

CIBAFI BRIEFING

Climate Risk Stress Testing and its Implications for Islamic Banks

CIBAFI is pleased to present its sixteenth "Briefing" on "Climate Risk Stress Testing and its Implications for Islamic Banks". This Briefing highlights the use of stress testing as a risk management and impact assessment tool for climate related risks. It presents an overview of climate risk stress testing, highlighting its specificities, key challenges, and current and planned related regulatory and supervisory exercises. The briefing also looks at the key implications of climate risk stress testing for Islamic banks and presents key recommendations for its effective use and implementation.

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1. Introduction

The urgency of climate change has been accelerating in the past years, with wide effects on societies and economies alike. For example, in 2021, weather and climate disasters were estimated to have led to losses of USD 145 billion¹ in the United States alone and around USD 350 billion² worldwide. In response, global action is accelerating, and global leaders are coming together more frequently to discuss this urgency and renew their commitment to the agenda, with a pledge of strengthened measures recently announced at the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow in 2021.

The financial sector is prone to impacts from climate change through two key drivers: physical risks resulting from rising extreme weather events and changes in climate patterns, and transition risks resulting from changes in technology, policies, and consumer behaviour during the transition to a low-carbon economy. Liability risks³ also constitute an additional source of impact. These risks can have important consequences on financial institutions through increases in uncertainty, changes in asset prices, and the exacerbation of credit, liquidity, and operational risks, posing potential vulnerabilities to financial stability⁴.

Given that, financial institutions and regulatory and supervisory authorities (RSAs) are becoming increasingly cognisant of the rising importance of climate risks for the financial sector and its stability, placing increased emphasis on the identification, monitoring, and management of these risks. Various tools are thus being used; in particular, scenario analysis and stress testing have emerged as essential instruments for climate risk management and impact assessment.

Both existing approaches to stress testing and the impacts of climate risks differ substantially between different types of financial institutions. The insurance sector, for example, has its own substantial literature in both these areas. This briefing, therefore, focuses on banking, though it may offer a helpful background to Islamic financial institutions (IFIs) in other sectors.

2. Stress Testing: Definition and Emergence

Stress testing is a method used for assessing and quantifying the vulnerability of a financial system, institution, or portfolio to specific defined risks under stress events. These events represent adverse historical or hypothetical plausible scenarios comprising of changes in market variables, such as a sharp fall in equity prices or an increase in interest rates. Stress testing usually serves two key objectives: 1) to inform financial institutions' capital adequacy assessment and complement internal risk management processes, and 2) to guide micro or macroprudential policies for financial stability purposes.

The use of stress testing gained vast attraction and adoption at the onset of the Global Financial Crisis (GFC), during which RSAs used the instrument to assess banks' recapitalisation needs and inform policy decisions. Beforehand, stress tests

were primarily used at a microprudential level to assess risks in individual banks, whether at the bank's own instigation or at that of supervisors. System-wide stress tests were not common until the introduction of the Financial Sector Assessment Program in 1999. However, these had limited influence on policies until their further development after the GFC. Today, stress testing forms an integral part of various supervisory assessment programmes. It is widely adopted as a key regulatory requirement and an internal risk management tool for banks and financial institutions⁵. Figure 1 outlines some of the early system-wide exercises.

Figure 1. Early System-Wide Stress Test Exercises



Source: (CIBAFI, 2022 derived from BoE, 2016)

There exists no uniformity in stress test exercises, varying widely across jurisdictions. In general, stress tests vary according to the test objective, the scope and types of risks covered (such as credit risk, market risk, liquidity risk, ...), the time horizon, the type and number of scenarios used, and the approach employed. Most RSAs issue regulations and guidelines to guide financial institutions' stress testing exercises. Global guidelines, such as the Basel Committee on Banking Supervision (BCBS) Principles for Stress Testing and the Islamic Financial Services Board (IFSB) Guiding Principles and Technical Note on Stress Testing, also inform banks and financial authorities' practices.

3. Adaptation of Stress Testing to Climate-related Risks

Several distinct features characterise climate risks compared to other traditional risks. They 1) evolve at a very fast pace, 2) are highly uncertain, 3) materialise over a long period of time, and 4) possess limited historical data due to the changing climate conditions or the novel nature of the risks. Hence, techniques relying on past data for risk quantification become unsuitable for assessing these risks. The Financial Stability Board's (FSB) Task Force on Climate-related Financial Disclosures (TCFD) and the Network for Greening the Financial System (NGFS)

1. (National Centers for Environmental Information, 2022)

2. (Swiss Re Sigma, 2022). Strictly, this figure includes other natural catastrophes such as earthquakes, but these were a small part of the total.

