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“Climate change stress testing allows supervisors to start to gauge climate-related financial risks. We anticipate that such tests will become global in the next two to three years.”

Janine Dow, Sustainable Finance, Fitch Ratings

Global Testing Is Expanding Fast

Regulatory climate change stress testing for banks and insurance companies is expanding fast. Supervisors within countries with clear environmental government policies, such as the UK and EU, are leading the initiative. French financial institutions will be the first to announce results in April 2021, before the UK launches its biennial stress test in June 2021.

The ECB will test significant eurozone banks in 2022 and Australia, Brazil, Canada, Hong Kong and Singapore have announced tests for 2021 and 2022. Fitch Ratings believes the need to better understand climate-change risks and opportunities, principally among supervisors, investors and financial institutions, is driving the global stress-testing trend.

NGFS' Scenarios Accelerate Testing Toolkit

Stress tests, using scenario analysis, are a good starting point for supervisors to gauge the extent to which financial institutions are exposed to climate-change risks. Most supervisors are drawing on scenarios and guides published by the Network for Greening the Financial System (NGFS), whose scenarios are backed by scientific research.

The collective expertise and rigour of the tests, based on commonality and standardisation, will help market participants clamouring for access to comparable information. We anticipate stress-testing will grow because it allows supervisors to gauge climate-related financial risks and consider potential mitigants.

Pace Varies Between Regions

Given that climate change is a priority for the US government under the Biden administration, our assessment is that climate considerations will become more high-profile for financial institutions, although the US remains a laggard in this regard. Formal climate-change stress testing of financial institutions in China and Japan has not yet been announced, but we believe this is coming soon.

New Zealand, where disclosure in line with Task Force on Climate-Related Financial Disclosures (TCFD) guidelines is already mandatory for banks, has not committed to testing. This is despite recognition that house prices and farming-sector performance (important for local banks) face environmental impacts.

In Latin America, Brazil's regulator is the only one to have made public statements regarding sustainability and committed to stress-testing of supervised banks. Large countries without public plans for stress tests include Russia, Turkey, South Africa and India.

Related Research

[ESG Credit Trends 2021 \(January 2021\)](#)

[The Next Phase: Megatrends and Financial Institutions' Ratings \(November 2020\)](#)

[What Investors Want to Know: Key Questions from Fitch's ESG Outlook Conference \(January 2021\)](#)

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Global Trend in Climate Stress-Testing

The Basel Committee on Banking Supervision (BCBS) has identified climate change as a potential risk to the safety and soundness of financial institutions and the stability of the global financial system. The BCBS believes that it would be beneficial for central banks, regulators, and supervisory bodies (together referred to as “authorities” in this report) to engage with the Financial Stability Board and other standard-setters to assess and manage these risks.

An April 2020 stocktake of climate-related initiatives from the BCBS noted that 24 of 27 respondents (of which 11 were Western European, eight from APAC and three from LatAm) have conducted research on climate-related financial risks. It also found that a third cited the potential of including stress-testing of climate-related financial risks, based on sensitivity analysis, for banks in the future.

Although few authorities currently submit their banking systems to formal climate change stress tests, momentum is growing. Several major jurisdictions have already announced tests (see the Appendix on page 10), and our research suggests several more are considering implementing them.

We anticipate more supervisors will start submitting their authorised entities to climate-related stress tests because they represent a good tool to gauge climate-related financial risks and consider how the prudential regime can be used to mitigate micro and macroprudential risks emanating from climate-change.

The Covid-19 pandemic has highlighted the importance of globally-coordinated responses to events with potentially severe global impacts. Climate-change risks are global and by end-2020 around 110 countries had signed up to the net-zero targets outlined in the Paris Agreement. This makes it more difficult for authorities, particularly those regulating banks in countries that are aligned with the Paris Agreement, to opt out of an exercise which could well contribute to preserving global financial stability, alongside helping jurisdictions meet Paris Agreement-aligned goals.

What Do the Tests Hope to Achieve?

None of the tests announced to date will test institutions’ capital adequacy, or be used to set minimum regulatory capital requirements.

The tests’ objectives are broad and will be used to deepen understanding of climate change-related risks, assess business model vulnerability, and better understand how to develop methodologies given incomplete data, and inadequacies of models.

For institutions, such tests help to deepen management teams’ understanding of financial risks linked to climate change, identify and address data gaps, and develop management approaches to mitigate risks. We have [already stated our belief](#) that deepening management teams’ understanding of climate-change risks is as important as trying to quantify the financial impacts on balance sheets, profit and loss (P&L) accounts and, ultimately, capital. The outcomes of the tests and the expertise gained through the process will also feed into developing cutting-edge risk-management approaches.

