NGFS Scenarios:

Available data and portals

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Central Banks and Supervisors
Network for Greening the Financial System

BANCA D'ITALIA
EUROSISTEMA

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Agenda

1. NGFS long-term scenarios: Data access, resources and focus on Italy
2. NGFS short-term scenarios: Data access, tools, resources and examples
3. NGFS short vs long-term scenarios: main differences

NGFS long-term scenarios:
Data access, resources and focus on Italy

Overview of resources on NGFS long-term scenarios

1

The NGFS long-term scenario documentation and data can be accessed via the following platforms:

Web resources

- NGFS Portal

Explanatory material

- Presentation and overview of the long-term Scenarios
- NGFS Scenarios Technical Documentation
- Note on damage functions & others
- User Guide
- Q&A and/or FAQ

Data

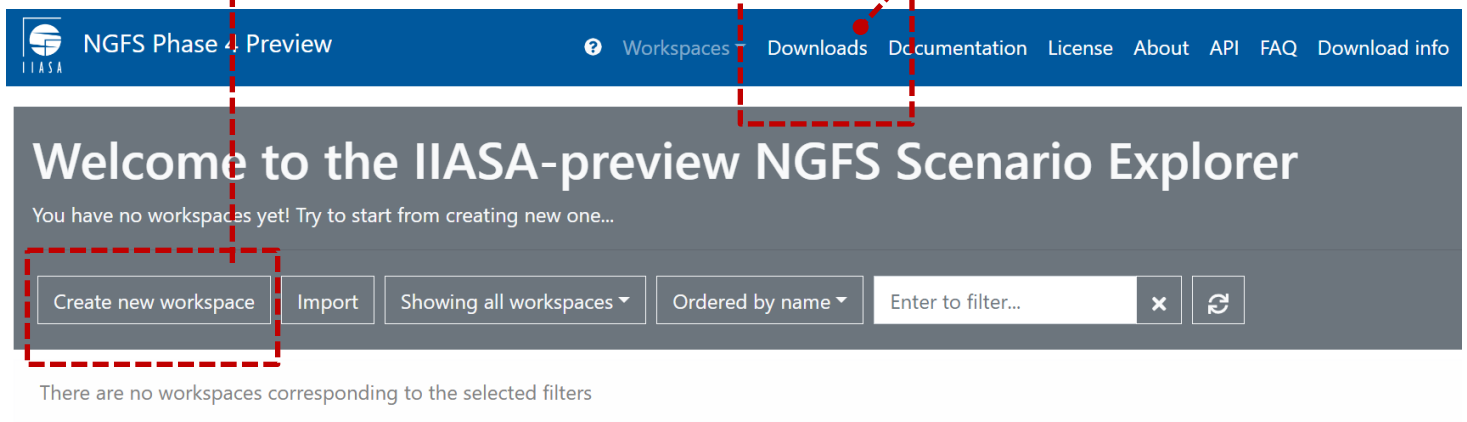
- NGFS IIASA Scenario Explorer
- NGFS Climate Impact Explorer

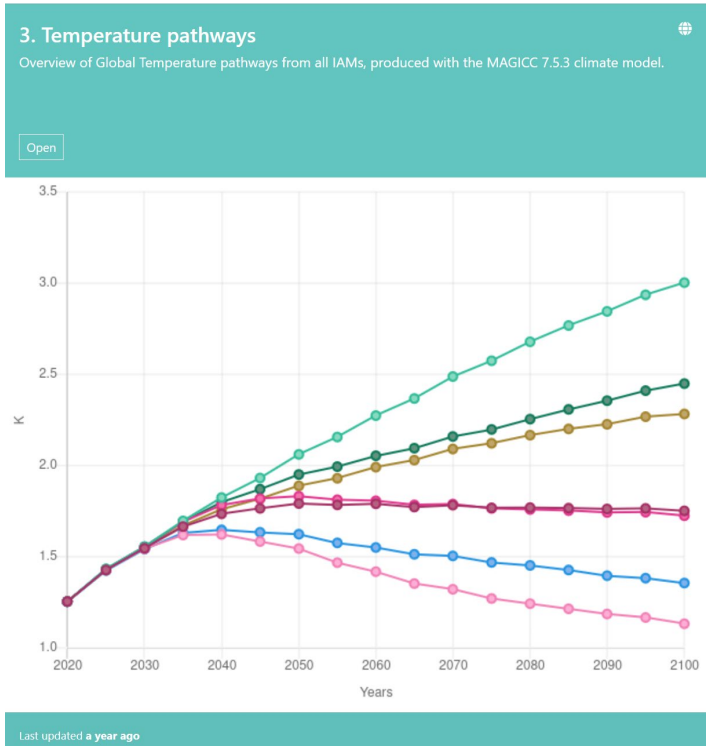
IIASA Scenario Explorer

The IIASA portal offers workspaces to select and visualize scenario data, and allows for bulk downloads of all data and documentations

Create your own workspace and start visualizing…

…or bulk download all NGFS data in csv format



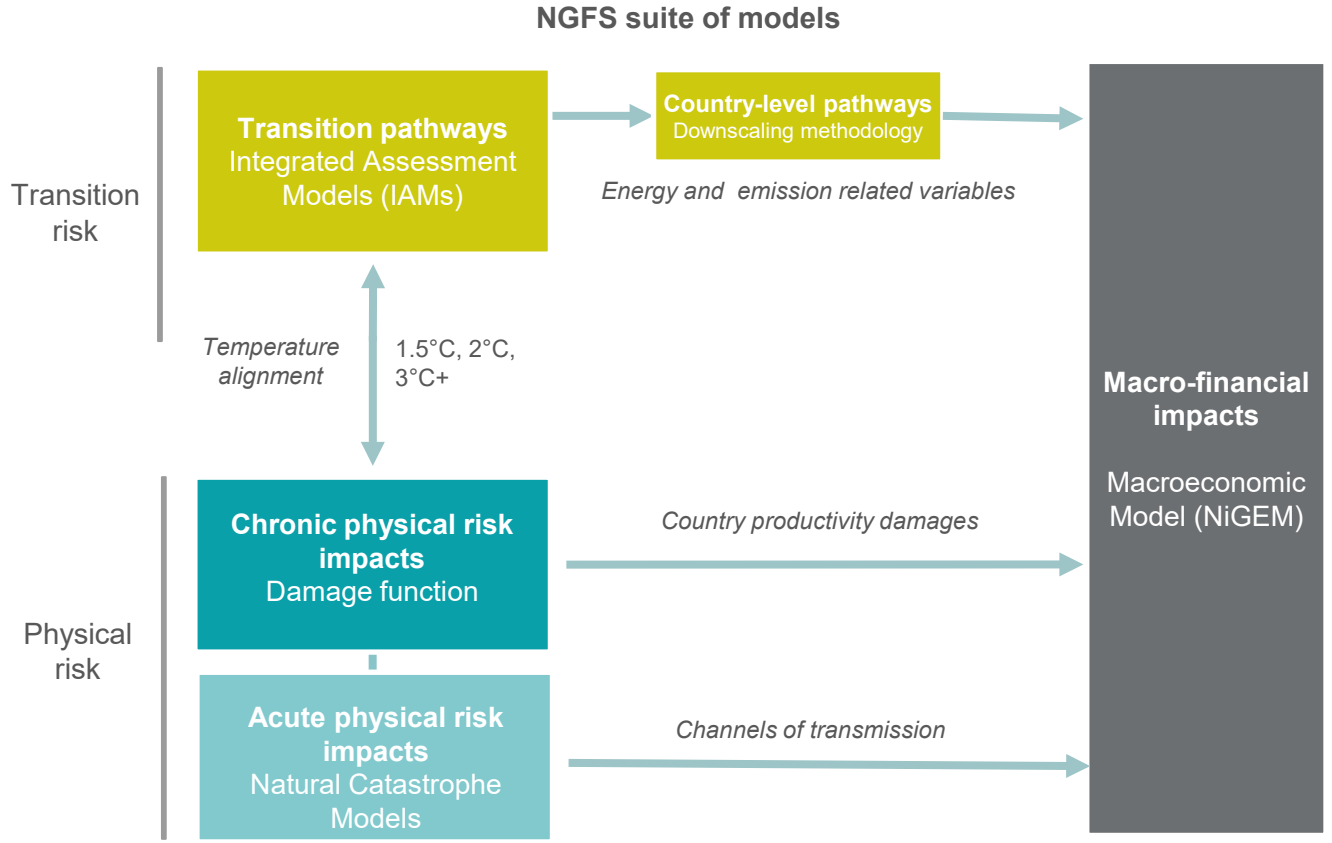


Access to the [NGFS-IIASA Scenario Explorer]

From modelling framework to data sources

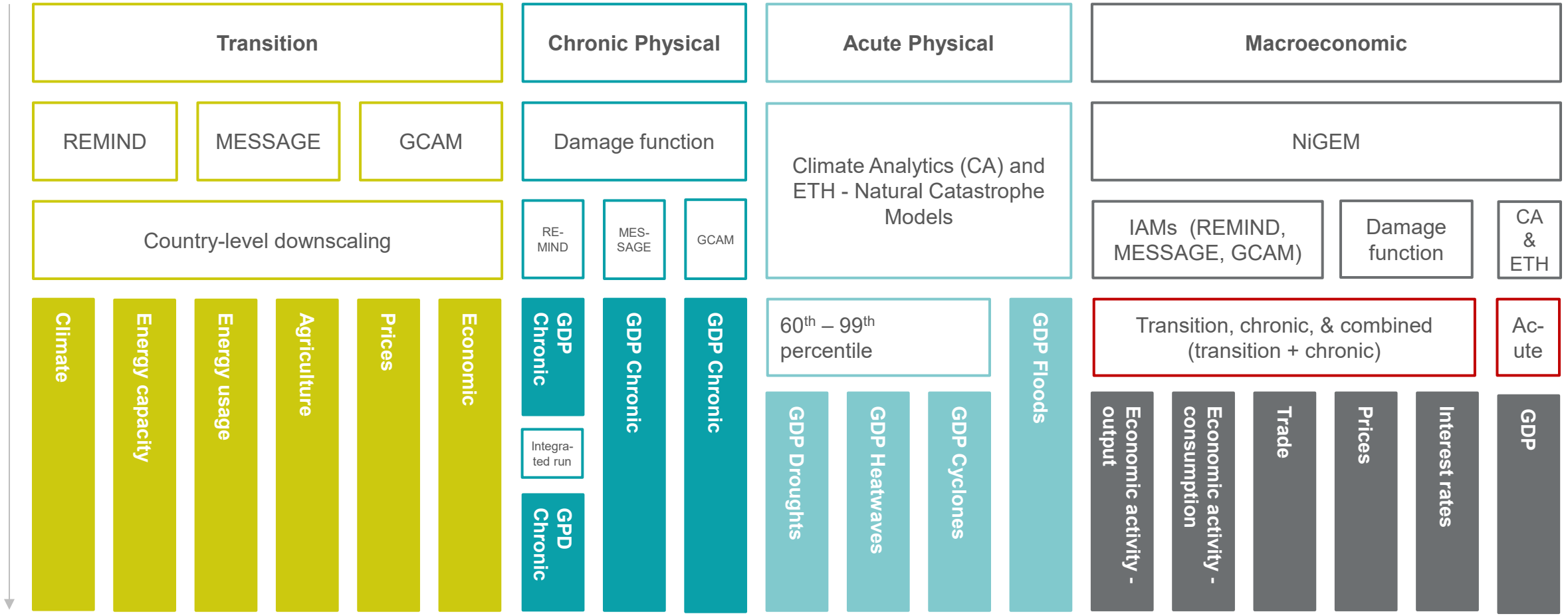
Physical risk, transition risk and macro-financial impacts are modelled separately (but consistently), producing various data sources

- **Transition variables** are separately produced by the three Integrated Assessment Models (IAMs): GCAM, MESSAGE and REMIND. These flow into the economic modelling.
- **Chronic physical risk variables** are sourced from a damage function, which is aligned with the IAMs based on the temperature pathways they produce
- **Acute physical risk** variables are generated by various Natural Catastrophe Models. They are provided to the macroeconomic model NiGEM by Climate Analytics (Phase IV)
- **Macro-financial variables** are produced by the econometric model NiGEM, based on respective IAM and physical risk inputs.

