

Pilot Exercise on Climate Risk Stress Test

By Banking Supervision Department

In light of the growing threats to the financial sector prompted by climate change, the Hong Kong Monetary Authority (HKMA) has set in motion a range of initiatives to strengthen the banking sector's capabilities for managing climate-related risks. In 2021, the HKMA conducted a pilot exercise on a climate risk stress test (CRST) to assess the banking sector's resilience to climate risks. The results indicate that the banking sector remains resilient to climate-related shocks despite the potential significant adverse impacts on banks under the extreme scenarios assumed in the exercise. Indeed, the participating banks have already benefitted from the exercise by strengthening their capabilities for measuring and assessing climate risks. In view of the CRST results, these banks have developed plans to enhance their climate strategies and risk-governance frameworks. The HKMA will continue to engage with the industry to support their capability building and refine the CRST framework with the aim of developing a more comprehensive approach to assessing the banking sector's climate risks in future exercises. A full report of the pilot exercise can be downloaded from the HKMA's website.

Introduction

Financial institutions should take early action to manage climate-related risks. They should develop the capacity to measure their exposure to climate risks in order to assess their resilience to potential shocks brought about by climate change. Because scenario analysis and stress testing are widely recognised as effective tools for measuring climate risks, the HKMA launched a pilot CRST exercise in January 2021 to assess the potential impact of climate change on the Hong Kong banking sector. There were two main objectives:

- **Climate resilience assessment** – designed to assess the climate resilience of the banking sector as a whole under various climate change scenarios; and

- **Capability building** – where the HKMA expects banks to build their capabilities in climate risk management through participation in the exercise.

The pilot exercise was supported by the banking industry with 27 banks, including 20 major retail banks and seven branches of international banking groups participating. Together they represented 80% of the sector's total lending, forming a solid basis for the HKMA to gain useful insights into the climate risk profile of the sector.

Overview of the exercise

The CRST comprises three scenarios, a physical risk scenario depicting a worsening climate situation, and two transition risk scenarios representing different pathways (i.e. disorderly and orderly) to a low-

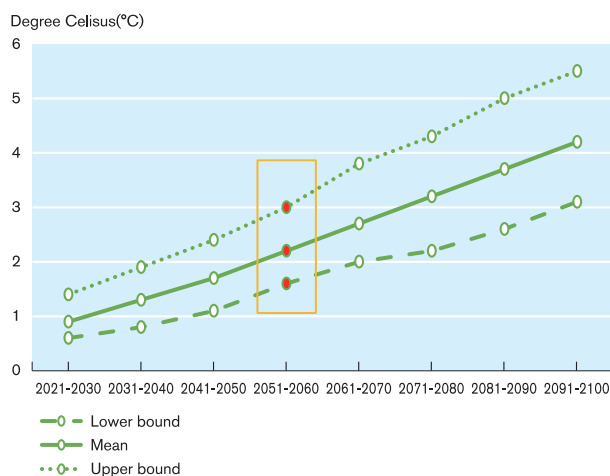
emission economy. Physical risk and transition risk are assessed separately under these scenarios, allowing for a better understanding of the impact of each of these risks on the banking sector. In all these scenarios it is assumed that the participating banks will not change their business strategies over the assessment horizon.

Physical risk

The physical risk scenario focuses on the projected climate situation of Hong Kong in the middle of the 21st century, with assumptions around potential increases in temperature and rises in sea level. This scenario is developed based on the climate projections of the Hong Kong Observatory in a situation of high greenhouse gas concentration (Charts 1 and 2).

