



Health check

Why central banks need to stress test climate risks

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SPI

**OMFIF
Sustainable
Policy
Institute**

6-9 Snow Hill, London
EC1A 2AY, United Kingdom
T: +44 (0)20 700 27898
omfif.org/spi @OMFIF
spi@omfif.org

Danae Kyriakopoulou
*Chair, SPI and Chief Economist
& Director of Research*

Levine Thio
*Research and Programmes,
Asia Pacific*

Clive Horwood
*Managing Editor and Deputy
Chief Executive Officer*

Simon Hadley
Director, Production

William Coningsby-Brown
Assistant Production Editor

**Sarah Moloney,
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John Orchard
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Health check 8



Danae Kyriakopoulou, chief economist and director of research, OMFIF

Designing financial systems for a healthy planet 11

Margaret Kuhlou, finance practice leader, WWF, and Thomas Vellacott, CEO, WWF Switzerland

Accurate risk measurement crucial to net-zero transition 12

Paul Hiebert, head of systemic risk and financial institutions division, European Central Bank

Climate enters IMF's risk analysis 13

Tobias Adrian, financial counsellor and director, Vikram Haksar, assistant director, and James Morsink, deputy director of the monetary and capital markets department, IMF

Pilot exercises help plan for climate transition 14

Laurent Clerc, director for research and risk analysis at the French Resolution and Prudential Control Authority, Banque de France

ECB needs to rethink market neutrality 15

Olaf Sleijpen, executive board member of De Nederlandsche Bank

Beyond green and brown: a principles-based taxonomy 16

Jessica Chew, deputy governor, Bank Negara Malaysia

Supporting sustainable finance in Mexico 17

Rafael del Villar, chief adviser to the governor, Banco de México

Central banks can help finance renewables 18

Gábor Gyura, head of sustainable finance, Magyar Nemzeti Bank

Managing climate risk uncertainty with technology 19

Edmund Lau, deputy chief executive, Hong Kong Monetary Authority

Forthcoming meetings 20

We can't self-isolate from climate change

Central banks have a vital role to play in supporting the net-zero transition. Many are beginning to incorporate climate considerations in their activities. But the conversation needs to pick up speed, writes Danae Kyriakopoulou, chief economist and director of research at OMFIF.

THIS VOLUME of the journal comes one year on from when most countries introduced lockdown measures to contain the spread of Covid-19. The anniversary is an opportunity to reflect on the way businesses, individuals and governments have adjusted to living in a new reality.

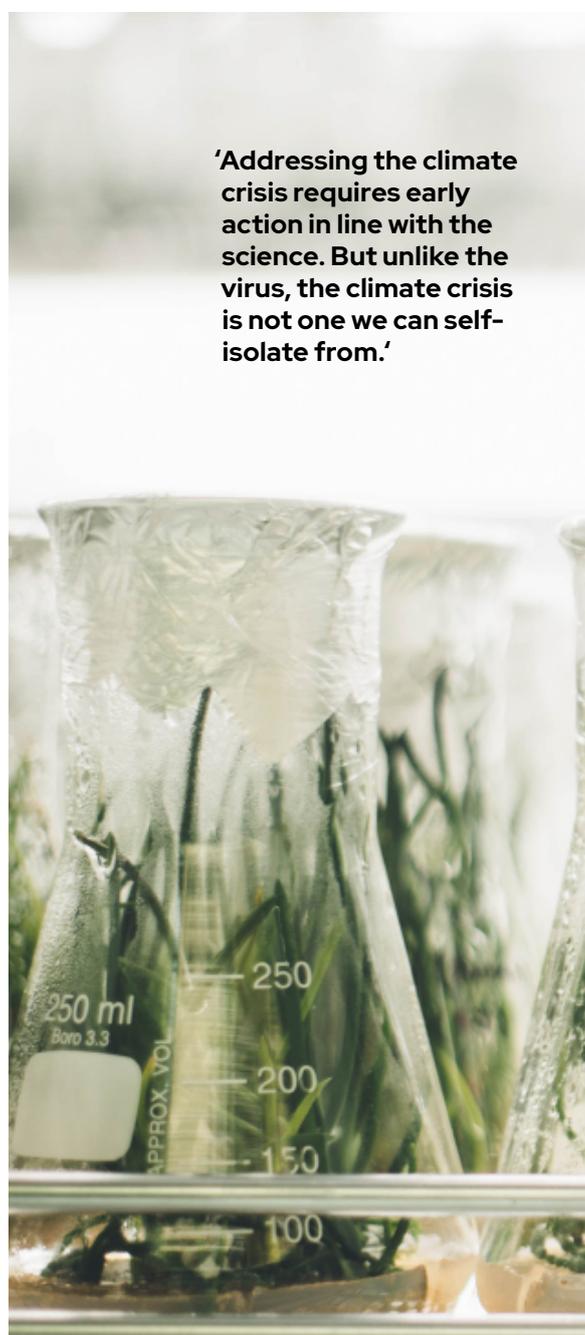
Two lessons stand out. First, countries that followed the science have generally been assessed to have better weathered the pandemic shock, both in terms of the health of their population and their economies. Second, preparing for tail risks and acting early helps to contain the virus and its consequences.

Similarly, addressing the climate crisis requires early action in line with the science. But unlike the virus, the climate crisis is not one we can self-isolate from. It requires adjusting our ways of living and working, and not just temporarily. As the February edition of this journal demonstrated, many economies are already suffering the consequences through heightened frequency and intensity of natural disasters. Gradual changes in temperatures are also beginning to show, for example in this winter's unusual and sudden switches from heatwaves to snowstorms across the Mediterranean, Texas and the Levant.

Central banks have been a key actor during the pandemic, ensuring that the health crisis does not become a financial one as well. Old fears of an 'empty toolbox' have given way to innovative support packages, stretching the concept of 'unconventional' policies. Central banks have a similar duty to respond to the looming financial implications of the climate emergency through physical and transition risks.

Encouraging steps are being taken across the community, from climate stress tests of financial institutions (pg 12 and 14) and developing sustainable taxonomies (pg 16), to addressing carbon bias in portfolios (pg 15) and using artificial intelligence and big data to track risks (pg 19). Initiatives such as the Central Banks and Supervisors Network for Greening the Financial System are setting an example for international co-operation.

These are all important steps in the right direction. But the window of opportunity to address this existential threat is small. Now that central banks have broadly achieved consensus and demonstrated accountability for the role they have to play, the conversation must focus on speed of action.



'Addressing the climate crisis requires early action in line with the science. But unlike the virus, the climate crisis is not one we can self-isolate from.'

Key decisions by central banks on sustainability, February – March 2021

UK updates Bank of England remit to include net-zero economy

Chancellor of the Exchequer Rishi Sunak revealed the updated remit of the central bank's monetary policy committee in the Spring Budget announced in March. The aim of the update was to reflect the government's economic strategy for a strong, sustainable and balanced growth that is consistent with the transition to a net-zero economy.



