Network for Greening the Financial System

NGFS long-term climate scenarios – Phase V

High-level overview

November 2024

NGFS
Central Banks and Supervisors
Network for Greening the Financial System

This note aims to provide users with a non-technical summary of the main evolutions in Phase V of NGFS long-term climate scenarios[1]. Section 1 outlines the key takeaways and results from Phase V. Section 2 focuses on the implementation of a new damage function for physical risk assessment, which is the subject of a separate explanatory note.

1. Key takeaways from Phase V of NGFS climate scenarios

As shown in the presentation, Phase V of NGFS climate scenarios introduces two main updates.

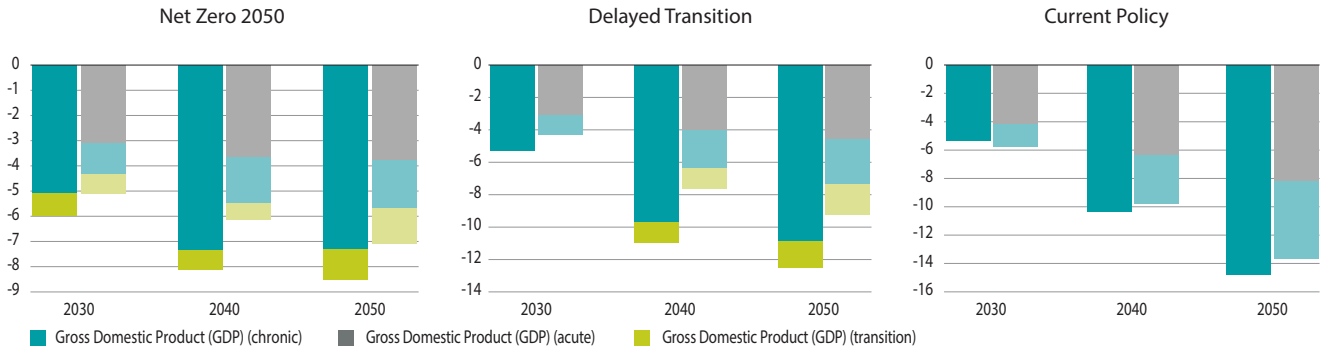
1. The NGFS scenarios have been **brought up to date with new economic and climate data**, policy commitments, and model versions. These updates reflect the latest GDP and population pathways and the most recent country-level commitments up to March 2024. They also use the latest release (v3.0) of the Shared-Socioeconomic Pathways (SSPs).
2. The **damage function** used to capture physical risk has been updated to be aligned with the latest climate science research (see section 2 of this document).

These updates result in higher physical risk estimates and higher (shadow) carbon prices required for an orderly transition.

- (Chronic) physical risk estimates have increased by factors of 2 to 4 across scenarios (**Figure 1**)[2]. However, these projections bear limitations that users should account for (see section 2).
- A carbon price of around \$300/tCO_2 would be needed by 2035 to incentivize a transition towards net zero by 2050, which is around \$50/tCO_2 more than in Phase IV. This reflects the delay in reducing GHG emissions, which requires stricter policies to meet unchanged climate targets.

The main insights from the results of previous vintages are confirmed and strengthened. A coordinated transition will be less costly than disorderly or no action in the long run. Limiting the temperature increase to 1.5 °C above pre-industrial levels in an orderly fashion is achievable, though it will require substantially more efforts.

Figure 1 **Global GDP impact by Climate Risk Source in *Phase V* (in full) and *Phase IV* (in transparent)**



Note: NiGEM, with REMIND input. The above figure shows how GDP is impacted across scenarios compared with a hypothetical (and fictive) baseline scenario in which no transition or physical risks occur.

1 DISCLAIMER: Neither the NGFS, nor its member institutions, nor any person acting on their behalf, is responsible or liable for any reliance on, or for any use of the NGFS scenarios and/or the supplementary documentation. This also applies to the use of the data produced under the scenarios – see section 5 in https://data.ene.iiasa.ac.at/ngfs/#/license.

2 Global GDP losses rise from in between 2% (Net Zero 2050) and 5% (Current Policies) in 2050 for Phase IV scenarios to in between 7% and 15% in 2050 in Phase V.

2. The new damage function and the increased impact of physical risk

A new damage function was introduced in Phase V of NGFS long-term scenarios. Consequently, output losses driven by (chronic) physical risk have significantly increased.

The new damage function proposed by Kotz *et al.* (2024), integrates the latest scientific evidence, which leads to higher loss estimates from physical risk than earlier studies.

This new damage function captures the effects of gradual changes in climate on the economy more comprehensively:

- It is calibrated using the **most recent climate and economic data available** and **covers a more comprehensive set of climatic variables** (temperature variability, annual precipitations, number of wet days, and extreme daily rainfall). The damage function used in the Phase IV NGFS scenarios (based on Kalkuhl & Wenz, (2020)) accounted only for changes in mean temperatures.
- By including **persistence effects**, the updated damage function captures the instantaneous impact of a climate shock on economic output and lagged effects up to ten years after the occurrence of the shock. It reflects that growth rates do not recover immediately from climate shocks, but are not permanently altered.