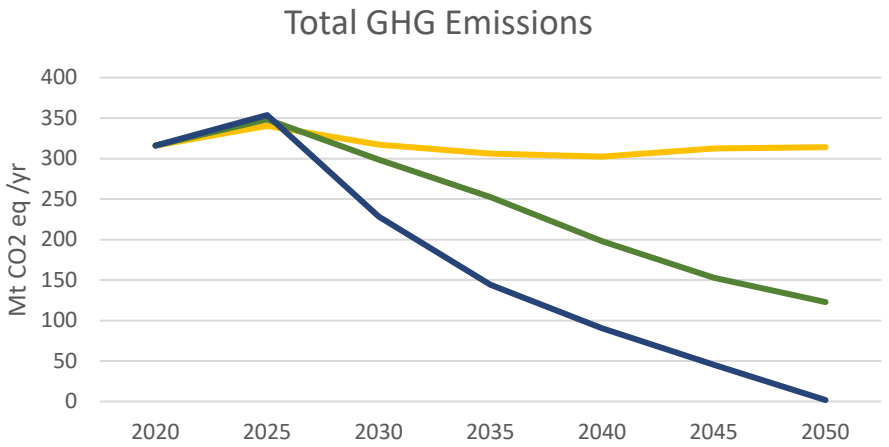


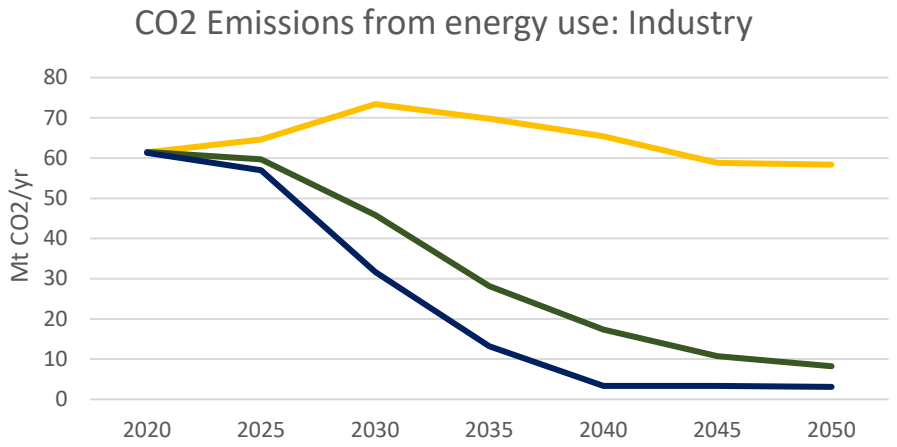
Data Available | Summary

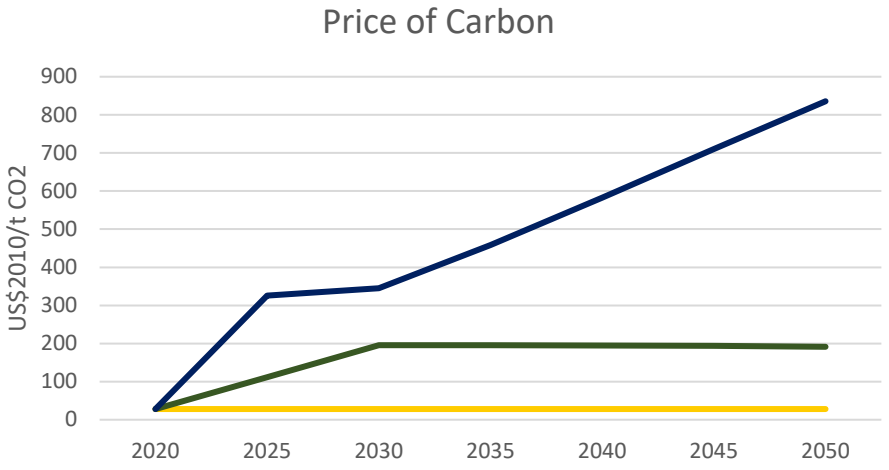
A wide variety of variables is available across multiple data sources

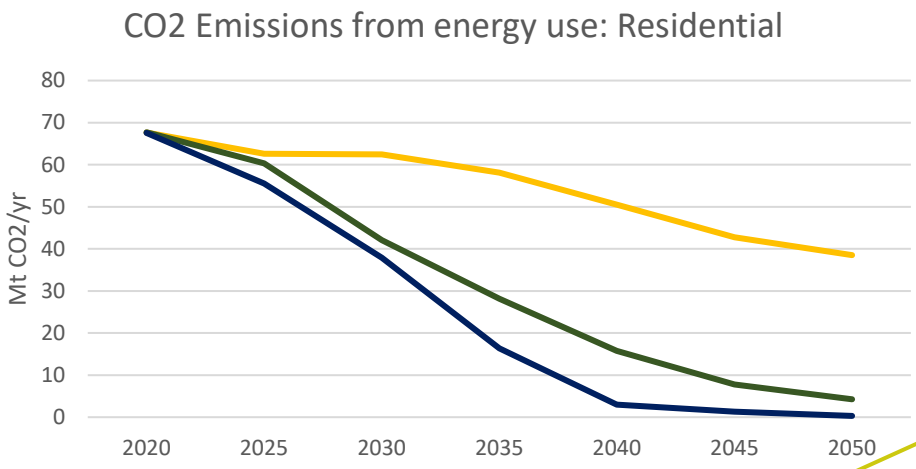


Italy: GHG and sectoral emissions







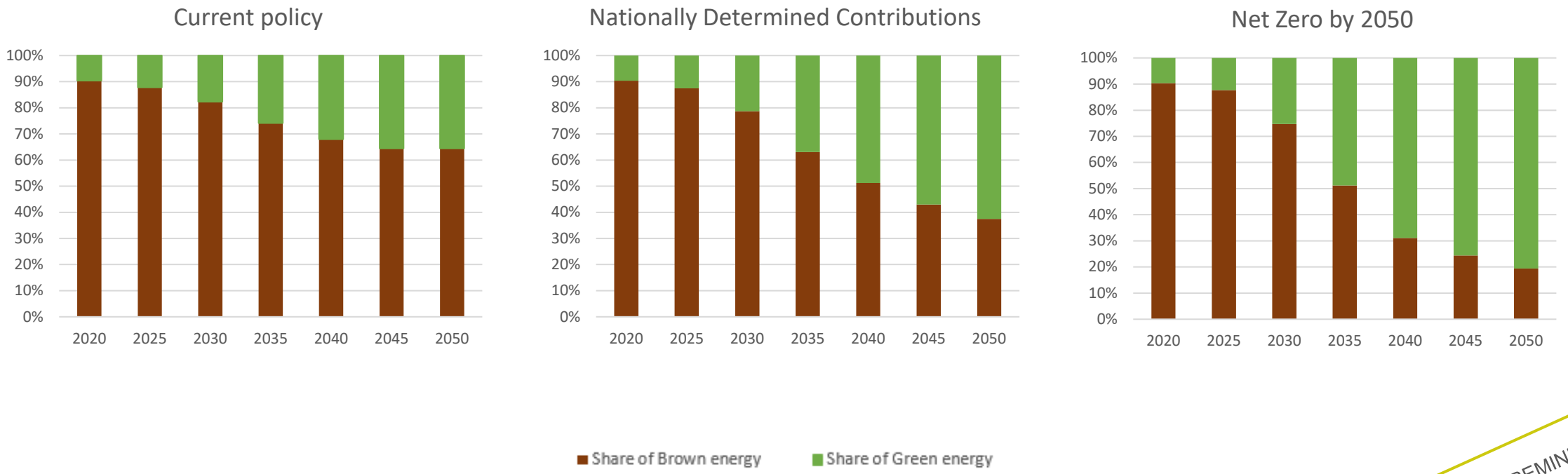


Current Policies
Nationally Determined Contributions (NDCs)
Net Zero 2050

Transition + REMIND + Italy

**Model used: IAM with REMIND. Data for Italy.*

Italy: Primary energy

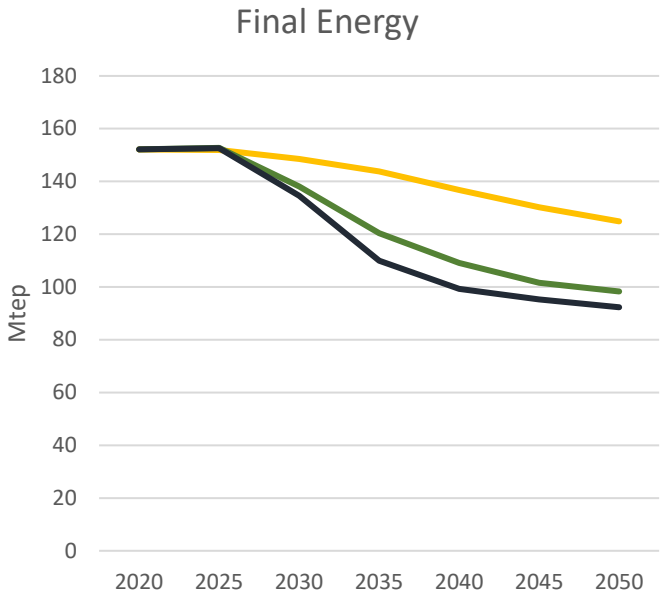


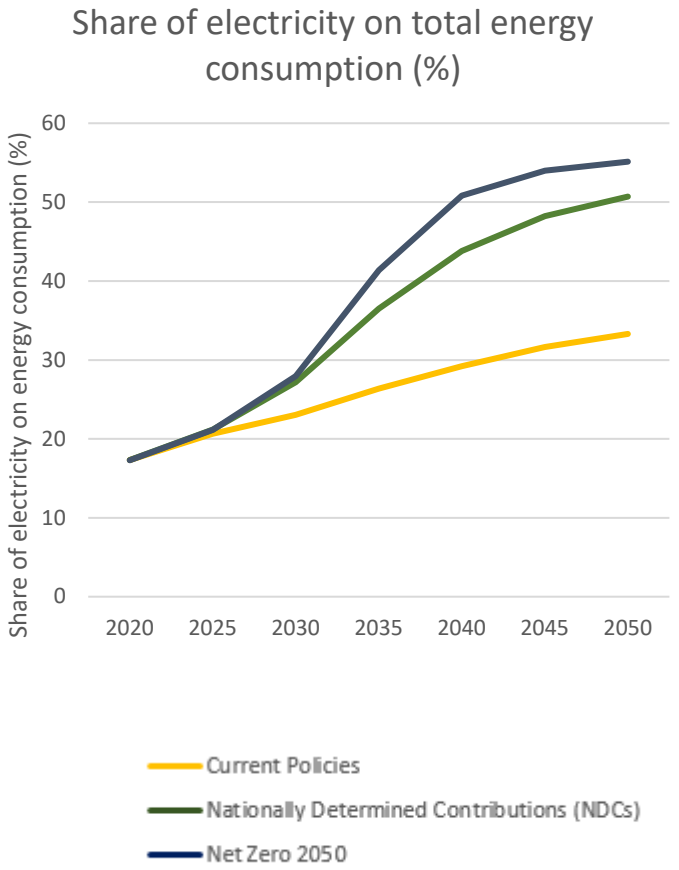
Transition + REMIND + Italy

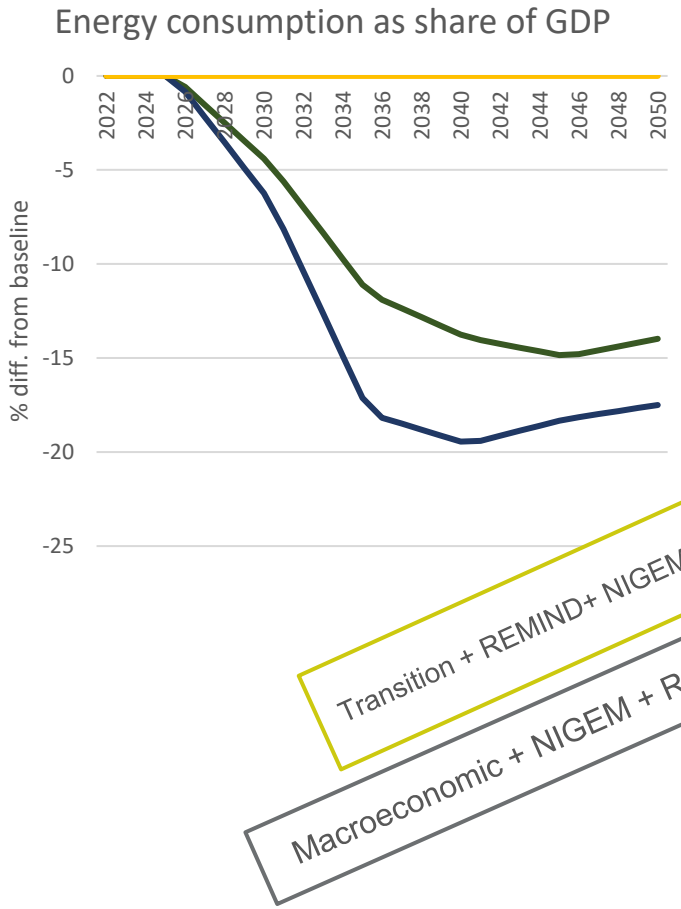
**Brown energy sources include Coal, Fossil, Oil, and Gas. Green energy sources include Biomass, Nuclear, Solar, Wind, Geothermal, and Hydro. Model used: IAM with REMIND. Data for Italy.*

Italy: Final energy

Losses and macroeconomic variables are (usually) shown relative to a 'baseline' scenario, which is a fictional scenario with no physical, nor transition risks.



