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Creating Opportunities

# What are the challenges to assess climate and sustainability risks?

Sustainable Finance Research Forum

EU Science Hub

BBVA Research, October 27 2022

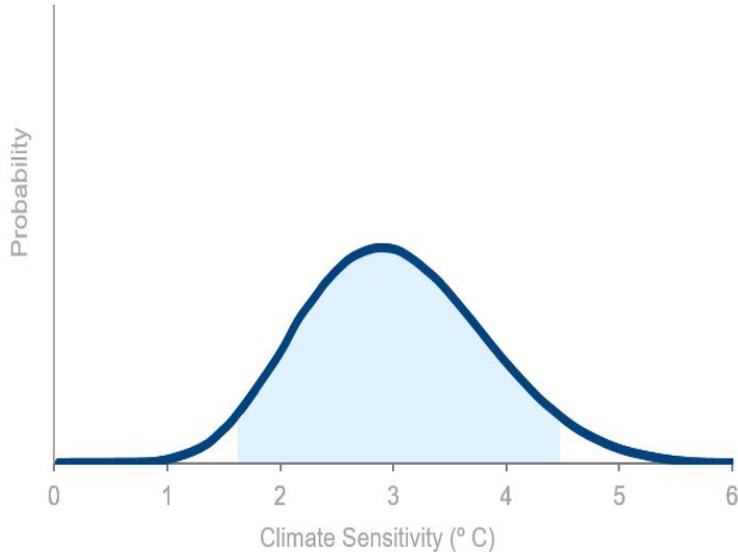
# Uncertainty is the signature feature of climate change in measurement, modelling,

...

## Measurement uncertainty

### CLIMATE SENSITIVITY TO CO<sub>2</sub>

(Meta analysis; area: 90% of probability interval)

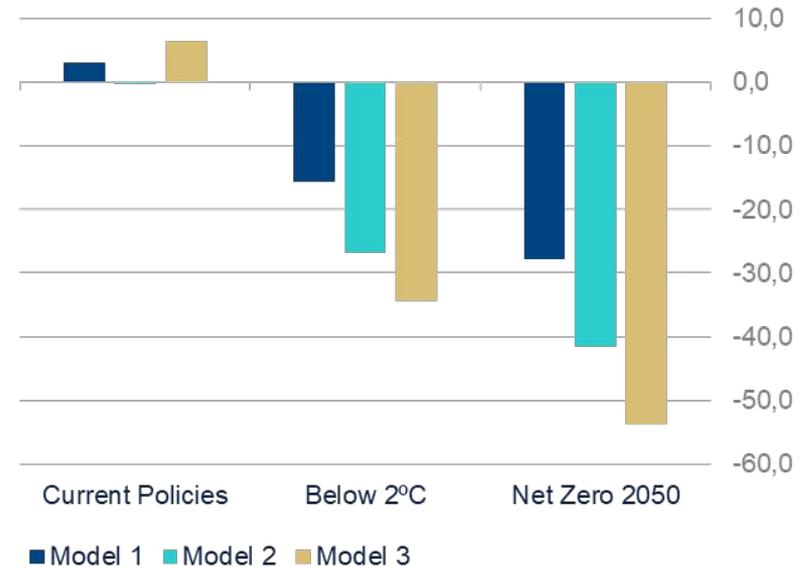


Source: [Andrés y Doménech \(2020\)](#) based on Knutti, Rugenstein and Hegerl (2017).

## Modelling uncertainty

### GHG EMISSIONS

% 2020-2030

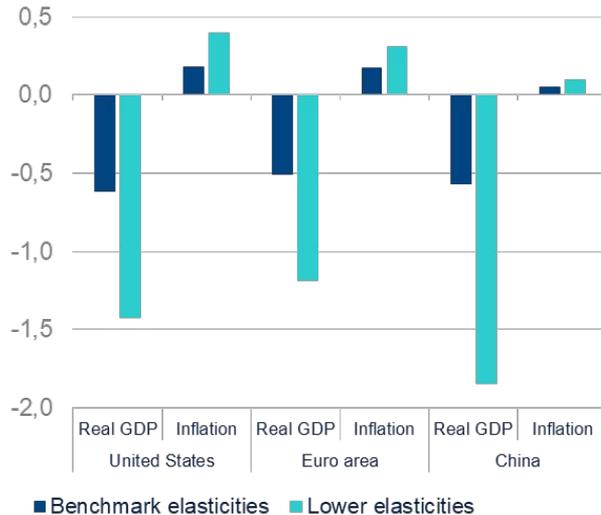


Source: BBVA Research, [NGFS Scenarios](#)