Climate Change Stress Tests Announced

Country	Authority	Dates
Australia	Australian Regulatory Prudential Authority	Designed in 2020; to be executed in 2021
Brazil	Banco do Central Brasil	Announced on 8 September 2020; results expected April 2022
Canada	Bank of Canada, Office of the Superintendent of Financial Institutions	Announced on 16 November 2020; detailed scenarios and information not expected until end-2021. Results date not disclosed
Eurozone	ECB/European Banking Authority (EBA)	Announced in November 2020; date set for 2022. Results date not disclosed
France	L'Autorité de contrôle prudentiel et de résolution (ACPR)	Conducted in December 2020; results expected April 2021
Hong Kong	Hong Kong Monetary Authority	Banks contacted on 4 December 2020; planned for 2021. Results date not disclosed
Singapore	Monetary Authority of Singapore	Guidelines published in December 2020. First results due before June 2022
UK	Bank of England	Test set for June 2021; results not expected until 2022

Source: Fitch Ratings, supervisors

Based on authorities’ disclosures, it appears that Western European climate stress tests will focus more on climate-related transition risks alongside physical risks. In contrast, tests in some Asian countries (such as Hong Kong’s pilot test) appear to be more focused on physical risks, such as the increased incidence of more extreme typhoons. Similarly, US authorities’ recent statements on their nascent supervisory approaches appear to focus more on physical climate-related risks.

Scenario Analysis; A Good Starting Point

Authorities will be using scenario analysis as a starting point for their climate change stress tests. France, Hong Kong, Singapore and the UK will be using the scenarios provided by the NGFS published in June 2020. We believe others will use scenarios consistent with those used by international peers, adapted to meet local requirements.

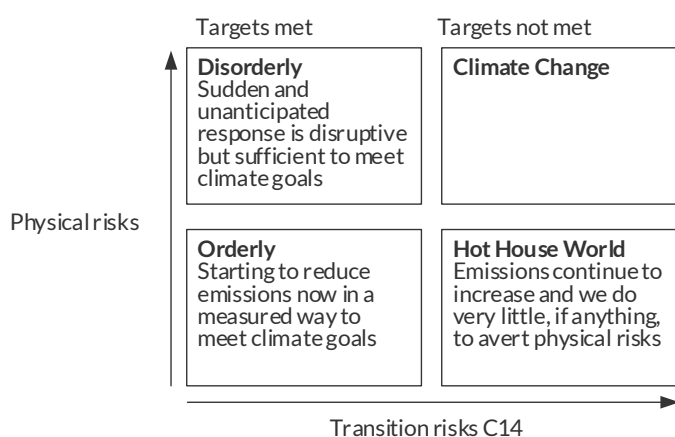
The NGFS is a group of central banks and supervisors who share best practice and contribute to the development of environment and climate-risk management in the financial sector. One of the network’s objectives is to mobilise finance to support the transition to a sustainable economy.

The NGFS scenarios provide a common starting point for authorities to analyse climate risks to the economy and financial

system. Of the eight scenarios, three representative scenarios explore different transition pathways for reaching various warming outcomes. Shadow emissions prices are used as a proxy for government policy intensity. Both Orderly and Disorderly scenarios (see diagram below) assess the transition to a net-zero carbon emissions economy, consistent with limiting global warming to less than two degrees Celsius (2°C).

However, the Orderly scenario assumes climate policies are introduced early before gradually becoming more stringent, with net-zero emissions achieved before 2070, and low physical and transition risks. In contrast, the Disorderly scenario assumes climate policies are not introduced until 2030, requiring sharper emissions reductions with higher transition risk. The Hot House scenario assumes only currently implemented policies with emissions growing until 2080 leading to 3°C+ in global warming and heightened exposure to severe physical risks. Five alternate scenarios explore different assumptions, such as different temperature targets, policy responses and/or technology pathways.

NGFS Climate Scenarios Framework



Source: Fitch Ratings, NGFS

Economic impacts modelled by the NGFS vary considerably. Transition risk impacts would be modest in the Orderly scenario, estimated at a 4% contraction in global GDP by 2100, but considerably higher under the Disorderly scenario, at around 10%. The impacts from physical risk in the Hot House scenario could contract global GDP by up to 25%. Regional differences would be acute, with major fossil-fuel-exporting regions having the highest transition risk.

The NGFS scenarios use multiple climate impact models to generate a range of data for transition risks, physical risks and economic impacts, but the output is subject to many limitations. The NGFS warns against these given that a broad range of assumptions had to be made around future social and economic trends, government environmental policy responses, technical advances in how to remove and reduce emissions, and numerous tail-risk events and unknown factors such as permanent rises in sea levels, extreme weather impacts and migration trends, for example. Work on refining the scenarios continues.

