Network for Greening the Financial System

Workstream on Scenario Design and Analysis

NGFS Short-Term Scenarios for central banks and supervisors

May 2025

NGFS

Central Banks and Supervisors
Network for Greening the Financial System

Joint foreword

Sabine Mauderer
Chair of NGFS

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Chair of the workstream on *Scenario Design and Analysis*

Climate change is not a distant threat – it is a current reality reshaping our economies and financial systems. Understanding the immediate impact of climate-related risks has thus become an urgent necessity for central banks and other financial actors. To address this need, the NGFS has released short-term climate scenarios. These scenarios provide valuable insights into the immediate implications of climate change and climate policies.

The NGFS short-term scenarios represent the first publicly available tool to provide a structured analysis of the immediate effects of climate policies and climate change on financial stability and economic resilience. The short-term scenarios complement the existing NGFS toolkit for assessing climate risk, including the NGFS long-term scenarios, which have become a well-established resource for financial actors to assess how economies might evolve over the coming decades. By bridging the gap between understanding the long-term risks arising from climate change and the benefits and costs of the green transition, the short-term scenarios address immediate policy needs and enhance our ability to respond effectively to climate-related challenges.

The NGFS short-term scenarios offer detailed sector analysis and extensive coverage of financial risk and macroeconomic variables. They explore how climate policies, extreme weather, economic trends and sectoral shifts interact, providing fresh insights into how climate change could impact our economies and financial systems over the next five years.

Robust and actionable climate risk analysis is essential for the global economy to navigate the climate challenge. Financial actors and policymakers must gain a deeper understanding of climate-related risks in order to prepare for them appropriately. The NGFS short-term scenarios are hence a vital instrument for conducting risk assessments and making informed decisions with greater confidence.

Acknowledgements

The Network for Greening the Financial System (NGFS) is a group of 144 central banks and supervisors and 21 observers (as of 11 March, 2025) committed to sharing best practices, contributing to the development of climate and environment-related risk management in the financial sector and mobilising mainstream finance to support the transition toward a sustainable economy.

The first vintage of the NGFS Short-Term Scenarios is a collaborative effort of the members of the Workstream on Scenario Design and Analysis and was prepared under the auspices of Livio Stracca (European Central Bank), Chair of the Workstream with support from the NGFS Secretariat. The NGFS Workstream on Scenario Design and Analysis has been working in partnership with an academic consortium from Climate Finance Alpha (CLIMAFIN), E3-Modelling/RICARDO, International Institute for Applied Systems Analysis (IIASA).

The NGFS thanks the modellers of the academic consortium: Stefano Battiston[1, 2], Philip Hackstock[4], Antoine Mandel[2], Marco Duenas[2], Andrea Mazzocchetti[6], Irene Monasterolo[2], Karl Naumann-Woleske[5], Leonidas Paroussos[3], Stelios Tsiaras[3], Kostas Fragkiadakis[3], Bas Van Ruijven[4], Yiyi Ju[4].

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Further thanks go to the members who authored the conceptual note which provided the groundwork for the scenarios' implementation.

1 Universität Zürich (UZH), Zurich, Switzerland; 2 Climate Finance Alpha (CLIMAFIN), Paris, France; 3 E3-Modelling/RICARDO, Athens, Greece; 4 International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria; 5 Wirtschaftsuniversität Wien (Vienna University of Economics and Business); 6 Ca' Foscari, University of Venice.

Contents

Key features of the first vintage of NGFS short-term scenarios

NGFS short-term scenarios are unique insofar as they:

- **Integrate climate policy, extreme weather events, economic trends and sectoral dynamics** to create scenarios that reflect the complex interplay between climate risks and business cycles – enhancing their value for climate risk analysis, policymaking, and stress testing.
- **Zoom in on the economic impacts of climate-related risks within a policy-relevant timeframe:** with a focus on the next five years, the scenarios are particularly useful for financial sector applications, such as stress testing, risk assessment, and guiding policy calibration.
- **Offer detailed financial and sectoral modelling with broad geographic coverage:** the scenarios provide granular projections across a wide range of financial variables, sectors, and countries, making them easily applicable for practical use.
- **Include compound physical climate risks:** the scenarios account for multiple transmission channels through which a sequence of extreme weather events – such as heatwaves, floods, wildfires, and storms – impact economies, including supply chain breakdowns.

Key messages: main results of the NGFS short-term scenarios

- **A well-paced implementation of effective climate policies, in a globally coordinated effort, limits the negative effects of a net-zero transition.** Gradual increases in carbon prices, coupled with effective recycling of carbon tax revenues into green investments, limit global output losses to 0.5% in 2030, while effectively reducing emissions.

- **Rapid and unexpected policy shifts increase the economic costs of transitioning and cause additional financial stress.** A delayed and abrupt transition generates global output losses of 1.3% and increases the unemployment rate by 1.3pp. Default probabilities rise significantly in high-polluting sectors, particularly by 35pp in coal and by 12pp in oil sectors, due to higher borrowing costs.

- **The possible occurrence of a sequence of plausible but extreme weather events in one region causes substantial GDP losses, with effects on the global economy.** The impacts of these extreme disasters vary across regions, with losses peaking at 12.5% of GDP in Africa. Effects of regional disasters affect the global economy through trade and financial linkages. Default probabilities rise significantly for high-capital and high-debt sectors, with increases of more than 10pp in the power supply sector.

- **A steady intensification of climate hazards in some regions, the continued efforts to transition in other parts of the world and shortages in the supply of critical minerals cause lasting economic effects.** Supply chain bottlenecks*, caused by climate disasters in some regions, can generate strong output losses and macroeconomic spillovers: global GDP losses would peak at more than 3%. In the regions where green transition efforts continue, they become more costly.

All values above are expressed as difference from the Baseline.

* Supply chain disruptions are modelled as changes in trade/elasticity matrix of specific commodities to simulate lower availability of critical material.

NGFS short-term scenarios overview

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What benefits do NGFS short-term scenarios provide?

The NGFS short-term scenarios represent a first-of-its-kind, publicly available tool offering a detailed and granular analysis of the near-term impacts of climate-related risks across the globe.

Focused on **a five-year horizon**, these scenarios complement the NGFS long-term scenarios, addressing the growing need for tools that support policy responses, financial risk assessments, and evidence-based decision-making in the short term. They are specifically designed to assess the dynamic interplay between:

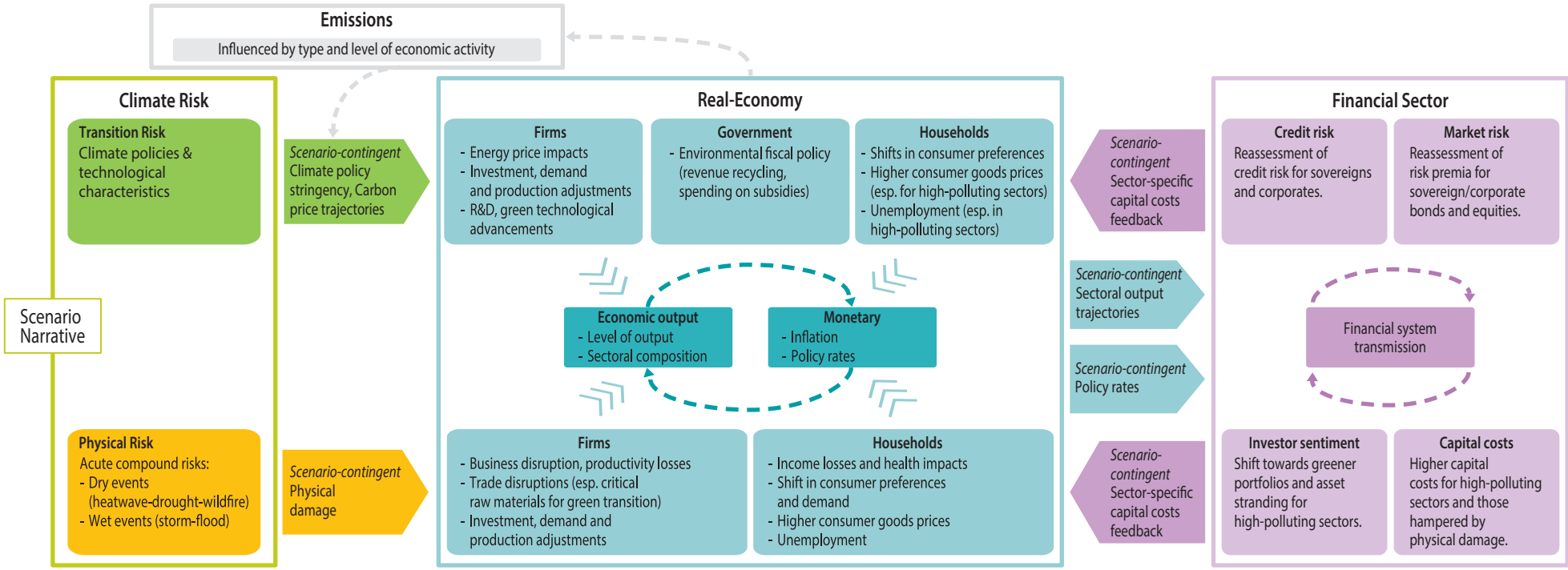
- **Climate policies** (transition risks);
- **Extreme weather events** (physical risks);
- **Macro-financial developments**.

Key innovations of these scenarios include:

- **Modelling of compound climate events:** specifically, simultaneous occurrences of multiple hazards such as floods, storms, heatwaves, droughts, and wildfires.
- **Cross-regional transmission of shocks:** incorporating short-term spillover effects of both transition and physical risk shocks through trade linkages, financial markets, and disrupted global supply chains.
- **Integration of real-economy financial-sector feedback loop:** capturing how changes in the cost of capital, financial conditions, and monetary policy responses influence macroeconomic dynamics and financial stability.

Potential future refinements to this first release of NGFS short-term scenarios will be informed by feedback from users and commentators.

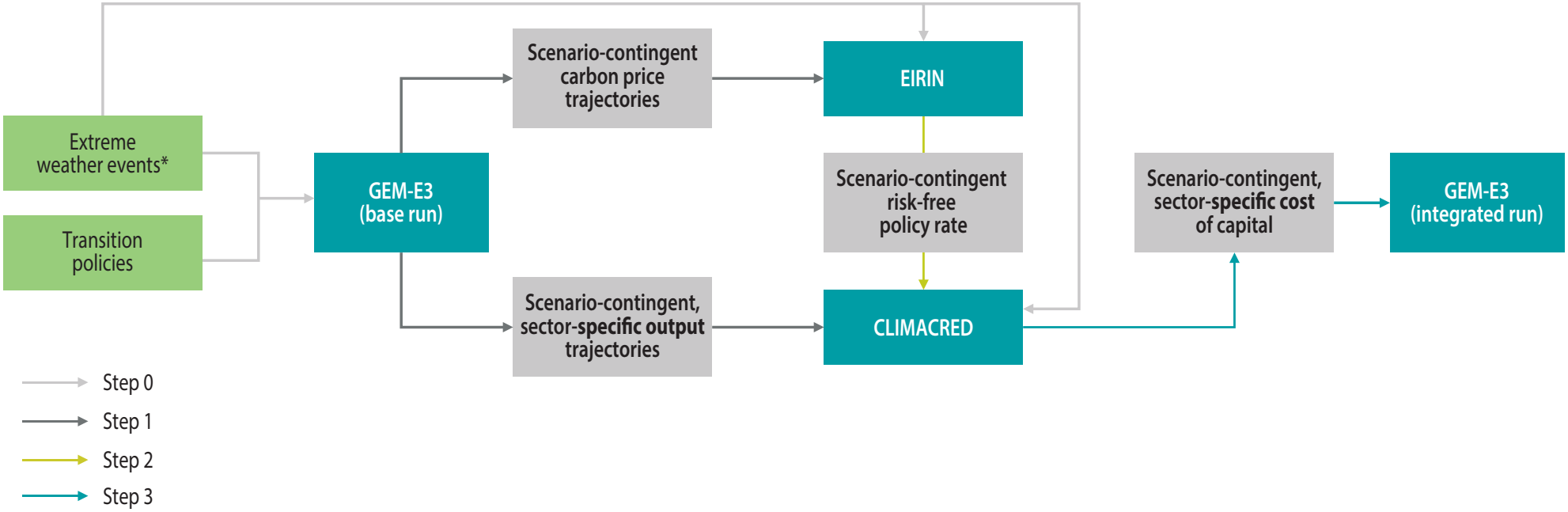
Transmission channels and economic feedbacks



Note: Due to the short time horizon of the NGFS short-term scenarios, impacts of emission trajectories onto short-term physical risk are not modelled.

Modelling framework

The NGFS short-term scenarios provide a range of data on transition risks, physical risks and economic impacts, produced by a suite of integrated models.

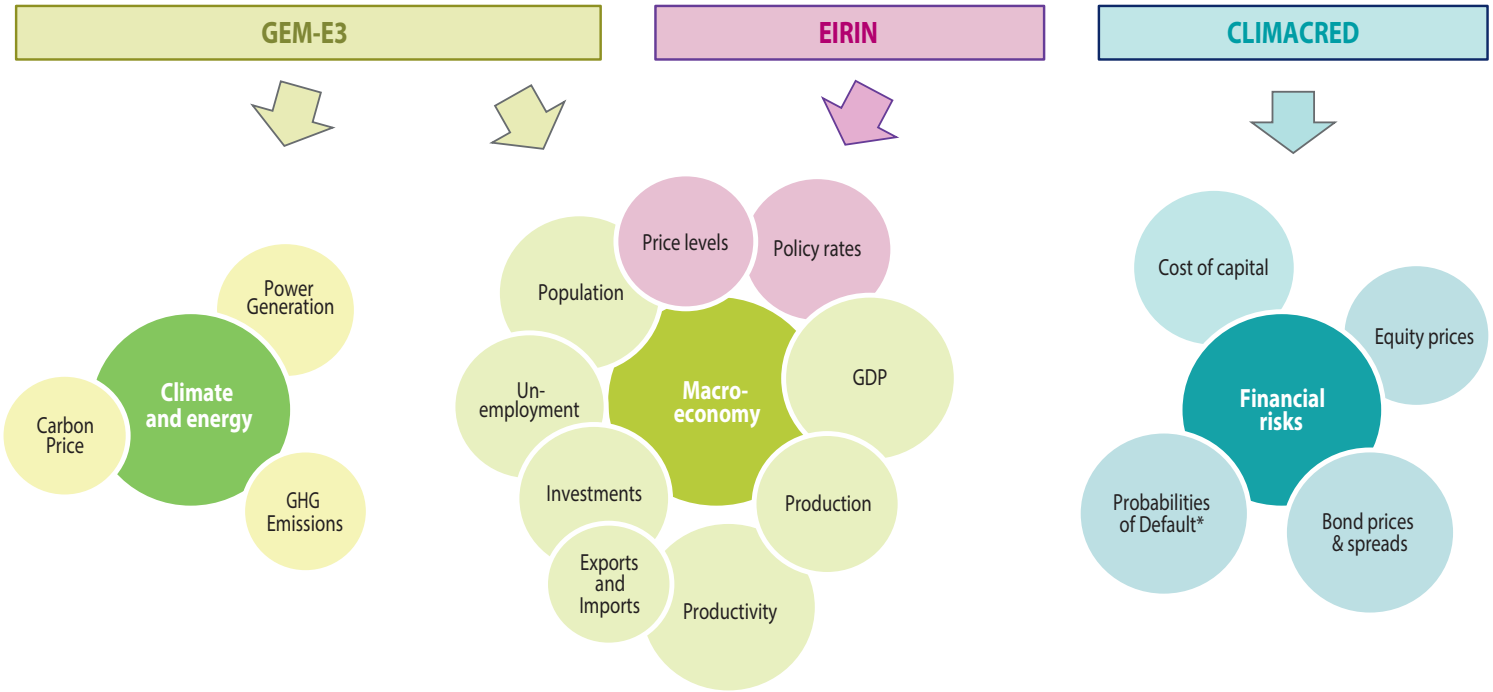


- ✓ **GEM-E3** is a Computable General Equilibrium Model for Economy-Energy-Environment used to determine the dynamics of real macro variables and climate related variables at a high level of granularity.
- ✓ **EIRIN** is a Stock-Flow Consistent behavioural model used to project inflation and monetary policy.
- ✓ **CLIMACRED** is a climate credit risk model that allows for scenario-contingent valuation of bonds and equity and of the associated costs of capital.

* For the implementation of physical risk, the direct physical effects on GEME3 sectors are applied to all three models, and combined in the GEM-E3 integrated run.

Modelling framework

The model outputs can be grouped in three data categories: climate, macroeconomic, and financial variables.



- ✓ **Sectoral granularity and country coverage:** 50 sectors and 46 countries covered by GEM-E3 and Climacred, 5 macro-regions by EIRIN.
- ✓ **Financial and macroeconomic variables:** enabling a wide range of analyses and applications.
- ✓ **Transition and physical risk:** covering both types of climate risks and the combination of the two (in the Diverging Realities scenario).

* In the current version of the model, CLIMACRED does not account for ad-hoc government guarantees, financial schemes that could be introduced to support or provide public backing for specific sectors in some countries, nor economic and industrial policy that might be available in a jurisdiction as response to an economic shock. Users are advised to account for such country-specific schemes in their analysis.

Scenario narratives and key assumptions

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Short-term scenario narratives

The short-term scenarios explore a different set of assumptions on the evolution of climate policies and physical risk. The narratives are outlined in the NGFS conceptual note.