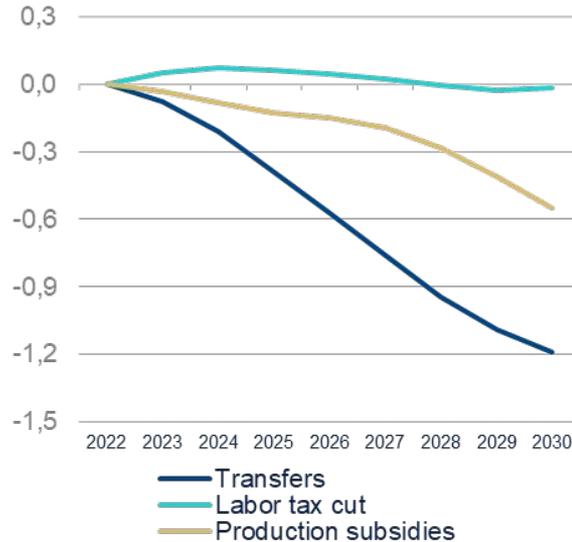
## ... and in deriving impacts on the economy

### Economic Impacts

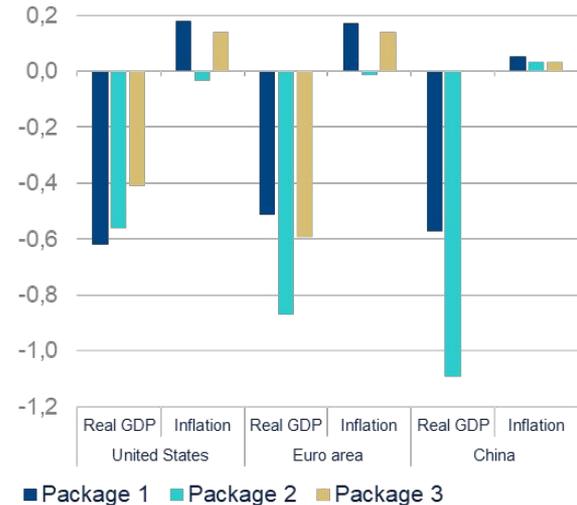
**SUBSTITUTION ELASTICITIES**  
Impact in 2030 of a GHG Tax under  
Different Elasticities  
(% and pp, deviation from baseline)



