

# Financial Risk & Regulation

## Climate risk stress tests

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In recent years, understanding and reducing the complex risks arising from climate change has become a priority for the supervisory authorities of the financial sector. To avoid the climate catastrophe, rapidly tightening climate policies and the already emerging direct effects of climate change can significantly impact the risk exposure of financial institutions. The scenarios developed by the NGFS (Network for Greening the Financial Systems) created by central banks and supervisory authorities help in the assessment of climate risks. In the past year, the FED, ECB, BoE, and MNB published the results of the climate stress test. The pressure towards the financial market participants to collect necessary data and to develop stress test processes are increasing. The direct capital requirement expectations are usually not related to stress tests. The results of the stress test carried out by the ECB in H1 2022 may already qualitatively influence the capital requirement expectations for the financial institutions participating in the stress test through the SREP.

### Definition and significance of the climate stress test

The aim of stress tests related to climate change is to present desirable and undesirable scenarios of possible warming potentials. According to the current state of our knowledge, the current amount of CO<sub>2</sub> in the atmosphere arising from the past emission have already become irreversible and lead to centuries-long effects. As per the Sixth Assessment Report of the IPCC, immediate action is needed to keep global warming below the critical 2° Celsius for reducing risks to human well-being and to ecological systems.

The typical scenarios include scenarios consistent with the Paris climate targets like favorable scenarios. There is an *organized version* of these scenarios when the policy-making process occurs in time and therefore implemented effectively.

By contrast, the *unorganized version*, namely the *postponed transition scenario* implies that the climate goals are achieved however due to late implementation the transition risks are higher compared to an organized transition. Another common scenario is the more realistic scenario, which includes the contributions defined for each country, that underlines a carbon dioxide reduction target that nations undertake under the framework of the Paris climate agreement. However, these current commitments do not prevent us from keeping warming below 2 degrees Celsius. An even more unfavorable scenario is a failed transition, which could include a warming potential of up to 3-4-5 degrees by the end of the century.

To achieve the Paris climate goals, significant political decisions shall be made in the next years. This entails a series of new risks related to climate change, collectively known as transition risks. If the

Paris climate goals are not achieved, the physical risks associated with global warming will determine the effects related to environmental change.

The scenario analysis can be a supervisory stress test that uses aggregated (macro-level or sectoral shock-based) variables as an input and output, called as a top-down approach. The same aggregated shocks can be used for bank-level stress tests. The aggregated shocks can be incorporated into traditional risk models, but financial institutions also use it for performing bottom-up stress tests. The analysis of climate shocks carried out on a transaction-level data. Under the former scenario the expansion of the current model can be considered, while the latter provide a solution as a development of new metrics and methodologies.

## Climate risk scenarios – NGFS

The key drivers of climate change scenarios are linked to transition risks and physical risks. Among the transition risks, we consider the appearance, spread and state aid of new technologies with low carbon emissions, rising carbon prices, the removal/increase in prices of fossil resources, the speed of removing carbon dioxide from the air, the increase in energy investments, the decarbonization of sectors, changes in consumer preferences, legal and reputational risks. Among the physical risks such as the rising average temperature, floods, droughts, heat waves, tornadoes and other direct effects related to extreme weather conditions, e.g. we can list the changed labor productivity.

The NGFS, created from the cooperation of central banks and supervisory authorities, plays a prominent role in determining climate risk scenarios. The organization planned and [analyzed](#) six major climate scenario narratives. In each scenario, the removal of carbon dioxide from the air is at a moderate level, the scenarios are determined by the dynamics of greenhouse gas emissions:

- In the **Net Zero 2050** scenario, it is possible to reach a trajectory not exceeding 1.5 degrees of warming, so that the global emission of CO<sub>2</sub> into the atmosphere and their natural/artificial removal from the atmosphere are balanced by 2050. In the case of some countries, the net zero level of all GHG emissions will be achieved by 2050. The transition is immediate and smooth, the technological change is fast.
- The **Below 2 Celsius** scenario also belongs to the orderly transition scenarios. The transition is immediate and smooth, also the technological change is moderate.
- In the **Divergent Net Zero** scenario, we reach global net zero emissions by 2050, but at a higher price than in the case of an orderly transition, because the synergy of policies started later than in the case of an orderly transition. The transition is immediate, but not smooth, the technological change is fast.
- The **Delayed transition** scenario assumes that annual CO<sub>2</sub> emissions will not decrease until 2030. Much stricter measures must be taken to achieve keeping the global warming below 2 degrees Celsius. The transition is delayed, and the technological change is slower.
- The **Nationally Determined Contributions** (NDCs) contain the contributions undertaken by each country, which, based on the current situation, do not limit warming below 2 degrees Celsius. The transition takes place only according to the level defined in the NDCs, the technological change is slow.
- In the **Current policies** scenario, there are no assumptions other than the current ones regarding policies adopted to mitigate climate change. In this scenario, the warming trajectory is highest, so physical risks dominate the impacts. The transition does not take place, the technological change is slow.

Macro-financial expectations belonged to scenarios, such as GDP, inflation, unemployment, and long-term interest rates, can help incorporate climate impacts into financial risk management models.

## Supervisory stress tests – MNB, ECB, BoE, FED

For the time being, more detailed climate stress tests typically appear in the stress test processes of regulatory authorities, which identify risks and their effects at the system level, and their methodology can be a starting point for the development of bank-level stress tests. For example, MNB identified the most affected sectors, ECB revealed the regions most exposed to physical risks, and the FED built a new methodology for identifying climate risks.

Following the NGFS scenarios, [MNB](#) examined 3 scenarios - in addition to the baseline scenario, the orderly and disorderly transition, and the failed transition. The effects of climate change were first translated into aggregated economic shocks, then coefficients related to sectoral NPL rates were measured, and finally, the excess NPL stocks estimated in the scenarios were quantified. The effects of physical and transition risks show different dynamics at the sector level, there will be clear losers and clear winners of the transition, which may also change depending on the scenario.

The [EKB](#) Climate risk stress tests are already part of its annual supervisory stress tests for 2022, which are still ongoing, and divided into three modules: a qualitative questionnaire to assess the level of risk-taking and the development of risk management procedures, a data requester for climate risk metrics (e.g. sectoral classification of exposures, financing of GHG impacts) as well as a data requester to determine the initial risk values of the climate risk stress test, and in the case of some financial institutions, the execution of the stress test itself.

During the process, the initial risk indicators broken down by country and portfolio must be defined as standard credit risk indicators: e.g. Stage 1-3 exposures and reserves, LTV values, LGD, recovery rates, etc. The ECB prepares forecasts for a wide range of macroeconomic variables, broken down according to NFGS scenarios, for EU member states and major global economic companies, which can serve as inputs in banking models. In these, a sectoral breakdown is also shown for some variables, facilitating the inclusion of climate risk during credit risk modeling. In addition to the macroeconomic and sectoral approach, the EKB considers it good practice for the corporate sector to prepare a customer-level credit risk impact analysis for climate risks. In the case of long-term transition risks, ECB enables a dynamic view of the climate exposures on the balance sheets of financial institutions: in the case of a credible green strategy, the green transition of carbon-intensive exposures can be assumed to decrease. The Pillar 2 capital requirements are not directly affected by the results of the stress test, but it is qualitatively integrated into the SREP process, so it may still affect the capital requirement expectation determined during the SREP. The ECB is expected to publish the results of the stress test in July 2022. A new direction is that ECB increasingly expects the at least partial application and combination of the bottom-up methodology with the top-down methodology.

In addition to its traditional capital adequacy stress tests, the [Bank of England](#) conducts exploratory stress tests. The Climate Biennial Exploratory Scenario (CBES) stress tests examining the effects of climate change are based on the 3 NGFS scenarios and are determined over a 30-year time frame (Early-action, Late-action, No-action). The purpose of the exercise is to increase the understanding of financial institutions and the central bank regarding the exposure to climate risks, the vulnerability of business models, and risk management solutions. The result of the stress test does not affect the capital requirements of financial institutions, but with the involvement of the largest credit institutions and insurance companies (around 60-70% market coverage) and specific feedback from the institution, it can still have a significant impact on the risk management practices of financial institutions. The results of the BoE's 2022 stress test were published on May 24, in which the British central bank drew attention to the danger to the profitability of the examined banks and the growth of broader macroeconomic risks in the event of failure to manage climate risks.