Bank of Japan highlights climate risks as a key theme in stress test

The Japanese central bank will highlight climate change risks as among the key themes in its bank examinations for the first time. In guidelines on the examinations due in March 2021, the central bank and the Financial Services Agency will analyse the impact of climate risks on financial institutions.



Hong Kong Monetary Authority plans to double green bond borrowing ceiling

With overwhelming market demand for green bonds in Hong Kong, the central bank plans to double the borrowing ceiling to HK\$200bn to explore future issuance in other currencies, project types and channels.



European Central Bank shares results from economy-wide climate stress test

The preliminary results of the ECB's stress test identified climate change as a major source of systemic risk. In the absence of further climate policies, the costs to companies arising from extreme events will increase substantially.



Selected central bankers' speeches on sustainability

23 March: [Lael Brainard \(bottom left\), member of the board of governors of the Federal Reserve System on financial stability implications of climate change](#)

21 March: [Yi Gang, governor of the People's Bank of China on China's monetary policy space and promoting green finance](#)

17 March: [Pablo Hernández de Cos, governor of the Banco de España on the role of central banks and banking supervisors in climate action](#)

9 March: [Ravi Menon, managing director of the Monetary Authority of Singapore on the future of capital being green](#)

3 March: [Benjamin E Diokno, governor of Bangko Sentral ng Pilipinas on the role of capital markets in championing the sustainability agenda](#)

3 March: [Isabel Schnabel, member of the executive board of the European Central Bank on green neglect to green dominance](#)

22 Feb: [Michelle W Bowman, member of the board of governors of the Federal Reserve System on economic inclusion in lower-income communities](#)

22 Feb: [Christine Lagarde \(right\), president of the ECB on the main policy priorities in investing in our climate, social and economic resilience](#)

18 Feb: [Lael Brainard, member of the board of governors of the Federal Reserve System on the role of financial institutions in tackling the challenges of climate change](#)

11 Feb: [Klaas Knot, president of De Nederlandsche bank on getting the Green Deal done and how to mobilise sustainable finance](#)

11 Feb: [François Villeroy de Galhau, governor of Banque de France on the role of central banks in greening the economy](#)



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FURTHER READING

Selected reports on climate change and sustainable finance, February – March 2021

MARCH

[EU Platform on Sustainable Finance – Transition Finance Report](#)

The report sets out the platform's key findings and recommendations by responding to six questions from the European Commission.

[WWF: Bankable Nature Solutions](#)

The publication introduces 13 case studies that offer different solutions for generating a financial return and positively impacting nature and climate change.

[World Bank Group – Enabling Private Investment in Climate Adaptation and Resilience](#)

The report proposes a blueprint for action to develop, finance and implement priority adaptation and resilience investments.

[Magyar Nemzeti Bank – Green Finance Report](#)

This report on the sustainability of the Hungarian financial system aims to increase transparency and strengthen market awareness of environmental sustainability considerations.

[European Commission – Assessment of Biodiversity Measurement Approaches for Business and Financial Institutions](#)

This update report reflects on the development of biodiversity assessment approaches for businesses and financial institutions and provides case study analysis.

[SUERF – Greening the UK financial system – a fit for purpose approach](#)

The policy note proposes an approach for the UK financial system to support climate economic policies instead of undermining them.

[Central Banks and Supervisors Network for Greening the Financial System – Adapting central bank operations to a hotter world](#)

The report examines the implications of climate change for central banks' operational frameworks and outlines options available for factoring climate-related risks into their monetary policy operations.

FEBRUARY

[United Nations Environment Programme Finance Initiative – Rising Tide: Mapping Ocean Finance for a New Decade](#)

The report maps the current state of ocean finance and reveals trends in lending, underwriting and investment activities that impact the ocean.

[Vivid Economics – Greenness of Stimulus Index](#)

The report assesses the effectiveness of Covid-19 stimulus efforts by G20 countries in ensuring an economic recovery that takes advantage of sustainable growth opportunities and builds resilience through the protection of climate and biodiversity.

[Finance for Biodiversity Initiative – The Dasgupta Review: What it Means for the Global Financial System](#)

The review sets out the arguments for action on biodiversity and highlights the need to identify and reduce financial flows that directly harm and deplete natural assets.

[Climate Policy Initiative – The Potential for Scaling Climate Finance in China](#)

The report provides an overview of the potential for climate finance, green finance and innovative finance to accelerate China's decarbonisation and support its transition to a green economy.

[Federal Reserve Bank of San Francisco – Climate Change is a Source of Financial Risk](#)

Senior policy advisor and Executive Vice President, Glenn D Rudebusch, highlights the climate risks and the steps the Federal Reserve is taking to mitigate and manage these risks in an economic letter that includes microprudential and macroprudential oversight.

[Finance for Biodiversity Initiative – Greening Sovereign Debt: New Paper: Building a Nature and Climate Sovereign Bond Facility](#)

The report sets out a proposal to establish a nature and climate sovereign bond facility, providing governments and investors with the tools to recognise nature's contribution to long-term sustainability and economic performance, and urgent solutions to the debt crisis.

OMFIF's latest sustainable finance activity

Reports

[Gender Balance Index 2021](#)



In the most comprehensive study to date of diversity at the top levels of central banks, sovereign funds, public pension funds and commercial banks, only three out of 540 institutions achieved a perfect GBI score of 100. The eighth edition of the index tracks the presence of men and women in decision-making positions in financial institutions based on a database of almost 9,000 individuals.

Meetings

- 8 March:** [Gender Balance Index 2021 launch](#)
- 8 March:** [Choose to challenge – Role models](#)
- 4 March:** [OMFIF-DZ sustainability symposium](#)
- 23 Feb:** [Infrastructure in the Covid-19 recovery](#)
- 17 Feb:** [Future of sustainable data and its role in achieving global sustainability goals](#)
- 3 Feb:** [OMFIF-SEACEN sustainability roundtable: Coming together for sustainability in 2021](#)
- 2 Feb:** [Sustainable finance outlook for 2021](#)

Commentaries

Commentaries published in February and March covered a variety of issues, from gender and celebrating International Women's Day, to new areas of sustainable investments and regional progress in the green transition.