CHART 1

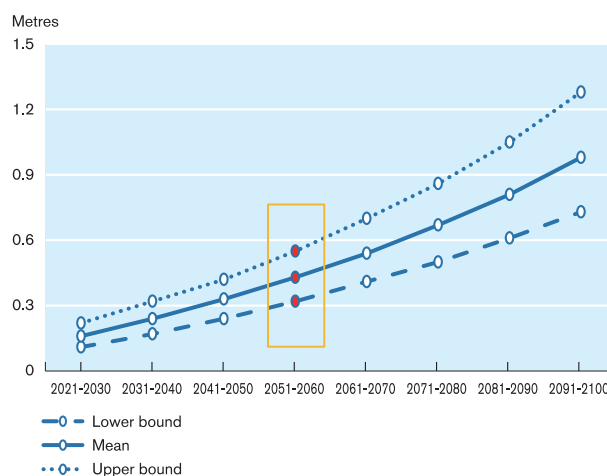
Projected changes in the annual temperature of Hong Kong relative to the average of 1986–2005 under high greenhouse gas concentration



Source: Hong Kong Observatory.

CHART 2

Projected changes in the mean sea level in Hong Kong and its adjacent waters relative to the average of 1986–2005 under high greenhouse gas concentration



Source: Hong Kong Observatory.

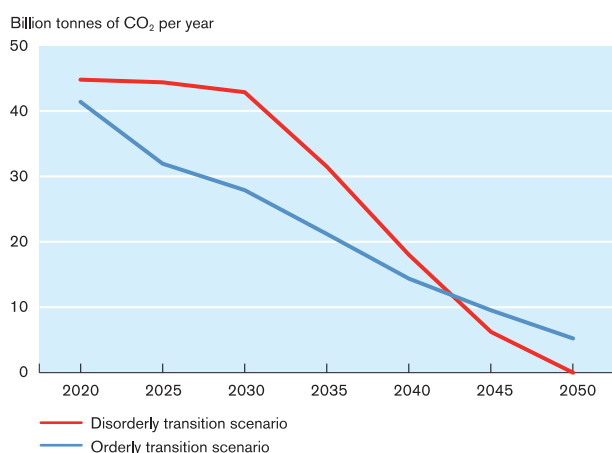
Under the scenario, physical risk will materialise in Hong Kong through two major types of climate hazards, typhoons and floods, causing property devaluation and disruption to businesses. Emphases of the assessment are therefore placed on the vulnerabilities of residential mortgages and other property-related lending in Hong Kong, and the potential operational losses associated with climate events.

Transition risk

The disorderly transition pathway assumes abrupt changes in climate policies of the authorities, while the orderly transition pathway assumes early and progressive action to achieve the climate goals of the Paris Agreement. Both transition risk scenarios are represented by the trajectories of the amount of global carbon dioxide (CO₂) emissions and the carbon price projected by the Network of Central Banks and Supervisors for Greening the Financial System (Charts 3 and 4).

CHART 3

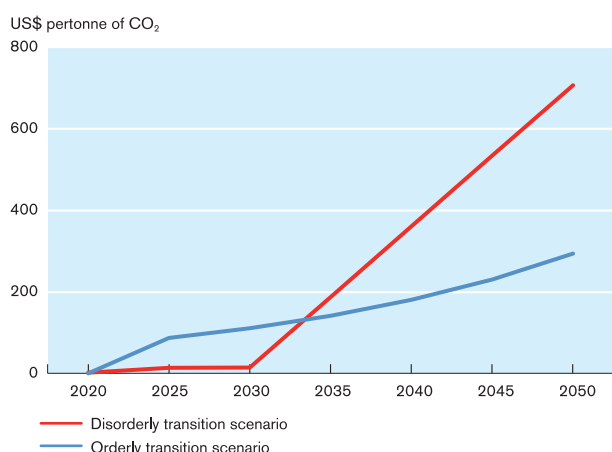
Carbon dioxide emission under different transition pathways



Source: Network of Central Banks and Supervisors for Greening the Financial System.

CHART 4

Carbon price under different transition pathways



Source: Network of Central Banks and Supervisors for Greening the Financial System.

All the participating banks are required to assess the five-year impact between 2031 and 2035 under the disorderly transition scenario, while the domestic systemically important authorized institutions have additionally conducted a 30-year assessment between 2021 and 2050 for the orderly transition scenario. Under both scenarios, the participating banks need to assess the potential transition impact on their exposures to seven industries, including the property development sector and six high-emitting industries, namely energy, utility, metals and mining, manufacturing, transportation and construction.