TRANSITION RISK

Highway to Paris: A technology-driven (and orderly) transition unfolds gradually. Carbon tax revenues are reinvested into green* subsidies and investments. While short-term energy prices rise, economic growth from higher investments offsets these impacts. Consumers and investors increasingly favour green sectors, while high-polluting sectors face rising credit risks and capital costs.

TRANSITION RISK + PHYSICAL RISK

Diverging Realities: Advanced economies (North America, Europe, Oceania and part of Asia) pursue a net-zero transition in line with Highway to Paris. The rest of the world is hit by a sequence of extreme weather events, with effects that propagate globally via trade and financial linkages. Supply chain disruptions in critical raw materials create spillover effects for advanced economies and increase the cost of their transition to a low-carbon economy.

TRANSITION RISK

Sudden Wake-Up Call: A world of widespread climate unawareness is challenged by a sudden change in policy preferences. Consumer and investor preferences shift abruptly toward green* sectors. A sharp surge in carbon prices triggers a supply shock. The transition occurs too suddenly for markets to adapt, leading to a "Climate Minsky Moment" – a wave of financial instability as asset values adjust abruptly.

PHYSICAL RISK

Disasters and Policy Stagnation*: A sequence of region-specific extreme weather events occurring in 2026 and 2027 result in capital destruction, reduced productivity and production, and creates cascading economic impacts. Trade and financial linkages spread the negative impacts across the world, amplifying financial and economic instability.

The "Disasters and Policy Stagnation" scenario is called "Low Policy Ambition and Disasters" in the conceptual note. This scenario has 6 versions, one simulation of extreme weather events per region, with the rest of the world is only affected via trade and financial linkages.

The conceptual note also included a fifth scenario, Green Bubble, which is not part of this scenario vintage. Physical risk is modelled, in the short-term scenarios, as extreme weather events (or "acute" physical risk). Chronic physical risk is not considered in these scenarios.

* For definition of "green" and other classifications, please refer to the annex slide "Variable and regional aggregations".

Key assumptions

The impact of physical and transition risk in short-term scenarios is driven by the level of policy ambition and coordination, physical risk shocks, investments, technology levers and expectations.

	Scenario	Transition shocks	International cooperation	Physical risk shocks	Investments	Financial markets
Net Zero Aligned	Highway to Paris	Carbon tax to reach net-zero	High	None	Carbon revenues **fully recycled*** into R&D and subsidies for clean energy technologies	Rise in capital costs and risk premia for polluting sectors
Net Zero Aligned	Sudden Wake-Up Call	Delayed carbon tax to reach net-zero	Low	None	Carbon revenues only **partially recycled*** for clean energy technologies	Sudden rise in capital costs and risk premia for polluting sectors
	Disasters and Policy Stagnation	None	Aligned with baseline	Region-specific disasters with international spillovers, compound shocks	Decreased consumption and investments	Rise in capital costs and risk premia in sectors and countries exposed to physical risk
	Diverging Realities	Carbon tax to reach net-zero in selected regions	Low	Region-specific disasters occurring consecutively in some regions of the world	Decreased consumption and investments. Carbon revenues fully recycled in the regions pursuing net-zero targets	Rise in capital costs and risk premia in sectors and countries exposed to physical risk or due to mitigation policies

Macro-financial risk perspective Lower risk | Moderate risk | Higher risk

* Carbon revenues are fully recycled for clean energy technologies in Baseline and Highway to Paris, with carbon revenues being much higher in the latter. In Sudden Wake-Up Call, the carbon revenues are also higher than in Baseline, but the additional revenues are redistributed to households for private consumption, rather than recycled for clean energy technologies.

Baseline scenario

The baseline of the short-term scenarios incorporates climate targets committed by January 2023.

The baseline scenario is calibrated using the **October 2023 IMF World Economic Outlook** projections*:

- The macroeconomic variables used to align the models to the IMF projections are *GDP, inflation, technical progress, sectoral growth, population levels, and consumption patterns.*
- The impact of *COVID-19* and the *energy price shocks of 2022* are considered in the calibration of the monetary policy response.

The scenario accounts for **climate targets** pledged by January 2023, such as:

- *Horizontal policies*, including country-specific GHG emissions reduction targets or carbon price targets.
- *Focused policies*, including policies for energy consumption, power generation or capacity by energy source (e.g. share of renewable** electricity in a country's energy mix).
- *Targets on fossil fuels.*

The baseline includes *legislated* policies***. The transition scenarios, *Highway to Paris* and *Sudden Wake-Up Call*, entail additional emission reduction efforts in order to reach net-zero****.

Note: **The short-term scenario baseline is comparable to the long-term Nationally Determined Contributions (NDCs) scenario.**

The NGFS NiGEM long-term baseline is a scenario without new climate policies and climate change impacts; the NGFS long-term Current Policies scenario does not have transition risk.

* The results are shown as differences from Baseline, to highlight the properties of individual scenarios. The differences might also allow users to construct jurisdiction specific or updated estimates on the basis of their own baseline projections.

** Renewable power generation is defined as energy produced from the following sources: Biomass, CCS bio, Geothermal, Hydro Electric, PV, Wind.

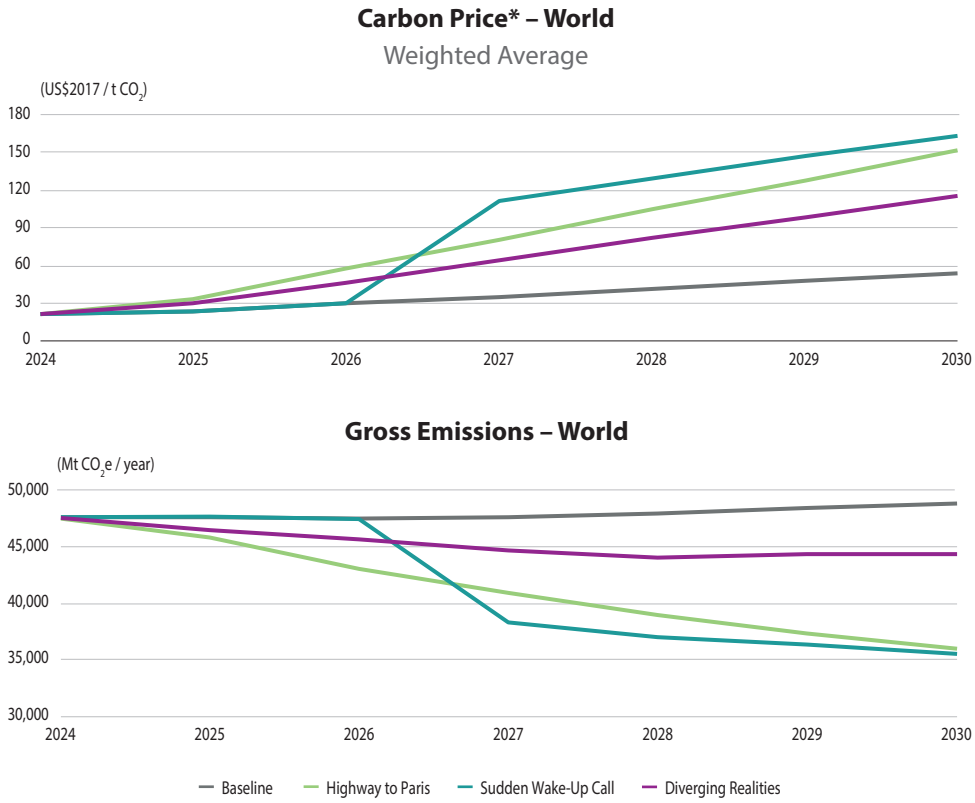
*** Policies adopted by the government through legislation or executive orders, and non-binding targets backed by effective policy instruments.

**** This definition includes pledged policies (NDCs) and additional carbon tax to reach the NZ targets.

Key assumptions: Transition Risk

Transition scenarios shed light on possible avenues for trying to achieve 2030 emission reductions that align with 2050 net-zero targets.

- **Transition risk** is mostly driven by the timing of the policies, level of carbon prices, and the extent to which carbon tax revenues are reinvested into green technologies.
- **Highway to Paris** describes a smooth, technology-driven, and coordinated transition, where carbon taxes increase gradually, leading to steady emission reductions. The revenue from carbon taxes is reinvested in green technologies, facilitating a more cost-effective shift toward net zero.
- **Sudden Wake-Up Call** depicts a delayed and abrupt transition. Governments postpone action until 2027, then implement steep carbon pricing without reinvesting all revenues in green technologies**. While emissions decline sharply by 2030, the transition comes at a higher economic cost.
- In **Diverging Realities**, only advanced economies (North America, Europe, Oceania and part of Asia***) follow transition pathways aligned with *Highway to Paris*, leading to a global reduction in emissions that falls short of net-zero targets.



* The carbon price represents the marginal cost of carbon abatement, acting as a general proxy of climate policy ambition.

** In the Sudden Wake-up Call scenario, some tax revenues are assumed to be redistributed to support households' consumption.

*** Some countries follow Highway to Paris transition but are geographically located in disaster regions and thus are subject to both transition and physical risk in the Diverging Realities scenario. This mainly impacts Asia, where Japan, South Korea and Turkey all experience both physical and transition risks.

Key assumptions: Physical Risk

The physical risk scenarios use a story-line approach* to explore a series of severe and compound, region-specific extreme weather events, capturing global spill-over effects.

- **Extreme weather events** impact the economy via several channels depending on the type of hazard. These are **capital destruction, productivity and production loss**, and **labour productivity loss**.

- In **Disasters and Policy Stagnation**, two types of compound events are modelled, one region at a time: (1) the combination of **droughts, heatwaves, and wildfires** (dry events) in 2026, and (2) the combination of **floods and storms** (wet events) in 2027. These are **plausible but extremely severe events** (return period of 1 in every 50 years). The scenario has **six regional versions**, where each assumes that the events occur in the given region, affecting the global economy through financial and trade linkages.

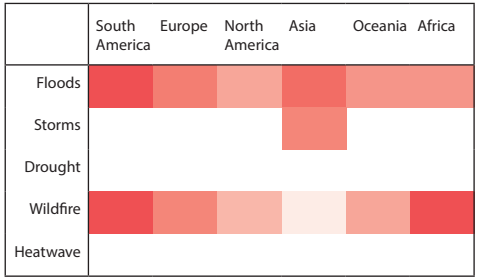
- In **Diverging Realities**, the combination of **heatwaves, droughts, and wildfires** are assumed to occur in Asia in 2025, in South America in 2026, and in Africa in 2027. **Floods and storms** occur in Asia in 2028, in South America in 2029, and in Africa in 2030. These events are less severe than in *Disasters and Policy Stagnation* (return period of 1 in every 20 years).

Weather impacts, average effects across countries of the region

(darker color indicates larger loss of productive factors)

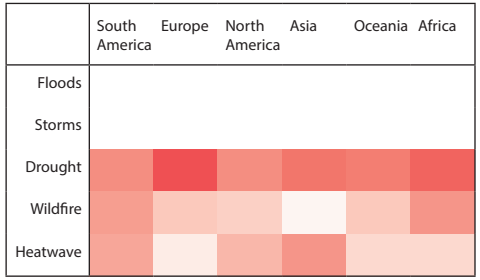
Power Supply

Disasters and Policy Stagnation

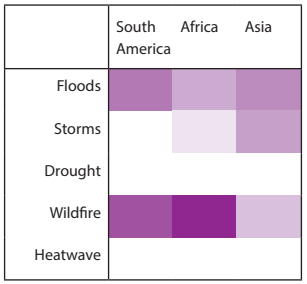


Agriculture

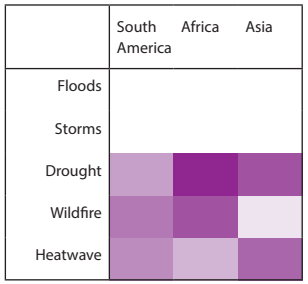
Disasters and Policy Stagnation



Diverging Realities



Diverging Realities



* A story-line approach consists of a narrative-driven scenario, describing a sequence of events over time, instead of focusing primarily on quantitative projections or probabilities (as it is instead done in the long-term scenarios for physical risk). One shortcoming is the focus on a specific set or sequence of events, while other combinations might be or turn more relevant.

** The impacts, as share loss, are reported on the same scale for convenience but are not directly comparable as they represent the lost share of different economic variables (physical assets, productivity). The impacts are averages over the years of impact, sectors and countries.

Data access, tools and resources

Accessing NGFS short-term scenarios data

NGFS climate scenario data are available on two platforms. There are several ways to access the data, which serve different users' needs and analytical requirements.

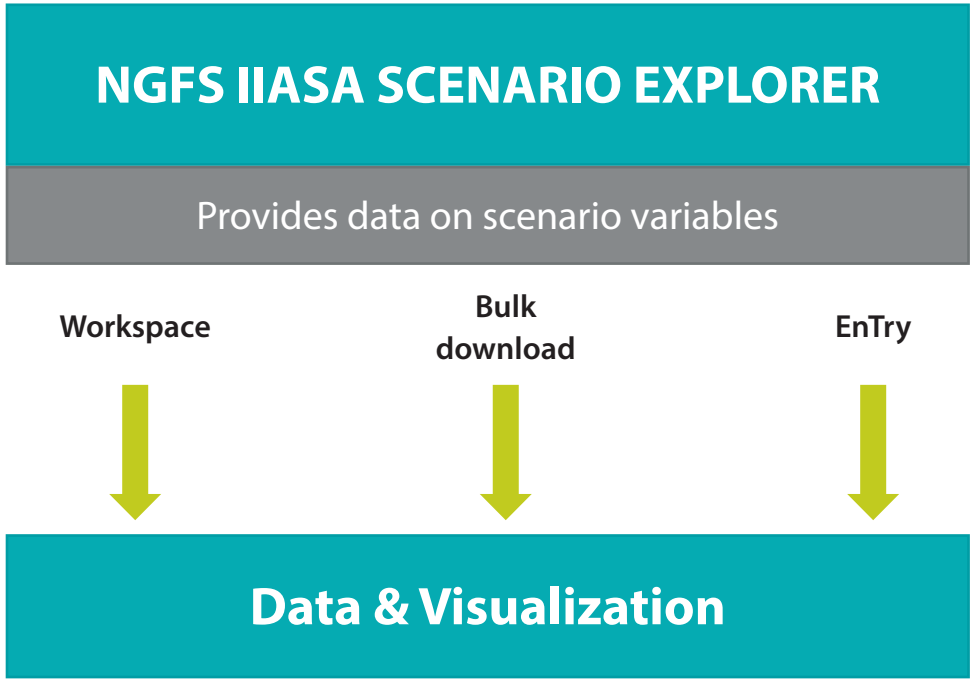
Data on the GEM-E3, EIRIN and CLIMACRED outputs can be accessed in the **NGFS IIASA Scenario Explorer**.

There are three main ways to access NGFS climate scenario data:

Workspaces: The NGFS IIASA Scenario Explorer provides an online interface to visualise and explore the data. Here users can explore and compare scenarios, regions, variables, and models.

Downloads: Data can be downloaded in bulk as .csv or .xlsx data frames from the NGFS IIASA Scenario Explorer.

Code-based access: The NGFS IIASA Scenario Explorer provides a direct API to access the data in coding scripts directly. To facilitate users' access to this method, the **NGFS EnTry Tool** is also available.



Technical documentation

The accompanying technical documentation follows a modular approach. This format allows readers with different levels of expertise and interest to better focus on the information relevant to them.

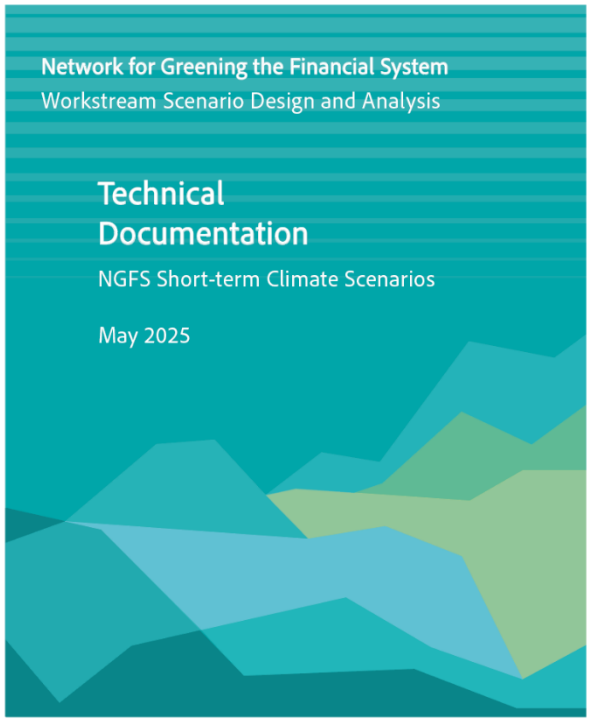


Table of contents

1. **Structure and objective** of the modelling framework
2. **Key modeling features** for the representation of **transition risks**
3. **Key modeling features** for the representation of **physical risks**
4. **Calibration** of the models for the **Baseline** scenario
5. **Highway to Paris scenario**
6. **Sudden Wake-Up Call scenario**
7. **Disasters and Policy Stagnation scenario**
8. **Diverging Realities scenario**
9. **ANNEX**, Appendix

Overview of resources on NGFS short-term scenarios

The NGFS short-term scenario data and resources can be accessed *via* the following platforms:

Data

- IIASA portal
- NGFS EnTry Toolkit

Web resources

- NGFS Website

Explanatory material

- Presentation Short-Term Scenarios
- NGFS Scenarios Technical Documentation
- Q&A and/or FAQ

The long-term scenarios materials (Phase V) can be found here: https://www.ngfs.net/en/publications-and-statistics/publications/ngfs-climate-scenarios-central-banks-and-supervisors-phase-v.