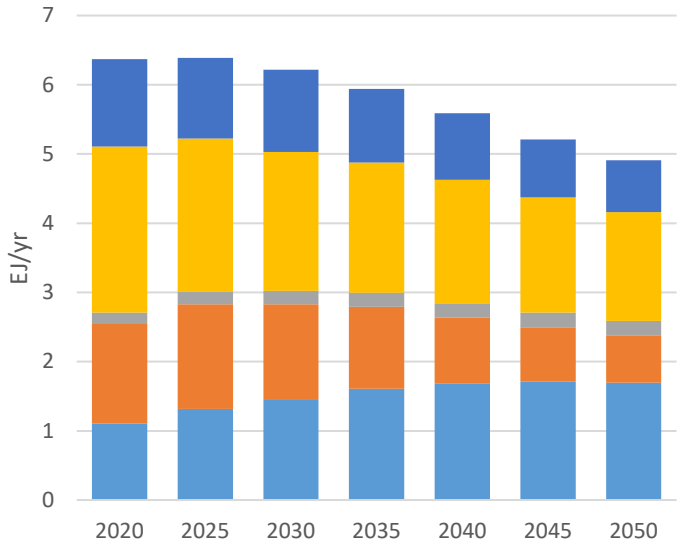




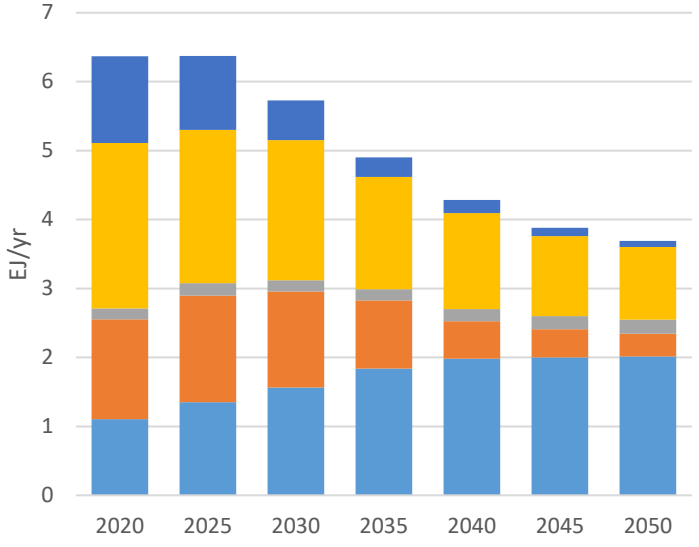
**Model used: IAM with REMIND. Data for Italy.*

Italy: Final energy mix

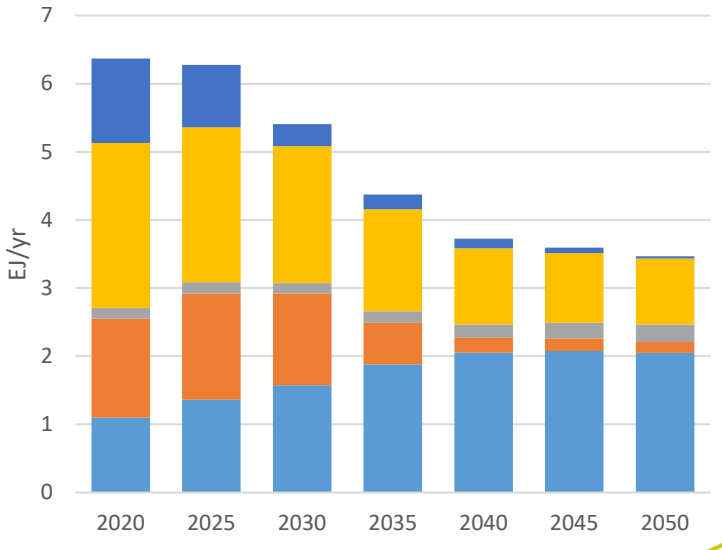
Current policy



Nationally Determined Contributions



Net Zero by 2050

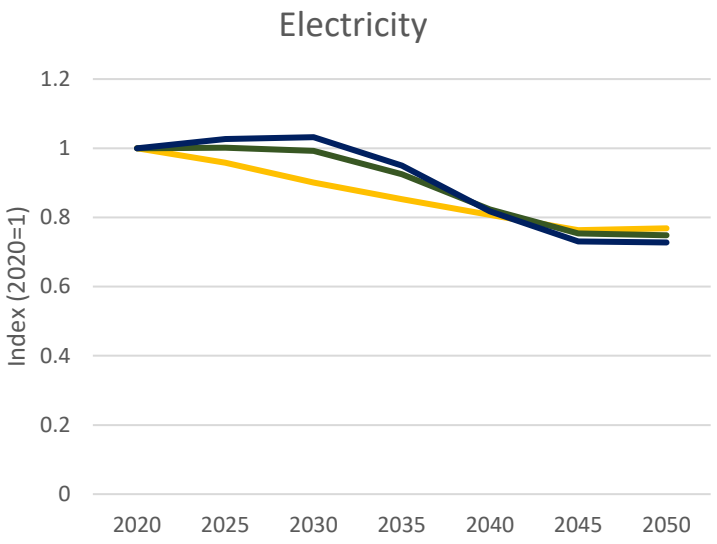


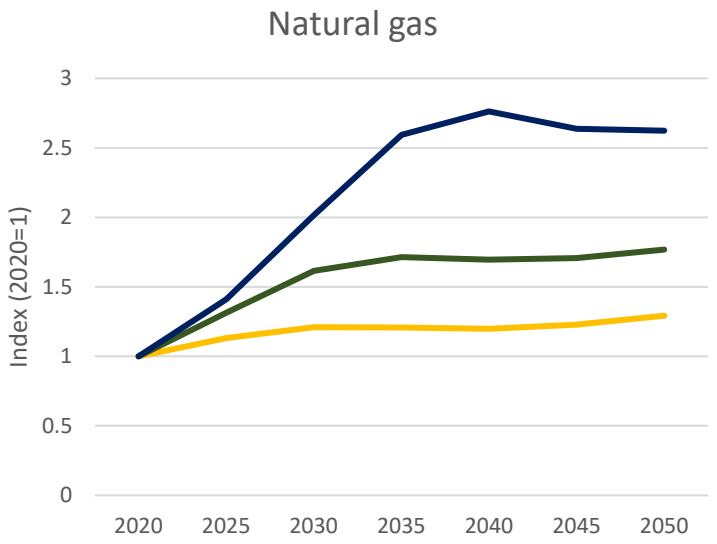
Final Energy|Electricity Final Energy|Gases Final Energy|Heat
Final Energy|Liquids Final Energy|Solids

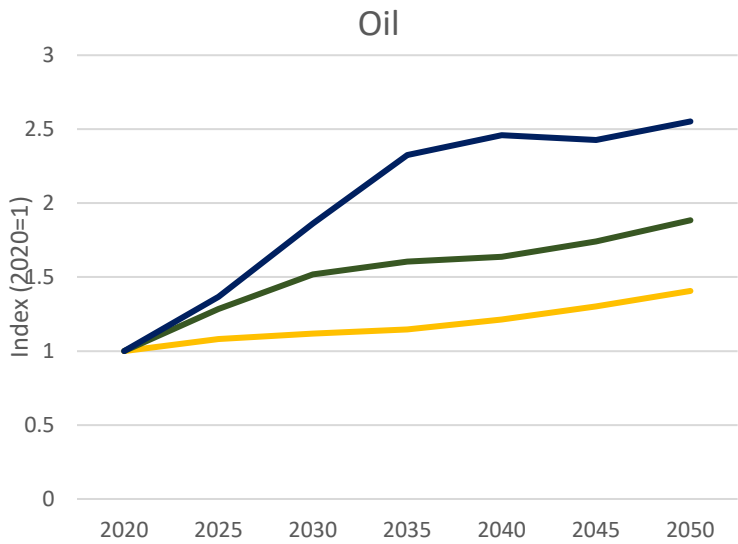
Transition + REMIND+ Italy

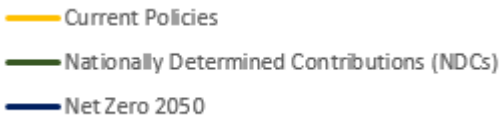
*Gases include all gaseous fuels such as natural gas; solids represent coal and biomass; liquids include oil products, biofuels and fossil synfuels.
Model used: IAM with REMIND. Data for Italy.

Italy: Final energy prices









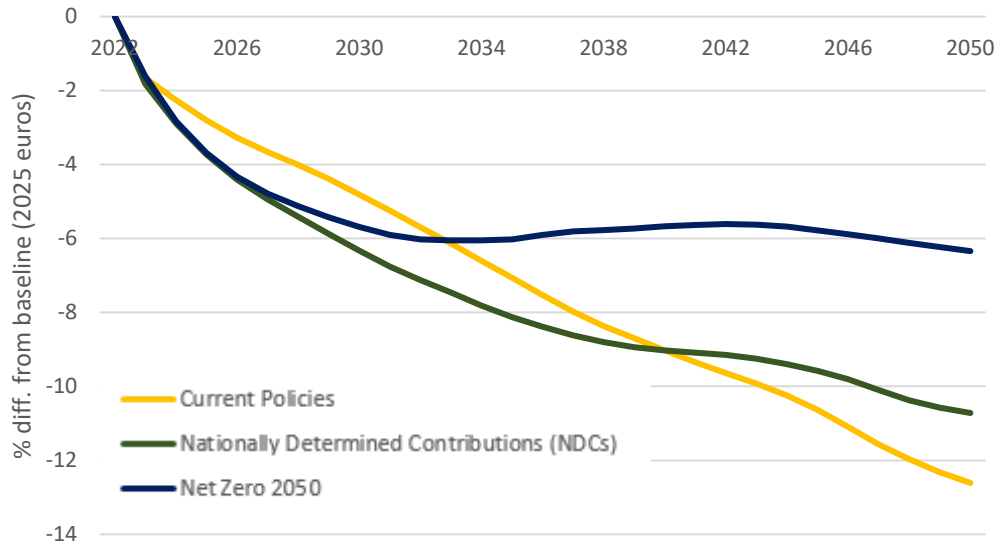
Transition + REMIND+ Italy

Model used: IAM with REMIND. Data for Italy.