3. Liability risks result from compensation claims and legal action filed by counterparties against institutions for losses they have incurred from physical or transition risks. These may include actions based on institutions' inadequate action relating to climate risks, for example, an institution not disclosing its exposures to climate risks to investors.

4. See CIBAFI Briefing Issue 13 "Climate Change and its Implications for the Financial Industry".

5. The Basel Framework emphasises on bank-level stress testing as an integral part of capital adequacy assessments within internal model approaches as well as in the assessment of minimum liquidity requirements (BCBS, 2022).

have both recommended the development and use of scenario analysis and stress testing for the assessment of exposures and vulnerabilities to climate-related risks. The forward-looking nature of these tests helps identify the potential impacts of climate-related risks under different plausible scenarios, allowing the quantification and assessment of exposures.

The use of stress testing to assess climate-related risks largely follows the same approach used in traditional exercises. However, several adaptations are needed to factor in the unique characteristics of climate-related risks.

The Bank for International Settlements (BIS) identifies four key areas where climate-risk related stress testing may differ from traditional banking and supervisory stress testing exercises.

i. Scenarios

Scenarios designed for climate risk stress tests involve more complexities as they need to consider both physical and transition risks and their various transmission channels. Interactions between both risks, such as when the occurrence of an extreme weather event prompts a change in policies, and amplifying factors should also be considered. Due to the high uncertainty associated with these risks, a higher number of scenarios would be needed to reflect the different possible outcomes that could occur.

ii. Time Horizon

Climate risk stress tests require longer time horizons than the usual three to five years since climate risks materialise over more extended periods, possibly spanning over 30 to 50 years.

iii. Modelling

The transmission of climate-related risks is much more complex than in traditional exercises, requiring more sophisticated modelling. Therefore, stress tests should consider the projection of climate risk variables' pathways, their impact on macroeconomic market variables, and the effect on traditional risks and potential financial losses.

iv. Data requirement

Climate risk stress tests require the use of a high level of granularity of data. This includes sectoral-classification of exposures and firm-specific data on individual counterparts as the impacts of these risks can vary widely based on the sectors, geographical location, and jurisdiction of exposures.

To date, climate risk stress testing has largely been conducted by RSAs, while its use by banks of their own volition remains at an early stage with only a few pilot studies being experimented.

4. Climate Risk Stress Testing as part of the Regulatory Toolbox

Recognizing the significance of climate change impact on banks and the financial sector, global authorities have been

increasingly issuing guidance to advance the understanding of climate-related financial risks and assist in their identification, assessment, and management. Some of the recent initiatives include the following:

- The NGFS, the BCBS, and the FSB recently issued reports on climate-related financial risks and related practices⁶.
- The NGFS issued climate scenarios in 2020, updated in 2021, to assist RSAs in assessing climate-related financial risks. The NGFS also issued guidance and recommendations to RSAs on various related topics⁷.
- In November 2021, the BCBS issued a consultative document on Principles for the Effective Management and Supervision of Climate-related Financial Risks, highlighting the use of scenario analysis and stress testing by banks where appropriate to assess climate risks' impacts.
- In March 2022, the new International Sustainability Standards Board (ISSB) issued two standard exposure drafts on sustainability- and climate-related disclosures, expecting entities to use climate-related scenario analysis or alternative methods to derive information on their climate resilience. Industry-based climate-related disclosures based on the Sustainability Accounting Standards Board (SASB) standards supplement the standards' requirements.

In line with the above, RSAs have recently undertaken various initiatives to better understand and monitor climate-related financial risks. These include conducting surveys to devise supervisory expectations; raising awareness through research and communication; setting regulatory disclosure requirements and publishing technical guidance for standardisation; and employing risk quantification measures. Some examples include the French Prudential Supervision and Resolution Authority (ACPR) surveys in 2016 and 2018 on climate risk exposures; the Hong Kong Monetary Authority (HKMA) stocktake exercise in 2019 on local developments in sustainable banking; the European Central Bank (ECB) Guide on Climate-related and Environmental Risks published in 2020, among many others.

Scenario analysis and stress testing have been particularly emerging as prominent tools used by RSAs to better understand and quantify climate-related financial risks. In this vein, several exercises have been conducted. These include exercises in the Netherlands, France, Canada, Hong Kong, United Kingdom, European Union (EU), and China, among others. Some RSAs have been conducting these tests under thematic exercises within their usual assessments. Examples are the EU thematic stress tests and the Bank of England (BoE) biennial exploratory scenario. Others are planning to roll out their exercises in this or the coming years, including Singapore, Japan, Morocco, and New Zealand.

