatory toolkits.

We would contend that they should. The risks posed by climate change are different to other ESG matters in two important ways. First is the issue of the tragedy of the horizon. Short-term benefits accruing to financial players are creating long-term threats which are transferred to society. Because they are non-cyclical, increasing and pervasive

throughout the economy, they are different to other sector-level threats. We do not have a historical data to guide us, left unattended the costs of inaction will rise, and there is a high chance of contagion between regions as a sudden fall in fossil fuel price will quickly be transmitted through energy markets, and cannot be reduced by diversification.

Using their regulatory toolkits to require the finance sector to adjust could be a powerful agent for change⁵⁵ alongside efforts by government. The finance sector in more advanced countries is facilitating the continued investment in brown assets (e.g. organising large syndicated loans to fund continued oil exploration) in developing countries thereby circumventing Paris Agreement targets in investors' home economies. Conventional credit risk models used by banks exacerbate the issue raising the cost of finance for fledgling, capital intensive low-carbon businesses impeding the roll-out of green technologies. A more



far-sighted risk assessment would view low carbon solutions more favourably. Also, because of the international nature of capital flows, it is difficult at a global level, for governments to restrict the flow of investment into new brown assets even though governments have signed international agreements like the Paris Agreement that imply such investments are unnecessary and dangerous. The absence of effective and credible carbon markets after so many decades of discussion illustrates the limits to what politics and treaties can achieve.

In this note we have suggested the sorts of actions already being used by CBFRs which could be applied to reducing potential climate risk exposures. The roll-out of QE across USA, Eurozone and UK has shown that central banks are able to develop, co-ordinate and implement powerful new policy tools. Arguably the reaction to the global

financial crisis has been more successful than governments faltering efforts to create a unified carbon market.

CBFRs could consider acting alongside governments, analysing and then acting on the continued under-pricing of carbon risks through the world economy.

Existing prudential regulation tools were strengthened by Basel III, allowing supervisors to better identify risky behaviours (lending to mortgages with high LTVs, varying assumptions in risk assessment models and increasing the holding of inadequate loss-taking capital). The tightening of the rule book now emphasises the holding of liquid and high-quality capital and increasing the amount of loss-taking capital. These were tailored to solve the causes of the global financial crisis. But liquidity and capital buffers are no defence against system-wide risks like a sudden change in sentiment causing a repricing ("Minsky moment") of carbon assets which will impact on large swathes of the economy

A second problem is that current interventions that maintain 'market neutral' asset purchasing either for QE or reserve management are themselves distorting, propping up older well-established fossil fuel intensive companies and current maturity distributions locking in old business models and impatient investment. It is important that any package of recommendations bring forward a perspective cognisant of future generations interests to overcome the tragedy of the horizon.

A number of commentators have proposed policy changes to affect the way central banks manage the risks from climate change.^{56, 57, 58 & 59} Below we add our own suggestions to emphasise the most urgent changes that we believe should be made. These are drawn from the case studies describing tools already used by CBFRs.

Recommendations

Market infrastructure

1. Define a brown taxonomy: EU's and Chinese governments are taking action to create a green taxonomy to support increased green lending and reduce the scope for green-washing. CBFRs are arguably more interested than governments in an accurate understanding of climate risk. Unlike the green taxonomy the brown taxonomy will not be 'voluntary' assignment in which an issuer selects to apply for a green certification, but an involuntary one in which a FI has to assign a loan as brown, possibly despite the issuer's protestations. As the prudential regulator they are the main customers of a brown taxonomy so as to properly identify climate risks on banks' and insurers' balance sheets. Defining a standard for brown assets (fossil fuel assets, equipment using and inputs into fossil fuels, assets highly vulnerable to physical risks from climate) would provide the building blocks for better climate risk disclosures. They should provide guidance on how the taxonomy is used by FIs to adjust the reported value of their assets.

The definition of a brown taxonomy has proved to be highly political. Businesses in the 'brown' economy have successfully, through the European Parliament, stopped the EU Commission developing such a taxonomy. Governments depending on their endowments of fossil fuels deposits may take different views of whether say gas infrastructure is brown or a transition solution. Mark Carney has argued "a richer taxonomy that does not take a binary approach is needed" and is calling for different shades of green. We believe such a brown taxonomy is necessary, and international working groups of regulators like NGFS better able to weigh up the evidence of what sectors to include and exclude. Potentially this could be led by a 'coalition of the willing' grouping of CBs like the European System of Central Banks could seek to understand the brown taxonomies.

Decision useful transparency

2. Mandate FIs to disclose climate risks: Requiring banks to disclose their exposures to climate risk as recommended by the TCFD. Ideally this understanding of risk should be built bottom-up, from assets in the real economy, to the balance sheets of the organisations that borrow and issue, through to FIs' balance sheets. Use would be made of the above taxonomy to undertake a portfolio analysis using individual loan/bond level data for each asset on FIs' books.