What Can We Learn from Previous Climate-Related Tests and Studies?

There are few precedents in the area of climate-related stress tests. Although earlier pilot tests are not directly comparable (see the following section), the Dutch central bank (Nederlandsche Bank; DNB) conducted a transition risk-focused test in 2018 on bonds, equities and corporate loans for Dutch financial institutions (FIs). The most punitive scenario under the latter reduced the value of banks' stressed portfolios by 3%, and common equity tier one (CET1) ratios fell by 4.3 percentage points over a five-year period.

An earlier French stress test found that large domestic banks and insurers have low exposure to physical risks and that management's integration of climate change into risk frameworks was increasing. More recently, the EBA found in December 2020 that more than 50% of a sample of large EU banks' exposures to large corporates are to sectors potentially subject to transition risk. In particular, the largest share of climate-relevant exposures comprises exposures to the manufacturing, electricity, construction, transport and real estate sectors.

We know that findings from the French and UK tests will only be disclosed at sector level, with no details published about the impact of climate-change risks on individual participants' balance sheets and P&L accounts. We also expect some quantitative metrics to be released by authorities and anticipate that these will be used to inform future prudential capital assessments.

Although both tests use NGFS scenarios as a starting point, the UK test differs from the French test by proposing to explicitly explore the implications of litigation risk. For insurers the Bank of England (BoE) is proposing a quantitative approach focused on assessing exposure and supporting risk management in relation to seven possible adverse legal rulings, without tying these specifically to any one of the three scenario paths. For bank participants, the BoE expects to include a set of qualitative questions only.

We believe that major French banks have a good understanding of climate-change risks, a sound record in data collection and disclosure on environmental risks, and transition strategies that improved significantly in 2020.

French property and casualty (P&C) insurers are well-placed to respond to the tests' data inquiries for catastrophe risk modelling given that much data is already needed to assess their solvency ratios. Their exposures to extreme weather risks are largely mitigated by a state-backed catastrophe regime operating through a national reinsurer. This in turn means that transition-related risks, and the huge amount of uncertainty around them, become proportionally far more important. However, dynamic balance sheets, whereby management teams have the flexibility of changing the balance-sheet mix, will likely dampen any financial impact to French FIs' assets and solvency ratios.

The UK's proposal to use a static balance-sheet assumption while projecting the impact over a 30-year period will not permit banks' management teams to alter their business strategies and portfolios, so could magnify projected risks and be regarded as a "worst case" view. In contrast, the French test will permit management actions to be reflected in balance sheets for most of the 30-year scenario

period, so we expect asset valuation and solvency outcomes will be less dramatic than for UK institutions.

In terms of readiness to address data gaps and develop risk-management processes and disclosures, we consider French FIs to be relatively well advanced in their disclosure and understanding of climate-change risks, based on a 2019 survey of French FIs' (see the following page). We expect the French stress test results in April 2021 to demonstrate FIs' progress in integrating climate risk into their risk-management frameworks and ability to start quantifying the financial impacts of climate change.

By comparison, a June 2020 letter from the BoE revealed significant gaps in UK insurance companies data, tools, processes and expertise. The BoE highlighted that participants were struggling to "translate high-level scenario specification into potential financial impacts"¹. The largest gaps relate to the evaluation of climate impacts on investments. However, we believe that UK FIs have had a steep learning curve and expect data submissions for 2021 testing to be much improved.

Findings from the new French and UK stress tests will build on existing regulatory expectations that FIs should take a more holistic approach to risk assessment and include climate-change risks when they perform internal capital and solvency assessments.

Since early 2019, the BoE's Prudential Regulation Authority (PRA) has required banks to assess all material exposure relating to the financial risks from climate change as part of their internal capital adequacy assessment processes (ICAAPs). In addition, since January 2021, all eurozone banks must embed the ECB's guidelines on climate-related and environmental risks into their internal capital and supervisory review and evaluation processes (SREPs). The US Federal Reserve System Bank (Fed) expects banks to measure climate-change risks, suggesting that loss-absorption assessments also need to be made.

Our view is that stress-test results cannot be viewed in isolation from prudential supervision and will eventually lead to additional holistic capital charges under the Pillar 2 regime. At the very least, we expect that stress tests will force banks to start to think more deeply about whether they need to hold additional capital to cover potential unreserved losses arising from climate-change risks. This should focus attention on sector distribution of loans and investments, moving away from areas which increase exposure to credit losses and therefore weigh more heavily on capital requirements.