Main results of the NGFS short-term scenarios

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Main results of the NGFS short-term scenarios

Key macro-financial results

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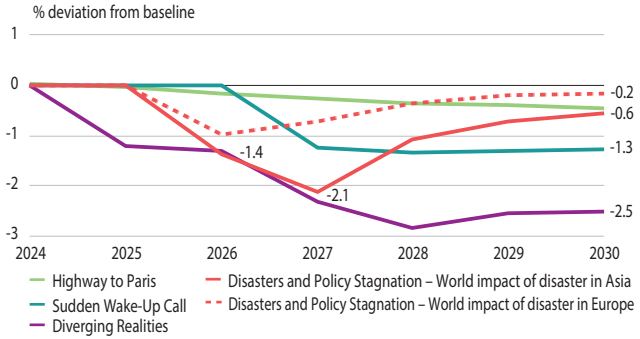
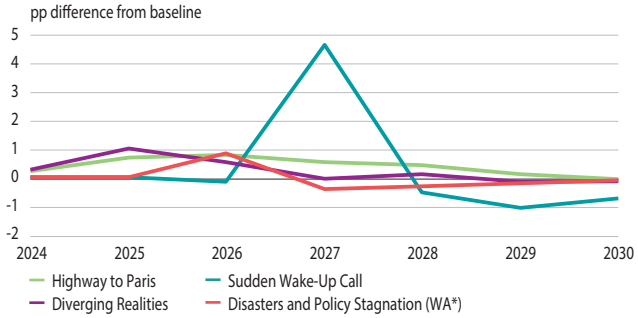
Economic impacts of climate-related risks

The different scenarios highlight the effects of different transition policies and of extreme weather events, focusing on macroeconomic dynamics, price stability and financial risks.

GDP – World

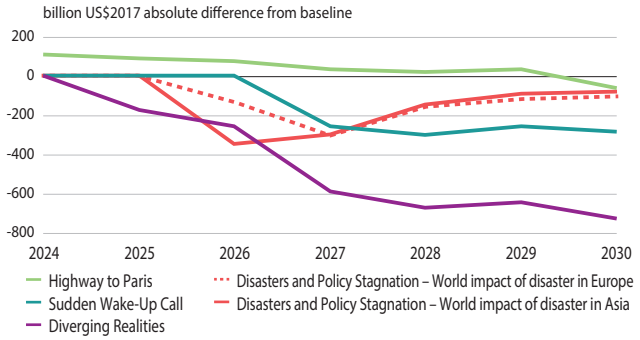


Inflation Rate – World



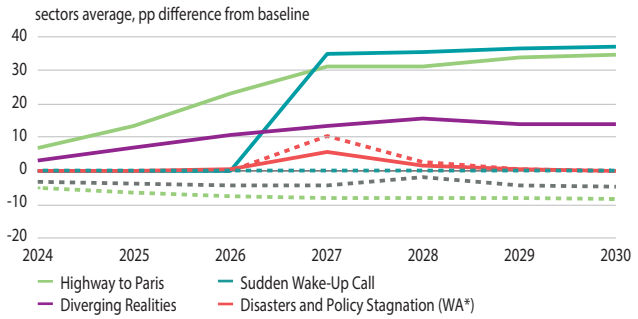
The *Disasters and Policy Stagnation* scenario has 6 different regional variants, with each variant showing the effect of extreme weather events affecting one region of the world and the global economy through trade and financial linkages. Those 6 variants **are individual and alternative scenarios**.

Trade (Exports) – World



Probabilities of Default – World

Coal (continuous line) *vs* Wind (dashed) sectors



* In Disasters & Policy Stagnation, prices and financial variables (PDs shown here) **do not have a global aggregate**, hence are shown as a global (GDP) weighted average of direct impacts on regions affected by extreme weather events in the 6 alternative scenario variants. Impacts on individual regions are shown in the *Disasters and Policy Stagnation* section.

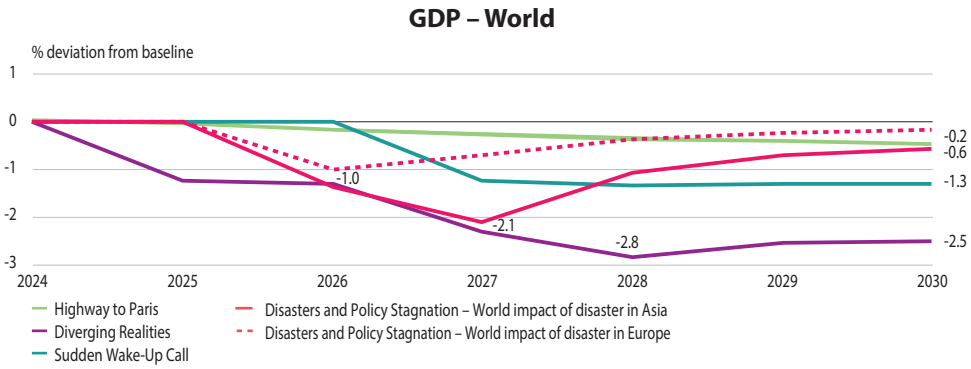
Gross domestic product and unemployment

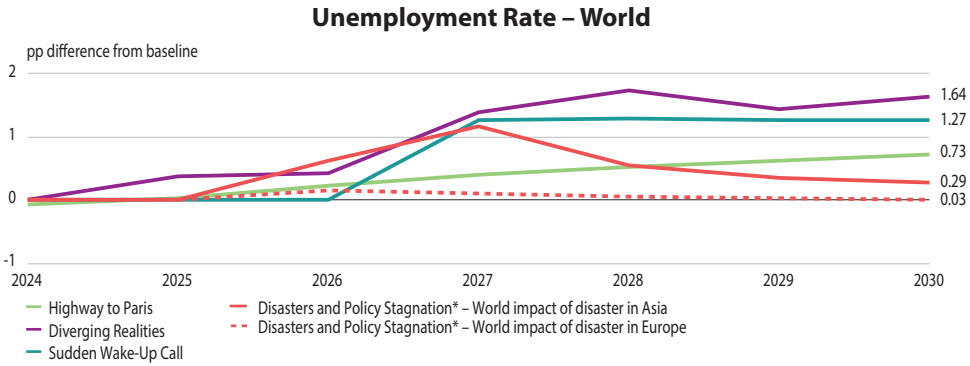
An early, ambitious, and globally coordinated green transition leads to limited economic losses, while extreme weather events cause severe macroeconomic disruptions and potentially lasting effects.

- **Transition risk** generates a limited GDP impact (-0.5%) and a moderate rise in unemployment (+0.7pp) when ambitious policies are implemented in an orderly manner (*Highway to Paris*). However, abrupt and disorderly policy shifts (*Sudden Wake-Up Call*) increase economic costs, leading to a 1.3% GDP decline and a 1.3pp rise in the unemployment rate in 2030.

- **Physical risk** impacts from compound and extreme weather events (affecting one world region only) lead to sharp but temporary output contractions. For example, declines reach up to 1.0% of global GDP in 2026 following extreme weather events in Europe, and up to 2.1% in 2027, following extreme weather events in Asia (*Disasters and Policy Stagnation*)*.

- In **Diverging Realities**, frequent and compounding weather shocks, alongside supply chain disruptions and transition efforts in some regions, result in global (and lasting) GDP losses of up to 2.8% and unemployment rate increases of up to 1.7pp in 2028.





* The physical risk in *Disasters and Policy Stagnation* occur in two years only (2026, 2027).

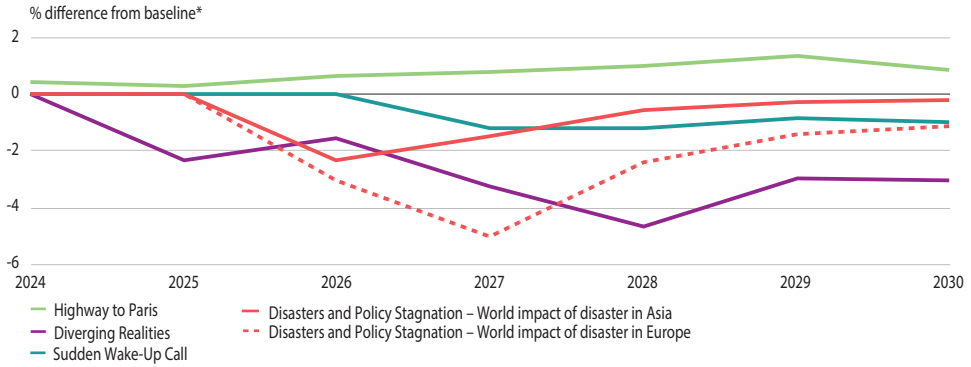
Investments and sectoral production

Transition efforts create "winning" and "losing" sectors. In contrast, extreme weather events tend to affect productive sectors more homogenously.

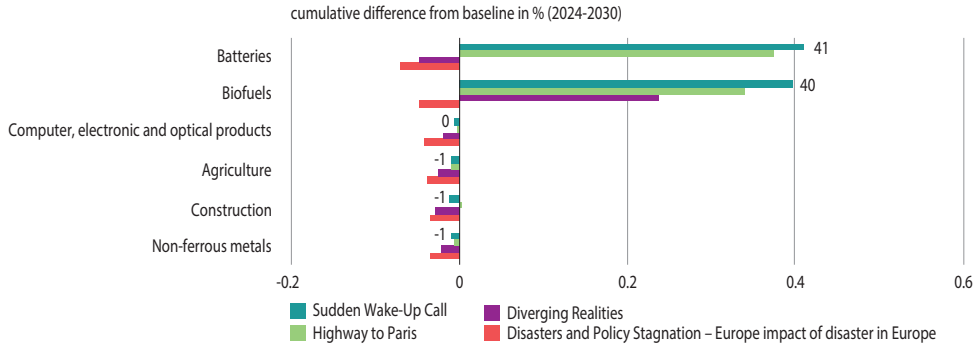
- **Investments** rise globally in *Highway to Paris*, supported by the recycling of carbon tax revenues into the green transition. In *Sudden Wake-Up Call*, investments decline due to lack of carbon revenue recycling. Physical risk scenarios cause a decline in investments, driven by lower economic activity, with a partial recovery after 2027 in *Disasters and Policy Stagnation* and longer-lasting effects in a *Diverging Realities scenario*.

- **Sectoral output** decreases in transition risk scenarios for high-emitting sectors, whilst increasing for green sectors, driven by higher green investments. This is partially reflected in *Diverging Realities*, where advanced economies proceed with the green transition. In *Disaster and Policy Stagnation*, economic sectors are more evenly affected by physical asset destruction and lower productivity levels.

Investments – World



Sectoral production, World

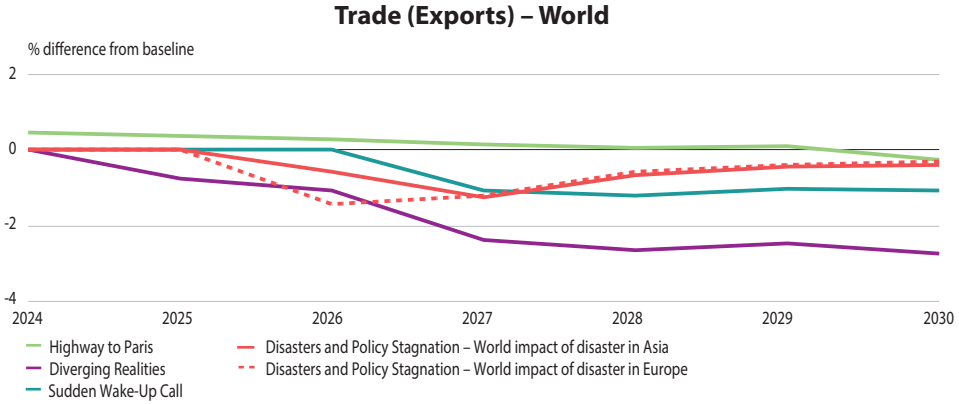


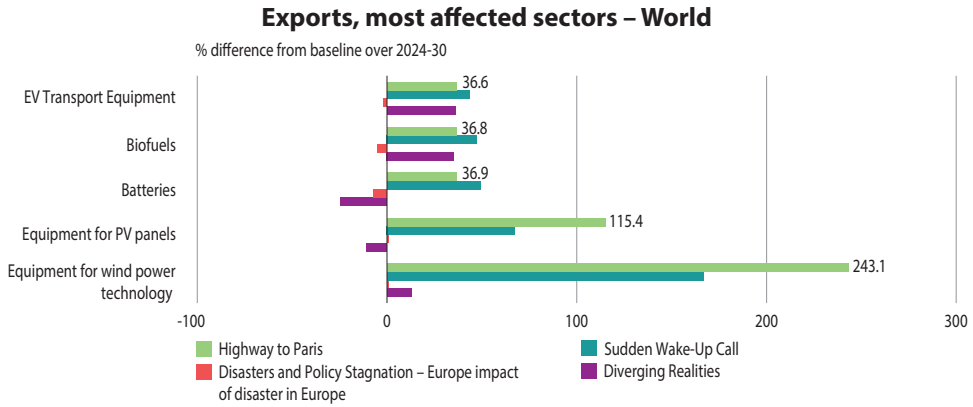
* Despite the carbon price shocks being implemented as of 2025, some investment and consumption adjustments to start already before 2025 caused by the Power Module of GEM-E3's perfect foresight.

Trade linkages

Trade in green energy equipment increases in the transition scenarios, while other sectors experience reductions in trade. In physical risk scenarios, the net trade effects are overall negative but more evenly distributed across sectors.

- Changes in trade levels are moderate in **transition scenarios**, with an overall increase in the *Highway to Paris* scenario and a decline in *Sudden Wake-Up Call*.
- Overall trade is negatively affected in the **physical risk scenarios**. The effects are smaller and temporary in *Disasters and Policy Stagnation* but become severe and long-lasting in the *Diverging Realities* scenario.
- In the transition scenarios, exports of **equipment and materials used for the green transition** increase. In the *Diverging Realities* scenario, supply chain disruptions and extreme weather events restrict this growth*.





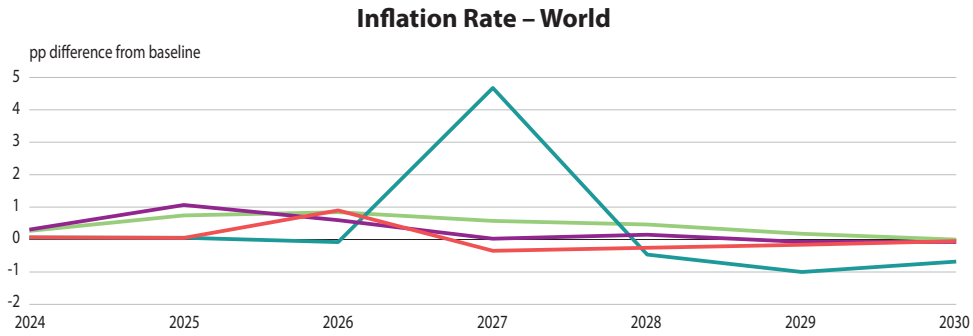
* Supply chain issues have impact on Batteries, EV Transport Equipment, Equipment for wind power technology, Equipment for PV panels, Equipment for CCS power technology.

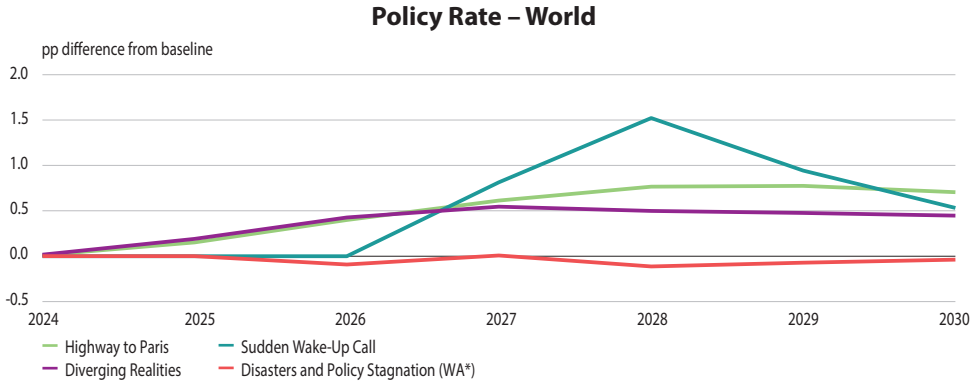
Inflation and policy rates

Global inflation responds sharply to carbon prices and the economic impact of natural hazards, prompting central banks to raise policy rates.

- In the **transition scenarios**, inflation is mainly driven by supply-side factors. Higher carbon taxes increase energy and production costs, which feed through to a higher overall price level. The increase is gradual in *Highway to Paris* and (for the regions implementing transition policies) in *Diverging Realities*. In response, central banks implement gradual rate hikes. In *Sudden Wake-Up Call*, a sudden and high carbon price is instead implemented, leading to an inflationary spike.

- In the **physical risk scenarios**, natural hazards initially lead to a short-run rise in inflation due to disruptions in production in the regions affected by extreme weather events. Deflationary episodes follow due to a sluggish output recovery**.





Note: EIRIN data does not cover Africa. Annual rates shown (quarterly results available in the IIASA portal).

* *Disasters and Policy Stagnation* is shown here as a global weighted average of a region being domestically impacted by disasters. Impacts on individual regions are shown in the *Disasters and Policy Stagnation* section.