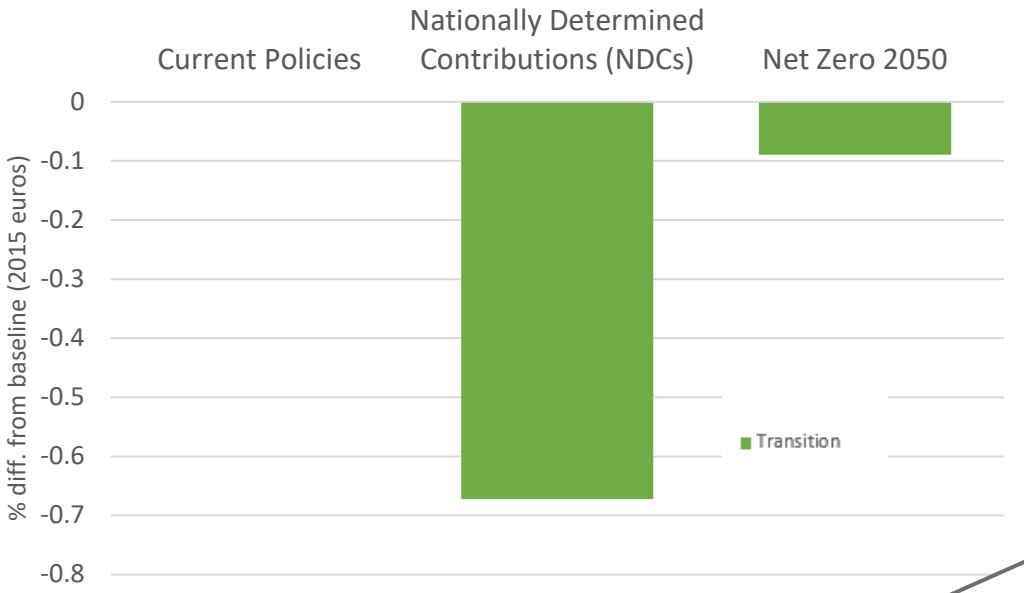
Italy: Transition & chronic physical risks

Macroeconomic variables are shown relative to a 'baseline' scenario, which is a fictional scenario with no physical, nor transition risks.

GDP losses from transition & chronic physical risks
(% diff. from baseline)



GDP losses from transition risks in 2050
(% diff. from baseline)



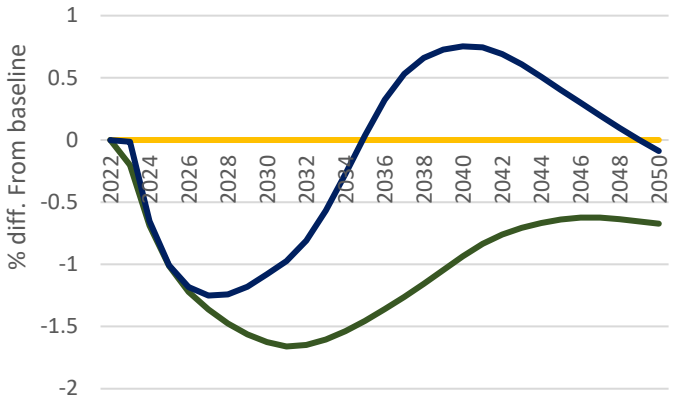
Macroeconomic + NIGEM + REMIND + Italy + Transition & chronic physical risks

The academic paper underpinning the chronic physical risk estimates in Phase V (Kotz et al., 2024) has received critiques in a post-publication review by Nature. The paper has since been substantially revised and is now subject to a new peer-review process. Users are advised to take this revision into account, especially considering that estimated losses in Phase IV were significantly lower than those in Phase V. Results related to transition risks (i.e., from IAM or NIGEM transition risk only) or acute physical risks are not affected by this revision.

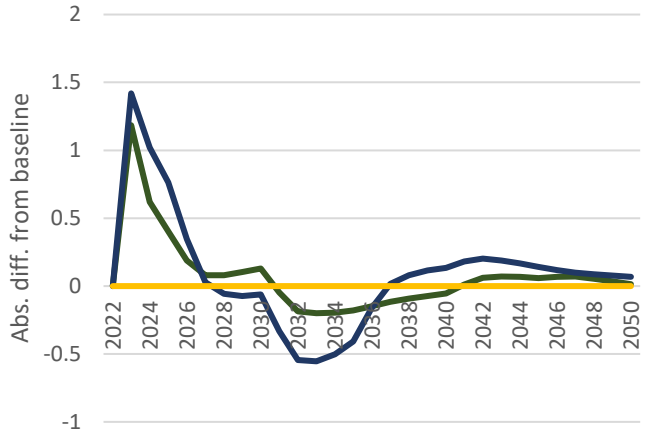
**Model used: NiGEM with REMIND inputs, considering both transition and (chronic) physical risks. Data for Italy.*

Italy: GDP, inflation and interest rate (transition)

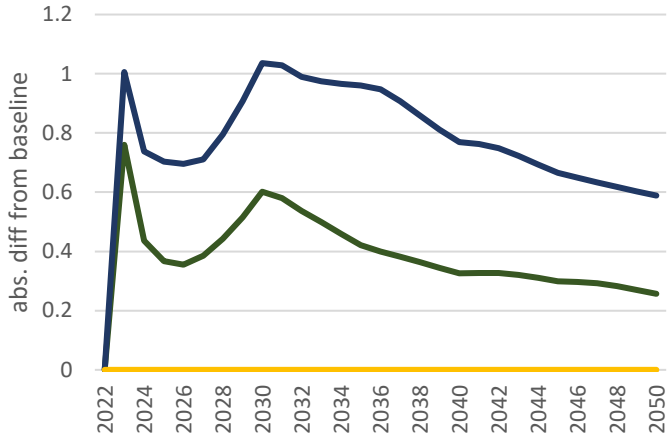
GDP (transition - % diff from baseline)



Inflation rate (transition - abs. diff from baseline)



Central bank rate (transition - abs. diff from baseline)



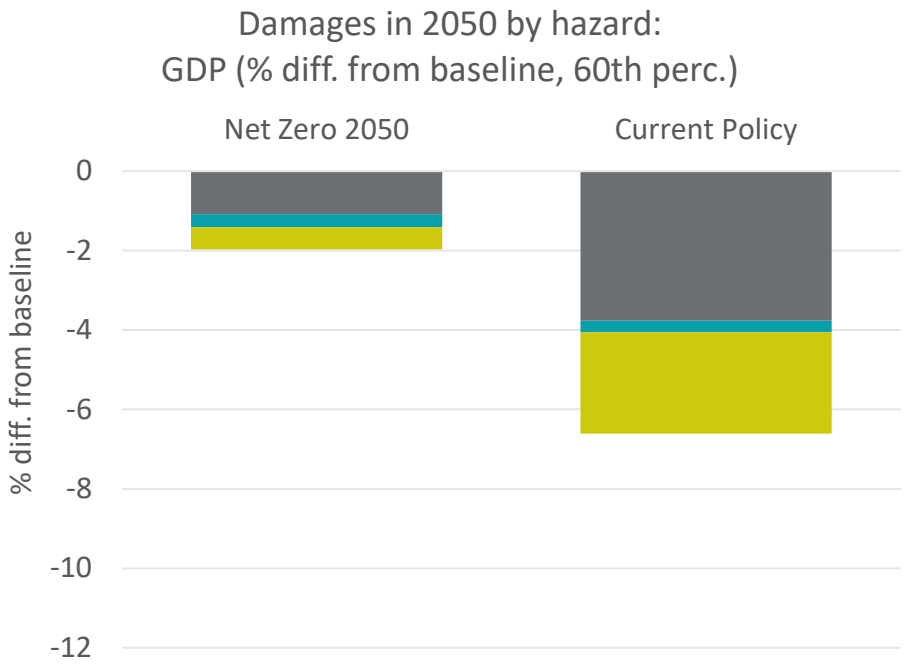
Macroeconomic variables are shown relative to a 'baseline' scenario, which is a fictional scenario with no physical, nor transition risks.

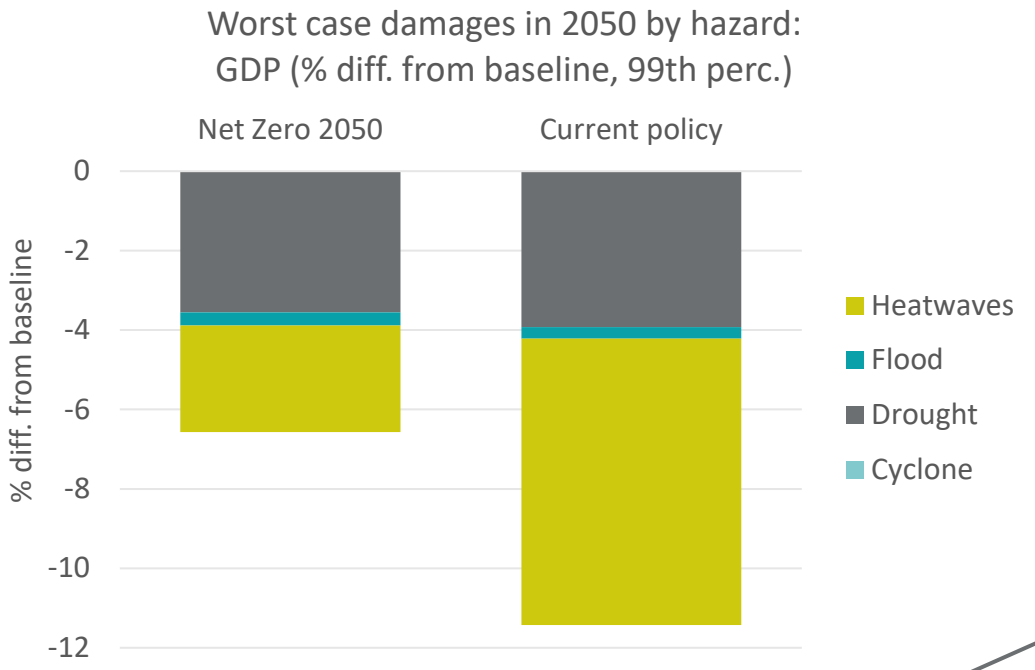
Current Policies
Nationally Determined Contributions (NDCs)
Net Zero 2050

Macroeconomic + NIGEM + REMIND+ Italy + Transition risk (only)