DNB FI Energy-Transition Risk Stress Test

In 2018, DNB conducted a top-down scenario stress test on slightly more than half of aggregate Dutch FIs' equity, bond and corporate loan portfolios (domestic banks, insurers and pension funds), using four disruptive energy-transition scenarios: firstly, a technology shock scenario where the share of renewable energy in the Dutch energy mix doubles; secondly, a policy shock where carbon prices rise steeply due to policy measures to reduce carbon emissions; thirdly, a double shock where carbon prices rise due to policy measures and the share of renewables in the energy mix doubles;

and, fourthly, a confidence shock where companies and households postpone investment due to policy uncertainty.

To calculate the financial impact of the stress scenarios, macroeconomic scenario simulations were combined with transition vulnerability factors over a five-year scenario term. However, the stress test did not take mortgage or commercial real estate exposures into account, due to significant data gaps at the time in measuring the energy efficiency of real estate (and thereby accounting for transition risks).

Despite the exclusion of real estate portfolios, the stressed asset impact was considerable. The double shock scenario was most punitive, reducing stressed asset values by 3% for surveyed banks, 11% for insurers, and 10% for pension funds.

Impacts on key solvency supervisory ratios were also material. Under a policy shock scenario, banks' CET1 ratios fell by 3.4%, insurers' solvency ratios fell by 6.9% and pension funds' coverage ratios fell by 10.2%. They fell even further under the double shock scenario (by 4.3% for banks, 10.8% for insurers and 11.8% for pension funds). In all the scenarios, exposure to the mining, petrochemicals and utilities industries created the most severe shocks.

The five-year term of the test appears severe, since most government environmental policies will likely introduce change over a longer period, to avoid financial and economic instability.

The DNB concluded that "the stress test results suggest that the losses for financial institutions in the event of a disruptive energy transition could be sizeable, but also manageable. A timely implementation of effective climate policies can help to avoid unnecessary losses". The test results also showed that disruptive energy transitions would affect Dutch FIs if they were introduced in a short time span but we consider this to be highly unlikely.

2019 Assessment of French FIs' Climate-Change Risks

In April 2019, the Banque de France's Autorite de Controle Prudentiel et de Resolution (ACPR) published results from its survey of French banks and insurers' practices to managing climate-change risks. The ACPR assessed transition risk assuming that the Paris Agreement target (global warming of no more than 2°C by 2100) is met and found that EUR613 billion of French banks' risks and EUR249 billion of insurers' risks were exposed to transition-sensitive, high-carbon-emitting sectors. This was equivalent to 12.2% of banks' net credit risks at end-2017 and 9.5% of insurers' investments.

The report found that:

- Climate risks were increasingly being reported to senior management and such risks were gradually being integrated into risk-management frameworks. This had uncovered the need to develop specialist expertise and tools. Climate-related risks were increasingly being regarded as an integral part of financial risks. This suggests that French FIs have a relatively well-advanced approach to integration of climate-change risks, most likely triggered by higher levels of

¹ Bank of England, June 2020.

climate-related disclosure required for institutional investors (including banks and insurers) from January 2016 in line with TECV (an environmental law introduced at end-2015). Findings from ongoing climate stress tests might highlight fewer data gaps than for other countries, where approaches to climate risks are less developed.

- Progress was, however, unequal, with greater advances made by the more sophisticated large, international banks and the monoline banks whose activities could be more easily mapped to a narrow range of climate-change risks. Purely domestic, retail banks lagged, hindered by a lack of urgency (as looming risks were not considered immediately material) and by shortcomings in regulatory guidelines. The ACPR also found that insurers rarely assessed climate-related physical risks to both assets and liabilities.
- The exposure of banks and insurers to physical risks was low but management teams' improvements in understanding such risks was still "modest". Non-life insurers were more advanced but tended to use five-year stress horizons, which fall severely short of the 2030-2050 timeframe during which physical risks are more likely to materialise.
- Most banks had tools to assess the impact of transition risk across different sectors on their loan books. The sophistication of models varied considerably, with some banks able to assess the value of their financed emissions, while others were only capable of identifying high-risk sectors. Insurers were more advanced in their use of ESG scores to measure transition risks in their investment portfolios but few were able to measure market-value shocks arising from energy transition scenarios.
- Climate-related reputation and legal risks were poorly understood.
- The study concluded that "climate change is still only partially and inconsistently integrated into FI's risk-management processes".

Climate-Related Risks Enter Mandates

Globally, there is an acceleration in the number of authorities that have identified that climate-change risks pose financial risks that must be monitored as part of financial stability mandates.