- 18 March:** [Tamara Singh and Masamoto Kenichi: Asia is ready to invest more in Central America](#)
- 15 March:** [Natalia Ospina and Levine Thio: Financial policy-makers weigh in on gender balance](#)
- 16 March:** [Simon Ogus: ESG criteria are distorting markets and portfolio decisions](#)
- 11 March:** [Gary Smith: Green push puts CBDCs centre stage](#)
- 10 March:** [Håvard Halland and Diego López: New Zealand sets climate benchmark for Norway](#)
- 9 March:** [Ana Botín: A 'she-cession' hurts us all](#)
- 5 March:** [Phillip Moore: Raskin says US ready to lead in climate battle](#)
- 4 March:** [José González-Páramo: EU can't go it alone in green transition](#)
- 3 March:** [Elliot Hentov: Biden impact on ESG investing will go deeper than climate](#)
- 26 Feb:** [Makhtar Diop: Private sector's retreat jeopardises rebound](#)
- 16 Feb:** [Danae Kyriakopoulou: ECB market neutrality crumbling](#)
- 10 Feb:** [Lim Cheng Khai: Addressing the protection gap in Asia](#)
- 9 Feb:** [Abdulrahman Al Hamidy: Arab financial sector defends against climate change](#)

Podcasts



Recent podcasts focused on the launch of OMFIF's eighth Gender Balance Index, revealing the new components and analysis of the report as well as what we can expect in the main findings.

- 23 March:** [Gender balance: is this the best we can do?](#)
- 23 Feb:** [Gender Balance Index 2021](#)



Stress testing for net zero

Central bankers are talking positively about their role in speeding up the green transition. Now they need to help deliver on carbon goals, writes Danae Kyriakopoulou, chief economist and director of research, OMFIF.

AS PUBLIC economic policy-making institutions, central banks and supervisors have a two-fold incentive for supporting a managed transition to a net-zero economy. First, to address climate-related risks to the economy and financial system. Second, to align their actions with the objectives of government climate policy, or, at a minimum, to ensure their actions do not directly contradict government climate policy unnecessarily.

Climate-related disasters and disruption to economic activity can affect asset values and create challenges for banks, insurers and investors. To achieve their climate commitments, governments and market participants will have to take actions that will inevitably affect

market incentives and reallocate capital across the economy.

The latter is key in refuting objections that by adjusting their actions to account for climate risks, central banks are verging into political territory. In most cases, governments have already pledged net-zero commitments or signed up to the Paris agreement. Central banks are adjusting their actions to reflect how these decisions will impact the financial system. As Deutsche Bundesbank President Jens Weidmann remarked in a speech in January, climate change and related policies can affect the mandates of central banks 'as they may have an impact on macroeconomic and financial variables such as output, inflation, interest rates and asset

prices, while altering the underlying structure of our economies.'

Some central banks have a direct mandate to support the sustainability agendas of governments. For example, the European Central Bank has a duty under the Treaty of the Functioning of the European Union to support EU economic policies, and the European Parliament urged the ECB in its 2020 annual resolution to take action against climate change. The UK has gone a step further with Chancellor of the Exchequer Rishi Sunak updating the Bank of England's remit in March 2021 to clarify that the economic strategy of the government includes supporting the transition to a net-zero economy.

With the motivation clear and direction broadly set, the focus has

now shifted to implementation. What can central banks do? What is already being done well and by whom? What lessons can others learn? It is important to recognise that central banks have different duties and priorities. In their monetary policy operations, they set interest rates and conduct unconventional policies such as quantitative easing. Some also have a financial stability mandate, including

prudential policy and supervision. Central banks are also investors managing considerable volumes of assets in their foreign reserves and pensions portfolios.

In a speech in February, Banque de France Governor François Villeroy de Galhau summarised the need to incorporate climate considerations across different areas. He suggested that a central bank needs to ‘target the

direct effects – better conducting its monetary policy and reducing its own risks – as well as the indirect effects – steering the behaviour of companies and financial institutions, through its disclosure policy, as well as its asset purchase and collateral policies.’

Central banks around the world are making progress with plenty of initiatives scheduled for the coming months (see table).



HONG KONG MONETARY AUTHORITY

Dec 20: Pilot exercise on climate risk stress test covering physical and transition risks. Launch of green and sustainable finance strategy

Jan 21: Continuation of work with authorised institutions (AIs) to promote green and sustainable banking in three phases

July 21: Update of Hong Kong’s Climate Action Plan 2030+

Aug 21: Adoption of the common ground taxonomy

First half of 2021: Industry consultation on supervisory requirements for AIs and participation of AIs in climate stress testing exercise

BANK OF ENGLAND

Nov 20: Work on stress test regarding design of the exercise and preparation

June 21: Launch of climate stress test exercise

Sept 21: First submission of firms’ risks

Dec 21: Second submission for system-wide impacts

Q1 2022: Publication of results

EUROPEAN CENTRAL BANK

Nov 20: Publication of a guide on climate-related and environmental risks

March 21: End of European single access point consultation. Preliminary results of economy-wide climate stress test

April 21: Launch of non-financial reporting directive review. Adoption of the first set of taxonomy technical criteria

May 21: Standing facilities platform consultation on taxonomy objectives beyond climate

June 21: SF platform report on harmful activities (taxonomy)

July 21: Adoption of the Renewed Sustainable Finance Strategy

Aug 21: ESAP proposal

Oct 21: SF platform report on a social taxonomy

Dec 21: Adoption of the second set of taxonomy technical criteria

Jan 2022: Delegated acts on climate change mitigation and adaptation apply

2022: New supervisory stress test focusing on climate-related risks and reviewing banks’ practices

BANCO DE MÉXICO

Sept 20: Launch of sustainability agenda to embed climate issues into policies on currency reserves management, stress tests and lending criteria

MONETARY AUTHORITY OF SINGAPORE

Dec 20: Publication of ‘Guidelines on Environmental Risk Management’

March 21: Submission of public comments for green and transition taxonomy

2020-22: Incorporation of a broader range of climate change-related risks as part of future industry-wide stress test

June 2022: Results of stress test

BANK OF CANADA

Nov 20: Launch of the pilot project on climate risk scenarios

End of 2021: Publication of a report sharing details on specific scenarios, methodology, assumptions and key sensitivities

BANK OF JAPAN/JAPAN FINANCIAL SERVICES AGENCY

Dec 20: Publication of ‘Supervisory Simultaneous Stress Testing Based on Common Scenarios’ with banking regulator, Financial Services Agency

April 21: Basic principles for transition finance

BANQUE DE FRANCE/FRENCH PRUDENTIAL SUPERVISION AND RESOLUTION AUTHORITY (ACPR)

April 21: Publication of results of the first climate stress test by ACPR

RESERVE BANK OF AUSTRALIA/AUSTRALIAN PRUDENTIAL REGULATION AUTHORITY

Feb 21: Climate change supervisory review. Release of APRA’s supervision and policy priorities for 2021

Aug 21: Stress test in the second half of the year

MAGYAR NEMZETI BANK

Jan 21: Taxonomy development

BANCO CENTRAL DO BRASIL

Sept 20: Announcement of climate stress test

April 2022: Results of stress test

Monetary policy: inflation dynamics and asset purchases

Several central bankers have highlighted the channels through which climate change and the remedial actions needed to tackle it affect their primary mandate of managing inflation. At a conference in March, Banco de España Governor Pablo Hernández de Cos noted the impact ‘on the so-called natural interest rate, which is an important benchmark for inflation targeting central banks when setting our interest rates’. ECB Executive Board Member Isabel Schnabel suggested in an online seminar that climate change may ‘hamper monetary transmission due to stranded assets, by affecting potential growth and the natural real interest rate, or by causing greater macroeconomic volatility’.