**Model used: NiGEM with REMIND inputs and considering only transition risks. Data for Italy.*

Italy: (Tail) acute physical risks





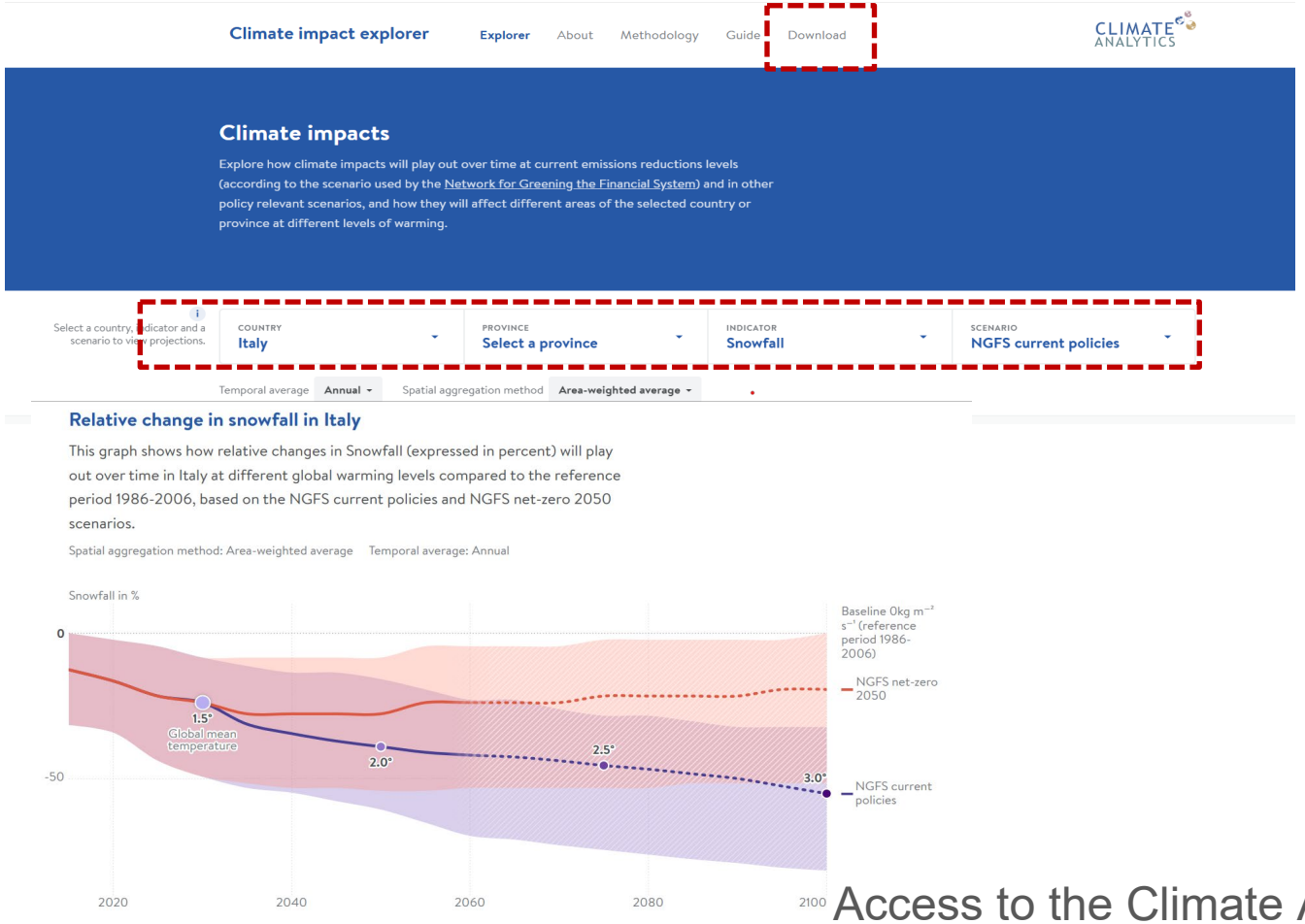
Macroeconomic variables are shown relative to a 'baseline' scenario, which is a fictional scenario with no physical, nor transition risks.

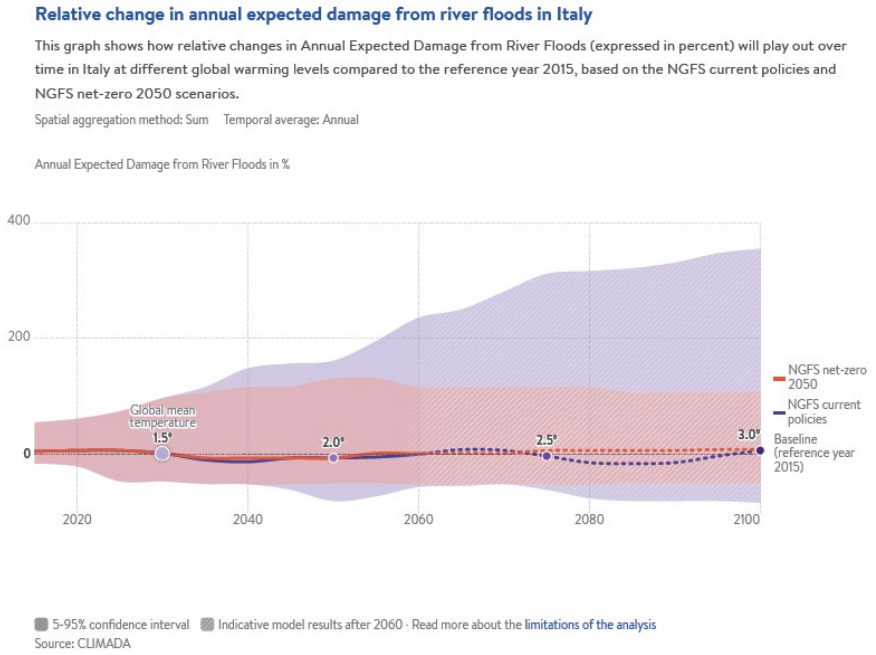
Macroeconomic + NIGEM + Italy + Acute physical risk (only)

**Model used: NiGEM considering only acute physical risks. Data for Italy.*

Climate Impact Explorer

Through the Climate Impact Explorer, climate-related data consistent with NGFS scenarios can be consulted and visualized





Access to the Climate Analytics Climate Impact Explorer

NGFS short-term scenarios overview (first vintage)

Data access, tools and resources, examples

Overview of resources on NGFS short-term scenarios

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

Web resources

- NGFS Website

Explanatory material

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

Data

- IIASA portal
- NGFS EnTry Toolkit

Short-term scenarios key assumptions

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

Net Zero Aligned

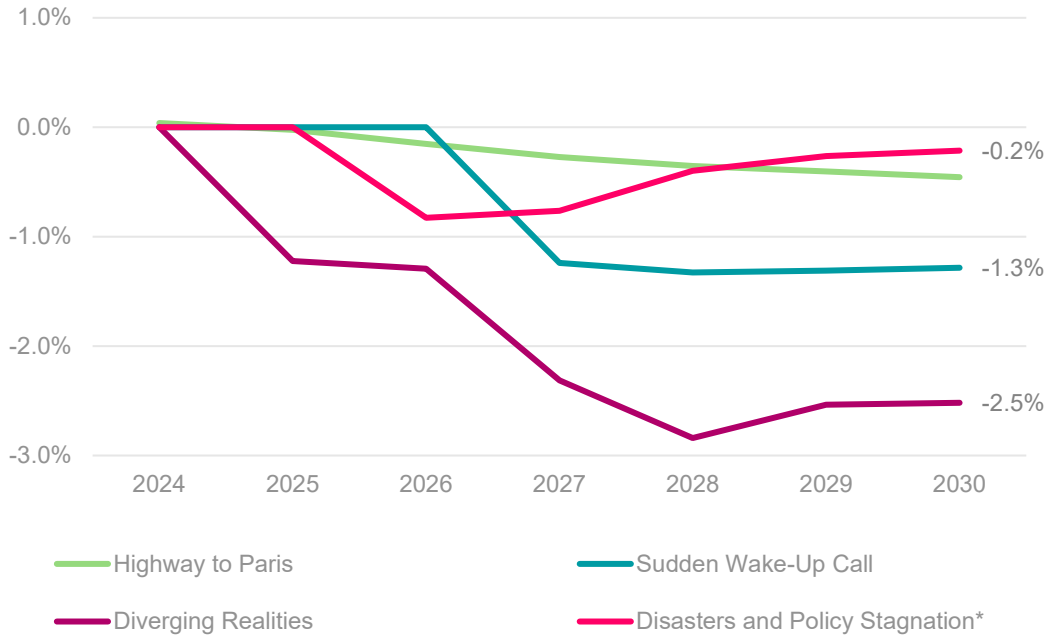
Scenario	Transition shocks	International cooperation	Physical risk shocks	Investments	Financial markets
Highway to Paris	Carbon tax to reach net-zero	High	None	Carbon revenues **fully recycled** into R&D and subsidies for clean energy technologies	Rise in capital costs and risk premia for polluting sectors
Sudden Wake-Up Call	Delayed carbon tax to reach net-zero	Low	None	Carbon revenues only **partially recycled** (in line with baseline) for clean energy technologies	Sudden rise in capital costs and risk premia for polluting sectors
Disasters and Policy Stagnation*	None	N.A.	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
Divergent Realities	Carbon tax to reach net-zero selected regions	Low	Region-specific disasters occurring consecutively, compound shocks	Decreased consumption and investments	Rise in capital costs and risk premia in sectors and countries exposed to physical risk or to implemented transition policies

Macro-financial risk perspective	Lower risk	Moderate risk	Higher risk

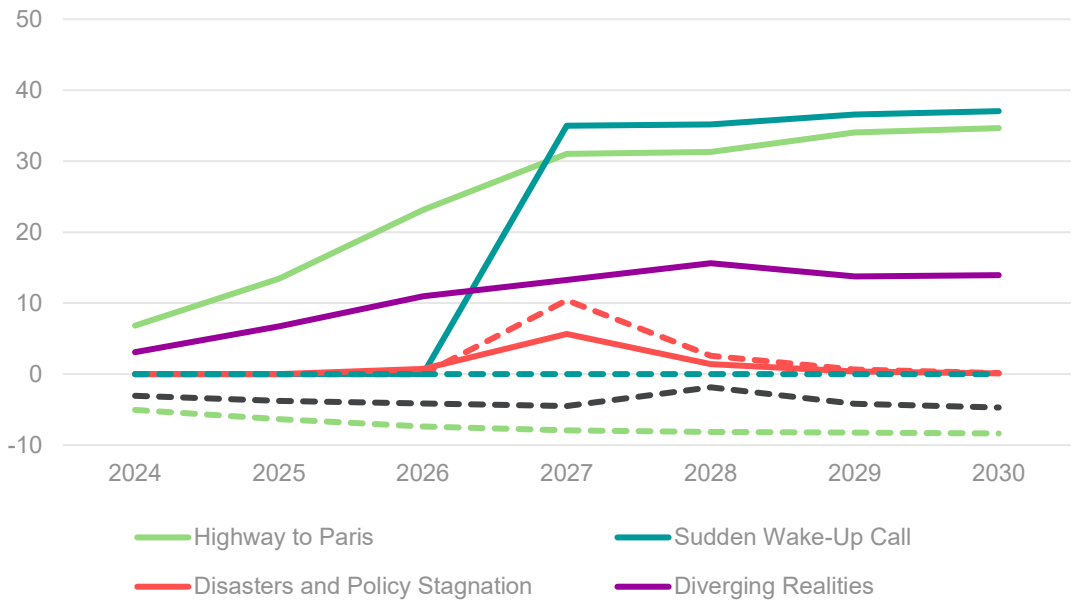
Economic impacts of climate-related risks - World

The baseline scenario is calibrated using the October 2023 IMF World Economic Outlook projections and accounts for climate targets pledged by January 2023

GDP - World
% deviation from baseline



Probabilities of Default - World
Coal (continuous line) vs Wind (dashed) sectors, average pp



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**.

*The *Disasters and Policy Stagnation* scenario has 6 different regional variants (one per regional physical shock) that should be used in isolation. For simplicity, the GDP value shown here is an average of world total impacts from those 6 individual (and alternative) regional shocks. For prices, a GDP Weighted average is used to reflect the size of each region in forming the world aggregate.

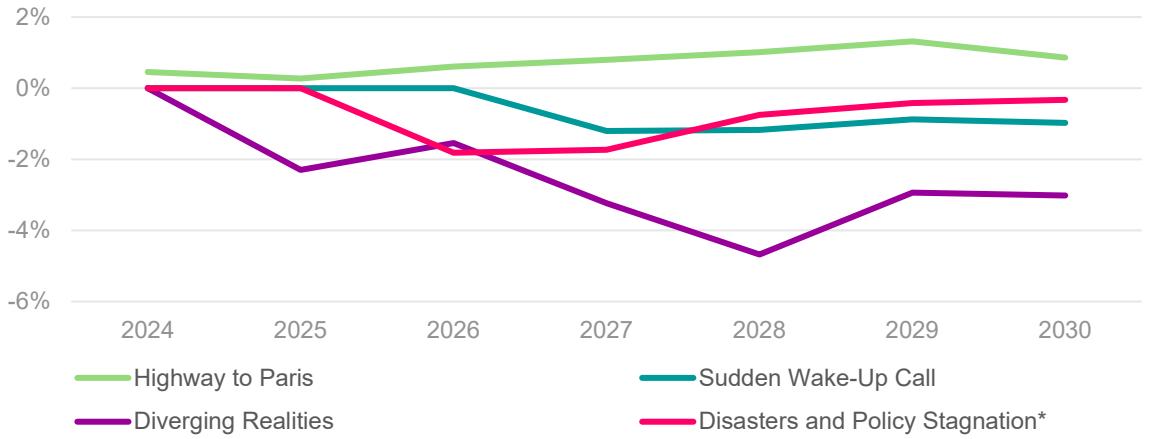
Investments and sectoral production - World

Transition efforts create 'winning' and 'losing' sectors, while extreme weather events tend to affect productive sectors more homogenously.