** The Diverging Realities scenario results at world level reflect transition shocks in part of the world and extreme weather events in other regions.

Financial market dynamics

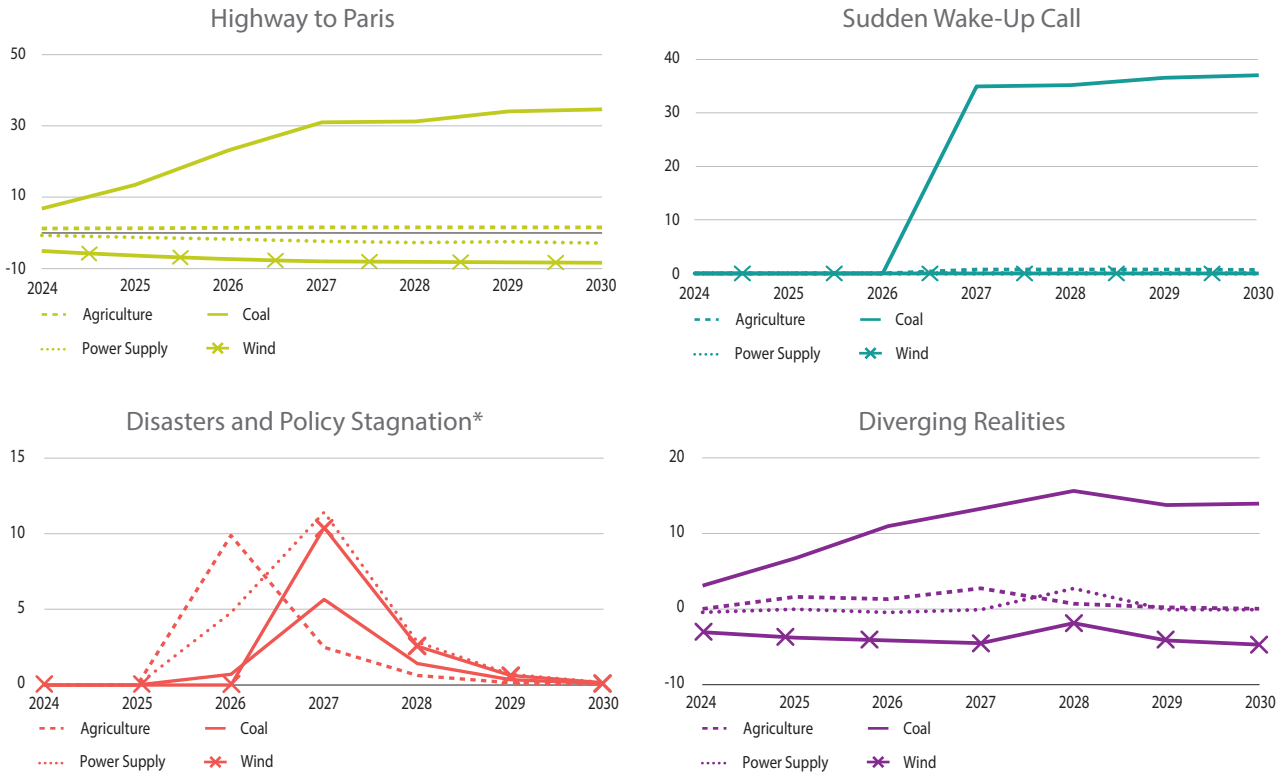
Transition risk leads to a concentration of financial risks within high-emission sectors. Physical risk amplifies financial risks across industries, especially in capital-intensive sectors.

- **Credit risk** significantly increases for high-emission sectors in *Highway to Paris, Sudden Wake-Up Call and Diverging Realities*** due to higher capital costs. In contrast, credit risk for green sectors decreases in *Highway to Paris*, driven by higher investments in these industries.

- **Physical risk** causes short-term spikes in default probabilities across all sectors, with agricultural and capital-intensive sectors (like coal production and power supply), being particularly impacted.

Probabilities of Default, Selected Sectors – World

pp difference from baseline



* *Disasters and Policy Stagnation* is shown here as a global weighted average of a region being domestically impacted by disasters.

** The *Diverging Realities* scenario results at world level reflect transition shocks in part of the world and extreme weather events in other regions.

Main results of the NGFS short-term scenarios

Transition Risk Scenarios: Highway to Paris & Sudden Wake-Up Call

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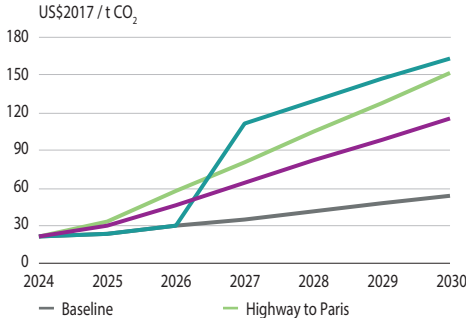
Transition risk scenarios – Overview of the results

Early implementation of ambitious climate policies pays off in a globally coordinated transition to low-carbon economy. Rapid unexpected policy shifts increase the economic costs of transition and can cause severe financial stress.

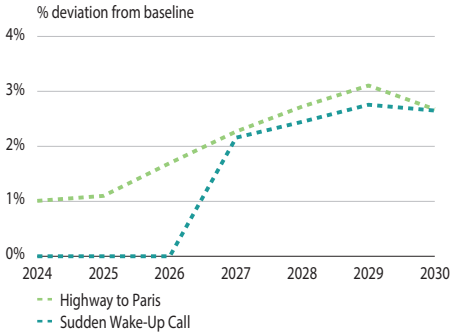
Carbon Price – World

Weighted Average

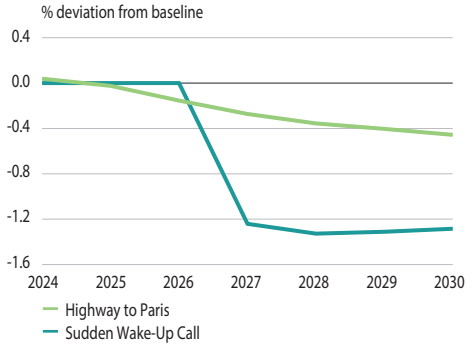


Green* Investment – World

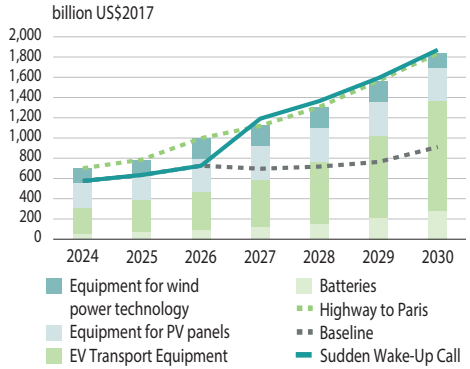
Share of total investment



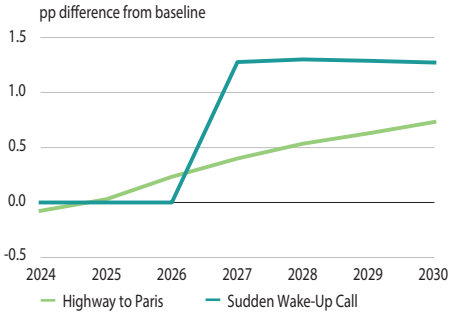
GDP – World



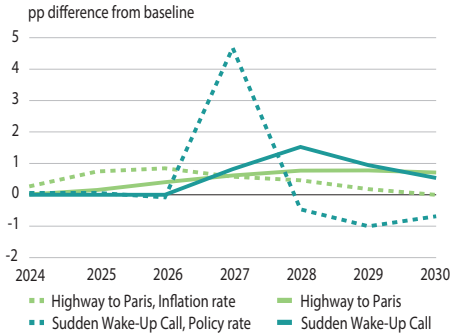
Clean Energy Technologies Production – World



Unemployment Rate – World

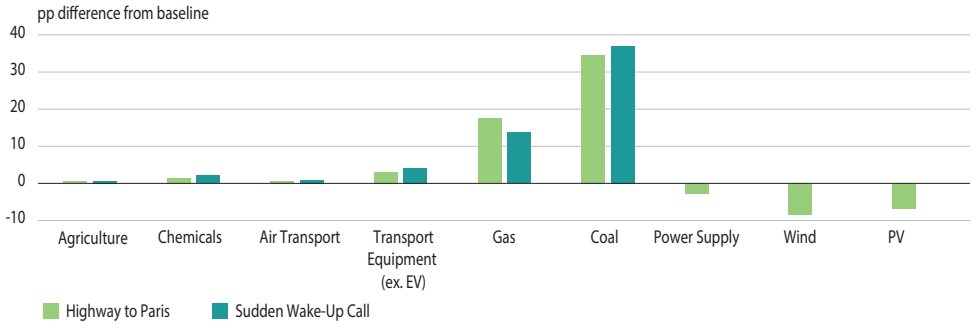


Inflation & Policy Rates – World



Probabilities of Default, 2030 – World

Average



* For definition of "green" and other classifications, please refer to the annex slide "Variable and regional aggregations".

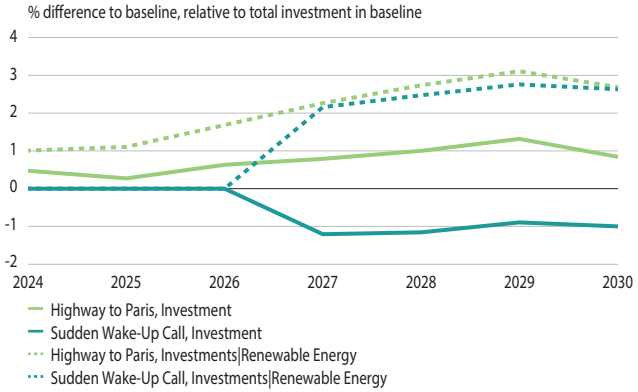
Green investments and technology

In the transition scenarios, by 2030, investments in green technologies are about $800 billion higher, and the share of green energy gradually grows to nearly 60% of the total energy production.

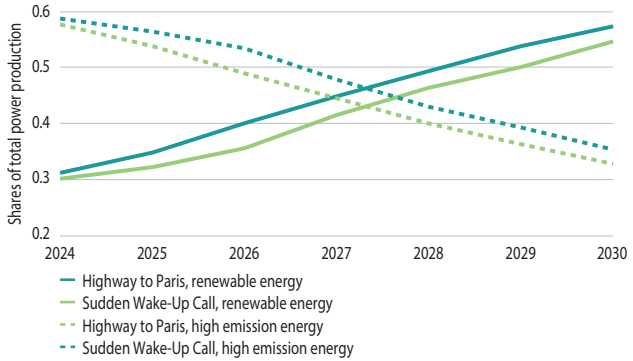
- In the **Highway to Paris scenario**, carbon revenues are used as subsidies for green investments and green R&D, accelerating the development and adoption of green technologies.
- In the **Sudden Wake-Up Call scenario**, carbon tax revenues are only partially used to support the transition. As a result, green technologies advance at the same pace as in the baseline scenario. While green investments rise after 2027, overall investment levels remain subdued due to higher energy costs and low subsidies.

	2024	HWTP 2030	SWUC 2030
Carbon Revenues Recycled	46.2	474.6	100.5
Carbon Revenues % GDP	0.05%	0.42%	0.09%
Green R&D	37.0	379.7	80.4
Green Investment Subsidies	9.2	94.9	20.1

Investment – World



Power Generation Technologies – World



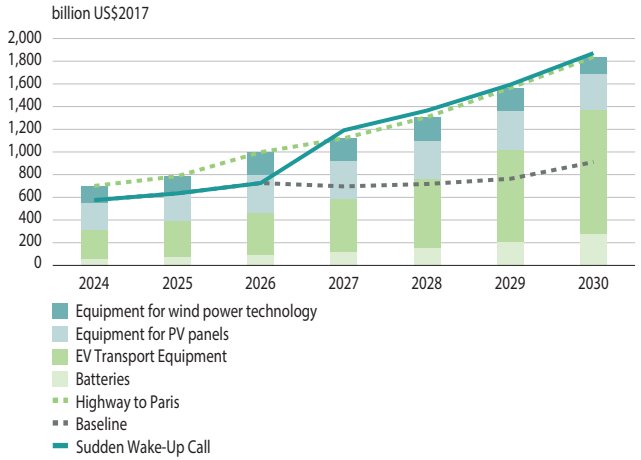
All figures refer to world economy.

Energy production technologies

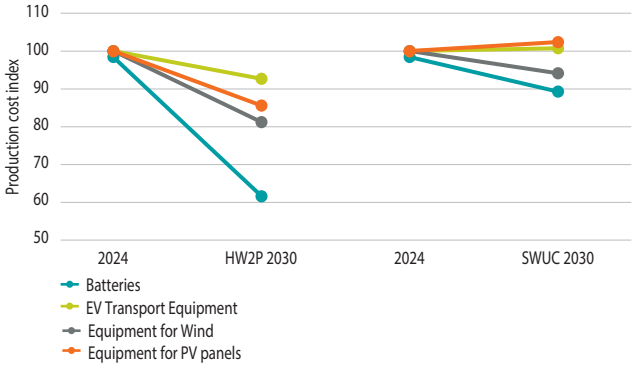
The market size of carbon-neutral energy technologies doubles compared to baseline levels, primarily driven by wind and solar energy.

- By 2030, **energy production from green technologies** more than doubles, reaching around $1.8 trillion in the transition scenarios: twice the size of the baseline projection.
- In the *Highway to Paris* scenario, green technology **production costs** decline due to high learning rates and increased R&D efforts. Conversely, in the *Sudden Wake-Up Call* scenario, unit production costs decrease more moderately for batteries and wind technology*.

Clean Energy Technologies Production – World



Unit Cost of Production for Clean Energy Technologies – World

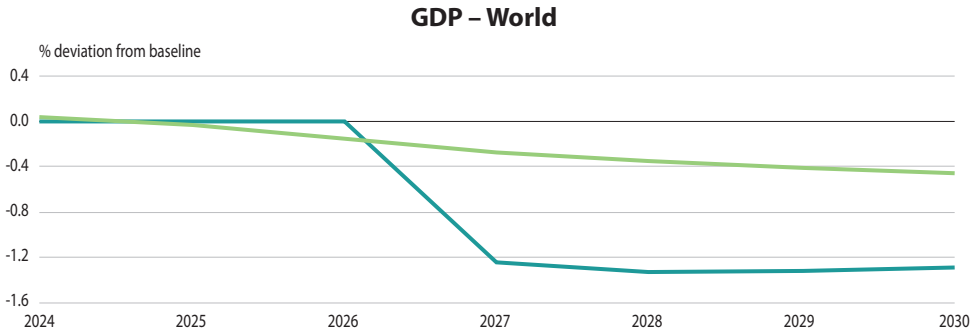


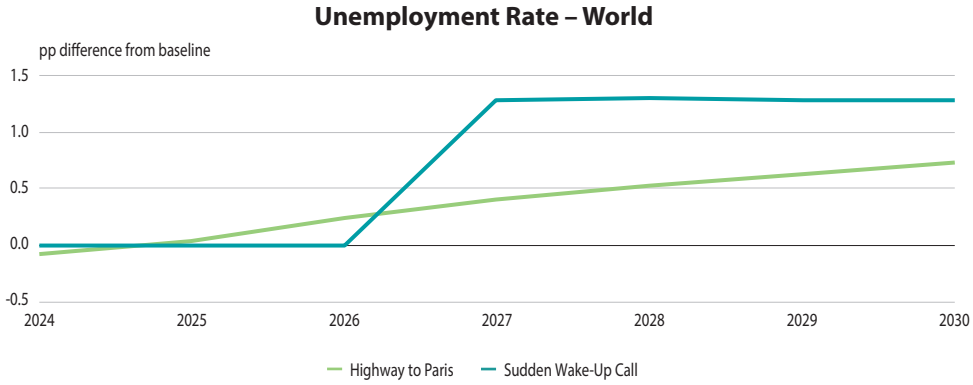
* Despite lower efficiency and the same level of investment, in Sudden Wake-Up Call, similar levels of green energy production are achieved due to the capital mobility assumptions: other sectors with lower efficiency convert capital to green energy production.

Macroeconomic effects

Increasing carbon prices lead to a negative supply shock, but green investments can provide a counterbalancing macroeconomic boost when carbon revenues are recycled efficiently.

- In the ***Highway to Paris*** scenario, GDP losses and associated job losses are limited. Increased total investments and advances in green innovation and technologies generate more jobs in green sectors, thus limiting the increased unemployment resulting from high-emission industries.
- In the ***Sudden Wake-Up Call*** scenario, the sharp rise in the shadow carbon price sparks higher green investment but does not lead to a net increase in total investment. As a result, GDP declines and unemployment rises compared to the baseline.