Yet while there is widespread recognition that climate change affects monetary policy, few central banks are adjusting their operations to account for this. Weidmann observed that, at a minimum, central banks need to ‘embed climate-related risks and developments in monetary policy analyses and update analytical and forecasting toolkits accordingly’.

There are several options for positive action, especially for central banks with asset purchasing programmes and lending operations that can be adjusted to reflect sustainability criteria. This applies to corporate bond purchasing programmes, collateral frameworks for lending to commercial banks, funding and refinancing operations (some of which are already targeted to support particular segments of the economy such as small and medium-sized enterprises) and differentiated reserve requirements. For example, the People’s Bank of China has introduced a framework whereby interest rates given to a bank on its required reserves may be increased if the bank obtains a positive green assessment.

Overall, as remarked by Villeroy de Galhau, ‘the greening of the central bank’s actions does not require a

further easing of monetary policy, but rather a recalibration of its tools.’

Supervision: stress tests and scenario analysis

The potential of climate risks to develop into financial stability risks has been the primary lens through which central banks have acted on climate change thus far. At the microprudential level, several supervisors have begun preparing and conducting climate stress tests, including those of France, the UK, the Netherlands, Canada and the ECB (see pages 12 and 14).

As Bank of England Governor Andrew Bailey remarked during a speech in November, central banks are ‘not only concerned with resilience at a micro-level, but also at a macro-

‘Lack of recognition is not the problem. What is lacking is consistent and credible implementation.’

Jens Weidmann, President, Deutsche Bundesbank, 11 Nov 2020

level’. At the macrofinancial level some are conducting scenario analysis and exploring the potential for climate risks to become systemic. The US Federal Reserve, until now largely an outlier among central banks for its mostly passive attitude to addressing climate risks, has set up a Supervisory Climate Committee to lead efforts to address climate risks. Board of Governors Member Lael Brainard remarked in February that the Fed is ‘closely following the climate scenario developed by other central banks and supervisory authorities and engaging with those institutions so we can learn from their experiences’.

Portfolio management: reserves and asset management

The third area where central banks can incorporate climate considerations is

the management of their assets, both in terms of their monetary portfolios as well as their foreign exchange reserves and other assets, such as staff pensions. Weidmann and Member of the Executive Board of the Deutsche Bundesbank Sabine Mauderer have been vocal in suggesting that central banks ‘should make sure that climate-related financial risks are given due consideration in their own risk management’ and that they should ‘consider only purchasing securities or accepting them as collateral for monetary policy purposes if their issuers meet certain climate-related reporting obligations’.

This is easier said than done. Most central banks face constraints in terms of the types of assets they can invest in, with a strong preference for liquidity and safety over returns. Some express concerns that excluding certain assets from their portfolio could lead to concentration or liquidity risks in the absence of suitable alternatives, with the sustainable finance market still very small compared to the overall investment universe. Further constraints include data gaps and challenges, including sustainability taxonomies and disclosures.

Finally, central banks can also contribute to the sustainable finance ecosystem and infrastructure. As Schnabel has suggested, ‘central banks can play an important catalyst role in speeding up the green transition and in supporting the development of the “green” market segment’. In Asia, central banks in China, Malaysia and Indonesia are in the process of developing sustainable taxonomies with PBoC Governor Yi Gang highlighting this as ‘the basis for identifying green economic activities and channelling funds to green projects’.

This edition of the SPI journal features articles from seven central banks expanding further on their initiatives and objectives. We thank them for their contributions and look forward to engaging further on this important agenda. •

Designing financial systems for a healthy planet

Margaret Kuhlou, finance practice leader, WWF, and Thomas Vellacott, CEO, WWF Switzerland, explain how the financial sector is starting to respond to the threat of climate change.

THE Covid-19 pandemic is a wake-up call. Catastrophic as it has been for livelihoods and economies, its impacts may pale in comparison to those ahead if we continue to disregard the health of the planet and weaken natural systems.

As we lose natural diversity and degrade ecosystem services, we radically restrict our opportunity to harness nature-based solutions to tackle climate change. These risks could catastrophically destabilise our financial system and present an existential threat to the global economy and our future prosperity.

The good news is that the financial sector is starting to respond to climate-related financial risks. The Central Banks and Supervisors Network for Greening the Financial System is acknowledging finance as a powerful tool for change. Its goal is to share best practice on aligning financial flows with the Paris agreement.

Now, with COP26 in Glasgow just around the corner, there are growing global expectations for promises to be translated into action. If world leaders choose to build a truly resilient recovery from Covid-19, 2021 could be the decisive year in which we make progress on mitigating climate change while also addressing biodiversity loss.

At WWF, the world's largest science-based conservation organisation, we are encouraging the financial sector to direct financial flows towards nature-positive investments and activities. A key focus is on accelerating the transition towards future-fit regulatory conditions that help systematically mobilise green capital.

We collaborate closely with central banks, financial supervisors and policy-makers to help translate their commitments on climate change into action. Our research on nature-related risks reveals their potential for significant economic and financial impacts. We are calling for:

- assessment and management of climate-related and environmental financial risks;
- regulatory action and a precautionary approach to mitigating these risks; and
- adaptation of financial regulation to fully consider all risks and ensure harmonisation and convergence of practices.

'As we lose natural diversity and degrade ecosystem services, we radically restrict our opportunity to harness nature-based solutions to tackle climate change.'

To benchmark current practices, we published the Sustainable Financial Regulations and Central Bank Policies framework which helps assess the policies and actions that central banks, regulators and supervisors in 40 countries are adopting to create a greener financial system. The framework also provides a roadmap for financial regulators to take into account environmental and social risks and enhance the stability and resilience of the financial sector. Country-level assessments of relevant

regulations and policies against the framework will be publicly available on an interactive online platform, facilitating comparison between countries and evidencing progress made.

Later this year, we will co-publish a paper on environmental risks driven by biodiversity loss as a source of systemic financial risk. This research will offer a scientific basis for meaningful dialogue with key stakeholders on the financial implications of biodiversity loss. We will provide regular overviews on data, tools and methodologies that can be used by financial institutions to quantify, understand and measure environmental risks.

To mitigate the devastating risks of irreversible climate breakdown and catastrophic nature loss, financial regulators need to act swiftly. Delaying action will only exacerbate growing climate-related and environmental risks, prolonging uncertainty in financial markets.