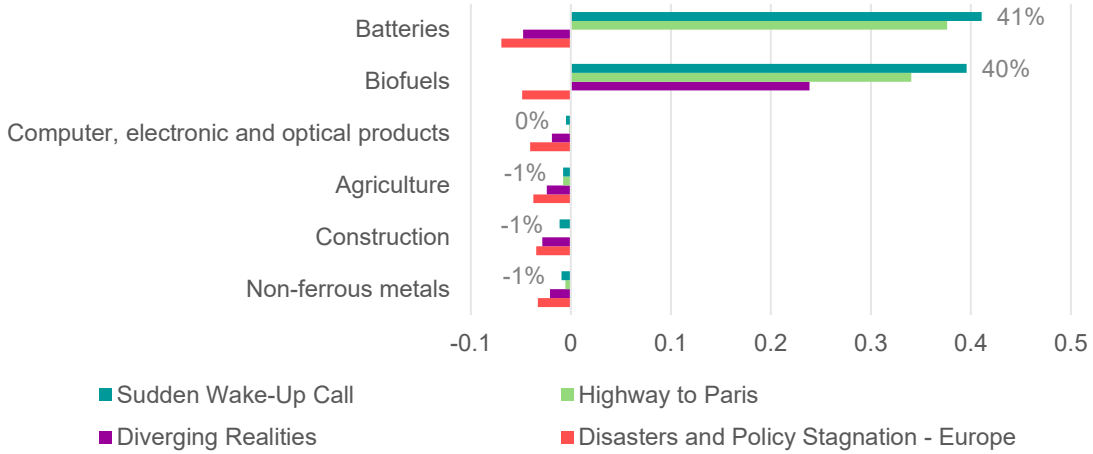
- **Investments** rise globally in *Highway to Paris*, supported by the recycling of carbon tax revenues into the green transition. In *Sudden Wake-Up Call* investments decline due to lack of carbon revenue recycling. Physical risk scenarios cause a decline in investments, driven by lower economic activity, with 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
% difference from baseline

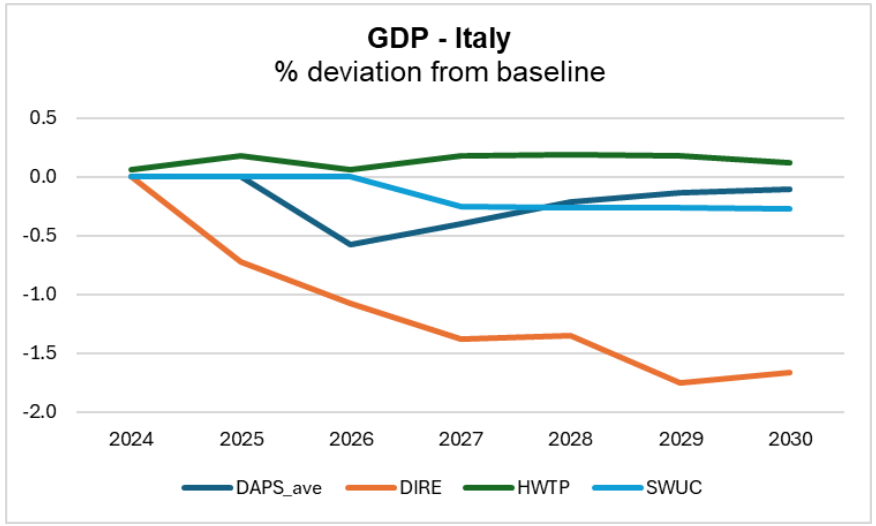


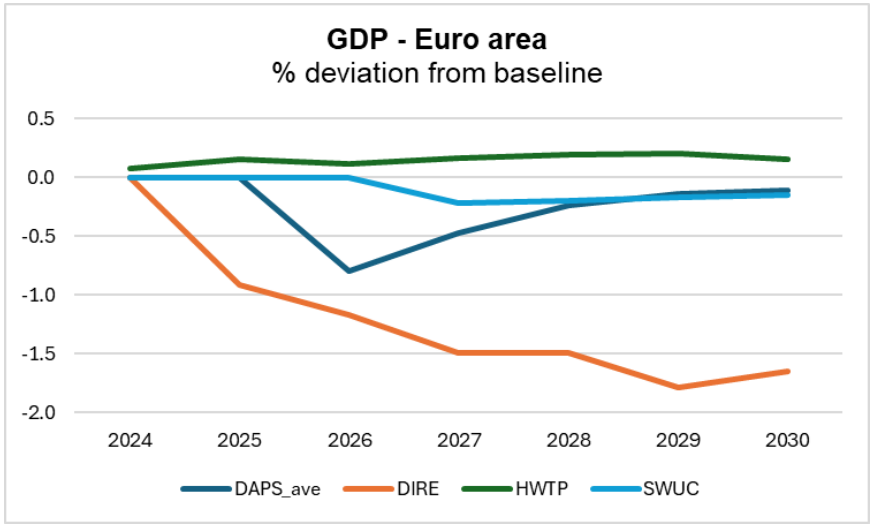
Sectoral production, World
Cumulative difference from baseline in % (2024-2030)

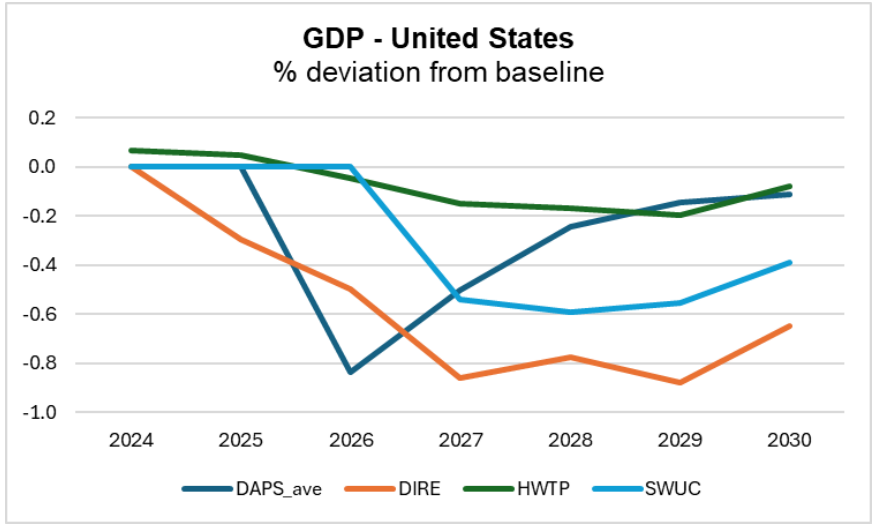


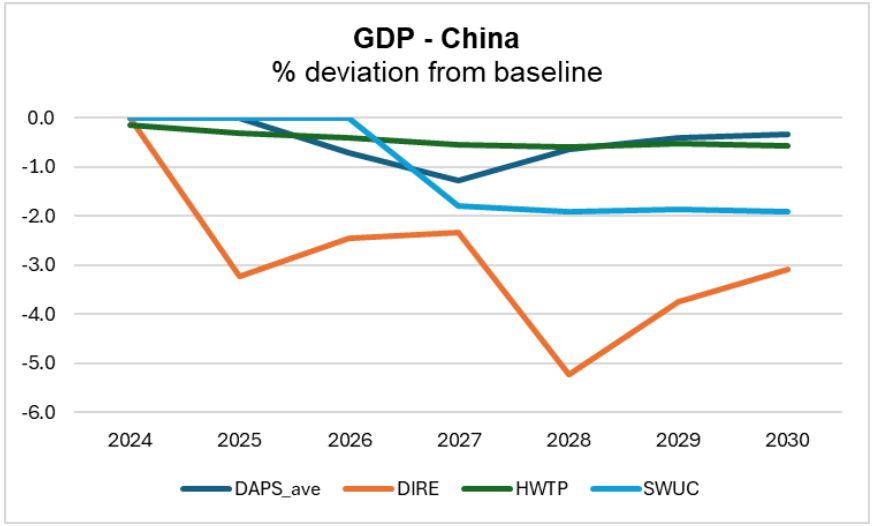
*The *Disasters and Policy Stagnation* scenario has 6 different regional variants (one per regional physical shock) that should be used in isolation. For simplicity, the value shown here is an average of world total impacts from those 6 individual (and alternative) regional shocks