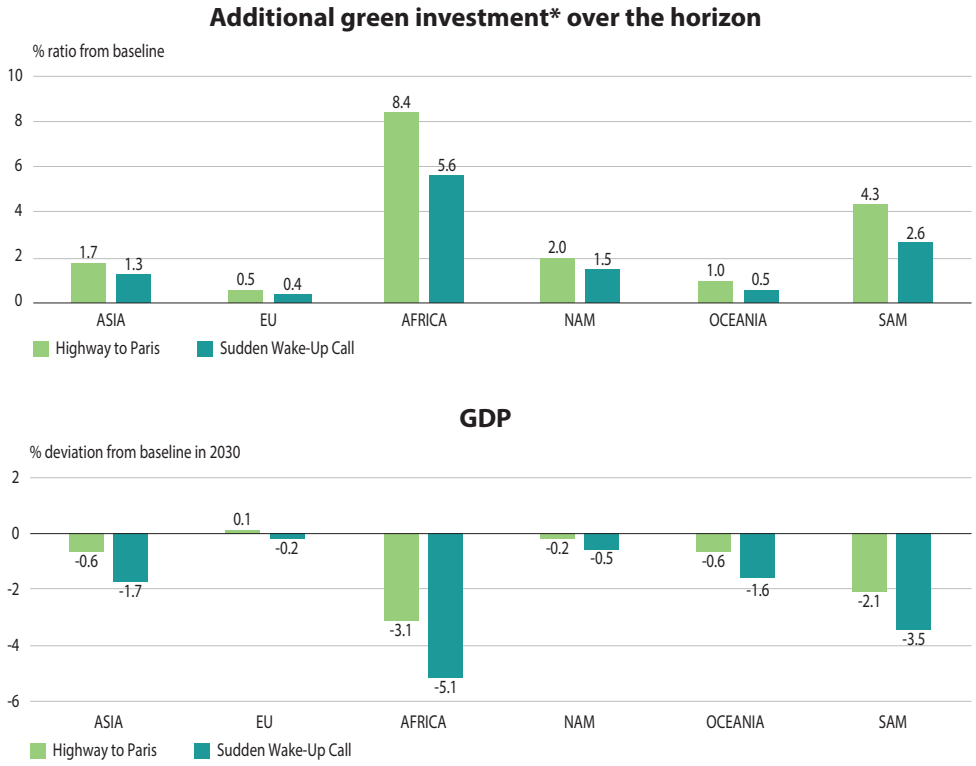




GDP impacts by region

Regions and countries with less ambitious climate policies in the baseline face greater challenges in terms of required additional investments and the impact of transition policies on growth.

- In an **orderly transition** under *Highway to Paris*, increased green investments drive faster technological advancement and result in smaller transition-induced GDP losses. Regions that have already committed to ambitious climate policies experience lower costs associated with the transition.
- In a **sudden transition** under *Sudden Wake-Up Call*, investments do not result in faster technological progress and GDP is impacted negatively across all regions, but with comparatively milder impacts in countries with ambitious climate policies in place.



* It is important to note that effective investments in some regions, like Africa, depend more strongly on effective access to affordable and favourable international financing conditions, like blended finance instruments, and strong guarantee mechanisms to mitigate investment risk, not explicitly represented in the models.

Inflation and monetary policy

Central banks face a surge in inflation due to higher (shadow) carbon prices. A delayed transition leads to a larger inflationary spike and a stronger monetary policy response.

Price levels and policy rates are shown as differences from Baseline. The data shown are the year-on-year inflation rates of the final quarter of the year. The EIRIN model provides quarterly frequency (which will be available on the IIASA portal).

The central bank sets the policy rate according to a Taylor rule, consistent with the ECB's New Area-Wide Model II (NAWM) based on Coenen *et al.* (2023) and Coenen *et al.* (2019; 2023), which takes inflation and output gap as driving variables (see more details in the technical documentation).

Financial sector dynamics

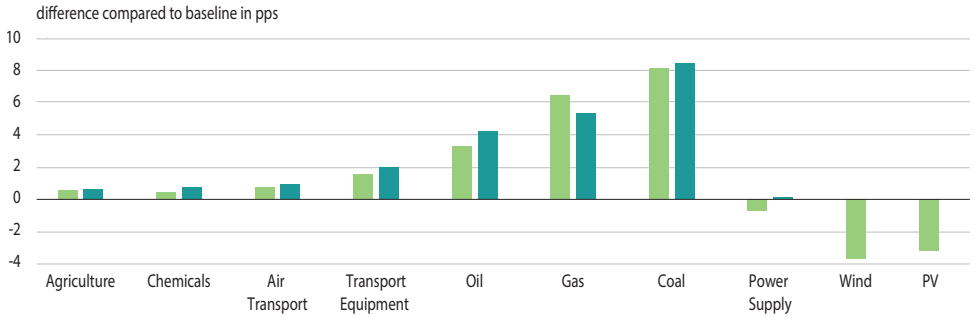
Financial risks increase for high-emission sectors, driven by higher costs and worsening investor expectations. Early and coordinated transition mitigates financial risks for green sectors by fostering investment stability and market confidence.

- **High-emission sectors** experience higher capital costs and higher probabilities of default, driven by
  (i) increased expenses stemming from (shadow) carbon prices and
  (ii) investors adapting their expectations to the high cost of transition of these sectors.

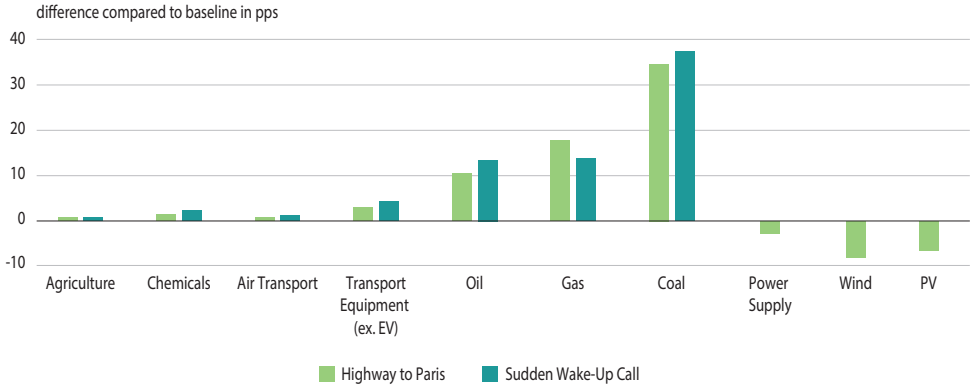
- In ***Highway to Paris***, green subsidies lead to a reduction in capital costs for green sectors.

- This development is absent in ***Sudden Wake-Up Call*** due to lower carbon revenue recycling in this scenario. As a result, a larger portion of the required funding must be raised by the private sector. This, alongside a more restrictive monetary policy environment, leads to higher associated capital costs.

Cost of Capital*, 2030 – World



Probabilities of default, 2030 – World



* Weighted average of cost of capital financed from debt and financed from equity.

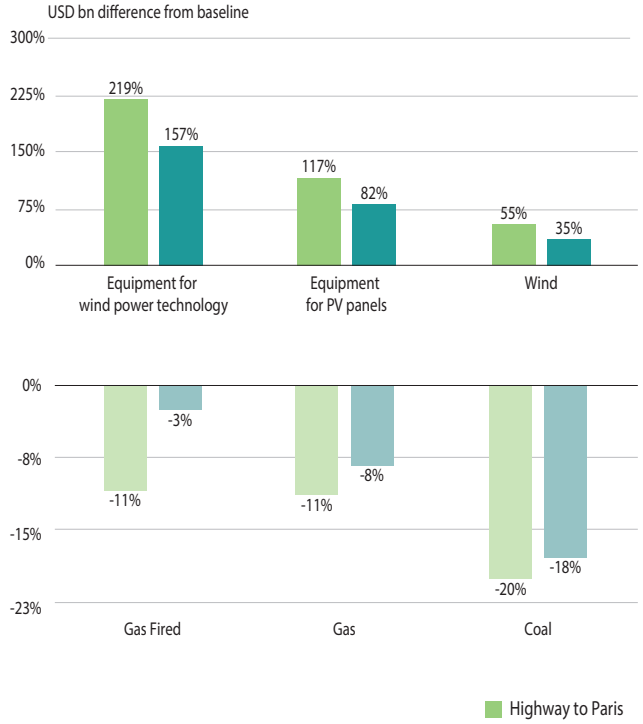
Trade and production

Green transition sectors see an increase in production and exports globally, while sectors not contributing to the green transition experience a decline in production and traded shares.

- **Green sectors** and the power supply sector see a surge in production and traded volumes related to renewable energy.
- In contrast, **high-emission sectors** face a decline in both production and traded volumes.

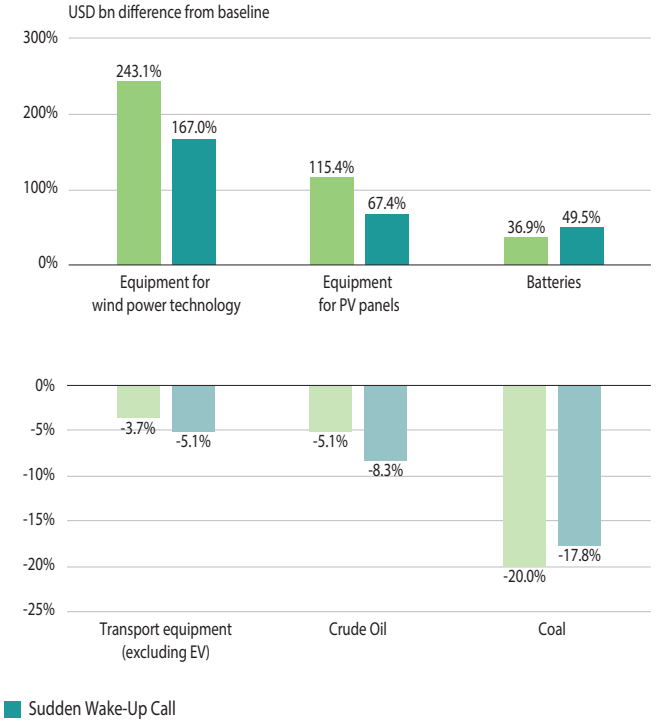
Production* – World

most positively (top) and most negatively (bottom) affected sectors (by 2030)



Exports* – World

most positively (top) and most negatively (bottom) affected sectors (by 2030)



Highway to Paris Sudden Wake-Up Call

*The sectors with marginal initial production in Baseline have been left out to improve readability.

Main results of the NGFS short-term scenarios

Physical Risk Scenario: Disasters and Policy Stagnation

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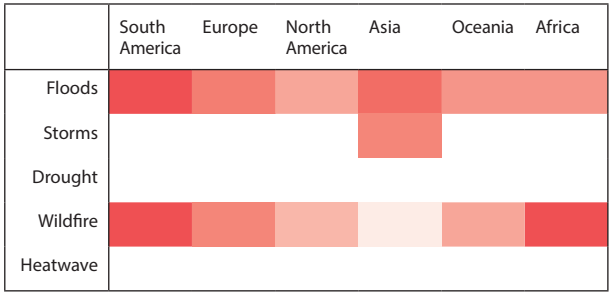
Disasters and Policy Stagnation – Overview of the results

A sequence of severe compound climate shocks can cause substantial and lasting GDP losses in the affected regions, with effects on the global economy through trade and financial linkages.

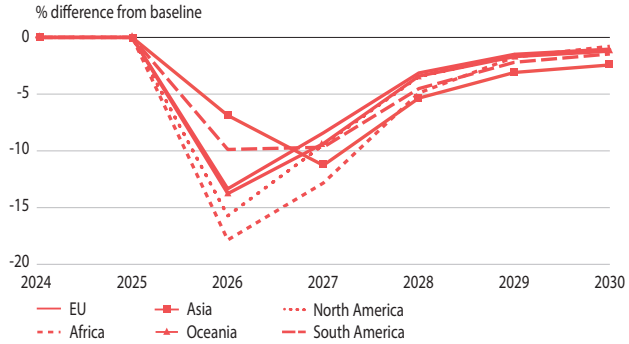
Effects on Power Supply sector

(darker color indicates larger loss of productive factors)



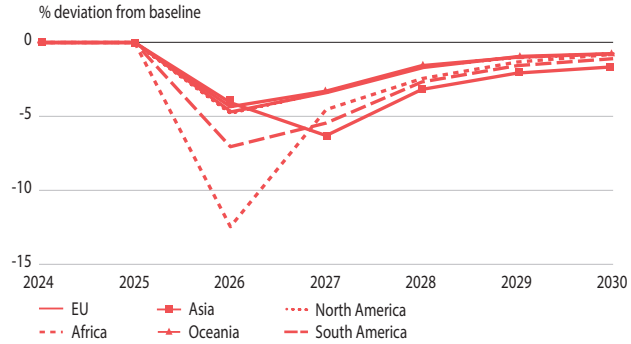
Investments

Effects on regions from own shock

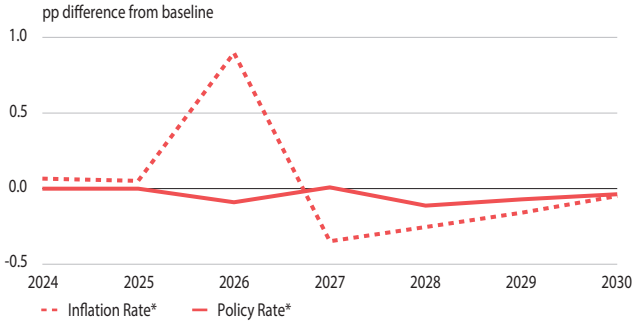


GDP

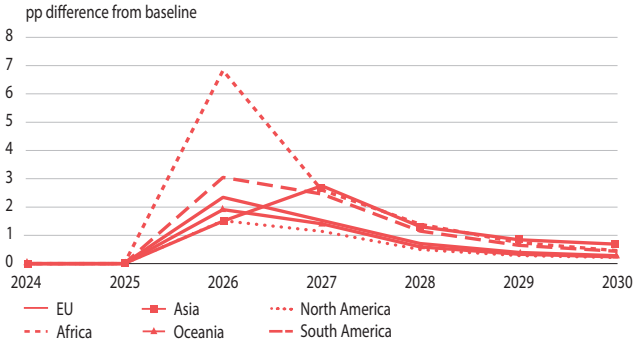
Region impacted by own shock



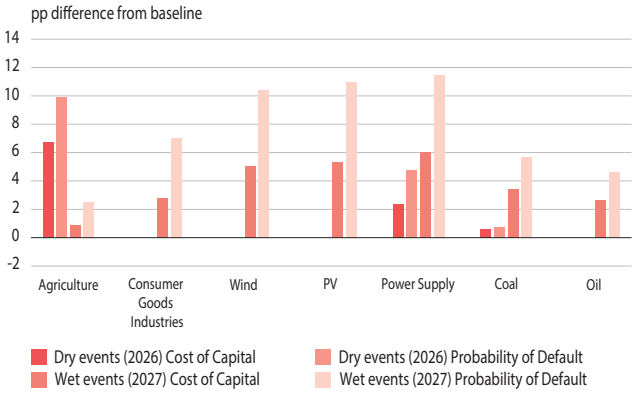
Inflation & Policy Rates – World



Unemployment Rate (%)



Probabilities of Default and Cost of Capital – World

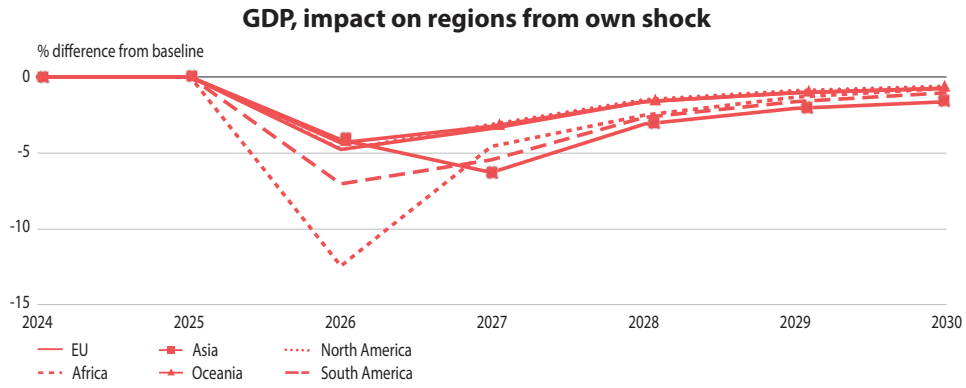


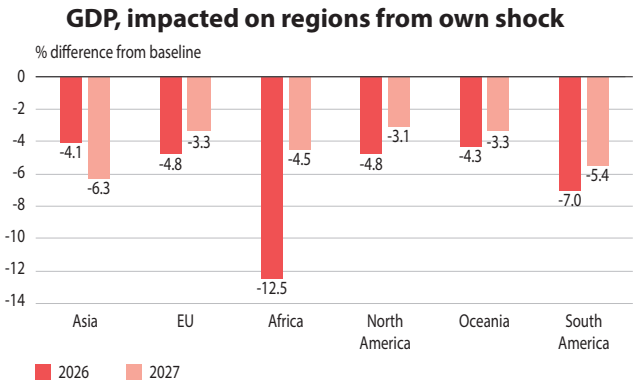
* *Disasters and Policy Stagnation* is shown here as a global weighted average of a region being domestically impacted by disasters.

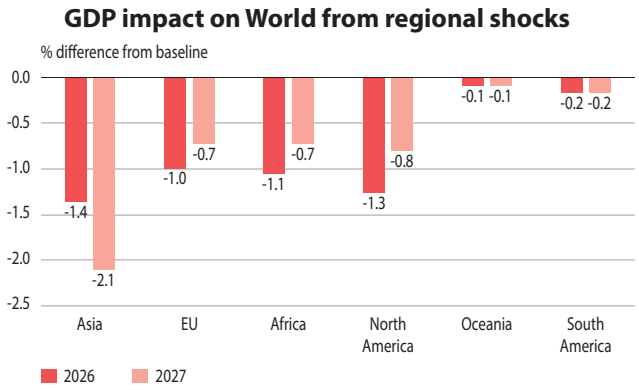
Macroeconomic effects (1)

Compound and extreme weather events significantly impact economic growth in the year of the shocks, followed by a slow recovery in the years that follow.