Our Greening Financial Regulation initiative seeks to demonstrate that designing a financial system for a healthy planet is an indispensable part of building a resilient, nature-positive global economy ready to respond to emerging risks, and able to invest in bankable nature solutions and opportunities.

Working closely with our partners and responding to the challenges they face, we aim to offer central banks, financial supervisors and policy-makers clear analysis and practical insights on sustainable finance, enabling them to make the bold revisions to financial regulation that we need to avert future crises. •

Accurate risk measurement crucial to net-zero transition

Addressing data gaps and expanding financial modelling are the two key building blocks in improving measurement, writes Paul Hiebert, head of systemic risk and financial institutions division, European Central Bank.

THE impact of climate change on the financial system is set to be profound. The costs of physical damage could reach up to one-quarter of global gross domestic product by the end of this century, amid considerable uncertainties around amplifying dynamics and so-called ‘tipping points’. Managing these costs is no mean feat.

The transition to a low-carbon economy will also entail upfront investments, requiring \$1.4tn when considering the energy sector alone, or up to \$20tn when looking at the economy more broadly. The impact of climate change will be highly path-dependent – timely intervention can stem the rise in temperatures accompanying carbon emissions.

Financial flows will be a key factor in economic adjustment. Specifying near-term risks to financial intermediaries as well as risks entailed by lending remains a work in progress. Within the European Union, the European Systemic Risk Board has been tasked with analysing this measurement, drawing insights from granular supervisory datasets matched with available carbon emissions reporting, geospatial data and economic and financial models to gauge potential risks to the 19 countries comprising the euro area.

Financial markets – while seemingly willing to price climate-related risks – are unable to fully reflect this risk in prices owing to disclosures that are incomplete

(selection bias in firm reporting), inconsistent (lack of accepted methodology for defining green and brown assets) and insufficient (virtually no reporting on downstream emission intensity of products of portfolios). This leads to informational market failures, irrespective of prospective allocative market failures. As financial market capacity builds, there may be scope for market overshooting and possible pricing dislocations.

Faced with the prospect of financial shocks resulting from climate change, ensuring the

‘Along the path to a less carbon-intensive economy, financial institutions will be exposed to risk – which needs to be managed.’

resilience of the financial system remains a key priority. Exposures of euro area banks to high-emitting firms appear limited on average, but concentrated in a few large exposures for some banks. Although many of the risks have yet to materialise meaningfully on the balance sheets of financial institutions, standardised exploratory scenario analysis can be an indispensable tool.

Research shows that early

action on climate risk, including adaptation and mitigation measures of governments, will have net benefits. Along the path to a less carbon-intensive economy, financial institutions will be exposed to risk – which needs to be managed.

Improving the foundations for more accurate and encompassing measurement of the financial risks posed by climate change will require two main building blocks. First, data gaps constraining fully representative analysis need to be tackled. Several initiatives in this area, supported by the Central Banks and Supervisors Network for Greening the Financial System, hold considerable promise. Granular data are needed – both geolocational, to evaluate susceptibility to climate risk, and forward-looking metrics of transition intensity to a net-zero economy, as the financial system inevitably shifts.

Second, efforts are needed to meaningfully expand available financial modelling for climate analysis – notably the ability to cost out long-term tradeoffs between physical risks of climate change and mitigating transition efforts.

As the old adage goes ‘what can be measured, can be managed’. As rapidly evolving work in risk measurement matures in central banks and supervisors, as well as the broader public and private sector, the foundations are being laid for timely and effective action to tackle this fundamental issue of our generation. •

Climate enters IMF's risk analysis

Analysing climate risk scenarios can strengthen the resilience of the financial system, explains Tobias Adrian, financial counsellor and director, Vikram Haksar, assistant director, and James Morsink, deputy director of the monetary and capital markets department, IMF.

THE Financial Sector Assessment Programme is a comprehensive analysis of a country's financial sector. It assesses the resilience of the sector, the quality of the regulatory and supervisory framework and the capacity to manage and resolve financial crises. The International Monetary Fund is adapting the FSAP to address challenges posed by climate change.

Using FSAPs to analyse climate risk scenarios can help our members better understand physical risks to the financial system and manage the transition to a low-carbon economy. The analysis informs policies for enhancing risk management and resilience. Unlike conventional stress testing, climate risk scenario analysis is not focused on quantifying possible needs of financial institutions relative to minimum capital requirements.

FSAP risk analysis has captured physical risks, such as insurance losses and non-performing loans associated with storms, floods and droughts. This has become common in FSAPs for small island states (such as the Bahamas, Jamaica and Samoa) and other countries prone to natural disasters.

FSAPs for systemically important financial sectors (such as Belgium, Denmark, France, Sweden and the US) have also typically covered natural catastrophe risks as part of insurance stress testing. More recent FSAPs have assessed both transition risks (Norway in 2020) and physical risks (the Philippines in 2021) and we intend to expand this in the coming year.

We are taking a three-stage approach. First, a climate financial

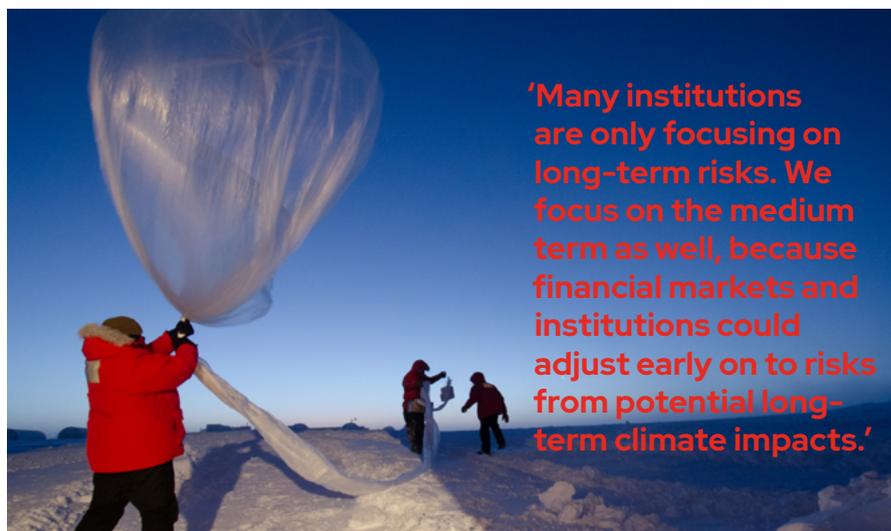
risk diagnostic to decide on the scope of the assessment and relevant physical and transition risks for any given country. Second, designing climate scenarios. And third, designing macrofinancial scenarios and using them to assess bank resilience in a similar way to standard FSAP bank stress tests. This will require adapting the conventional approach to stress testing in several ways.

Our climate risk scenario analysis will consider financial stability risks over the medium term (three to five years) and the long term (30 to 50 years), given the nature of climate risks. Many institutions are only focusing on long-term risks. We focus on the medium term as well, because financial markets and institutions could adjust early on to risks from potential long-term climate impacts.