Country-specific GDP impacts of climate-related risks



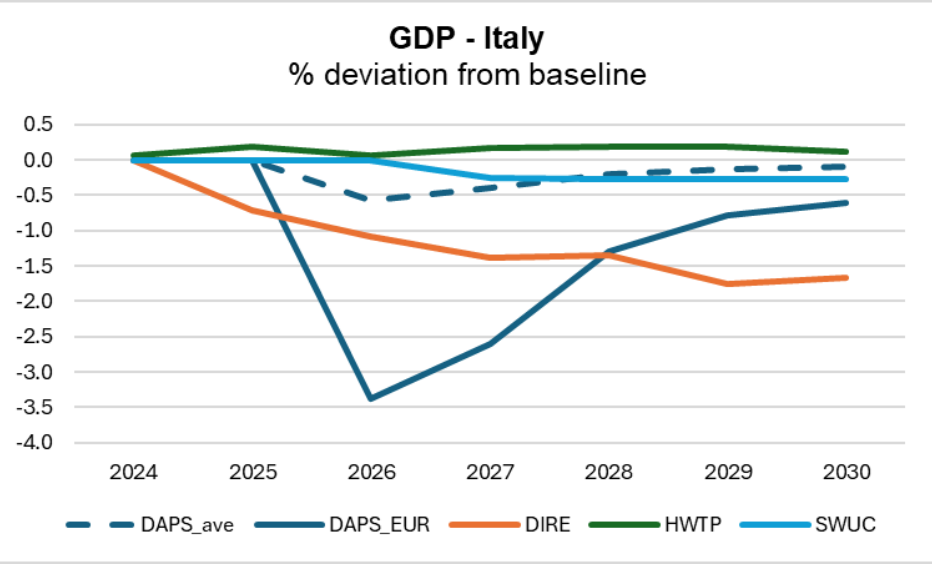


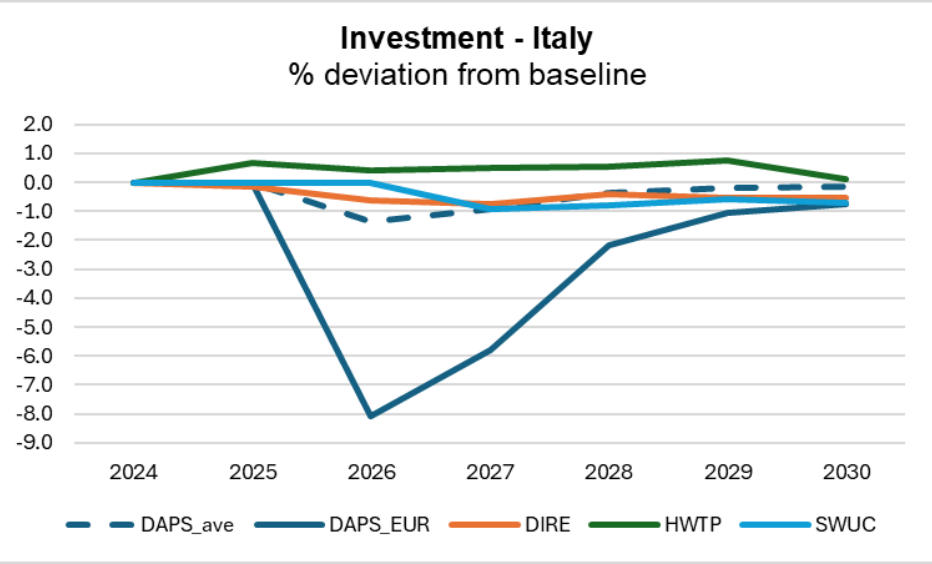


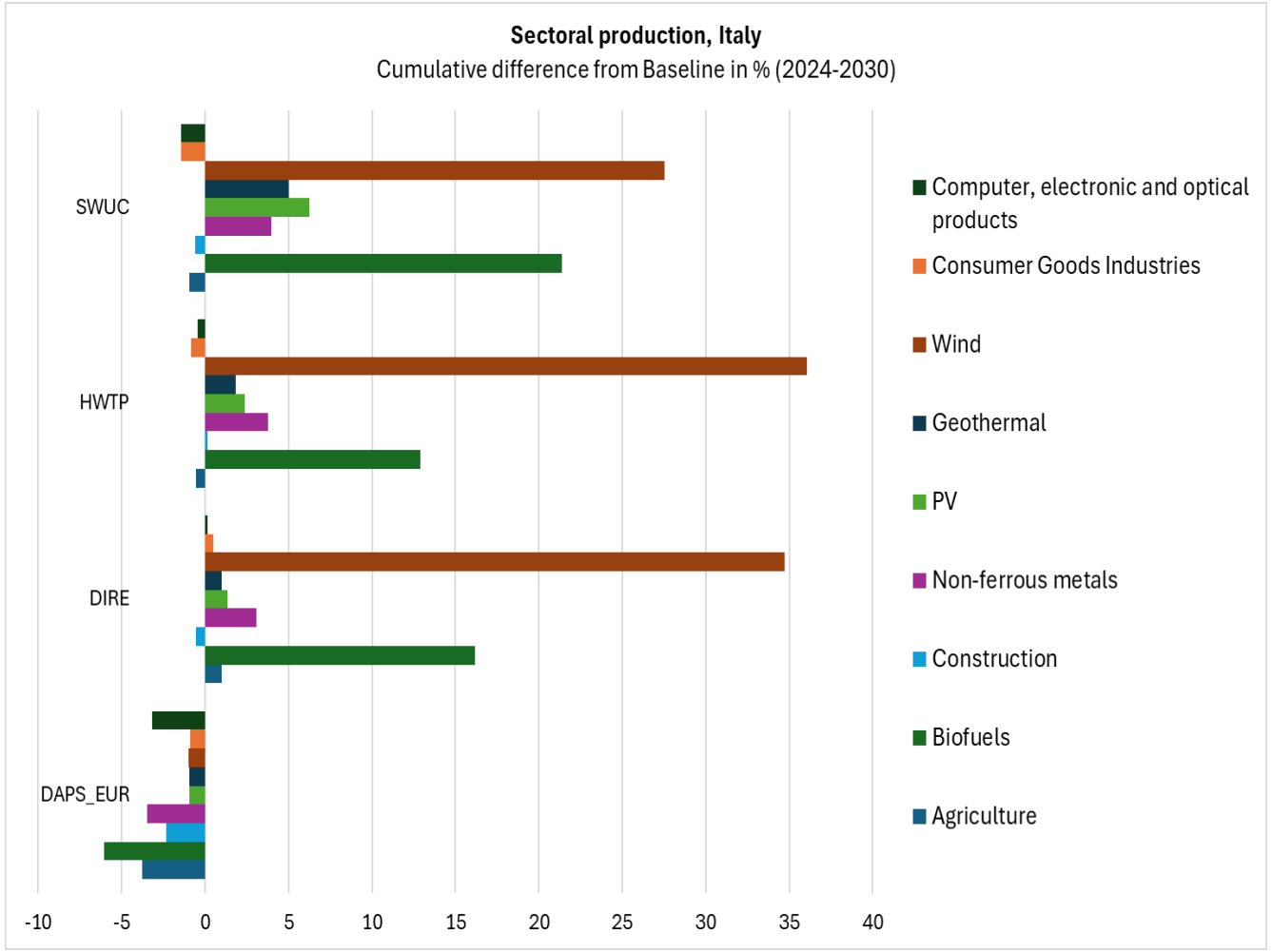


*The *Disasters and Policy Stagnation* scenario has 6 different regional variants (one per regional physical shock) that should be used in isolation. For simplicity, the GDP value shown here is an average of country total impacts from those 6 individual (and alternative) regional shocks. For prices, a GDP Weighted average is used to reflect the size of each region in forming the world aggregate.

Economic impacts of climate-related risks - Italy







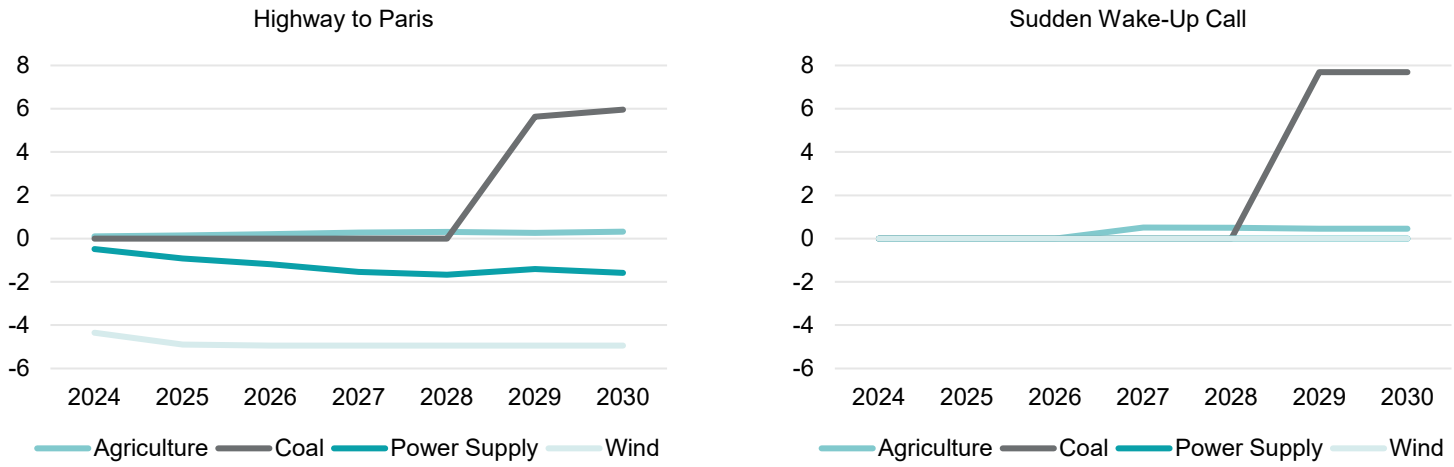
DAPS_EUR = Considers European physical shocks
DAPS_ave = average impacts from 6 (alternative) regional shocks

Financial market dynamics in 2 scenarios - Italy

Transition risk leads to a concentration of financial risks within high-emission sectors.

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

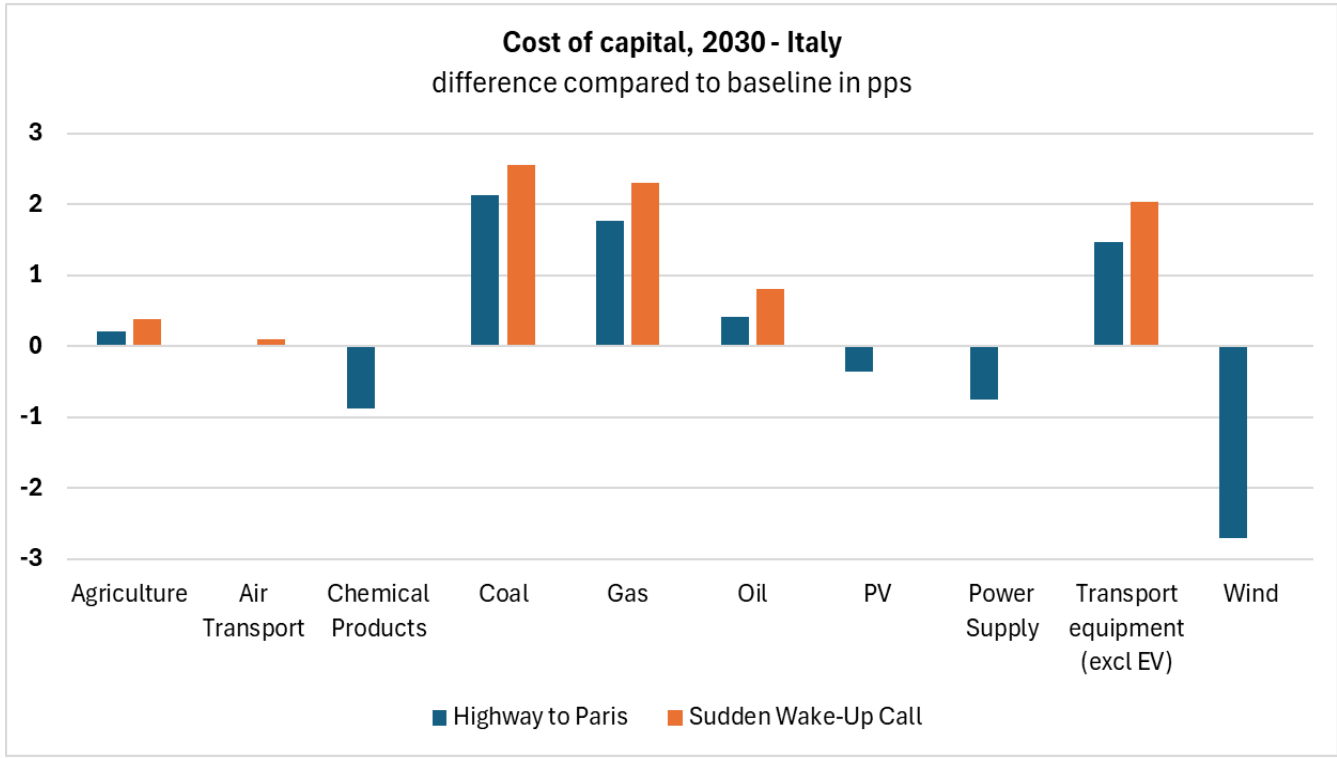
Probabilities of Default, Selected Sectors - Italy
pp difference to baseline



Financial sector dynamics in 2 scenarios - Italy

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

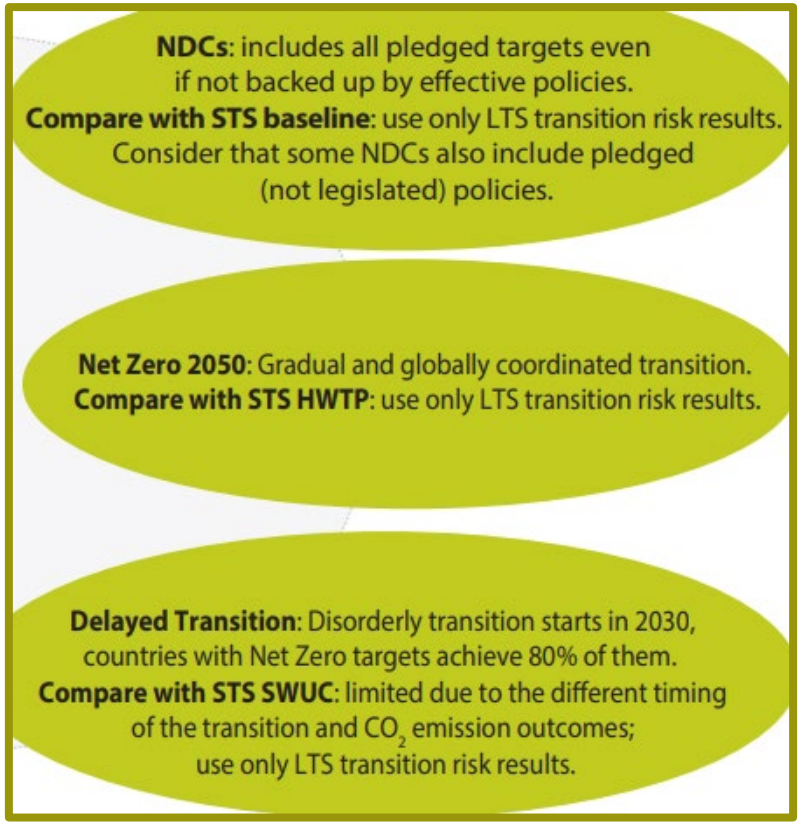
- **High-emission sectors** experience higher capital costs and higher probabilities of default, driven by
  (i) increased expenses stemming from (shadow) carbon prices and
  (ii) investors adapting their expectations to the high cost of transition of these sectors.
- In **Highway to Paris**, green subsidies lead to a reduction in capital costs for green sectors.
- This development is absent in **Sudden Wake-Up Call** due to low 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 the restrictive monetary policy environment, leads to higher associated capital costs.



