



EUROPEAN CENTRAL BANK

EUROSYSTEM

Climate scenarios: what, why, and how*

*ESG and climate risk assessment for the
financial sector, WU Wien*

* Thanks to Tina Emambakhsh, Mario
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Outline

- 1 Climate scenarios: long- versus short-term
- 2 NGFS short-term scenarios
- 3 Policy application: the Fit-for-55 stress test

Disclaimer

*This presentation should not be reported as representing the views of the European Central Bank (ECB).
The views expressed are those of the authors and do not necessarily reflect those of the ECB.*

1 Climate change risk for financial stability and climate stress testing



Financial institutions are exposed to **transition** and **physical risk** via loans borrowed to **firms, households** and **governments**



Vulnerabilities from climate risk are **concentrated** in certain regions and economic sectors



Long-term stress-testing suggests that economic and financial **losses** from climate risks can be **significant** in the absence of climate policies

Climate stress testing

*The forward-looking nature of stress testing exercises makes them better suited to assess future exposures and potential losses that cannot be extrapolated from past data, such as those related to climate risk**

* BIS "Stress-testing banks for climate change – a comparison of practices"

Climate scenarios: which time horizon?

Short (e.g. 3-8 years)

- ✓ Lower **uncertainty**, especially related to climatic dynamics
 - ✓ Increased **focus on interaction of climate with macro-financial variables**
 - ✓ Horizon useful to inform **prudential decisions** and **internal governance**, e.g. in a traditional stress test framework or risk management framework
 - ✓ More flexibility in **analyzing** timing of **transition policies** and of **increased acute physical risk** events
- ✗ Not able to capture long-term impacts of a changing climate

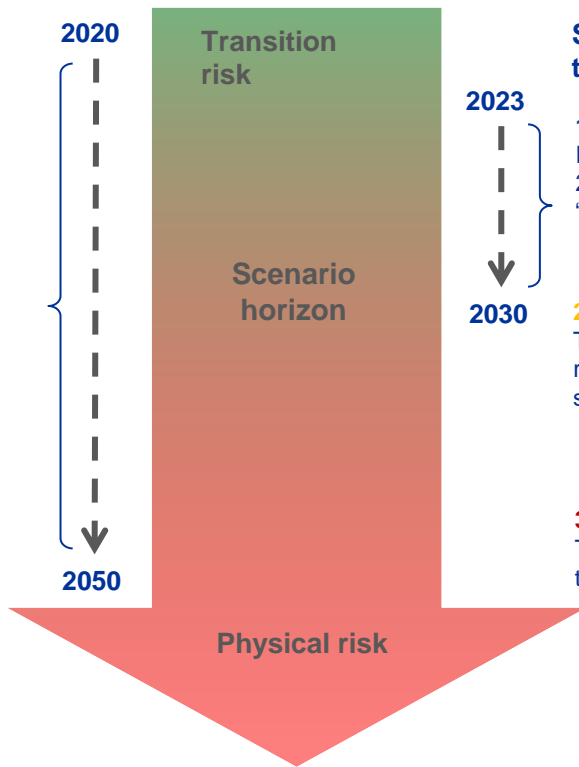
Long (e.g. 30 years)

- ✓ Can assess **implications of emission levels on temperature** developments
 - ✓ Provides insight to the interdependence between **transition** and **physical** risk, with more focus on climatic dynamics
 - ✓ Can guide government actions/**policy proposals** and **strategic** decisions
- ✗ Higher uncertainty, and beyond asset maturities

1 Long-term vs. short-term scenarios for climate stress testing: ECB approach

Long-term: Cost-benefit analysis of transition and physical risk

- 1. Orderly transition with limited physical risk**
Early implemented climate policies with limited costs
- 2. Disorderly transition with average physical risk**
Delayed climate policies implemented with higher costs from transition and physical risk
- 3. Hot house world with extreme physical risk**
No new climate policies, limited costs from transition but extremely high costs from physical risk