Assessment of the banking sector's climate resilience

The assessment results indicate that climate risks can give rise to a significant adverse impact on banks' profitability, capital positions and operations. However, despite the significant potential impacts of climate change, the Hong Kong banking sector remains resilient to climate-related shocks given the strong capital buffers built up by the banks over the years.

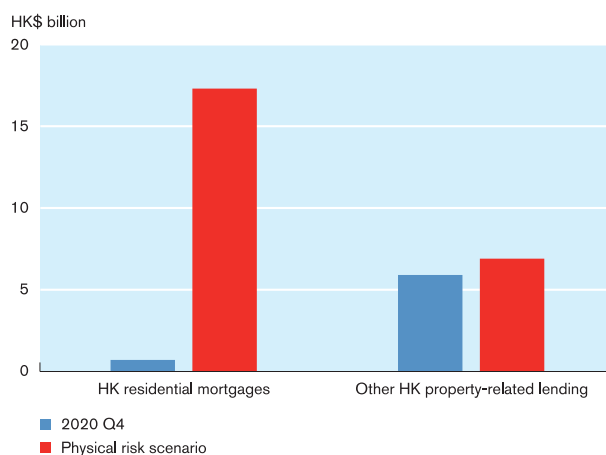
Physical risk assessment

In aggregate, the participating banks have evaluated the physical risk impact on Hong Kong property-related loans amounting to HK\$2.9 trillion, accounting for 28% of their total lending. Of these property-related loans, 55% are residential mortgages.

The expected credit losses of the banks' property-related lending in Hong Kong are projected to rise sharply under the physical risk scenario, with the one-year expected credit losses of their Hong Kong residential mortgages surging 25 times from HK\$0.7 billion to HK\$17.3 billion (Chart 5). This indicates a substantial increase in the risks faced by the banks in this area. The banks also anticipate a higher level of operational losses arising from damage to office premises and disruptions to business operations.

CHART 5

Expected credit losses of Hong Kong property-related lending



Source: HKMA.

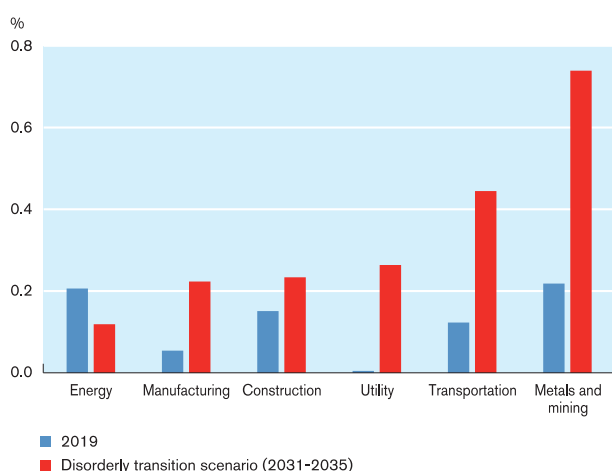
Transition risk assessment

The participating banks have assessed their exposures to the seven prescribed industries amounting to HK\$3.2 trillion, representing 31% of their total lending. About half of these exposures are to the six high-emitting industries.

Transition risk will manifest itself mainly in terms of increased credit exposures of the participating banks. The impact is particularly conspicuous under the disorderly transition scenario. The annualised credit cost of lending to the high-emitting industries under this scenario will rise by three times to reach 0.3%, compared to the level in 2019. Exposures to the metals and mining and transportation sectors are the most severely affected (Chart 6). Higher credit cost, together with a significant increase in credit risk-weighted assets of the assessed exposures, will lead to a notable deterioration in the banks' capital positions. Domestic systemically important authorized institutions' capital adequacy ratios, for example, will on average drop by three percentage points over the five-year horizon under the disorderly transition scenario. Even with an orderly transition, it is assessed that the annualised credit cost of lending to the high-emitting industries will rise steadily throughout the 30-year horizon (Chart 7).