Short vs long-term scenarios: main differences

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

- **Narrative assumptions:** Different narratives, policy storylines and applied shocks. Transition narratives may partly align, but the timing differs.
- **Modelling frameworks and transmission channels:** Different suites of models and transmission channels.
- **The baseline:** 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 also on the SSP2, 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.
- **Variables definitions:** Availability and definitions of the variables might differ.

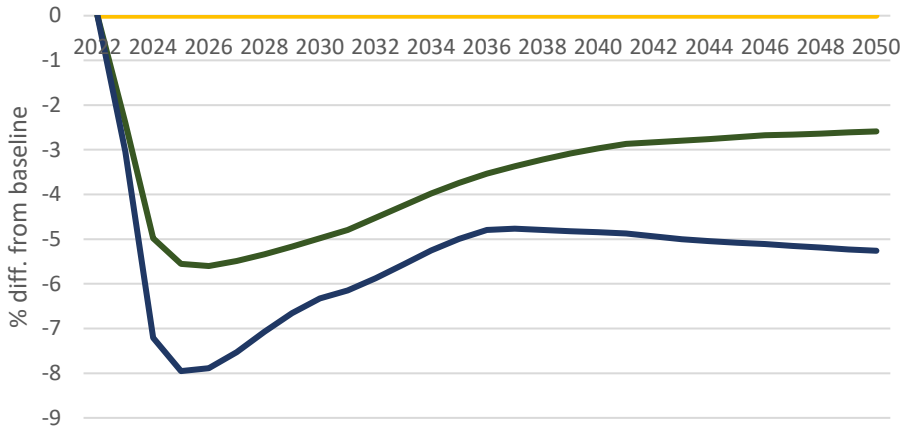


Appendix

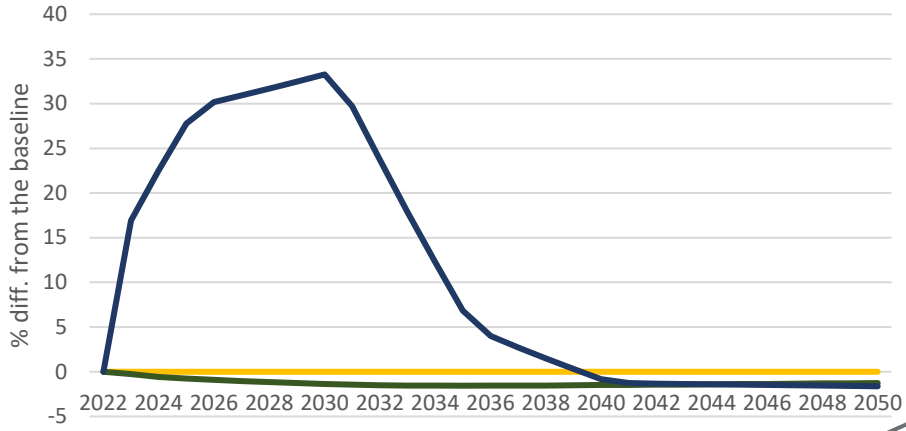
Italy: Private and Government investment (transition)

A

Private investment
(transition - % diff. from baseline)



Government investment
(transition - % diff. from baseline)



Macroeconomic variables are shown relative to a 'baseline' scenario, which is a fictional scenario with no physical, nor transition risks.

Current Policies
Nationally Determined Contributions (NDCs)
Net Zero 2050

Macroeconomic + NIGEM + REMIND+ Italy + Transition risk (only)

**Model used: NiGEM with REMIND and considering only transition risks. Data for Italy.*

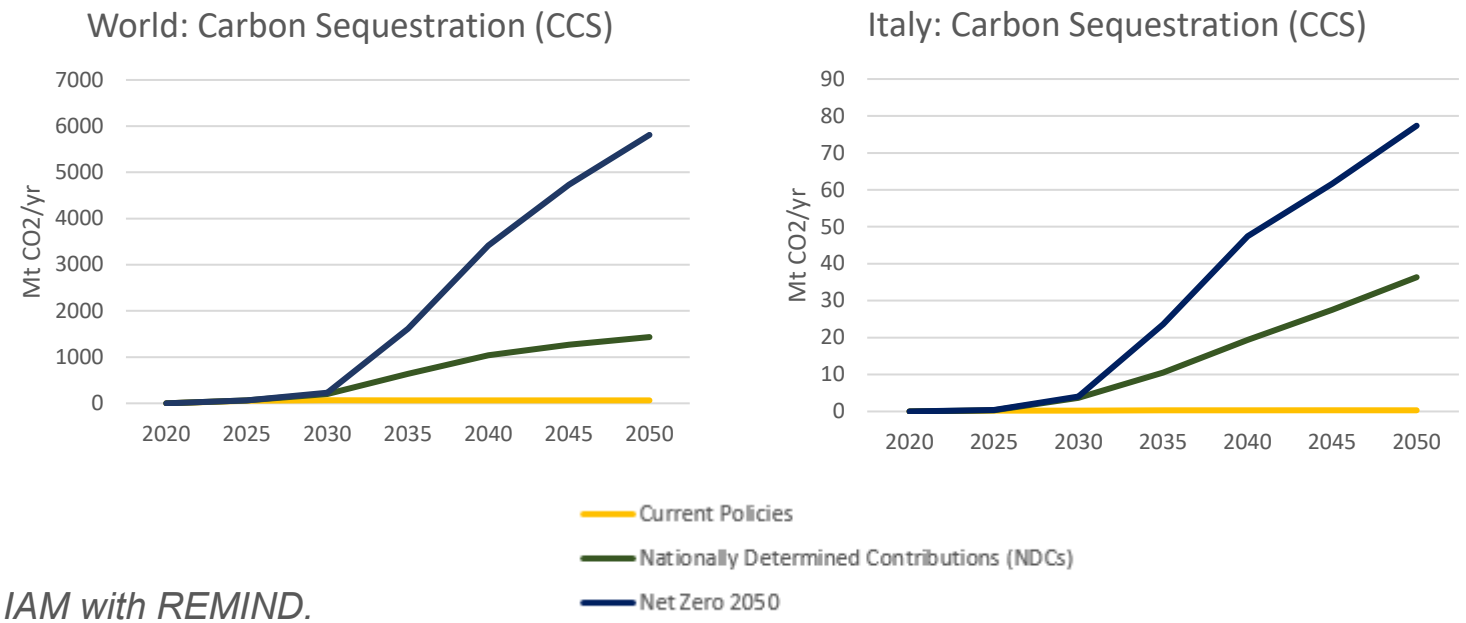
Issues for discussion: uncertainty on mitigation

A

1. Uncertainty on technologies to remove, capture and storage C02

- **Achieving ambitious emission target necessitates the employment of technologies to capture and store durably the CO2 in excess from the atmosphere or at the emissions sources**
  - Carbon Dioxide Removal (CDR) from the atmosphere (i.e. reforestation, Direct Air Carbon Capture and Storage (DACCS))
  - Carbon Capture and Storage (CCS) of CO2 at emissions source

- **The still limited utilization of these technologies casts doubt on the realistic attainment of the targets**
  - Estimates on the required volumes of CDR by 2050 range from 1.5 to 10 billion of tonnes per year
  - The NGFS Net Zero 2050 scenario makes **an optimistic assumption** on their availability within the range identified in the literature assuming that CCS technologies will cover about 6 billion of tonnes in 2050



*Model used: IAM with REMIND.

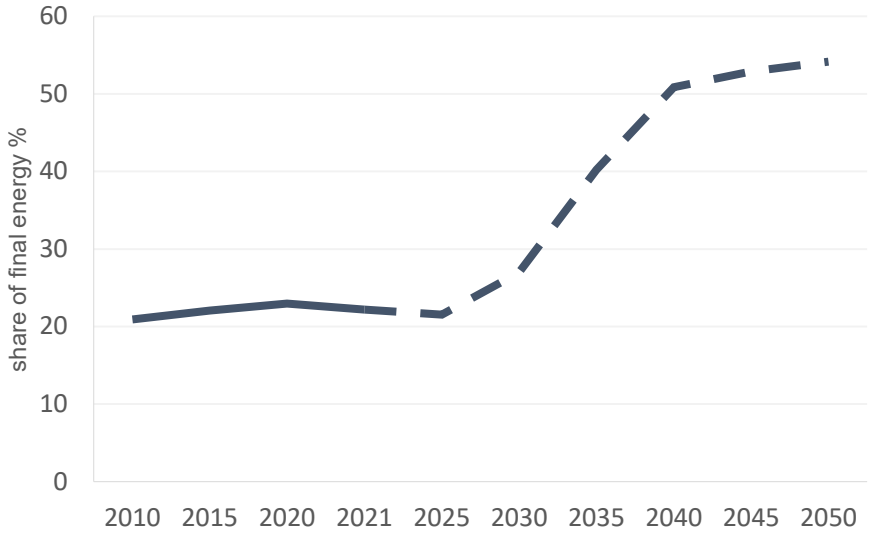
Issues for discussion: uncertainty on mitigation

A

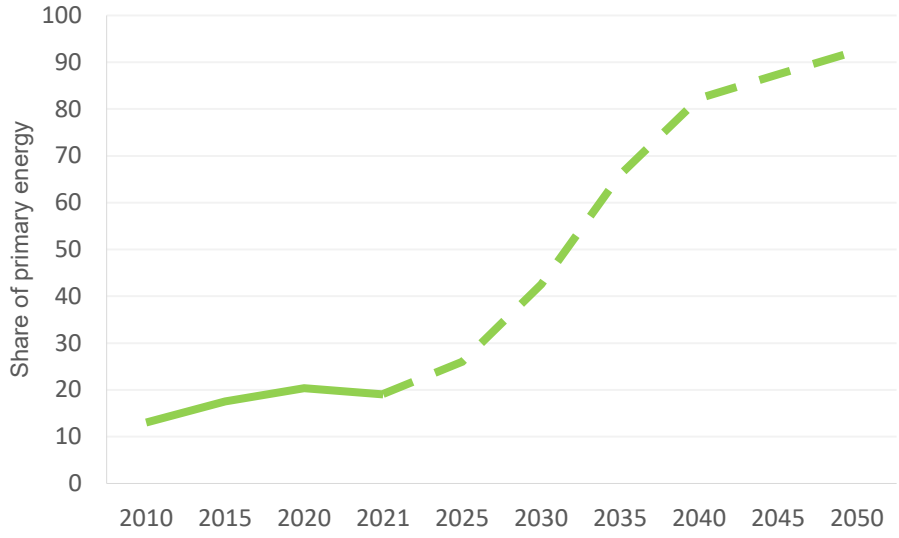
2. Uncertainty on the development of renewable energy

- **The orderly scenarios imply an uptake of renewable energies and electrification never seen before**
  - Data are updated to take into account latest trends in renewable energy technologies and energy markets
  - Still, **several factors might slow down the deployment of renewable energy**
  - For instance, high policy rates, geopolitical risks, the decreasing likelihood of continued cost reduction in renewable energy technologies (IMF, 2023) and supply chain constrains on critical minerals

Electricity share of final energy:
Net Zero by 2050



Renewable energy as share of total energy:
Net Zero by 2050



Solid - historical data. Dotted . NGFS NET ZERO by 2050 scenario. Model used: IAM with REMIND. Data for Italy.

Issues for discussion: physical risk and policies

A

3. Fiscal and monetary policies do not react to physical risks

- It can be helpful to look at transition and physical impacts on macro variables separately