The [FED](#) used its own approach during scenario planning. They identified a 50 percent drop in fossil energy market indices as climate stress. They developed the CRISK risk measure - to which banks are sensitive in different ways depending on their fossil industry exposure, capital strength, and size - shows how much additional capital the bank would need in the event of a climate shock.

## MNB expectations

In its [Green Guidelines](#), the MNB explained what it expects from banks regarding the climate stress test. Regarding the scenarios, you expect them to be consistent with internationally published scenarios, such as those of the Intergovernmental Panel on Climate Change (IPCC) or the International Energy Agency (IEA). New risks arising in connection with climate change, such as transition and physical risks, must be considered in the scenarios.

Banks need to study over a longer time and calculate the effects of the baseline and extreme scenarios on the capital requirement. The effects of climate change are significant in the medium and long term, which is why it is vital to expand the forecast time horizon to accurately assess the effects. After assessing the results of the climate stress tests, banks need to effectively communicate the results to all relevant departments, especially the management, and start risk reduction measures.

## Challenges and limitations of the banking climate stress test

The climate stress test challenges financial institutions from several sides. One of the most difficult tasks is translating climate scenarios into economic shocks. These are created during a complex modeling process where several approaches are used at the same time, such as Integrated Assessment models. Their construction and maintenance are extremely resource intensive.

Instead of internal model building, external data sources can also be used to identify shocked macroeconomic, financial, and sectoral variables. However, the results of the scenarios are not always publicly available, their geographic or sectoral coverage is not necessarily broad enough, and they do not include Hungarian specialties. If the bank wishes to use publicly available databases, it can use the currently available limited data or wait for the publication of new results (e.g. publication of ECB stress trajectories).

The development of the internal models is also necessary when shock aggregated variables are used. While the effects of climate change usually appear in the medium and long term (up to 30+ years), standard risk models only look forward 2-3 years. To be able to quantify the climate risks, it is necessary to extend the forecast time horizon in the current methodological approaches.

If the financial institution decides to do transaction-level stress tests, it can incorporate climate risks into the analysis of its portfolio using a new methodological approach. The first step of this is the development, collection, and estimation of metrics related to climate risk. However, the availability and reliability of customer-level data are uncertain for the time being, data related to climate risk will have to be collected, e.g. during the credit assessment.

Measurement and disclosure requirements for large companies will alleviate these problems soon. Both the probability of collapse and the expected loss realized in the event of collapse may be affected by climate change. In the case of long-term housing loans, for example, the geolocation of the mortgage may be important, where physical risk may increase, as well as in the industry in which the customer works, where transition risks may modify future solvency.

## Insurance climate stress tests

Risks from climate change also affect insurance companies through many channels, in January 2022, EIOPA published recommendations for the industry for the third time regarding the use of climate stress tests. Transition risks are a major risk for the investment portfolio managed by insurance companies. When evaluating market risks, insurance companies must pay extra attention to the risks related to the carbon intensity of their exposures. The physical risks associated with climate change can have a major impact on the risk indicators of damage events affecting insured assets (e.g. floods, droughts, fires). When creating stress tests, insurers can determine specific risk assessments for their exposures (bottom-up), and they can apply new assumptions that consider the effects of climate change into their models regarding the probability of occurrence of risk events, their correlation, and the magnitude of the effects (top-down).

## Next steps

Financial institutions need to identify climate risks and areas most affected. Areas with higher exposure should be investigated more deeply in the first round. The identified risks must be built into a favorable and unfavorable scenario narrative, and then the intermediate climate shocks must be quantified. To assess the effects, it is necessary to extend the time horizon of the current models or to develop new climate risk metrics and methodologies (such as ESG scoring or the CRISK methodology). The missing data must be collected, and then the short, medium, and long-term effects must be quantified. The next step is to communicate the results to the affected areas and then strategic planning for risk mitigation measures can begin.

Assessing and managing climate risks is a great challenge for financial institutions. However, promoting the green transition is not only a socially important matter, but also means the emergence of new business opportunities for banks/insurers in the light of changing consumer preferences.

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