FSAPs will consider both physical

and transition risks. Physical risks are especially relevant for many of the IMF's smaller and more vulnerable members and will require close co-operation with climate scientists. The highly microsectoral and geospatial sources of climate-related financial risks present important data and modelling challenges. The uncertainties surrounding carbon pricing and associated spending of carbon tax proceeds also present modelling challenges for assessing transition risks.

The immensity of the climate challenge calls for global co-operation. The IMF will work closely with the United Nations, the World Bank, the Financial Stability Board, the Central Banks and Supervisors Network for Greening the Financial System and other international standard-setting bodies to address this crisis. •



'Many institutions are only focusing on long-term risks. We focus on the medium term as well, because financial markets and institutions could adjust early on to risks from potential long-term climate impacts.'

Pilot exercises help plan for climate transition

The climate pilot exercise aims to make the financial system more aware of climate risks, explains Laurent Clerc, director for research and risk analysis at the French Resolution and Prudential Control Authority, Banque de France.

THE French Resolution and Prudential Control Authority (ACPR) launched its first climate pilot exercise last July. It aims to measure climate change risks and raise financial institutions' awareness of them.

This exercise is the first of its kind. It covers a 30-year period (2020-50), far beyond the traditional three to five-year window of standard exercises. It takes into account the global nature of climate change at sectoral level, covering at least 80% of the global exposures of French banks and insurers.

It relies on four scenarios: three for assessing transition risks, two of which rely on the high-level scenarios published by the Central Banks and Supervisors Network for Greening the Financial System last June, and one for assessing physical risks, corresponding to the worst scenario of the Intergovernmental Panel on Climate Change

'This exercise takes into account the global nature of climate change at sectoral level, covering at least 80% of the global exposures of French banks and insurers.'

(representative concentration pathway 8.5).

For insurers, physical risk is assessed at the municipal level for domestic liabilities. The exercise includes the assumption of an increased probability of pandemics and the development of pathologies related to the deterioration of air quality in urban areas consistent with more frequent and intense heat waves.

The exercise combines static (until 2025) and dynamic (2025-50) balance sheet assumptions, enabling firms to mitigate the impact of climate change on their balance sheets and reduce their emissions. It is a voluntary exercise, with no implications in terms of capital requirements.

To provide financial institutions with relevant data, ACPR and the Banque de France developed an analytical framework based on a suit of models. It starts with the NGFS high-level scenarios resulting from the projections of several integrated assessment models. These projections are used to calibrate the transition shocks from carbon taxes and productivity developments, thanks to an international general equilibrium model.

This model then generates the relevant macroeconomic and financial variables (such as gross

domestic product, inflation and employment) at both national and international levels. These results feed into a general sectoral equilibrium model, which enables the economic activity of a given

'The ACPR aims to measure climate change risks and raise financial institutions' awareness of them.'

country to be broken down into 55 sectors for each scenario.

This sectoral model relies on a global input-output matrix, combining energy and non-energy inputs from all countries with the domestic labour factor. The outcomes of this sector block, when combined with the macroeconomic and financial projections, feed into a credit risk rating model, which estimates the default probabilities of companies, and a financial module, which generates projections of asset prices, yield curves and credit spreads for each scenario and geographic area.

The results of the climate pilot exercise will be published in April 2021. •

ECB needs to rethink market neutrality

It's time to address market failures and carbon bias in financial markets, writes Olaf Sleijpen, executive board member of De Nederlandsche Bank.

DRASTIC efforts are needed to reduce carbon emissions and meet the climate goals of the Paris agreement. While governments are the driving force behind the transition to carbon-neutral economies, central banks have an important role to play in identifying and reducing climate-related risks.

These risks are often not accurately priced in financial markets. This is mainly due to inadequate carbon pricing and incomplete information about climate-related exposures. As a result, financial markets do not fully internalise expected costs of climate change and climate-related policies in asset prices. This market failure leads to inefficient allocation of resources and carbon bias in capital markets.

The most direct way to address this is for governments to introduce better carbon pricing measures. This will force markets to internalise climate-related externalities and make sustainable investments more attractive compared to carbon-intensive alternatives.

Global accounting standards for climate risks are needed to foster better transparency and address information gaps in markets. Central banks can contribute to this in two ways.

First, they can disclose the climate-related risks of their balance sheets. This sets an example and could encourage the disclosure of such risks by other financial market participants.

Second, central banks may consider making climate disclosures a requirement in their monetary operations (both in refinancing operations and purchase programmes). This transparency would help central banks improve their assessment of climate risks.

Central banks should also consider addressing carbon bias in their monetary operations, which comes from carbon bias in financial markets. For example, the European Central Bank applies the concept of market neutrality in its purchase programmes. However, market capitalisation weighted benchmark – as used in the ECB's corporate sector purchase programmes – may not be appropriate. Market failures that distort relative prices may be a reason to use other concepts of market neutrality that better reflect climate-related risks and externalities.

What is appropriate may differ for each central bank, dependent on its mandate and the type of monetary operations. The ECB has to consider how to take into account climate-related risks in monetary policy, because climate change can directly and indirectly affect price stability. The ECB also has to support general economic policies in the European Union, one of which is 'a high level of protection and improvement of the quality of the environment'. In its strategy review, the ECB is exploring how, within the boundaries of its mandate, it can consider climate-related risks in the conduct of its monetary policy.

So, although governments are the primary actors in climate-related policies, central banks have an important role to play in fostering transparency and in the way they shape their monetary policy and operations. •

'Market failures that distort relative prices may be a reason to use other concepts of market neutrality that better reflect climate-related risks and externalities.'



Beyond green and brown: a principles-based taxonomy

The rollout of the new taxonomy in Malaysia can be used to manage climate risks and strengthen financial resilience, explains Jessica Chew, deputy governor, Bank Negara Malaysia.

BANK Negara Malaysia recognises the urgent need to effectively manage climate risks given the wider ramifications for the financial sector and the economy. In preparing the Malaysian financial system to become more climate-resilient, BNM supports an orderly transition that is consistent with preserving inclusive financial services for households and businesses.

To achieve this, BNM believes that measures to strengthen climate resilience must also provide meaningful support and viable solutions to help businesses transition towards green activities and operations. It is particularly important for a country like Malaysia to minimise significant social and economic dislocations that can arise from the premature exclusion of certain sectors or economic agents.

BNM's immediate priorities are to build a strong foundation in climate risk management for the financial industry. An important step is the development of a principles-based taxonomy to inform risk assessments and direct financial flows to activities that support the transition to a low-carbon and climate-resilient economy.