As with traditional stress testing exercises, climate stress tests vary widely across jurisdictions, with RSAs employing different methodologies for their exercises. Table 1 below compares some selected exercises.

6. This includes the Guide for Supervisors Integrating climate-related and environmental risks into prudential supervision (NGFS, 2020); A progress report on global supervisory and central bank climate scenario exercises (NGFS, 2021); Climate-related financial risks – measurement methodologies (BCBS 2021); Climate-related risk drivers and their transmission channels (BCBS, 2021); and Supervisory and Regulatory Approaches to Climate-related Risks – Interim Report (FSB, 2022).

7. This includes the Guide for Supervisors Integrating climate-related and environmental risks into prudential supervision (2020); Guide to climate scenario analysis for central banks and supervisors (2020); and Guide on climate-related disclosure for central banks (2021).

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Table 1. Comparison of Selected Climate Risk Stress Test Exercises

	ACPR/BDF ⁸	BoC ⁹	HKMA	BoE	ECB ¹⁰
Period of Exercise	July 2020 to April 2021	November 2020 to January 2022	January 2021 to December 2021	June 2021 to May 2022	January 2022 to July 2022
Sample	9 banking groups and 15 insurance groups	2 banking groups and 4 insurance companies	27 banks: 20 major retail banks and 7 branches of international banking groups	7 banking groups and 12 insurance companies	41 banks
Risk coverage	Physical and transition risks	Transition risks	Physical and transition risks	Physical, transition, and litigation risks ¹¹	Physical and transition risks
Time horizon	30 years	30 years	5 – 30 years	30 years	1, 3, and 30 years
Number of scenarios	4 scenarios	4 scenarios	3 scenarios	3 scenarios	6 scenarios
Risk variables	Transition: Energy technologies and climate policies Physical: Increase in temperature of 1.4°C – 2.6°C	Transition: Energy technologies and climate policies	Transition: Climate policies Physical: Local temperature and sea level pathways	Transition: Energy technologies, climate policies, and consumer preferences Physical: Global and regional temperature pathways	Transition: Climate policies Physical: Heat and droughts, and floods
Approach¹²	Bottom-up	Top-down and bottom-up	Bottom-up	Bottom-up	Bottom-up
Granularity of Analysis	Sectoral level	Macroeconomic, sectoral, and counterparty level	Sectoral and counterparty level	Macroeconomic, sectoral, and counterparty level	Sectoral level

Sources: (CIBAFI, 2022 derived from ACPR and BDF, 2021; HKMA, 2021; BoE, 2021; BIS, 2021; NGFS, 2021; BOC and OSFI, 2022; ECB, 2022)

Most RSAs employ NGFS scenarios within their exercises, calibrating them to their specificities. Some consider only physical or transition risks while a growing number consider both, although not many include second-round effects¹³. In addition to banks, insurance companies have also been increasingly involved in these exercises given their importance in covering/non-covering certain financial losses. Exercises have employed a mix of top-down and bottom-up approaches, targeting micro and macroprudential purposes.

Climate stress tests have been conducted so far as an exploratory and preliminary exercise for educating both supervisors and supervised institutions on climate-related risks, with no direct consequences on capital requirements.

Among the objectives targeted are 1) assessing and quantifying the exposures of banks and the financial system to climate-related risks; 2) encouraging and guiding banks in managing these risks and rebalancing their exposures; and 3) raising awareness and building capabilities at banks and RSAs around the measurement and management of these risks. In general, results have helped to shape the understanding of supervisors and institutions on climate risks and their impacts. The

exercises have also highlighted various challenges associated with climate-related financial risks assessment.

5. Key Challenges in Climate Risk Stress Testing

While stress testing could provide a valuable tool for assessing the potential impacts of climate-related risks, several challenges exist for both banks and RSAs in its use, possibly undermining its efficiency.