A report published by the Financial Stability Board in July 2020 said that 75% of 32 supervisors and members surveyed already consider, or plan to consider, climate-related risks as part of their financial stability monitoring. EU supervisors have been most vocal in terms of embedding climate risks in supervision mandates. However, outside the EU, there are still relatively few public statements that confirm that bank supervisors and regulators have formally integrated climate-change risks into their supervisory mandates.

Responses to a BCBS April 2020 survey showed that the majority of authorities lack an explicit mandate to monitor climate-related financial risks. However, respondents also stated that they view climate-related risks as an implicit part of their regulatory framework, as it falls within their prudential mandate to manage all relevant risks to the financial sector. All respondents agreed that

climate change may result in risks that could have financial-stability implications for the banking system.

High-Profile Commitments Add Momentum

The US, under the Biden administration, is a new entrant to the debate on climate-change risks for the financial sector, but we believe it will add considerable weight to the movement, especially given the country's record of decisive, timely action to implement regulation and introduce change.

On 25 January 2021, the Fed and ECB established dedicated units to focus on climate-change risks. The mandate of the Fed's Supervision Climate Committee is to deepen understanding of the risks posed to financial stability by climate change and assess the impacts on individual regulated banks, infrastructure and markets in general. The Fed's November 2020 Financial Stability Report had already marked a departure from previous silence on climate change by explicitly referencing ESG risks for the first time and guiding that banks are expected to add climate risks to the list of material risks that they are required to identify, measure and monitor.

The ECB's new climate-change centre will unify all climate-change workstreams that have been operating under diverse areas of responsibility, and will cover a broad range of topics, ranging from monetary policy to prudential supervision.

In both cases, the units are high-profile, judging by the appointments made. In the US, Kevin Stiroh, previously head of the New York Fed, has been appointed to lead the Fed's committee, while the ECB centre will report directly to ECB President Christine Lagarde.

At the International Climate Adaptation Summit in the Netherlands in January 2020, the IMF's managing director said that the fund will include climate in its annual country assessments, include climate-related financial stability risks in its financial sector surveillance, and track the economic impact of climate-change risks and mitigating factors in its assessments of macroeconomic data.

Regions Are Moving at Different Speeds

APAC – Momentum Is Gathering

Climate stress testing for banks will take place sometime in 2021 for Hong Kong and in June 2022 for Singapore.

The Hong Kong Monetary Authority has stated that climate change is particularly relevant to Hong Kong given its coastal position and worsening extreme weather. In December 2020, it invited banks to stress-test for climate-change risks, allowing a high degree of flexibility in terms of methodology and granularity of information for this pilot test.

We believe that leading international banks and the major Hong Kong subsidiaries of international banks are better positioned to participate in climate change stress tests relative to small and medium-sized local banks. It initially appears that the Hong Kong banking system should have a limited direct impact from climate-change risk, given that its direct exposure to carbon-emitting sectors, such as electricity and gas, only accounted for 1% of customer lending at end-2020.

Real estate exposures remain the key risk for Hong Kong banks, with commercial properties and residential mortgages accounting for 32% of customer lending. Extreme weather conditions in Hong Kong have historically led to costly property damage. For example, “super typhoon” Mangkhut in 2018 led to HKD2.3 billion of claims related to property damage. We anticipate that the pilot stress-test results may improve understanding of the potential impact to Hong Kong banks’ lending books from extreme weather conditions.

The Monetary Authority of Singapore (MAS) is fairly well-advanced in its recognition and surveillance of FIs’ climate-change risks. Initiatives to improve environmental disclosure, gather data and strengthen risk-assessment frameworks are already operating and a “green” taxonomy is being launched. MAS already incorporates climate risk scenarios (such as extreme flooding) in its annual banking and insurance stress-testing, but guidelines announced at end-2020 for the new tests incorporate a broader range of risks and build on work conducted by other regulators.

We believe implementation of the stress tests will not pose a major challenge to Singapore’s major banks given that they have been preparing for a few years. The MAS published risk-management guidelines in December 2020 and banks have been taking steps to reduce their exposures to coal financing and oil and gas. Sector data is not very detailed but banks reduced their oil and gas exposures to 4%-6% of their lending portfolios in 1Q20, from 5%-7% in 2016, which was not very high. The banks’ at-risk exposures are primarily offshore, such as in the financing of fossil-fuel powered utilities, palm oil plantations, forestry and mining, which are significant in the economies of emerging Southeast Asian countries such as Indonesia, Malaysia, Myanmar and Vietnam. However, these exposures are still small as a share of their total risk exposure.