- **Africa, South America, Europe, Oceania, and North America** withstand stronger shocks in 2026 from heatwaves, droughts and wildfires, with the former two regions being very severely affected.
- **Asia** is the most affected in 2027, from impacts of **floods and storms***.
- **Effects at global level** are most sizeable in the scenario of extreme weather events hitting Asia in both 2026 and 2027, due to the importance of the region in the global economy and the strong effects of the events on the region.







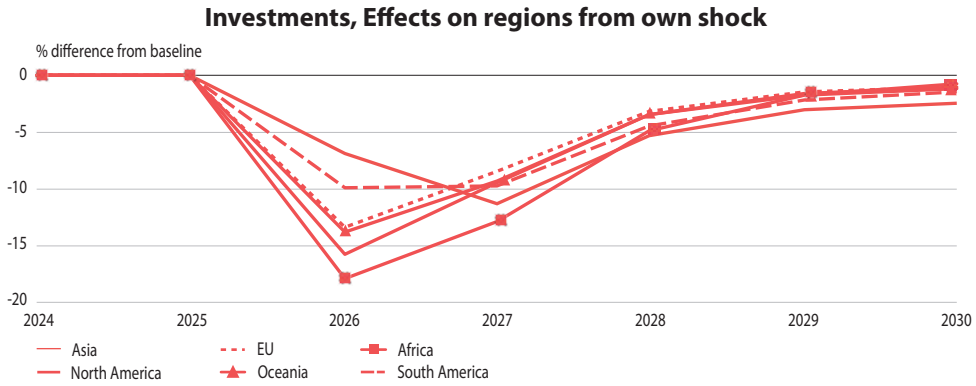
* As expected in the case of compound events, 2027 effects cannot be interpreted as a sole effect of the disasters of that year because they are also influenced by the previous year's events.

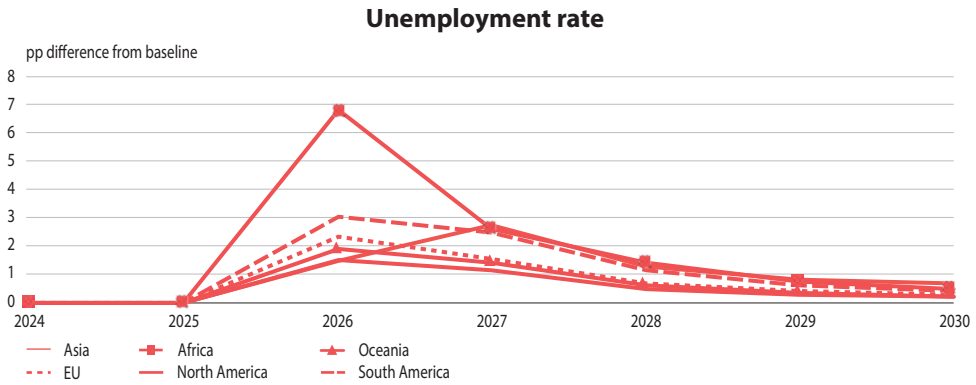
Macroeconomic effects (2)

Extreme weather events cause a fall in investments and spike in unemployment. Following the disasters, investments recover and partially offset the previous reductions.

- **The extreme weather events cause a decrease in investment** levels in 2026, which rebounds starting in 2027 for most regions but remains at lower levels relative to the baseline. **Asia** is more severely hit by floods and storms, which further delays the investment recovery to 2028.

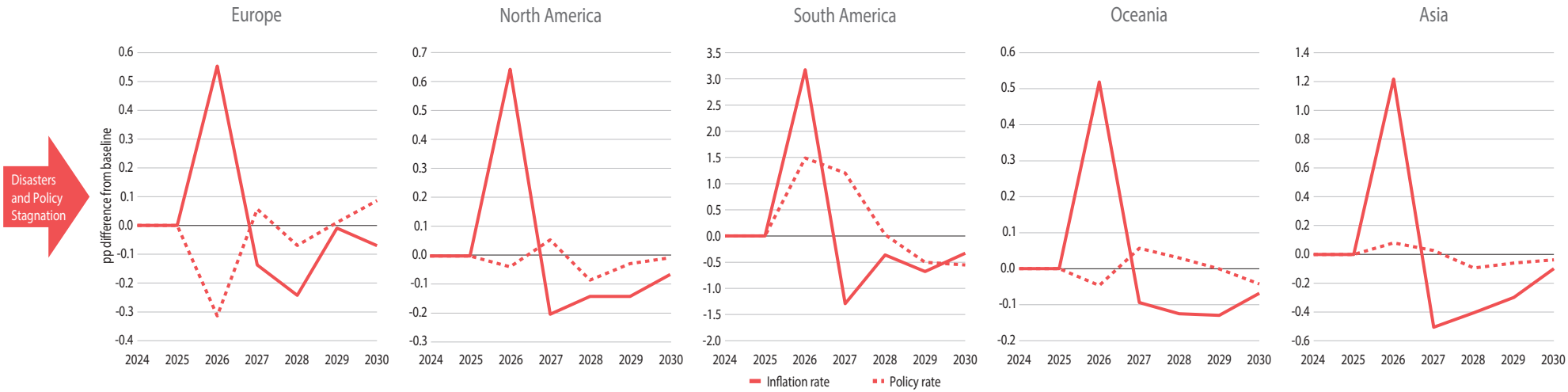
- **Unemployment rates** initially increase and subsequently stabilise at slightly higher levels. Effects in **Africa** are stronger than in other regions. In **Asia**, impacts are strongest in 2027.





Inflation and monetary policy

Compound extreme weather events constrain supply, leading to inflationary pressures stemming from higher production costs.



- **Drought-Heatwave-Wildfire** events cause sharp reductions in production, leading to an increase in prices. Central banks' responses range from tightening to accommodative or neutral, driven in part by the significant GDP gap created by this set of events.

- **Flood-Storm** events also lead to supply constraints through capital destruction and additionally weaken consumer demand. Together with weakened demand following previous extreme weather events, this results in deflationary episodes.

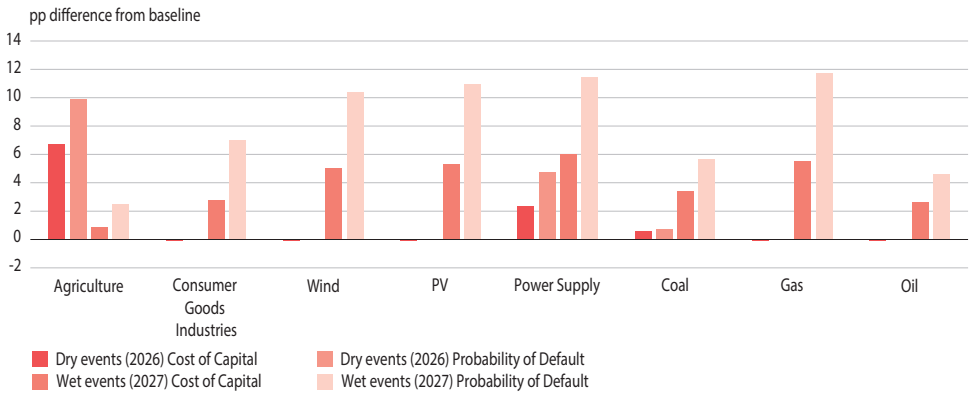
Price levels and policy rates are in differences from Baseline. The data shown are the year-on-year inflation rates of the final quarter of the year. The EIRIN model provides quarterly frequency (available on the IIASA portal).

Financial sector dynamics

Extreme physical risk events lead to an increase in the cost of capital and default probabilities across sectors, particularly in agriculture and capital-intensive sectors.

- The **agricultural sector** is the hardest hit financially by physical risk, with **dry events** causing high productivity losses and driving up cost of capital and default probabilities.
- **Wet events** raise financial risk across sectors due to production losses and capital destruction.
- The **power supply** sector is significantly impacted by both **dry and wet events**, making it particularly vulnerable to physical risk*, despite its crucial role in the green transition.

Probabilities of Default and Cost of Capital – World**



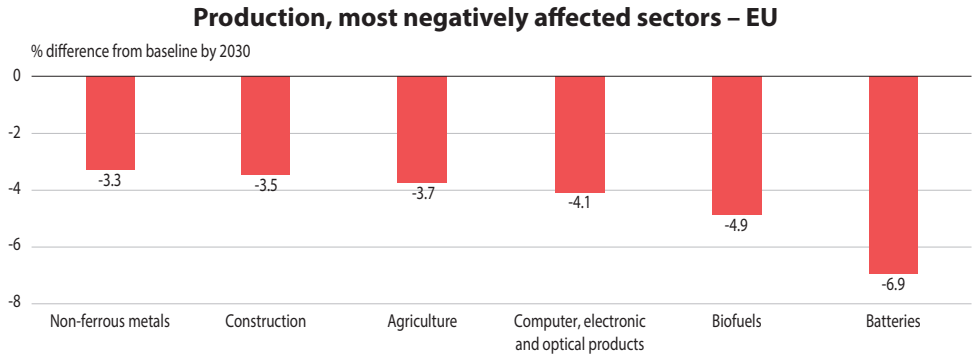
* The power sector (similarly to other capital-intensive sectors) can be particularly vulnerable to physical risk due to (i) high capital intensity, that makes it particularly vulnerable; (ii) high debt to capital ratio (sectoral average) that leads to large financial amplification of shocks.

** In Disasters & Policy Stagnation, prices and financial variables (PDs shown here) **do not have a global aggregate**, hence are shown as a global (GDP) weighted average of direct impacts on regions affected by extreme weather events in the 6 alternative scenario variants.

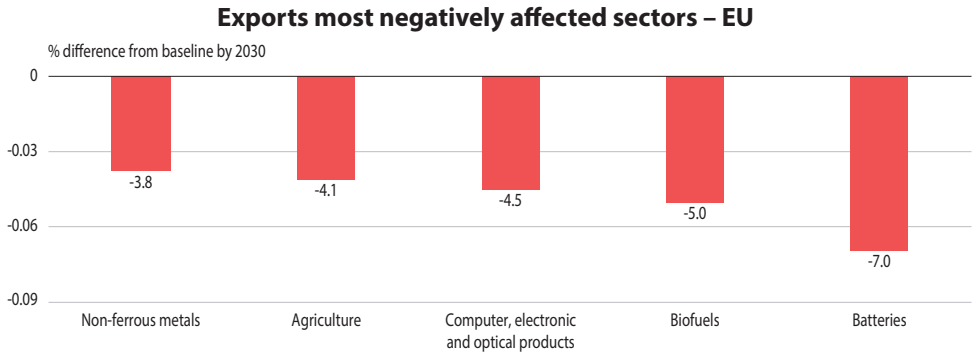
Trade and production

Extreme weather events have strong negative impacts on both production and exports of the affected region.

- Following extreme weather events in Europe, the **production** for some sectors in Europe drops significantly by almost 7% compared to the baseline, following infrastructure destruction.



- **Exports** decrease in particular for products relying on complex technologies and chemicals.



* The above charts refer to Europe and European physical shock for readability.

Main results of the NGFS short-term scenarios

Transition and Physical Risk Scenario: Diverging Realities

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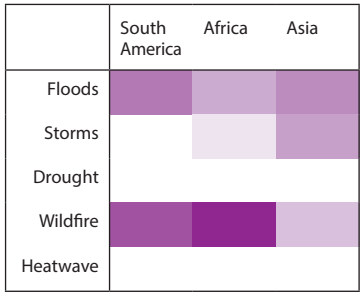
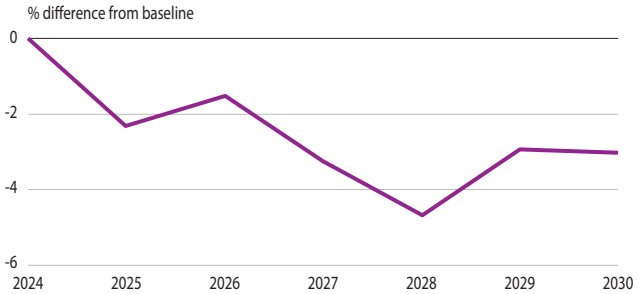
Diverging realities – Overview of the results

Intensifying climate hazards in some regions lead to shortages in the supply of critical minerals needed for the successful green transition in advanced economies. Risks spillover across countries through trade and financial linkages.

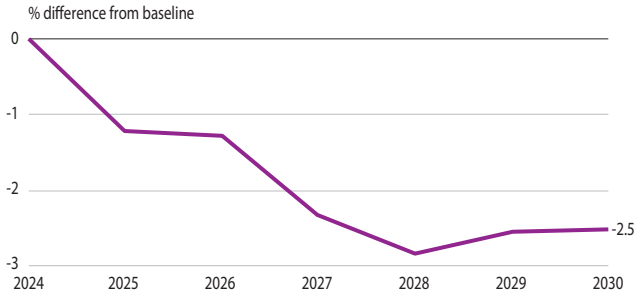
Weather effects on Power Supply sector
(darker color indicates larger loss of productive factors)



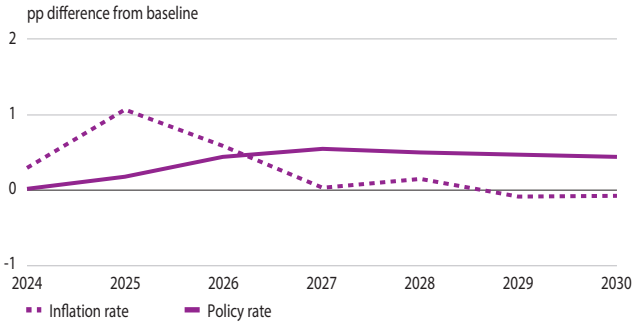
Investments – World



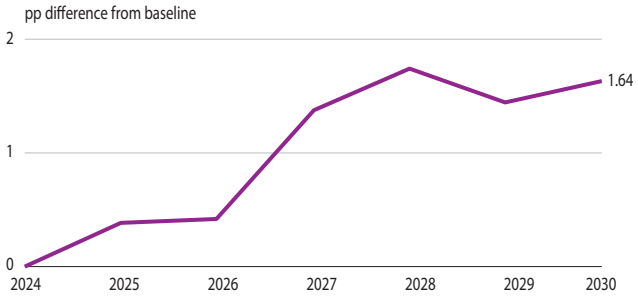
GDP – World



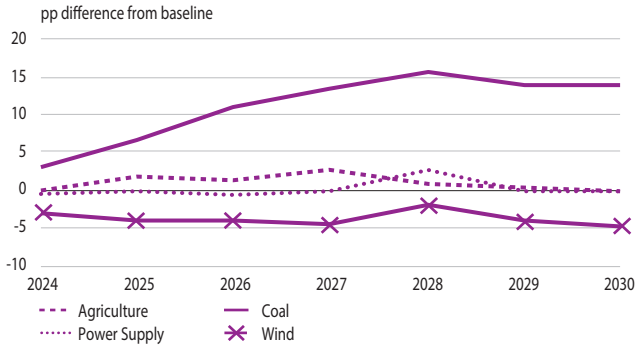
Inflation & Policy Rates – World



Unemployment Rate – World



Probabilities of Default – World

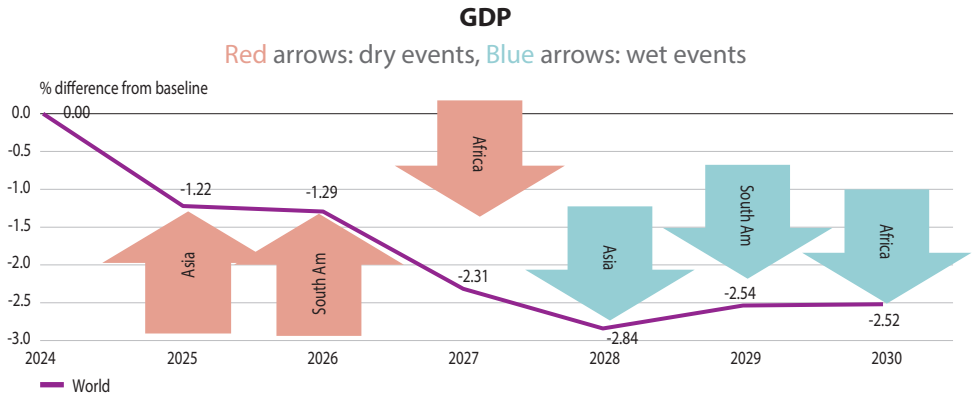


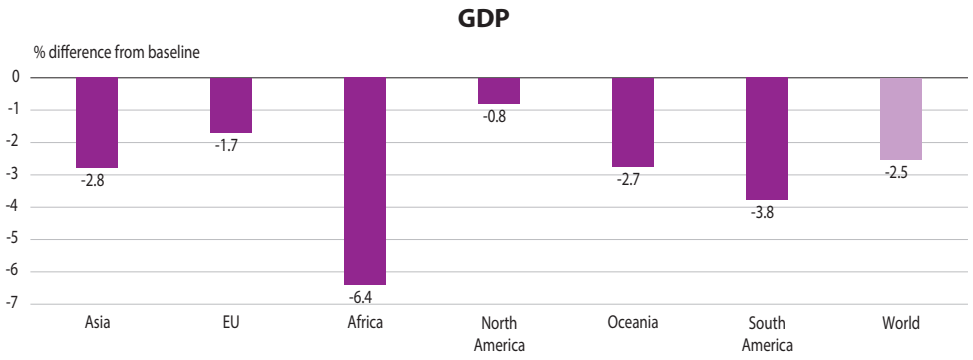
All figures refer to world economy.

Macroeconomic effects

The effects of a sequence of adverse weather events in some regions spill over to other regions, while advanced economies face the costs related to transition.