5.1. Methodological Complexities

The distinct nature of climate-related risks raises various challenges when developing methodologies and modelling techniques that integrate their unique characteristics. In particular, complexities arise in incorporating physical and transition risks in scenario designs and accounting for feedback effects; accounting for the sectoral and geographical heterogeneity in climate impacts within models; and adapting existing models and maintaining consistency in results. Significant challenges also arise in considering the evolution of bank portfolios and exposures under time horizons that go beyond existing maturities. While some stress tests have assumed static balance sheet structures, such assumptions may well be unrealistic. Dynamic assumptions, in which balance sheet structures change in response to the risks and impacts of climate change, allow for more realistic outcomes by integrating

8. Bank of France

9. Bank of Canada

10. This follows the ECB's economy-wide climate change stress test conducted in 2021.

11. Litigation risks were considered for the general insurance sector only.

12. A bottom-up supervisory stress test involves the aggregation of results from individual exercises conducted by banks to inform supervisory needs, these tests being conducted through (or not) a common framework. On the other hand, a top-down exercise is conducted by supervisors using their own frameworks using data collected from banks.

13. Second-round effects consider the transmission of initial impacts of climate risks to the financial system and the real economy and the adaptive and mitigating responses resulting from therein, such as a decrease in insurance coverage. A non-consideration of these effects could underestimate or overestimate the financial losses resulting from climate-related risks.

banks' strategic decisions over the test period; however, this introduces increased modelling uncertainties and complexities.

5.2. Data Availability and Quality

A significant challenge relates to the availability of granular and reliable data on which these tests could rely. Large gaps exist today in available data on risk exposures, including at sectoral and geographical levels. There is also a lack of reliable data related to future pathways of physical and transition risks. In addition, RSAs face challenges in obtaining consistent and comparable data from banks due to the different frameworks used for disclosures. Some of these challenges are being partly lessened through third-party data depositories¹⁴, information collection exercises, and regulatory reporting requirements.

5.3. Capabilities and Resources Needs

The novelty of climate risk stress testing and its various complexities impose important capability needs for both banks and RSAs. This includes deploying resources across the entity or from external parties to conduct the tests; equipping staff with the required skills and knowledge; developing or acquiring analytical tools that factor in the specificities of climate risks; and close engagement and cooperation between banks and RSAs.

6. Key Implications for Islamic Banks

With the alignment of their underlying principles with the sustainability agenda, Islamic banks and financial institutions can play a crucial role in facilitating the transition to a low-carbon economy. This can be performed through channelling funds to green and sustainable projects and providing resilience to vulnerable groups against climate risks. However, their location and portfolio concentrations can also be prone to critical climate-related risks, including physical and transition risks.

RSAs in jurisdictions where IFIs mainly operate are becoming increasingly aware of the importance of climate-related risks, with several planning for or in the process of implementing related regulatory requirements.

The Central Bank of UAE (CBUAE) issued in January 2020 Guiding Principles on Sustainable Finance, encouraging banks to integrate these within their risk management frameworks. The CBUAE also initiated a survey to raise institutions' awareness on climate risks and is planning to develop related stress tests in the coming period. Similarly, the Central Bank of Bahrain (CBB) circulated a questionnaire in January 2021 to assess regulated institutions' practices related to these risks. In response, the CBB asked institutions to raise awareness of climate-related risks within their institutions and consider means for risks identification and management, with later requirements to be implemented for qualitative and quantitative data disclosures.

Other measures include those of Bank Negara Malaysia (BNM), which issued a climate change and principle-based taxonomy to assist regulated financial institutions in assessing the climate impact of economic activities. Recently, BNM also issued an exposure draft on requirements and guidance on climate risk management and scenario analysis that has come into effect in June 2022, with climate risk scenario analyses to be required from institutions, including IFIs, from 2025.

Increased cognisance of the importance of these risks and their effects is gradually being seen in Islamic banks. In a recent CIBAFI survey conducted in 2022, respondents, comprising of 94 Islamic banks from 35 countries, ranked climate change risks as the 17th most pressing risk facing their business in the next 1-3 years, from a list of 22 risks; although this is still low, it compares to a rank of 20 in a previous year. In line with this, most respondents also expressed committing to achieving net-zero emissions and managing their exposures. Despite this, however, Islamic banks remain exposed in many jurisdictions to high climate-related risks, especially in the GCC with high portfolio concentrations in the hydrocarbon sector and in jurisdictions like Indonesia and Malaysia where physical risks are high.

Islamic banks may face important challenges in managing these risks, particularly when conducting climate risk stress test exercises and scenario analyses. This includes the lack of data availability and granularity on exposures, especially with most Islamic banks operating in developing countries, which could inhibit the effective assessment of these risks and the implementation of related stress test exercises. Additionally, with most being relatively small and given the complexities of these exercises, few Islamic banks may possess the technical ability and resources to develop their own methodologies for evaluating climate-related risks and their related impacts. Islamic banks also need to consider unique impacts relating to their operations when managing and assessing these risks, such as their vulnerability to the transmission of climate-related risks from the takaful sector or the impact on Shariah compliance, which could add to the complexities involved.