As a result, the estimated global losses from (chronic) physical risk are significantly higher compared to the previous version of the NGFS scenarios, by a factor of 2 to 4 across scenarios in 2050 (also see **Figure 1**). Not only does the new damage function result in generally more severe losses, but it also exhibits distinct dynamics due to its enhanced comprehensiveness and robustness.

A clear understanding of some technical aspects behind the NGFS estimates of output losses from climate change is crucial for their interpretation and use.

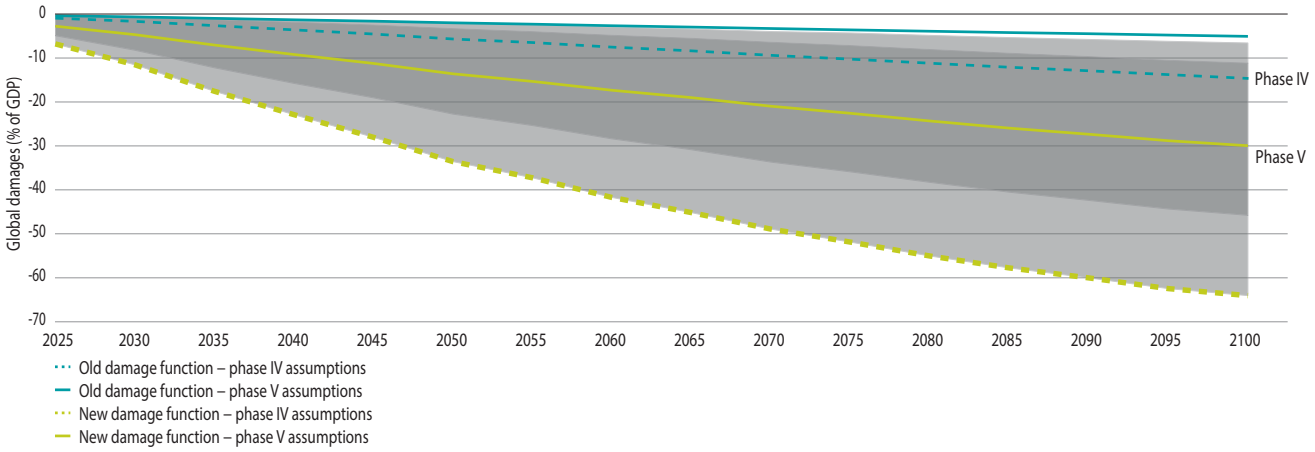
- Damage projections should be interpreted against a baseline without climate change. While economic prospects would be significantly worse with high global warming, all scenarios foresee growth compared to current levels of global economic output.
- Damages from physical risk should no longer be taken as the simple sum of chronic and acute damages. Some of the climate variables of the new damage function (*e.g.* extreme daily rainfall) may partially capture the impact of acute events that are modelled separately in the NGFS scenarios. However, the revision of (chronic) physical risk impacts is mostly due to the persistence effects of climate shocks (see Explanatory note, Annex 4).

Future climate change losses remain characterized by high uncertainty, and the NGFS assessment of physical risks has limitations users should account for.

- Loss projections come with a wide confidence interval leading to **high uncertainty level** (**Figure 2**). The core estimates used in the new vintage consider median assumptions for damage projection and temperature trajectories; in previous vintages, more adverse assumptions were applied, as the damage function was more likely to underestimate economic losses. Moreover, those assumptions were not consistently applied across scenarios.
- NGFS scenarios do *not* account for long-term climate adaptation measures, for some climate phenomena (*e.g.* tipping points), for indirect socio-economic impacts (*e.g* migration), and for other sources of risk (*e.g.* nature-related risks, the occurrence of polycrises). It cannot be excluded that the economic effects of climate change turn out to be even more severe than visualized under the NGFS scenarios.
- The use of NGFS physical risk assessments may require complementary analyses to meet users' specific objectives. In this regard, the guidance and the caveats provided by the NGFS to users on how to use the NGFS climate scenarios in its guidance note remain relevant. In general, while the NGFS climate scenarios are certainly a helpful tool, they do not alleviate the responsibility of financial institutions to design and implement their own risk management frameworks.

Figure 2 **Confidence interval of global GDP loss projections**[1]

Chronic physical risk damages under Current Policies scenario



1 The shaded area represents the confidence interval of new damage function impacts. The dark shaded presents the 5-95th percentile of the damage projection for the 50th temperature percentile. The light shaded area presents the 5-95th percentile of the damage projection for the 5-95th temperature percentile.

Box

Where to find more detailed information on the Phase V of NGFS long-term climate scenarios

For more detail, please refer to the:

1. General **presentation** of the main evolutions, results, and data access modalities of NGFS longterm scenarios.
2. **Explanatory note** on *"Damage functions, NGFS scenarios, and the economic commitment of climate change".*
3. **Technical Documentation** with detailed and updated information on the modelling assumptions of NGFS long-term climate scenarios.
4. **Data & Resources** page in the Scenarios Portal, to display the results or download bulk data.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