The development of green finance and promotion of a more sustainable economy is a priority in China and we believe regulators are considering formal bank climate change stress testing. In December 2020, the governor of the People’s Bank of China (PBOC) noted that “the PBOC will strengthen [a] study on the potential impact of environment and climate risks on financial stability”², suggesting that stress testing may materialise soon. The PBOC also referred to other countries’ stress-testing initiatives and potential impacts on financial stability in its 2020 Financial Stability Report.

Furthermore, the UN’s Principles for Responsible Investment network and other signatories are leading a UK-Chinese government-backed pilot scheme on climate-related and environmental disclosure for banks, which also mentions climate stress testing in China.

In China, only Industrial and Commercial Bank of China Limited (A/Stable) has conducted climate stress tests, with pioneering initiatives dating back to 2016, to assess environmental impacts across exposures to several sectors (thermal power, aluminium, steel, and thermal power) and from specific events (drought and the introduction of certain environmental taxes in the country).

The Bank of Japan rarely addresses climate-change risks directly but in October 2020 Governor Kuroda said that the banking sector had to increase efforts to make itself more resilient to the shocks of

climate change. Japan recently committed to Paris Agreement targets but has yet to announce any formal climate change stress testing for banks.

The Japan Financial Services Agency (JFSA), established an Expert Panel on Sustainable Finance in December 2020 to discuss environmental issues and a policy approach as well as the goal of achieving carbon-neutrality by 2050. The JFSA has not confirmed media reports that it is preparing for a pilot climate scenario analysis and stress testing covering the country’s top five banks. However, in October 2019, 2DII – an independent, non-profit organisation which works to align financial markets and regulations with the Paris Agreement goals – announced a partnership with JFSA to evaluate the impact of climate-related risks to Japan’s financial stability. We believe implementation has likely been delayed due to the coronavirus pandemic.

The second phase of Taiwan’s Green Finance Action Plan, launched in August 2020, added prudential regulation considerations around climate change for the first time. The Taiwan Financial Supervisory Commission says it is assessing whether to include scenario analysis and climate change stress tests for the financial sector, and integrate climate change risk into solvency assessments for the insurance sector. It also encourages FIs to conduct their own climate risk stress tests and consider capital allocations based on their findings. However, it has yet to be announced whether the upcoming stress test exercise in April and May 2021 include climate change risks.

In February 2021, the governor of Korea’s Financial Supervisory Service (FSS) discussed a climate change stress test model developed by the FSS and highlighted the importance of NGFS recommended disclosures as they can help supervisors to assess climate-related risks of financial systems. The FSS warned of climate-related risks to the country’s financial system and said the stress model considers Korea’s sustainability plans as the economy transitions to a low-carbon economy. Information about the timing of such stress testing is not public.

The Australian Prudential Regulation Authority (APRA) is designing a climate vulnerability assessment to explore potential financial exposure and macroeconomic risks to large banks, the financial system and the economy from both physical and transition-related climate risks. This should also assist APRA in understanding how large banks might adjust their business models in response to different climate scenarios. In 2021, APRA will also release climate risk guidance to ensure regulated entities take a strategic and risk-based approach to the management of climate-related financial risks.

We believe exposure to potentially stranded assets is a major environmental risk for Australian banks. The larger banks have articulated plans to exit coal financing over the next five to 10 years, suggesting they are aware of these risks. The impact of climate change on agriculture exposures is likely to come to the fore, particularly as it relates to exacerbation of climatic extremes such as drought and floods.

However, direct exposure to these industries is manageable. For example, agriculture, forestry, fishing and mining represent 3%

² Central bank speech, December 2020.

(with mining accounting for less than 1%) of exposure at default for the two largest banks that disclose this separately.

A third potential issue is the risk of under-insurance or no insurance in higher-risk areas. For example, in northern Australia, the risk of cyclone-related damage has forced increases in insurance premiums. To date, losses associated with climactic events at banks have been overwhelmingly borne by insurers despite the risk of underinsurance.

New Zealand, the first country to make TCFD climate change disclosure mandatory for companies, has not set a date for climate change stress testing for banks. However, we believe it is likely that such tests will be introduced because the Reserve Bank of New Zealand (RBNZ) says it is exploring options for incorporating climate risks within its stress-testing framework. The RBNZ's climate change policy also highlights the insurance sector, house prices and farming as specific areas of analysis regarding climate risk.

The Reserve Bank of India has not announced any climate change stress testing for banks. However, one goal in its 2020-2021 agenda is to assess the "unique risks posed by climate change" to systemic banks and consider if this has implications for its supervisory framework.

EMEA – Remains at the Global Forefront

Supervisors in the EU and UK remain at the forefront of climate change risk assessment. They are developing ambitious disclosures on environmentally sustainable activities, including a proposal for a green asset ratio to show the extent to which financing activities are associated with EU taxonomy and are therefore aligned with the Paris Agreement.