As opposed to a green or brown binary assessment, a principles-based approach supports businesses in transition by recognising climate risk mitigation and adaptation efforts over time while ensuring assessments are rigorous. This approach combines assessments at economic activity level and overall business level to ensure progress towards greening financial

services is sustained. The taxonomy encourages financial institutions to help businesses transition to greener practices in a way that improves rather than erodes development outcomes and helps build capacity within businesses to better manage climate-related risks.

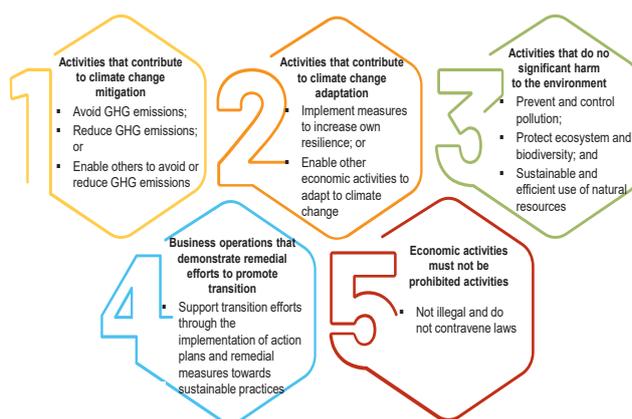
Another important component is the development of a sectoral and activity impact-based risk management toolkit. To start with, the focus is on palm oil, renewable energy and energy efficiency activities, followed by manufacturing, construction and infrastructure, as well as oil and gas by the end of the year.

Within the Association of Southeast Asian Nations region, BNM has been supportive of the development of a taxonomy that can provide a common language for sustainable finance and promote efficiency. Asean economies share

common exposures to climate-related risks as well as challenges in mitigating such risks.

The majority of Asean countries are resource-based economies with higher risks of stranded assets if disorderly transition occurs. Most are also developing countries, with substantial needs for funds, expertise and technology to support an orderly transition. BNM therefore sees great value in pursuing a coordinated and regionally coherent financial sector response to the climate challenge.

To this end, BNM is working closely with central banks in the region on building a regional taxonomy. The rollout of the Climate Change and Principle-based Taxonomy in Malaysia combined with other relevant experiences of regional economies will be particularly instructive in the process. •



1. Key features of the Climate Change and Principle-based Taxonomy

Five guiding principles for capturing the impact of economic activities and business operations on the climate and the broader environment.

Source: Bank Negara Malaysia

Supporting sustainable finance in Mexico

Rafael del Villar, chief adviser to the governor, Banco de México, explains the role of the Sustainable Finance Committee in encouraging financial institutions to integrate climate risks in decision-making.

IN RECENT YEARS, Banco de México has been actively promoting and supporting financial institutions in the adoption of measures that integrate climate and environmental, social and governance risks and opportunities in decision-making.

In May 2020, together with the United Nations' development and environment programmes, BdM published 'Climate and Environmental Risks and Opportunities of the Financial System of Mexico', an in-depth report on the state of awareness and consideration of ESG and climate-related risks by Mexican financial institutions. The study was based on a detailed survey and in-person interviews with the senior management teams of financial institutions. It provided an assessment of drivers and challenges, as well as a set of recommendations to better align financial flows to a sustainable and low-carbon economy.

Last year, Mexico's Financial System Stability Council (CESF) created the Sustainable Finance Committee (CFS). The CFS will support the CESF with analysis, information and guidance on sustainable finance and its implications for financial stability.

Members of the CFS include financial authorities and regulators as well as representatives from the private financial sector. The CFS engages financial market actors in this agenda, through dialogue, guidance, capacity building and regulation.

The CFS has approved four working groups. First, the sustainable taxonomy WG is developing a broad taxonomy that

considers social aspects and several sustainable development goals. It is internationally comparable, particularly for financing green activities.

The mobilisation WG will provide more visibility to sustainable activities and technologies. In addition to taking stock of such activities, it will evaluate the role that development banks, as well as other possible actors, have in promoting the adoption of material ESG practices by listed and non-listed firms.

The ESG risk WG is looking into ways to accelerate the inclusion of climate-related risks and opportunities in decision-making processes of financial institutions. Currently, the risks associated with climate change are not fully incorporated into asset prices. The

goal is for regulators and financial institutions to integrate financially material environmental data and forward-looking methodologies and tools in their decisions.

Finally, the disclosures WG is analysing different ESG standards, mindful that existing standard fragmentation may increase reporting costs for firms. This WG closely monitors international financial institutions, such as the International Financial Reporting Standards, International Organization of Securities Commissions and Federation of Small Businesses. It assesses the work done on the adoption of recommendations made by the Task Force on Climate-related Financial Disclosures and on embedding sustainability risks into global accounting frameworks. •

'The goal is for regulators and financial institutions to integrate financially material environmental data and forward-looking methodologies and tools in their decisions.'



Central banks can help finance renewables

The energy sector will be key for the transition to a net zero economy, writes Gábor Gyura, head of sustainable finance, Magyar Nemzeti Bank.

IF CENTRAL banks are going to seriously address climate risks and play a positive role in the transition to a net-zero economy, they should look at how the energy sector is financed. The complexity of the topic calls for a considered financial regulatory approach and Magyar Nemzeti Bank has just embarked on this journey.

One year ago, with the outbreak of the Covid-19 crisis, the International Renewable Energy Agency's flagship report, 'Renewable Energy Statistics 2020', laid out a path to creating a sustainable energy system. It suggested that by putting renewables at the centre of the recovery from the pandemic, we could align our economies with the Paris agreement, unlock a \$100tn boost to global gross domestic product and create millions of new jobs by 2050.

The Hungarian national strategy (published in early 2020) set ambitious targets for expanding renewable energy power production. By 2040, approximately HUF2.2tn (\$7.3bn) of new investment will be needed (HUF112bn per year) in the sector, which would trigger around HUF1.6tn (\$5.3bn) of new debt financing. This does not include the construction of energy storage capacities and the cost of network development, which also require significant investments adding up to HUF500bn (\$1.7bn).

Hungary's GDP is roughly \$154bn, so such an ambitious growth plan poses a challenge to the energy and finance sectors. MNB set the dual goal of assessing and reducing climate-related risks for the financial system to encourage financial institutions to operate more sustainably. Green financing can help to mitigate macro-level sustainability-related risks, feeding

back to the financial system and even to individual market players.

Polluting forms of energy production are more exposed to increasingly stricter environmental regulations and could therefore be riskier in the long run. The best way to decarbonise the economy is for central banks to support green energy production so that industries and households can be more sustainable. Renewable energy is not without environmental challenges (such as the problem of solar panel waste), but

'Current loan level credit databases do not differentiate between loans financing green and brown energy production. The climate lens has been missing from both banks' and regulators' approaches until now.'

central banks should start to implement green financial policies.

In doing so, MNB realised that energy production loans have so far been 'colour blind' in Hungary. In most cases banks do not flag renewable loans within the energy class in their data systems. Current loan level credit databases do not differentiate between loans financing green and brown energy production. The climate lens has been missing from both banks' and regulators'

approaches until now.