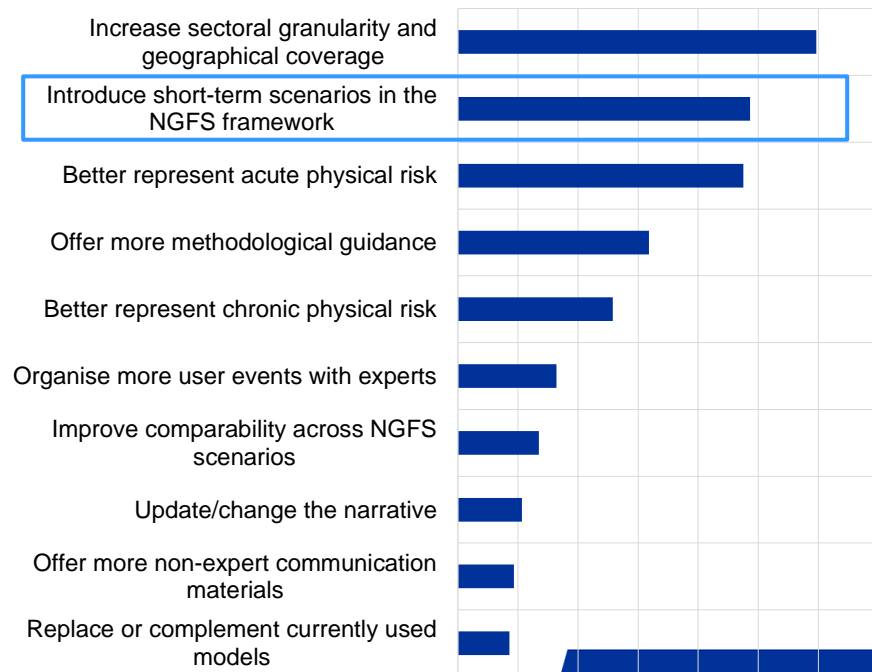


Short-term: Impact assessment of transition timeliness & ambition

- 1. Accelerated transition**
Immediate and intense green transition triggered by the 2022 energy crisis. Emission reductions compatible with “net-zero” targets.
- 2. Late-push transition**
Transition starts with a delay of 3 years, when the economy recovers from the 2022 energy crisis. Emission reductions still compatible with “net-zero” targets.
- 3. Delayed transition**
The transition starts with a delay of 3 years, but efforts too weak to generate emission reductions aligned with net-zero targets.

2 Production of short-term climate scenarios is high in the priority of the NGFS, to complement on the existing long-term scenarios

NGFS Survey: priorities for improving the climate scenarios



Accounting for shocks that have a short-term impact and subside in the medium/long term:

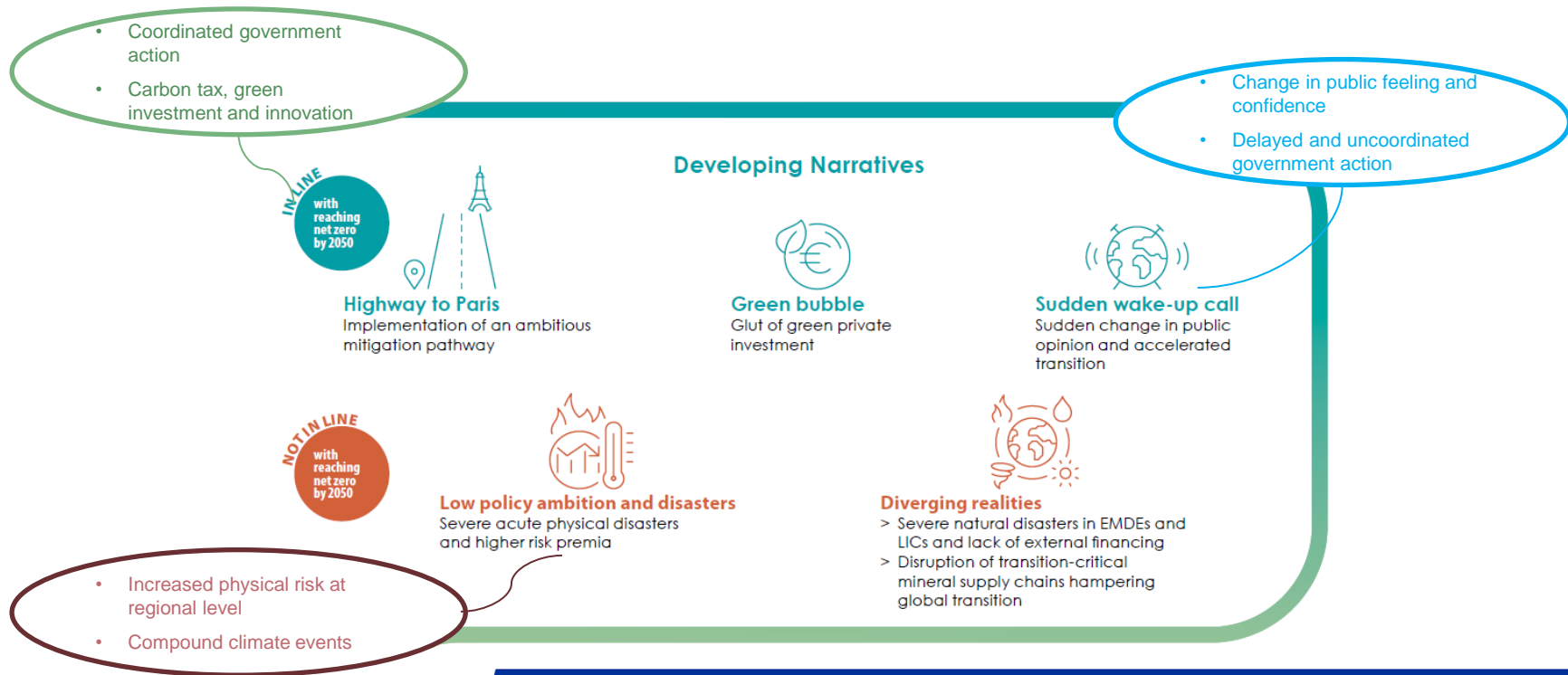
- **Cyclical factors** such as commodity prices and consumer confidence.
- **Physical risk:** capturing the effects of acute weather events or climatic disasters
- **Country specific shocks**, like new country policies and developments
- **Sectoral analyses**, e.g. direct and indirect impact on financial sector