Few details of the ECB's planned inclusion of climate stress in its 2022 supervisory stress are available. Published objectives are very broad. However, given the EU's strong focus on sustainability, we expect the published guidelines will be comprehensive.

Country-specific initiatives continue in the Netherlands and Spain. In October 2020, Banco de España stated that it was already developing a supervisory climate-related stress test focused on credit-related transition risks, with physical risks to be incorporated at a later stage. The DNB is a pioneer of climate-related stress testing for banks and more stress testing is planned to assess the impact of climate change on the financial sector.

In Switzerland, the Swiss Financial Market Supervisory Authority (FINMA) is addressing the subject of climate-related financial risks as part of its supervisory remit. In June 2020, it said it was analysing the transition risks for Credit Suisse Group AG (A-/Stable) and UBS Group AG (A+/Stable), the country's two major banks, as part of a pilot project. We believe broader sector-wide testing may follow.

Canada - Ahead in North America

The Bank of Canada and the Office of the Superintendent of Financial Institutions have committed to conducting climate change stress tests on six Canadian banks and insurers. The tests aim to broaden understanding of exposure to climate change risks, improve the FIs' understanding of risk-management capabilities and assess their exposure to the risks of climate change and the transition to a low-carbon economy. We do not expect detailed

scenarios to be disclosed until end-2021, but believe they will be tailored to the country's resource-heavy economy.

We expect the tests will focus on banks' and insurance companies' exposure to the energy sector, which contributes 10% of Canada's GDP. Direct loan exposure to the oil and gas sector was less than 2.5% of gross loans among Canada's seven largest banks as of end-January 2021. This is not material but banks also have indirect oil and gas exposure – for instance, through mortgages in energy-reliant provinces such as Alberta – which also range up to approximately 3% of gross loans.

Within the near-term rating horizon, Fitch-rated insurers in Canada appear well-positioned to manage physical climate change risks, especially because large insurance companies use sophisticated models and mitigating strategies to minimize risks related to hurricanes and other extreme weather. Longer-term preparedness, which is important when considering the long-term nature of climate change and focus of regulatory stress testing, is still difficult to assess at present, and there remains considerable uncertainty around the pace of transition risks.

Canada's supervisors are moving more quickly than those in the US. However, under the new Biden administration, US policy on climate risk may more closely follow that of global regulatory leaders. Over time, we will likely see the development of climate-related "best practices" for FIs, the refinement of data-collection and reporting standards, and climate change risk scenarios in supervisory stress tests.

LatAm – Brazil Leads the Region

Among Latin American regulators, the Central Bank of Brazil (BCB) is the most advanced in its thinking on climate change risks and how these should be incorporated into bank supervision. Since 2017, large Brazilian banks must consider all environmental risks in their internal capital adequacy assessments and the BCB encourages banks to disclose climate change data in line with TCFD guidelines. Large Brazilian banks already report in line with these guidelines.

A review of sustainability reports produced by Brazil's largest banks – such as Banco Bradesco S.A. and Itau Unibanco S.A., both rated 'BB'/Negative – reveals a strong commitment to sustainability and details on how environmental risks are identified, measured and incorporated into risk-management policies. The 2019 integrated reports of the two banks provide an estimate of the value of financed emissions throughout the groups and details of advisory services and special lending programmes aimed at helping customers to reduce emissions and achieve other environmentally friendly goals.

In September 2020, the BCB included sustainability in its supervisory mandate, influenced by the impact of extreme weather on macroeconomic variables and growing awareness that climate change can affect financial stability. The introduction of climate change stress tests is an integral part of the supervisor's sustainability goals. According to media reports, the first tests are set for 2022.

The Banco de México says that "greening the financial system" is part of its regulatory function, but work on environmental understanding is still at an early stage. We expect formal climate change stress testing to be a long-term prospect. A February 2020

study commissioned by the Banco de México set out high-level recommendations for FIs, such as the incorporation of ESG risks and opportunities into risk assessment and management strategies, the reinforcement of internal policies, and the improvement of management competency. However, the study also recognised that analysis of climate-related physical and transition risks and opportunities remains at an early stage among Mexican FIs, as 64% of banks had yet to assess physical risks and 81% had yet to assess transition risks. In addition, 70% of banks were either unfamiliar or only just learning about TCFD recommendations.