MNB launched a comprehensive project to identify room for improvement in the renewable energy finance market. The initial analysis fortunately showed that non-performing loan levels are low in the segment, but there is clearly work to be done to keep it that way, if such a dynamic growth is foreseen in climate policy plans.

Through consultations with commercial banks and project developers MNB was able to spell out in its report, 'Financing the Hungarian renewable energy sector', the various risks of the segment (such as risks related to the energy market, price, exchange rate, balancing costs, tenor) and start conversations about how such risks could be mitigated. The aim is to support financial stability and the supply of renewable energy finance. However, the de-risking measures (like a possible credit guarantee scheme) are not within a central bank's arsenal.

Even if renewable energy production is not without risks, there is a strong case for differentiating between green and brown in capital requirements to acknowledge transition risks of non-sustainable energy production. In December 2020, MNB announced its new scheme providing more favourable capital requirements for corporate loans financing renewable energy production. The scheme will last for five years, until which time the outcome of the EU's debate about whether a differentiated prudential treatment of green versus brown assets in the EU banking framework will be introduced. •

Managing climate risk uncertainty with technology

Edmund Lau, deputy chief executive, Hong Kong Monetary Authority, explains how the financial system can use technology to manage climate-related risks.

CLIMATE change is a source of multiple risks affecting both the real economy and the global financial system. For central banks and financial regulators, a key question is how to properly manage climate-related risks while ensuring that the financial sector continues to perform its critical function of allocating capital, preferably to greener and more sustainable causes.

As part of this, the Hong Kong Monetary Authority and other financial regulators focus on six areas: risk management, transparency and accountability, awareness and capability, innovation and products, opportunities in Mainland China and international collaboration. It is an ambitious agenda, and we are exploring how to leverage technology to deliver it.

One obvious area is data and analysis. In banking, scenario analysis and stress testing are increasingly being used to manage climate risk. But availability of data is a big challenge. This is one reason why financial regulators in Hong Kong announced last December that the recommendations of the Task Force on Climate-related Financial Disclosures will be mandatory across relevant financial sectors in Hong Kong by 2025.

However, more needs to be done. Climate risk analysis is a departure from conventional financial analysis in the degree of uncertainty. Climate outcomes, the pathways toward these outcomes and transmission back to the financial system are highly unpredictable and any impact is not felt uniformly across the economy. A robust analysis would

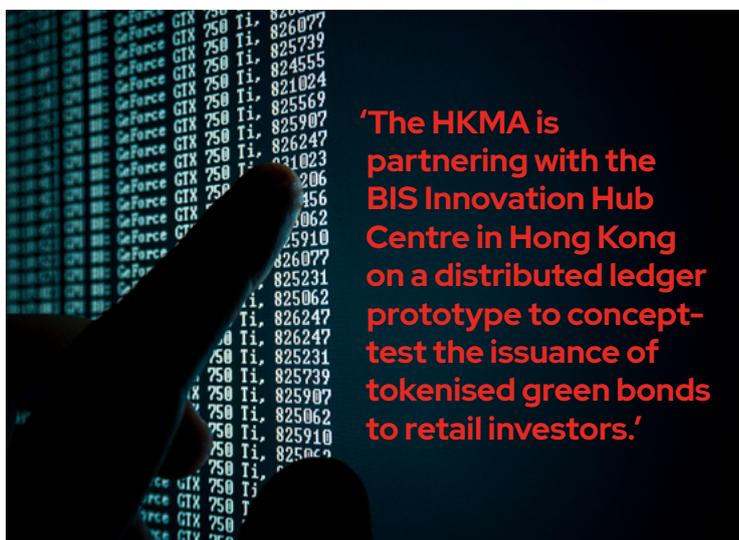
therefore have to draw in other, more granular data, potentially in unstructured formats and from sources with which financial institutions are less familiar.

Here, technologies may be able to help. For example, in 2019 the HKMA launched the Granular Data Reporting initiative, which analyses granular transaction-level data from banks. Alongside big data analytical techniques, this can potentially enable more accurate assessment of climate risks, such as the identification of residential mortgage loans in areas prone to flooding risks, or loans to sectors or corporations with relatively higher carbon emissions.

Technology can also be used in market development. Take issuance of green bonds as an example. Blockchain and smart contracts could streamline the

issuance process, reducing costs and enhancing efficiency, potentially making green bonds more accessible to the public. These technologies, together with the internet of things, could be combined to monitor and report on the use and environmental impact of green bonds proceeds, enhancing transparency, credibility and investor engagement. As a market facilitator, the HKMA is partnering with the Bank for International Settlements Innovation Hub Centre in Hong Kong on a distributed ledger prototype to concept-test the issuance of tokenised green bonds to retail investors.

As we deal with rising temperatures and changing climate, a symbiosis of two of the hottest topics currently in finance – sustainability and tech – could be a fruitful way forward. •





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FORTHCOMING MEETINGS

APRIL

In conversation with Kevin Stiroh: The role of the Federal Reserve in mitigating climate-related financial risk

15 April 2021, 15:30-16:30

Kevin Stiroh, senior adviser in the supervision division at the Federal Reserve, discusses the Fed's supervision climate committee and its work to increase standards, supervisory practice and capital to mitigate climate-related financial risk.

Stress testing and climate scenario analysis: Providing transparency and pathways for mitigating climate impact

28 Apr 2021, 14:00-15:00

Financial systems are more exposed than ever to climate impact, so incorporating climate scenarios into risk assessments is fundamental to any financial strategy. This roundtable with Sylvie Goulard, deputy governor of Banque de France and James Morsink, deputy director of the monetary and capital markets department at IMF, will examine macroeconomic stress testing, as well as the methodology, objectives and datasets needed to develop reliable, consistent testing and analysis to identify exposure.

MAY

In conversation with Olaf Sleijpen: Quantifying the risk of climate change to financial stability

5 May 2021, 12:00-13:00

This roundtable discussion with Olaf Sleijpen, division director of supervision policy at De Nederlandsche Bank, will examine the work that DNB has conducted in establishing standard metrics to quantify climate risk. He will analyse how central banks can measure the carbon dioxide impact of their own reserves and balance sheets, and measure portfolio risk to mitigate climate impact.

The role of green loans and targeted lending in providing economic growth

11 May 2021, 12:00-13:15

Anna Breman, deputy governor of Riksbank, and Gábor Gyura, head of sustainable finance at Magyar Nemzeti Bank, look at the role of green loans in financing the transition to low-carbon economies and green capital markets. This roundtable will discuss the role central banks play in driving green loan and banking initiatives through providing easy access to capital for green projects. It will also touch on the increasing demand for and innovation of green credit markets and how these initiatives can produce competitive advantages and opportunities for growth.