Short term modelling frameworks more suitable to analyse:

- **Compound shocks and tipping points**, e.g., climate and business cycle shocks
- **Financial amplification**, e.g., intra-finance contagion, assets fire sales
- Alternative **transmission channels** of transition policies and physical damages

Short-term scenario narratives aim at exploring a wide range of shocks, related to both transition policies and physical risk

Five narratives, exploring different policy and physical risk pathways. No connection between transition policies and physical risk



Policy application: Fit-for-55 climate stress test exercise

The EU Commission mandated the European Supervisory Authorities to conduct, together with the ECB and ESRB, a one-off “Fit-for-55” climate scenario analysis exercise to test how the agreed transition policies would affect the financial sector (also accounting for cross-sectoral spillover effects) and, in turn, the real economy over an 8-year horizon.

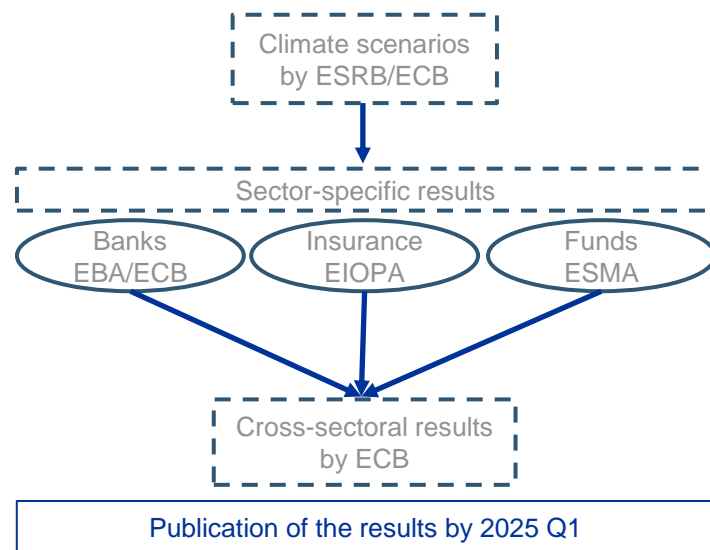
What is the Fit-for-55 package?

- Fit-for-55 refers to the EU’s target of reducing net GHG emissions by at least 55% by 2030. The Fit-for-55 policy package aims to bring EU legislation in line with the 2030 goal.

What are we going to test?