- Regional disasters hitting specific regions affect the world economy through **trade and financial linkages**. Advanced economies already bearing transition costs are further impacted by supply chain disruptions in critical raw materials needed for the transition*, lowering trade and production.
- **Africa, South America and Asia** suffer the strongest economic shocks, being directly affected by a wave of adverse weather events, combined with global effects of disasters elsewhere.
- **North America, Europe and Oceania experience less pronounced but still sizeable GDP losses.** These regions still sustain the cost of the green transition and are additionally affected by supply chain interruptions of critical raw materials.
- **Global GDP** is severely hit and does not recover within the scenario horizon, due to ongoing physical disasters.





* Impact on Batteries, EV Transport Equipment, Equipment for wind power technology, Equipment for PV panels, Equipment for CCS power technology.

Inflation and monetary policy

Regions affected by extreme dry events are initially subject to inflationary pressures stemming from higher production costs. Advanced economies implement transition policies and are affected by global supply constraints, which also leads to inflationary pressure.

- **Dry weather events** in Asia and South America* create significant price increases (occurring 2025 and 2026 respectively). **Wet weather events** generate more moderate price impacts (2028 and 2029 respectively) as demand is dampened following earlier physical events.

- **Transition efforts**, hampered by the effects of extreme weather events abroad and supply chain interruptions, drive inflation and monetary policy response in the advanced economies.

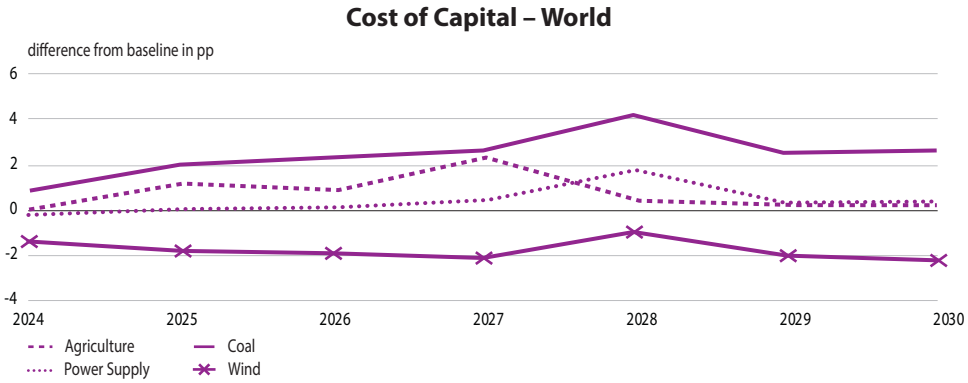
Price levels and policy rates are differences from Baseline. The data shown are the year-on-year inflation rates of the final quarter of the year. The EIRIN model provides quarterly frequency (available on the IIASA portal).

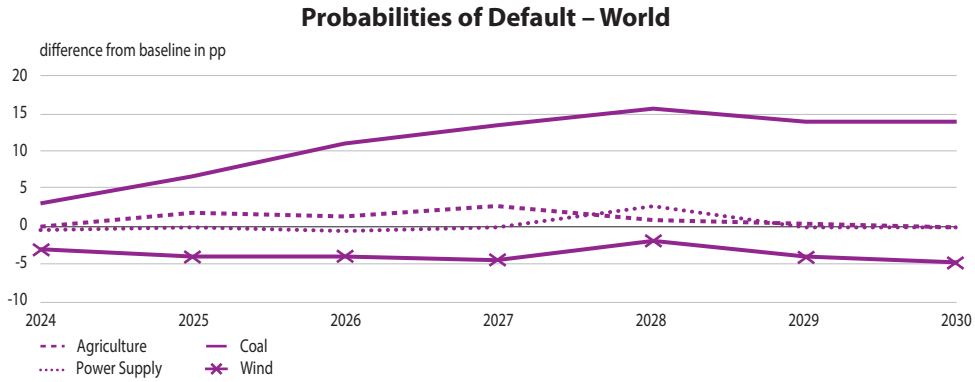
* Africa is also struck by severe weather events, but this region is not covered by the monetary policy model (EIRIN).

Financial sector dynamics

Financial risks in the Diverging Realities scenario increase due to extreme weather events, leading to the most adverse impacts for the agriculture and power supply sectors. High-emission sectors are also negatively impacted by the partial implementation of transition policies.

- **Dry events** from 2025 to 2027 lead to a considerable increase in capital costs and default probabilities for the **agricultural sector** globally.
- On the other hand, from 2028 to 2030, **wet events** increase financial risk more strongly* for the **transport, power supply** and **consumer sectors** as well as **high-emission sectors**.
- While **green sectors** are also affected by extreme weather events and supply chain limitations, the capital intensive and high-emission sectors are more strongly impacted due to the additional effects of transition policies in advanced economies.





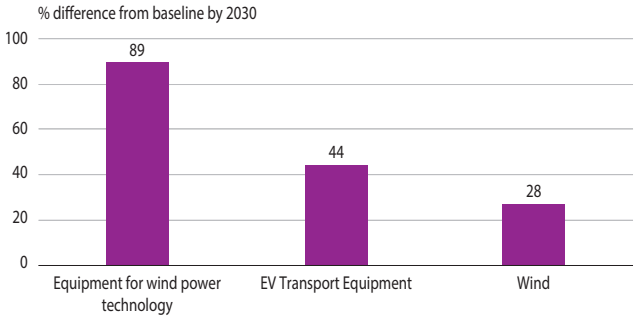
* Large impacts in 2028 are driven by the fact that wet events occur in Asia, which is a large producer of many affected goods (e.g. coal). Furthermore, capital intensive sectors are particularly vulnerable to infrastructure destruction from wet events.

Trade and production

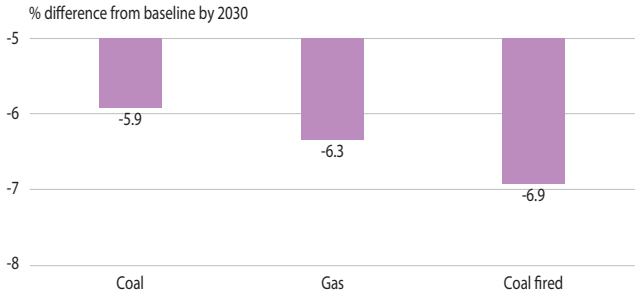
The transition continues to be pursued by advanced economies, but due to supply chain interruptions, production and trade of green equipment is lower than in the transition scenarios.

- **Production of green energy equipment** is about half the level of transition scenarios, with goods affected by supply chain interruptions particularly hampered (in particular batteries, equipment for EVs, wind power technology, PV panels and CCS power technology).
- **Trade is also at lower levels** when compared to transition scenarios, with particularly negative effects on green transition equipment, due to the supply chain interruptions.

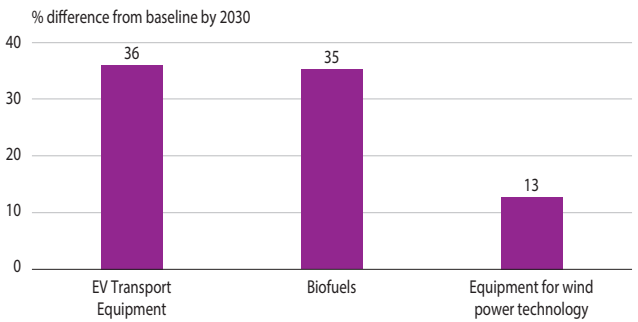
Production, most positively affected sectors – World



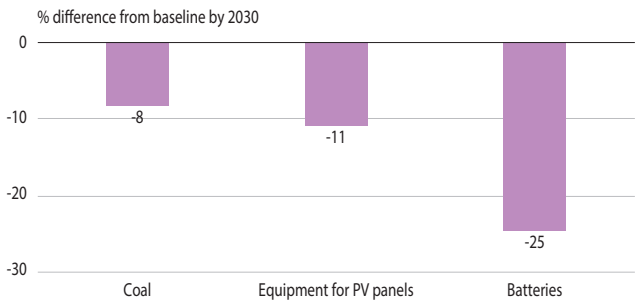
Production, most negatively affected sectors – World



Exports, most positively affected sectors – World



Exports, most negatively affected sectors – World



Interactions with NGFS long-term scenarios

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Comparison with NGFS long-term scenarios

NGFS short- and long-term scenarios should be compared with caution as they explore different narratives and employ different modelling frameworks.

There are major differences between the two scenario sets, these include:

Narrative assumptions

- The two scenario sets contain unique narratives, associated policy storylines and applied shocks.
- Transition narratives may partly align, but the timing of policy differs.

Modelling frameworks and transmission channels

- The short- and long-term scenarios are based on different suites of models, each with unique transmission channels.
- The baseline for the short-term scenarios are calibrated based on the IMF's October 2023 World Economic Outlook, whilst the Phase V long-term scenarios are calibrated on the the SSP2 population and growth rate trend, IMF World Economic Outlook and NIESR baseline projections.

Physical risk and geographical locations

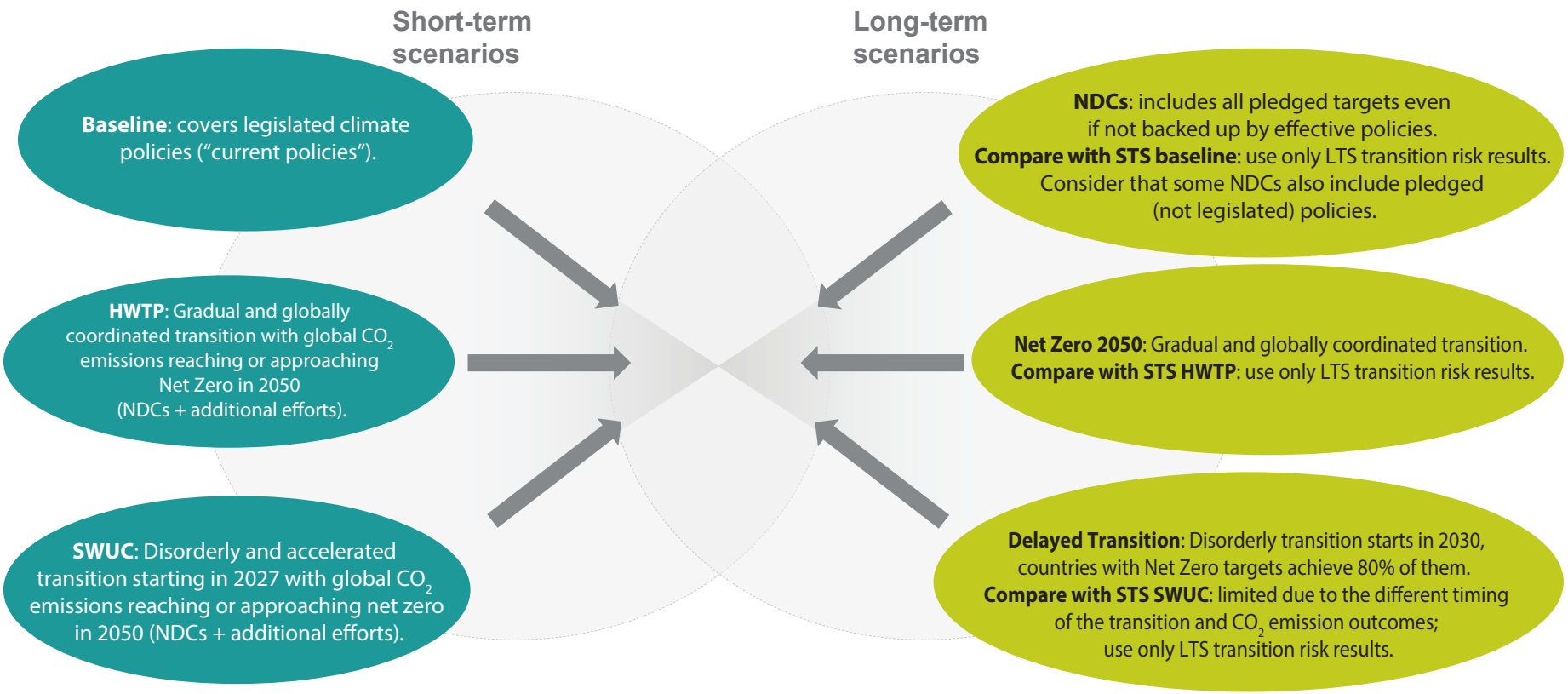
- In the short-term scenarios, physical risk is driven by specific acute compound events occurring in selected years and affecting each continent individually, while also accounting for trade and financial linkages.
- In contrast, the long-term scenarios model annual acute and chronic physical risks at the country level projecting them forward with a probabilistic approach to link them to changes in weather drivers over the longer time horizon.

Variables definitions

- While many variables are available in both scenario sets, definitions of these variables might differ.

The **carbon price** in both long- and short-term NGFS scenario frameworks represents **the marginal cost of abating the emissions until reaching the emission target**, after accounting for the explicitly modelled transition efforts (e.g. green investments, R&D). The two model frameworks however capture differently some of those important economic dynamics (e.g. R&D), leading to different levels in shadow carbon price. Additional differences come from varying timing and mixes of climate policies, modelling of technological progress and baseline assumptions.

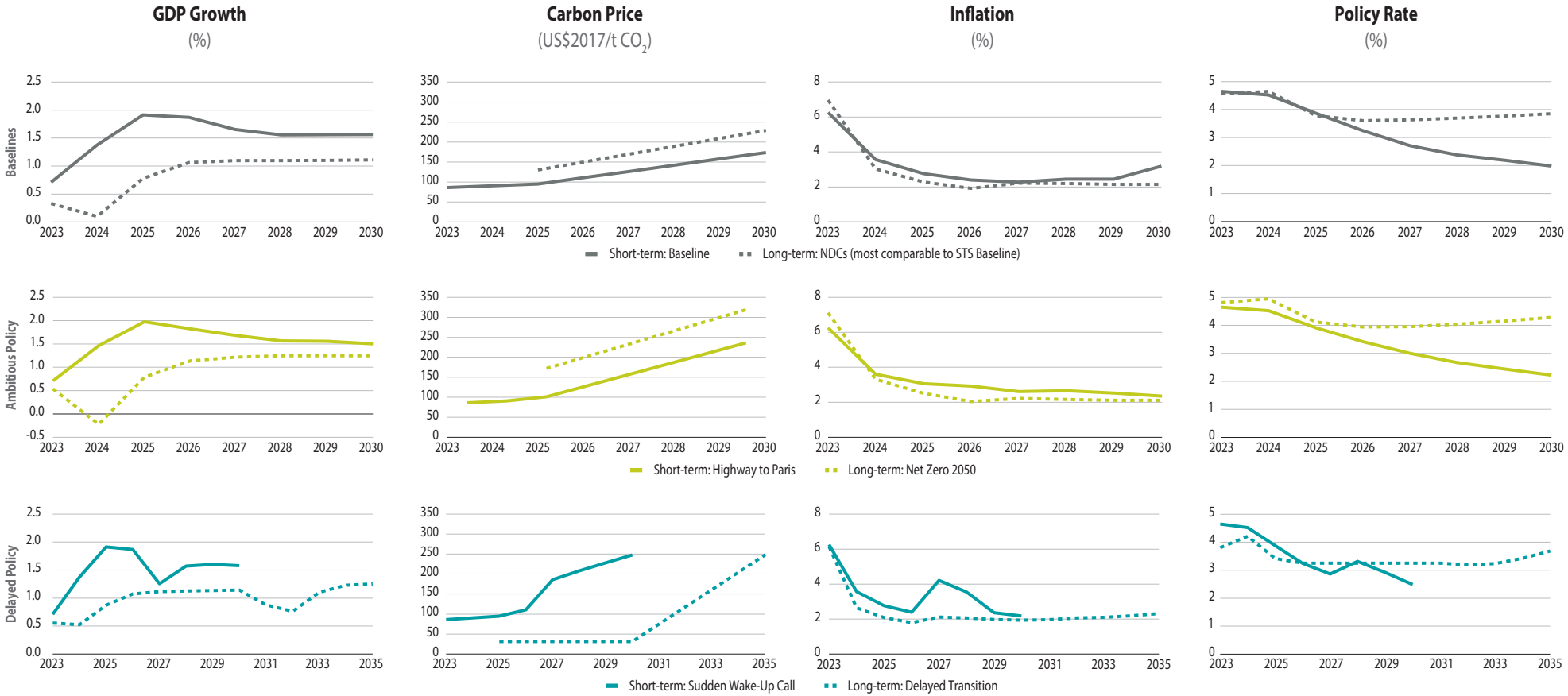
Limited comparability with NGFS long-term scenarios



* In the long-term scenario, the baseline in NiGEM is a hypothetical scenario without new climate policies and climate change impacts. The Current Policies scenarios adds physical risk to that baseline.

Comparison with NGFS long-term scenarios (Phase V)

Some variables show similarities in trajectories (see below example of Europe, dashed is long-term).



Note: For comparability, only transition impacts of long-term scenarios are shown here. Long-term carbon prices calculated at five-year intervals; thus, long-term scenario graph data starts in 2025. all data from long term scenarios are from NiGEM, based on Remind-MagPie from Phase V.