CHART 6

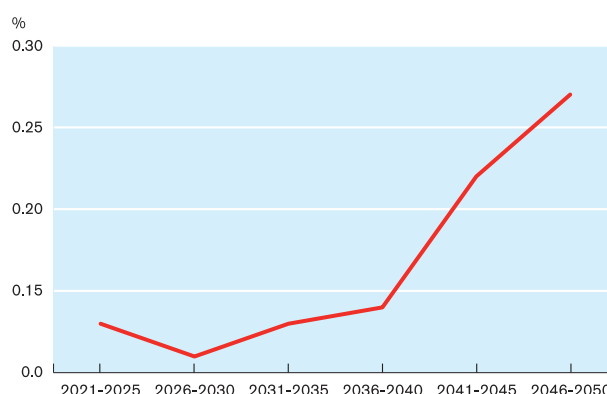
Annualised credit cost of lending to the high-emitting industries in 2019 and 2031–2035 under the disorderly transition scenario



Source: HKMA.

CHART 7

Annualised credit cost of lending to the high-emitting industries under the orderly transition scenario



Source: HKMA.

Limitations of the assessments

As this is a pilot stress testing exercise, the participating banks are provided with a flexibility to adopt some simplified assumptions in their analyses. For instance, most of the banks focus their assessment on exposures directly affected by climate-related shocks without taking sufficient account of the broader economic impact of the intensified climate hazards and the spillover effect on the non-high-emitting industries. The projected impact of climate change on the banks may not have been fully captured in the assessment due to these simplified assumptions.

Capability building of banks and challenges ahead

As a result of the pilot exercise all the participating banks have substantially strengthened their capabilities of measuring and assessing climate risks. Starting from data collection and risk identification, to risk assessment using newly developed methodologies and result reporting to senior management, the full cycle of the exercise has allowed the banks to raise firm-wide awareness of climate risks and strengthen their capabilities. Some of the banks benefitted more by making an extra effort to conduct more granular and in-depth analyses beyond the HKMA's requirements. A discussion forum organised by the HKMA also facilitated the banks' capability building by providing a knowledge-sharing platform for banks to learn

good practices from each other. Although the participating banks are at different stages in developing their climate risk management capabilities, the exercise has enabled them to deepen the understanding of their risk levels, the potential areas of vulnerabilities and the transmission channels of climate risks.

However, some major gaps identified in the exercise remain, especially those concerning data availability and assessment methodologies. In particular, the participating banks highlighted the inadequacy of granular and reliable data as the biggest challenge for modelling and assessing climate risks. This challenge is exacerbated by the lack of widely accepted standards for classifying and identifying climate risk exposures. The uncertain timing of the materialisation of climate risks and the lack of historical events have also made developing and validating models for assessing climate risks more difficult.

Actions to address climate risks

Although the resilience of the banking sector against climate-related shocks is well supported by the banks' strong capital buffers, the impacts brought about by climate change can be long-lasting and grow in severity over time due to irreversible changes in climate patterns. The more frequent and rapid shifts in climate policies in response to climate change can also pose additional transition risks to the banking sector. Therefore, in view of the vulnerabilities and gaps identified in the CRST, the participating banks have developed plans to adjust their business strategies and strengthen their risk governance frameworks to ensure their ongoing resilience to climate risks. These include strategic allocation of resources to climate resilient activities, such as green financing and providing transition finance to their customers' adjustment to a low-emission business model, and the incorporation of a broader range of climate risk factors into their risk management frameworks. They have also undertaken to keep abreast of market developments and make continuous efforts to strengthen their capabilities in managing climate risks.

Way forward

In view of the potential challenges facing banks in closing the gaps identified in the pilot exercise, the HKMA will continue to engage the industry to support banks' capability building and explore possible solutions to tackle these challenges. This will focus on areas requiring the concerted effort of banks to improve the climate resilience of the industry as a whole. The HKMA will also enhance the CRST framework by refining the scenario specifications and reporting requirements with the aim of developing a more comprehensive framework for future exercises. The current intention is to undertake another CRST in two years.