- In the **baseline scenario** the Fit-For-55 package is implemented in an economic environment that reflects current forecasts
- One **adverse scenario** focuses on short-term climate-change related risks that could materialise in the form of asset price corrections triggered by a sudden reassessment of transition risk - “**Run-on-brown**”(RoB)
- A **second adverse scenario** combines climate-change related risks with other macroeconomic stress factors, consistent with scenarios for regular stress tests

Structure of the exercise



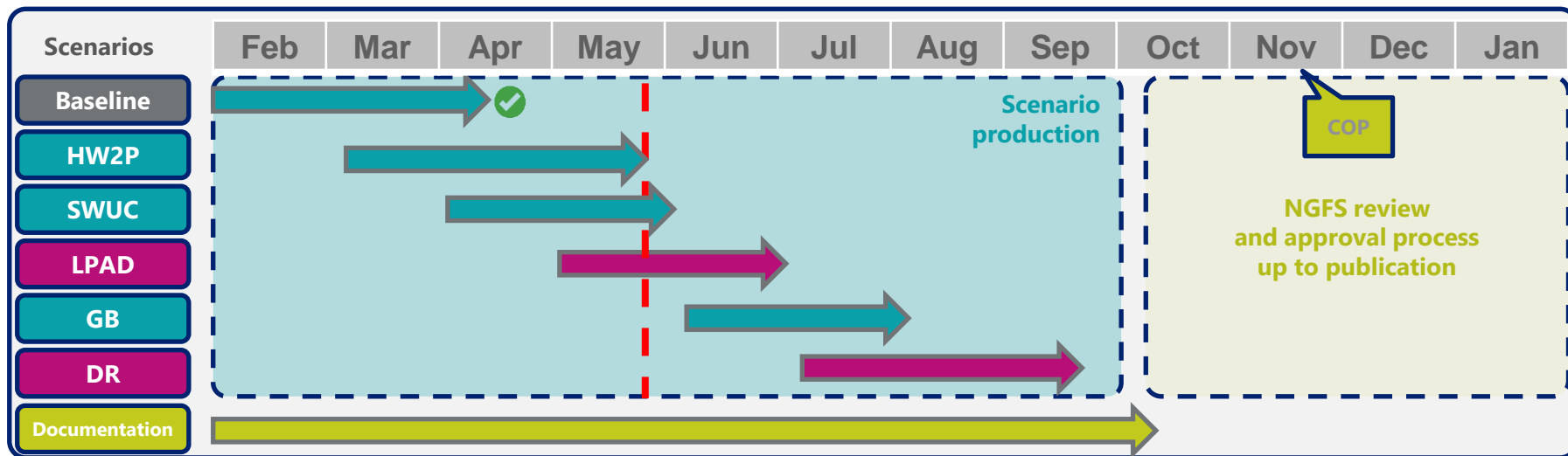


Background

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All scenarios are being developed from scratch. The goal is to complete modelling work in 2024 and publish at the beginning of 2025

The scenarios are being developed in a collaboration between the NGFS and the IIASA-Climafin-E3M consortium
Publication timeline is tentative and subject to NGFS internal procedures, quality control and approvals