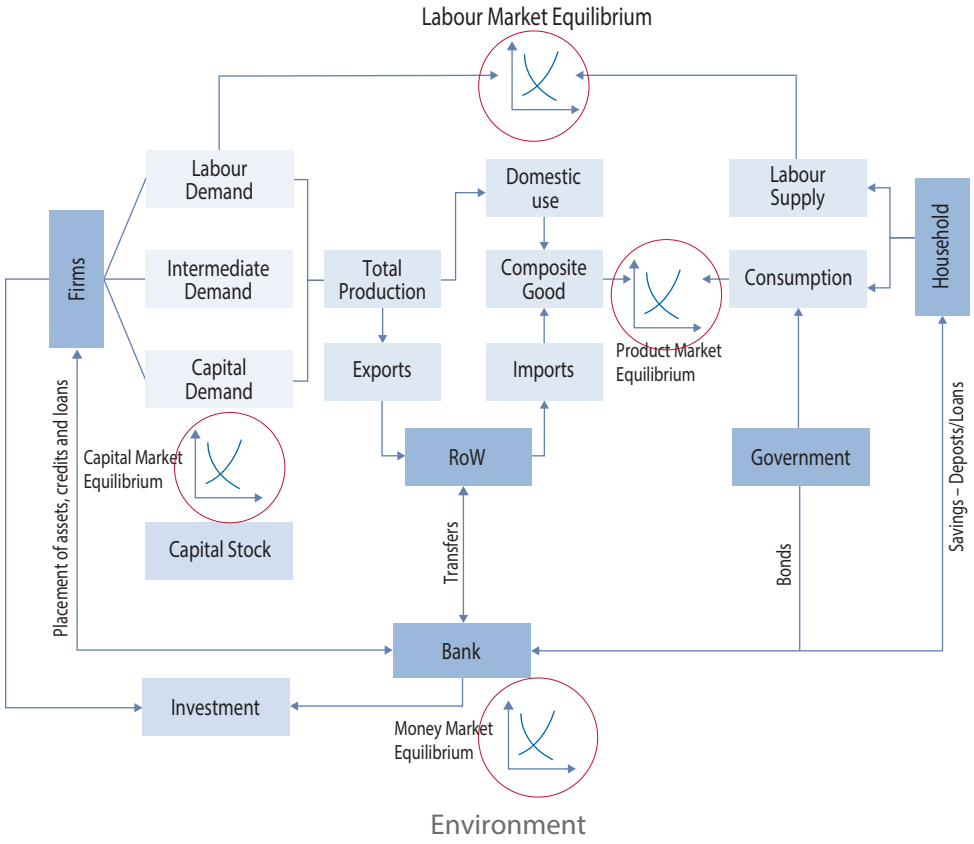
Annex

GEM-E3

A global, multi-regional/-sectoral, recursive dynamic CGE model which provides details on the macroeconomy and its interaction with the environment and the energy system.

46 countries-regions (individually representing the G20, EU27 and other major economies), whole economy aggregated to **50 economic sectors** with a bottom-up representation of the energy system:

- Discrete **power generation technologies** and T&D sectors.
- Explicit treatment of energy carriers (supply and demand) – conventional fossil fuels, biofuels, hydrogen.
- Detailed technological options for household (different heating and cooling appliances, mobility through conventional, plug in hybrid, electric vehicle etc.)
- Different **CES nesting structures** in industrial sectors considering the substitution possibilities.
- Discrete representation of the sectors manufacturing clean energy technologies (**Wind, PV, electric cars, Biofuels etc.**), featuring endogenous bilateral trade (identification of origin – destination).
- All **GHG emissions are covered** (CO_2, CH_4, N_2O, PFCs, HFCs, SF6) – combustion and process related. Explicit representation of **abatement options** for key GHG emitting industries (power sector and transport) – **Marginal abatement Cost Curves** for the rest.
- Technology **progress** is explicitly represented in the model depending on **R&D expenditure** by private and public sector and taking into account spill-over effects. **Learning by doing** effects are captured by explicit learning curves calibrated per energy technology.



CLIMACRED

CLIMACRED is a structural credit risk that produces scenario-contingent estimates of transition and physical risk.

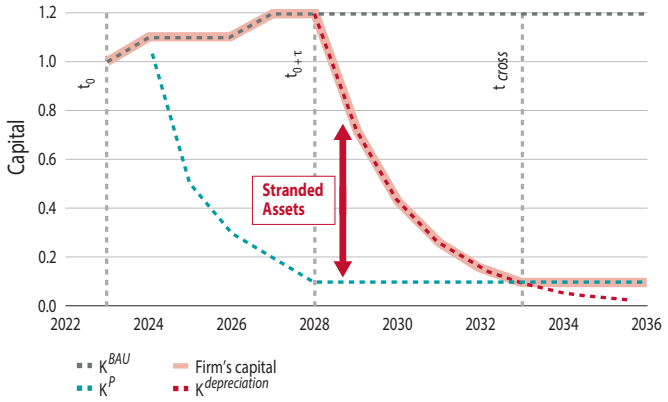
- The model simulates the evolution of the balance sheet and of the income statement of a firm and the impact of transition and/or physical risks on this evolution.
- The model is calibrated on a baseline scenario; market's expectations and the valuation of financial assets is assumed to be initially consistent with this baseline scenario.
- In a policy scenario, a fast adjustment in market expectations about the policy implementation leads to a valuation adjustment of the financial assets.
- In the case of transition risk, the asset-side of the balance sheet is impacted by asset stranding while the reduction of output reduces the cashflow and thus the financing capacity.
- In the case of physical risk, the destruction of productive capital diminishes the assets of the firm and/or increases its debt because of reconstruction costs, while business interruptions reduce the cashflow.

Effect of stranding on the trajectory of capital in a simple case

$$PD_t^{BAU} = P(A_t^{BAU} \leq L_t^{BAU})$$

$$PD_t^{S} = P(A_t^{S} \leq L_t^{S})$$

$$\Delta PD_t = PD_t^{S} - PD_t^{BAU}$$



$$\sum_{\text{Hazard type, asset}} \{\text{Exposure} \times (\text{Hazard} \mid \text{Climate scenario, time horizon}) \times \text{Vulnerability}\}$$

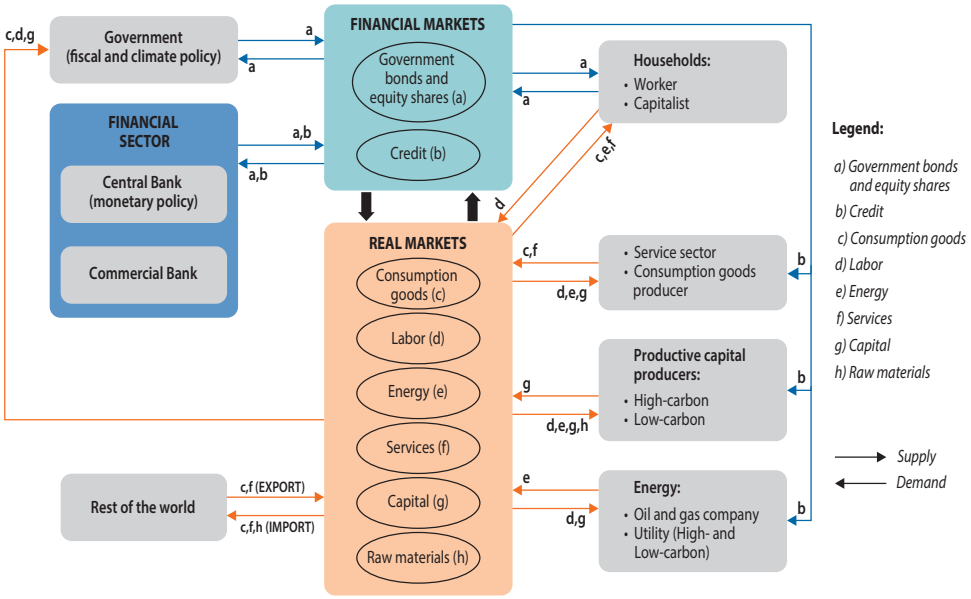
Economic value and geo-localization of asset exposed	Probability $P(h,a\|C,T)$ of occurence of hazard h on asset a, conditioned to climate scenario S and time horizon T	Damage-given-hazard intensity based on geography and sector specific damage functions

EIRIN – the model

- Stock-Flow Consistent macro-financial model, open economy, calibrated at the country/regional level.
- Limited number of heterogeneous agents and sectors (source of income and wealth, skills, access to finance, high/low-carbon capital) interacting through markets (e.g. financial market, energy, goods, services).

Agents, sectors and markets of the EIRIN economy

Grey boxes: agents and sectors. **Light blue box**: financial markets.
Orange box: real markets. Outgoing arrows: supply. Incoming arrows: demand.



Main features:

- Captures **financial sector dynamics** and finance-macro feedbacks *via* risk assessment.
- Differentiates impact across high vs low-carbon investments; high *vs* low resilience.
- Recognizes **endogenous money creation** (banks create money through lending).
- **Adaptive expectations:** agents cannot fully anticipate shocks. This, in turn, affects the magnitude of the shock in the economy and its persistency.

EIRIN – Taylor Rule and monetary policy transmission

- The central bank sets the policy rate according to a **Taylor rule**, see **ECB's New Area-Wide Model II** (Coenen *et al.* 2023).

$$R_t^4 = \omega \cdot R_{t-1}^4 + (1 - \omega) \cdot \left[R_{Base} + \psi \cdot \left(\frac{CPI_t}{CPI_{t-4}} - \Pi \right) \right] + \gamma \cdot \left(\frac{GDP_t}{GDP_{t-1}} - \Delta \right)$$

Weight of persistency in the policy rate

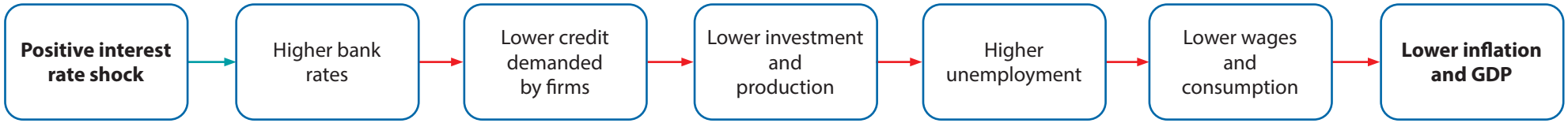
Inflation deviation from target

Output gap

- Main **monetary policy transmission channels**: a **positive monetary policy shock** leads to higher interest rates, which in turn lead to lower credit and investment, higher unemployment, lower wages and consumption, and ultimately leads to **lower inflation and GDP***.

Transmission channels of a positive interest rate shock

Green arrow: direct impacts of policy rate on bank rates. Red arrows: indirect impacts



Source: authors' own elaboration.

R_t^4: annualized short-term nominal interest rate in quarter t; ω: weight of persistency in the policy rate; R_{Base}: annualized nominal interest rate in absence of inflation or GDP growth deviations; ψ: weighting of the inflation deviation; Π: inflation target; CPI_t/CPI_{t-4}) year-on-year change in CPI; γ: weight of the output gap in the monetary authority's response; Δ: quarterly GDP growth rate target.

* The adjustments shown in the chart initiate in the quarter of the shock or the one immediately after, depending on specific behavioural rules. However, the effects of the shock continue to unfold in the following quarters.

GDP impacts in transition risk scenarios

GDP losses from transition risk are limited but vary across regions.

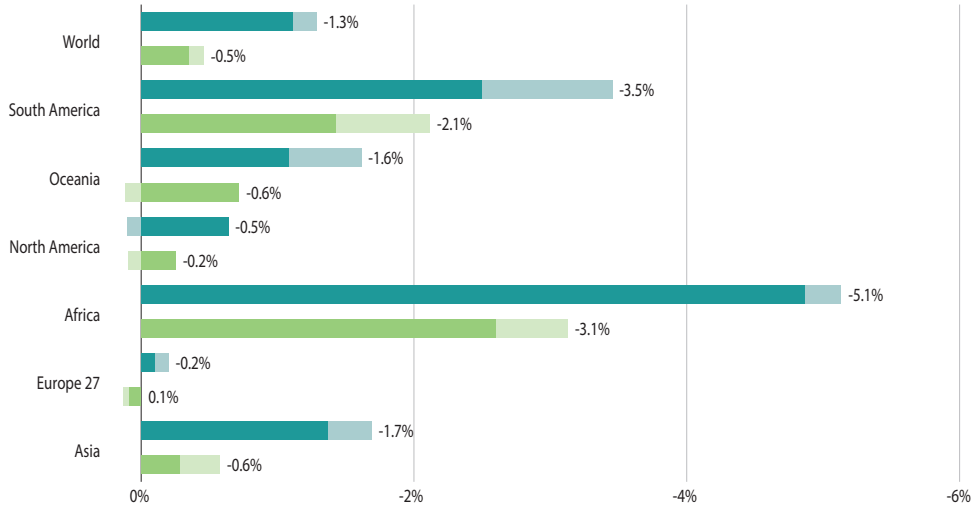
Transition risks impact the macroeconomy via both first- and second-round effects.

- **First-round real economy effects** drive the bulk of GDP impacts from transition risk as the economy adjusts to implications of an ambitious policy trajectory.
- **Second-round financial effects*** arise through ensuing financial sector adjustments and their consequences on the financing costs of sectors. They are stronger in *Sudden Wake-Up Call*, increasing GDP losses by up to 1pp (for the South America region).
- The **impact of transition risk** depends on the level of ambition of climate policies implemented in the baseline. Regions with more ambitious climate policies already in place experience a smoother transition to a low-carbon economy, when comparing to Baseline.

GDP

Highway to Paris (2030), Sudden Wake-Up Call (2030)

(First-round real economy impacts in solid, second-round financial impacts in transparent)



* The second-round financial effects are captured by the EIRIN and CLIMACRED models, capturing expectations, financial risks and monetary policy. They are modelled via changes in risk free rates and in cost of capital by sector and fed back into the final GEME3 run, providing the aggregate macro-impacts.

GDP impacts in physical risk scenarios

Due to feedback between the macroeconomy and financial markets, significant GDP losses arise in physical risk scenarios.

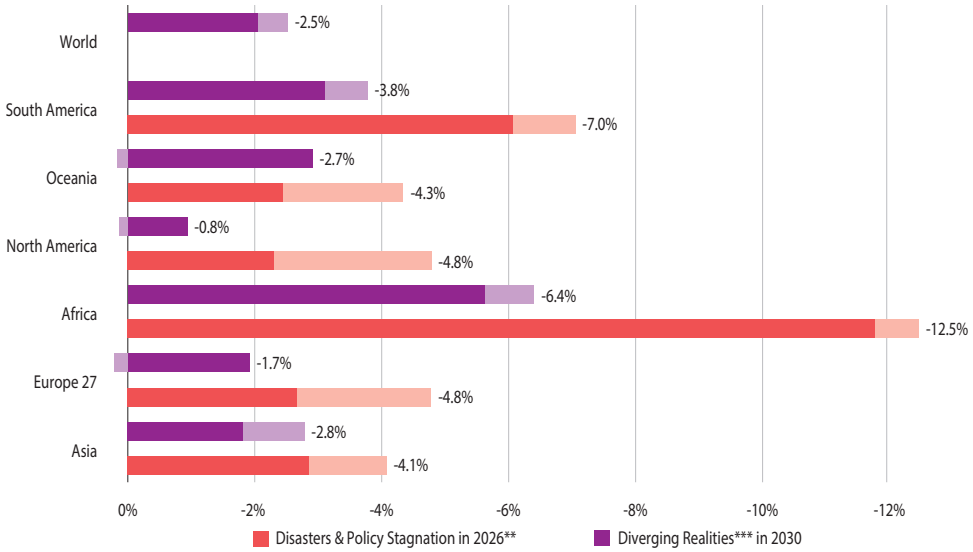
Physical risks also impact the macroeconomy via both first- and second-round effects.

- In terms of physical risk, **first-round real economy effects** and **second-round financial effects** are more even. Notably, less-developed regions are still most strongly impacted by the initial real economy effects.
- Output impacts are generally more severe for Drought-Heatwave-Wildfire events than Flood-Storm events under a *Disasters and Policy Stagnation* scenario. In the *Diverging Realities* scenario, regions not directly experiencing extreme weather events are affected due to spillovers via supply chain bottlenecks*.

GDP Impacts: Physical Scenarios

Disasters & Policy Stagnation in 2026**, Diverging Realities*** in 2030

(First-round real economy impacts in solid, second-round financial impacts in transparent)



* Regions not affected by extreme weather events in this scenario are North America, Europe and Oceania.

** The Disasters and Policy Stagnation scenario has multiple versions, one per region. In the chart, each region bar refers to the own shock to that region. For that reason, a World aggregate is not shown here.

*** Diverging realities is both a physical and transition risk scenario, as advanced economies follow ambitious climate policy.

Variable and regional aggregations

The tables below provide an overview of aggregated regions and variables.

Region	Included sub-regions GEME3 / CLIMACRED	Included sub-regions EIRIN
Asia	China, India, Indonesia, Japan, Saudi Arabia, South Korea, Turkey	China is used as the representative country.
Africa	South Africa	Not modelled
EU	Refers to the 27 countries in the European Union	Equivalent to Europe in EIRIN
North America	Canada, Mexico, USA	Canada, Mexico, USA
Oceania	Greater Oceania region	Australia, New Zealand
South America	Argentina, Brazil	Brazil is used as the representative country.

Aggregated variables	Included variables
Renewable energy investments	Biomass, Biomass Solid, Biofuels, CSS Bio, Geothermal, Hydrogen, Hydro Electric, PV, Wind
Renewable energy power generation	Biomass, CCS bio, Geothermal, Hydro Electric, PV, Wind
High-emission energy investments	Coal, Coal fired, Crude Oil, Gas, Gas Fired, Oil, Oil Fired
High-emission energy power generation	Coal fired, Gas fired, Oil fired
Other energy investments	CCS coal, CCS gas, Clean Gas, Nuclear
Other energy power generation	CCS coal, CCS gas, Nuclear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