Policy measures to stimulate green investment	When?
Market Infrastructure	short-term
1. Define a brown taxonomy and guide on its usage	
Decision useful transparency	
2. Mandate FIs to disclose climate risks	immediately
3. Climate scenarios and stress tests	short and medium-term
Prudential	
4. Adjust risk weightings for capital adequacy	medium-term
5. Adjust High Quality Liquid Assets haircuts	medium-term
Monetary	
6. Brown penalties and offsetting green support factors for collateral framework	medium-term
7. Align APP with ESG objectives	medium-term
Other functions	
8. Green reserve management & pension funds	short-term
9. Central banks that already use credit guidance tools should extend them to include green lending	short-term

3. Climate scenarios and stress tests: The TCFD suggests the disclosure of climate-risk data should inform organisations' boards and their strategies. CBFDs can help stimulate the process by developing a set of test scenarios consistent with advice provided by bodies like IPCC or national environmental protection agencies on future mitigation pathways and climate impacts to stress test capital adequacy under Pillar two of the Basel III. While a small set of reference scenarios (including a 1.5°C scenario) should be defined to ensure comparability, FIs should be free to add their own scenarios and explain the rationale for their inclusion.

Greening prudential regulation

4. Adjust risk-weightings for capital adequacy tests: Basel III's Pillar 1 capital adequacy rules cannot be changed without extensive international consultation, and the need for substantial financial evidence. However, under Pillar 2 stress tests the capital adequacy rules could be subjected to climate stress tests where holdings of green and brown assets would perform differently.

Our proposal is that CBFRs use brown and green taxonomies and the results from stress tests to set differential weights used for risk-weighted asset assessments. This is a major change requiring the risk weights to use forward looking scenario models to augment the existing methodology to assess historical

risks. Similar adjustments could be made under Solvency II for insurance companies that operate in the EU.

5. Adjust high-quality liquidity assets haircuts: Adjustments valuing high-quality liquid assets perhaps increasing the quality requirement for brown assets 1-2 notches but loosening the liquidity or credit quality requirement for green assets to allow them into the eligible universe. Central banks are understandably reluctant to reduce the overall stringency of the capital adequacy and liquidity tests, and the reweighting should be undertaken to ensure there is no overall, deterioration in the bank balance sheet quality when the brown and green adjustments are jointly applied.

Greening monetary policy

6. Applying a brown penalising factor in the collateral framework: Central banks could review the haircut applied to brown assets used in forward looking stress tests. This would mean larger haircuts for brown assets (loans and debt instruments) offered as collateral. This means that banks that use loans (or bonds) with underlying assets which are vulnerable to physical climate and transition risks, would have a higher haircut.

7. Offsetting green supporting factors FIs would be allowed to offset, but not exceed, the aggregate value of the increased haircut from their brown assets by using

green assets (green loans and green debt instruments) which have a lower haircut. Our proposed change would ensure that the overall collateral framework was no less stringent than now, but banks were incentivised to lend to more climate resilient and high energy efficiency properties.

8. Green QE: Quantitative easing (QE) could contribute to the structural transition to a low carbon economy by injecting money into targeted sectors such as renewable energy and low carbon transport and shunning brown assets, while simultaneously fulfilling its primary aim of stimulating the economy.¹² At the moment there are often insufficient issuances of qualifying green bonds, but pre-announcing the intention to include these additional criteria would incentivise issuers to identify suitable assets, and to originate new green loans that could be refinanced through green bonds. To achieve this, central banks would purchase green assets, like green asset-backed securities from commercial banks. These would specify climate resilience and energy efficiency in the underlying loan pool perhaps starting with the housing markets in countries with high quality data on climate physical risks. Conversely properties that are vulnerable to climate risks and bonds from firms exposed to transition risks would be negatively screened. Such criteria enhanced quality criteria in a targeted manner for qualifying green assets. This would redress this systematic bias and help expand credit to these sectors.

The idea here would be to relax the credit requirements for green assets perhaps by one or two notches and increase those for brown assets. This would broaden the universe of assets being purchased for QE replenishment, and also stimulate the issuance of more green debt instruments (and indirectly of green loans), and with a greater variety of tenors. This could be viewed as a move away from the market neutrality principle towards a market-making role and needs to be considered carefully with government. It needs to be recognised that QE - through its scale and duration - has likely distorted the economy already, and question is one of what sort of distortion best serves society's needs. The proposal provides a forward signal that the monetary authority is keen to purchase green assets to stimulate the development of the market especially of long dated green bonds and loans. There might also be a tightening of requirements for brown assets, or indeed screening criteria to remove some brown assets altogether from the eligible universe.

Other central bank functions

9. Greening reserve management and CB pension schemes: CBs preference for assets purchased for reserve management is for high quality assets that are highly liquid. This is true even for authorities like HKMA or ECB that hold vast pools of assets for very long periods of time where liquidity, and "quality" should be assessed on forward looking scenario assessment. The same logic discussed for QE could be applied for reserve management and CB pension schemes too.

10. Credit guidance: CBFR setting explicit targets or discounts to interest rates to guide bank lending to preferred sectors has fallen out of favour in most OECD countries. Such mechanisms could be used to guide green investment, where central banks still perform such a role, for instance in India (Priority Sector Lending targets) or Bangladesh.

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