CIBAFI recently published its Sustainability Guide for IFIs to assist Islamic banks in integrating sustainability and environmental, social, and governance aspects in their business activities and operations. In the guide, Principle 3 covers Environmental and Social Sustainability Risk Management aiming to guide banks in managing risks related to environmental issues including, but not only, climate change. The guide helps provide a starting point for Islamic banks in identifying and assessing their exposures to climate risks and building capabilities that can assist in meeting emerging regulatory requirements. In particular, it can help facilitate data gathering by Islamic banks on climate and environmental risks that can assist in filling gaps for conducting climate risk stress test exercises.

7. Conclusion and Recommendations

Climate change has been accelerating at an unprecedented pace over the past years, causing significant global social and economic impacts. As a result, financial institutions and RSAs have become increasingly cognisant of the associated financial risks, emphasising their identification, measurement, and management. In this vein, climate risk stress testing and scenario analysis are emerging as valuable tools for quantifying the potential impacts of climate-related risks on financial institutions/the financial system. To date, most climate risk stress tests have been undertaken by RSAs as preliminary learning exercises; however, supervisory expectations and global authorities' guidance are expecting banks and financial institutions to develop and run their own climate risk stress tests in the coming years. This could raise important challenges for IFIs in terms of data availability and required resources that allow them to conduct these tests.

14. These include open data repositories providing raw climate information, such as the European Space Agency Climate Change Initiative, and platforms (open or commercial) providing aggregated past and (or) projected climate risk drivers data for specific industries, assets, or locations, such as the S&P Trucost Physical Risk dataset and the OS-Climate initiative.

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It is therefore recommended that Islamic banks should:

- Build clear strategies to identify, measure, and manage exposures to climate-related risks.
- Identify existing data gaps on climate-related exposures and work on collecting the missing data through engaging with counterparties and leveraging third-party repositories.
- Conduct pilot stress test exercises, through internal or external expertise, to assess areas of deficiencies and improvement.
- Conduct training to develop internal capacities and raise awareness among staff on environmental and climate-related risks.
- Closely follow up and communicate with RSAs to inform them on areas of required guidance.
- Collaborate with other key stakeholders, including other banks, financial institutions, national and international bodies, and non-governmental organizations, among others, to build internal capacities and leverage global experiences and expertise.
- Leverage the CIBAFI Sustainability Guide to guide efforts in the identification, assessment, and management of exposures to climate and environmental risks.

It is also recommended that RSAs should:

- Establish a common understanding of climate-related risks through the development of climate taxonomies, leveraging common definitions proposed by global standards to help in assessing and managing related exposures.
- Identify data needs for the assessment and monitoring of climate-related risks and set guidance, recommendations, and disclosure requirements in line with global standards for the collection and building of comparable and reliable data.
- Conduct exploratory climate risk stress tests, in line with the recommendations of global bodies, to assess the understanding of the industry on these risks, evaluate their potential impacts on micro- and macro-levels, and build capabilities at banks and financial institutions.
- Provide detailed guidance to banks and financial institutions on frameworks and methodologies that can be used in climate risk stress tests.
- Build internal capabilities through capacity building programs.
- Engage in a cross-border dialogue with other RSAs for experience-sharing and leveraging global best practices.

About CIBAFI

CIBAFI is an international non-profit organisation founded in 2001 by the Islamic Development Bank (IDB) and a number of leading Islamic financial institutions. CIBAFI is affiliated with the Organisation of Islamic Cooperation (OIC). With over 130 members from more than 30 jurisdictions from all around the world, CIBAFI is recognised as a key piece in the international architecture of Islamic finance. Its mission is to support the Islamic financial services industry's growth by providing specific activities and initiatives that leverage current opportunities while preserving the value proposition of Islamic finance. CIBAFI is guided by its Strategic Objectives, which are 1) Advocacy of Islamic Finance Values and Related Policies & Regulations; 2) Sustainability and Innovation Integration; 3) Industry Research and Analysis; and 4) Professional Development.

Contact Information:

General Council for Islamic Banks and Financial Institutions (CIBAFI)
Jeera 3 Tower, Office 51, Building No. 657, Road No. 2811, Block No. 428
Manama, Kingdom of Bahrain. P.O. Box No. 24456

Email: cibafi@cibafi.org
Telephone No.: +973 1735 7300
Fax No.: +973 1732 4902
www.cibafi.org

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References

For more information about the references, please access the following link:

[References of CIBAFI's 16th Briefing](#)