NGFS Short Term scenarios: IIASA-Climafin-E3 modelling team

Modelling framework

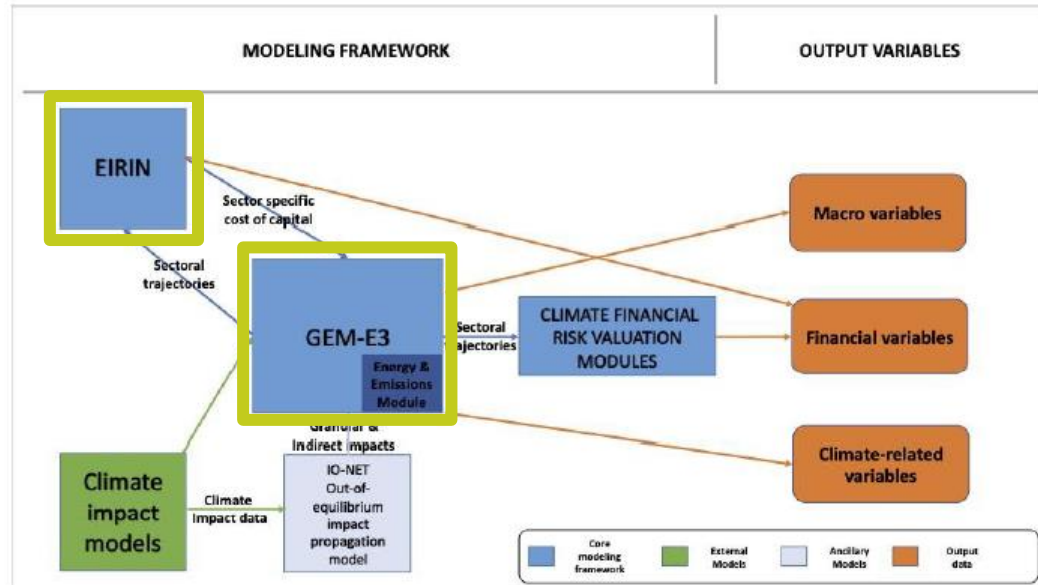


Figure 1: Overview of the project's modeling framework and interaction across models

Workstream 2

GEM-E3: A global, multi-regional, multi-sectoral, recursive dynamic computable general equilibrium (CGE) model which provides details on the macro-economy and its interactions with the environment and the energy system (the climate module is also included in GEM-E3).

EIRIN: is a Stock-Flow Consistent (SFC) behavioural model. Agents and sectors: network of interconnected balance sheets economy (and financial sector represented).

NGFS long term climate scenarios at a glance

7 scenarios are currently available, each of them exploring a different set of assumptions

Low Demand assumes that reduced energy demand mitigates the pressure on the economic system to reach global net zero CO₂ emissions around 2050.

Net Zero 2050 limits global warming to 1.5°C through stringent climate policies and innovation, reaching global net zero CO₂ emissions around 2050.

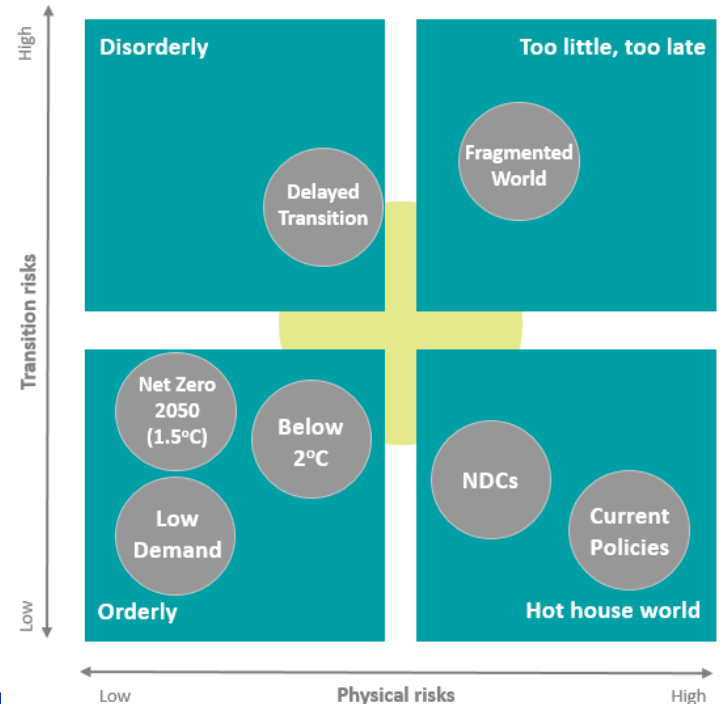
Below 2°C gradually increases the stringency of climate policies, giving a 67% chance of limiting global warming to below 2°C.

Delayed Transition assumes annual emissions do not decrease until 2030. Strong policies are needed to limit warming to below 2°C. Negative emissions are limited.

Nationally Determined Contributions (NDCs) includes all pledged targets even if not yet backed up by implemented effective policies.

Current Policies assumes that only currently implemented policies are preserved, leading to high physical risks.

Fragmented World assumes a delayed and divergent climate policy response among countries globally, leading to high physical and transition risks.



A suite of models are aligned in a coherent way, each with its own scope: physical risks, transition risks, and macro-financial impacts

- **Transition risk models** include 3 Integrated Assessment Models (IAMs), that derive the impacts of policy ambitions on emissions, energy sector, and land use
- **Physical risk models** include acute and chronic physical risk models, projecting physical risk based on the Global Temperature Paths (GMTs)
- The **macroeconomic model** is NiGEM, employed to understand the consequences of transition and physical risk on key macro-financial fundamentals
- **Country-level downscaling** is applied to IAMs world regions to provide more granular information on the implications of NGFS Scenarios for 184 countries.