Africa and Middle East – No Plans to Stress Test

No African authorities have announced any climate-related stress tests. The South African Reserve Bank (SARB) commented on the climate change risks to FIs in its November 2020 *Financial Stability Review*. The study highlights the risks of drought and cites historic examples of drought affecting the agricultural and tourism sectors. However, it also stated that South Africa's exposure to transition risks largely arises from external factors over which the country has little control. The country's reliance on coal power and mineral

exports exposes it to shifting international sentiment around sustainability.

The SARB also noted environmental risks faced by insurers. However, given that the country's relatively weak fiscal position could weaken its response to climate disasters, losses would most likely have to be borne by the private sector. Limited climate-related disclosure by FIs limits the SARB's ability to assess the sector's exposure to environmental risks. We believe climate change stress testing is unlikely until disclosure improves.

Regulators in the Middle East have yet to publish specific climate-related guidance, despite the region's high exposure and vulnerability to environmental risks, particularly given the region's scarcity of water and dependence on the hydrocarbon sector, which faces transition risks. In January 2020, the Dubai Financial Services Authority published a voluntary set of guiding sustainability principles aimed at encouraging FIs to incorporate ESG considerations into their governance, strategy, risk management and disclosure frameworks.

Appendix

Climate Change Stress Tests - Global FIs

Country	Authority	Date	Results expected	Name of stress/exercise	Objective	Voluntary/Mandatory	Entities covered	Capital impact	Scenarios	Value chain included	Physical/transition-al risks	Approach
Australia	APRA	Designed in 2020; to be executed in 2021	ND ^a	Climate change financial risk vulnerability assessment	To estimate the financial impact from climate change	Not specified. However, we believe it will be mandatory for the groups that APRA is targeting at each round (e.g. the largest banks as the initial candidates for the assessment)	Largest deposit-taking institutions	No	"Consistent with those used by international peers"	ND	Both	Top-down
Brazil	Banco Central do Brasil	Announced 8 Sept 2020	22 Apr 2021	ND	Climate stress to be included in all supervisory stress-testing exercises	ND	ND	ND	Not disclosed	ND	ND	ND
Canada	Bank of Canada, Office of the Superintendent of Financial Institutions	Announced 16 Nov 2020; detailed scenarios and information not expected until end-2021. The Bank of Canada is incorporating climate change risk in its analysis of the country's economy and financial system	ND	Climate vulnerability assessment	Build on FIs' climate change capabilities; increase understanding of exposure to climate change risks; improve understanding of risk-management capabilities; evaluate FIs' exposure to risks and the transition to a low-carbon economy	ND	Six banks and insurers	No	"Canadized" scenarios to take account of resource-heavy nature of domestic economy	ND	Both	ND
Eurozone	ECB/EBA	Announced Nov 2020; to be executed in 2022	ND	Climate stress to be included in supervisory stress tests	To assess the growing importance of climate change for the economy and its financial impact on banks	ND	Banks	ND	ND	ND	Both	ND
France	ACPR	Dec 2020	Apr 2021	Climate change stress test	To make French banking and insurance establishments aware of climate change risks	Voluntary	All banks and insurers	No	NGFS	Yes	Both	Bottom-up
Hong Kong	Hong Kong Monetary Authority	Banks contacted 4 Dec 2020; planned for 2021	ND	Climate risk stress test	To assess the climate resilience of the overall banking sector and to help participating banks build the capability to measure climate	Voluntary	Banking sector	No	NGFS; representative concentration pathways adopted by the intergovernmental panel on climate change	No; the assessment should focus on exposures directly affected by changes in climate patterns and transition pathways, such as assets vulnerable to climate hazards and exposures to clients in high-carbon-emission industries	Both	Both top-down and bottom-up

Climate Change Stress Tests - Global FIs (Cont.)

Country	Authority	Date	Results expected	Name of stress/ exercise	Objective	Voluntary/ Mandatory	Entities covered	Capital impact	Scenarios used	Value chain included	Physical or transition-al risks	Approach
Singapore	MAS	Guidelines published Dec 2020	By June 2022	Ongoing bank-by-bank stress test (no specific name). To be updated and disclosed at least annually	To help develop responsible financing policies for banks exposed to high-climate-risk sectors	"Guideline" but sets out the regulator's expectations of best practices that in-scope banks are supposed to implement. Much closer to mandatory than voluntary.	Locally incorporated banks only (including locally-incorporated subsidiaries of foreign banks). Includes all local and foreign operations of these entities.	No	NGFS	Yes (up to Scope 3 of TCFD if possible)	Both	Bottom-up
UK	BoE	Jun 2021	2022	Biennial exploratory scenario stress test	Fact-finding; sharing information; identifying data gaps	Mandatory	Large banks and insurers	No	NGFS	Yes	Both	Bottom-up

^a Not disclosed. Source: Fitch Ratings, bank supervisors



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