**CARBON TAX RECYCLING OPTIONS**  
Impact of Recycling Options in the United  
States  
(% deviation from baseline)

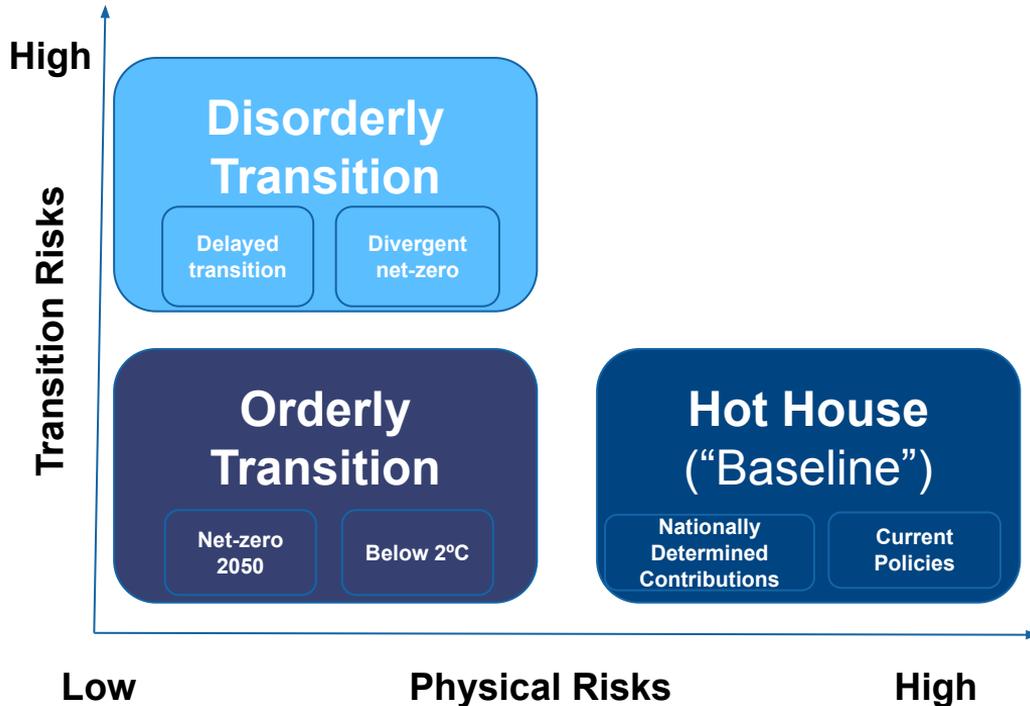


**POLICY PACKAGES**  
Macroeconomic Impact of the Three  
Policy Packages in 2030  
(% deviation from baseline)

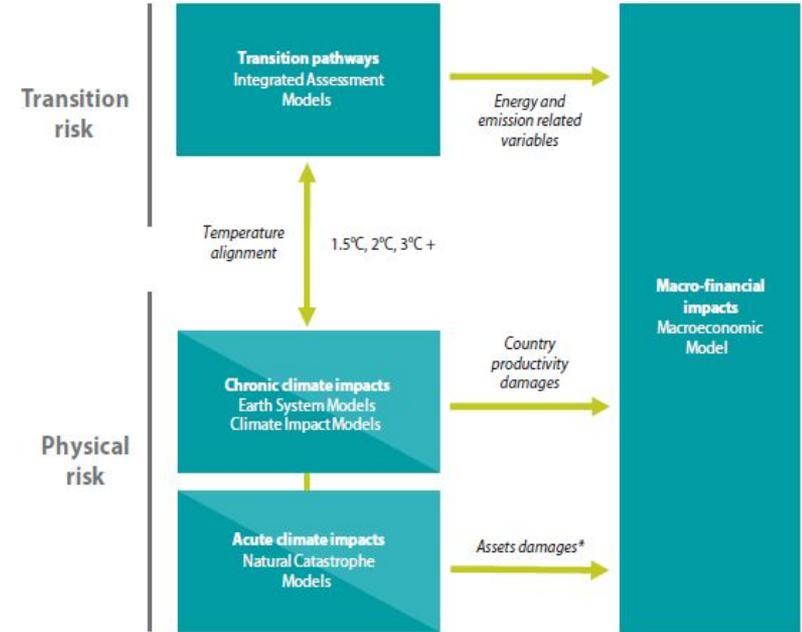


# The challenge: The multiplicity of alternative futures with compounded risks and the complexity of climate and economic integrated modelling

## SET OF REPRESENTATIVE SCENARIOS



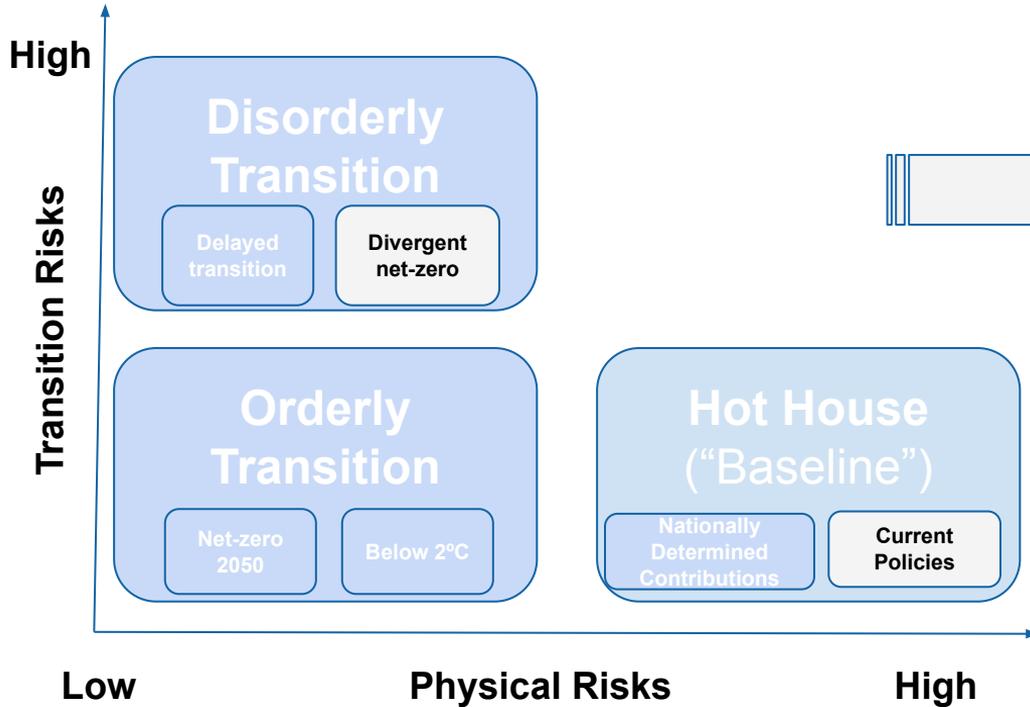
## NGFS SUITE OF MODELS APPROACH



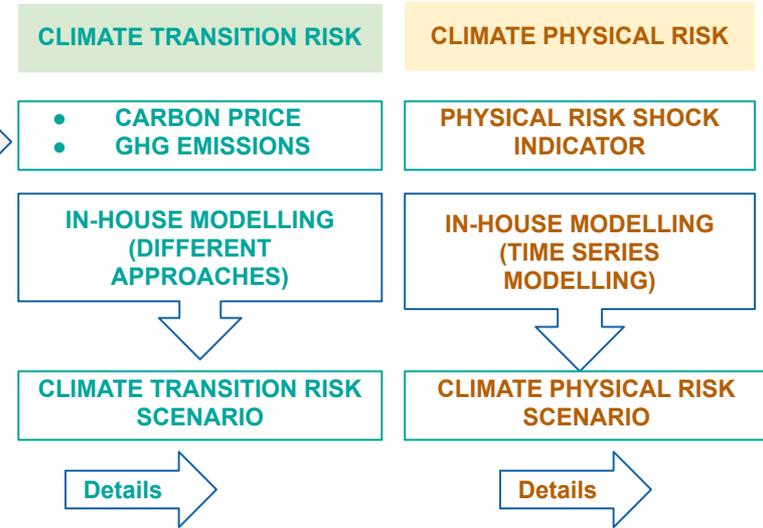
■ Data available in the IIASA database ■ Data available in the NGFS CA Climate Impact Explorer

# A practitioner’s approach to climate analysis: A few alternative futures, “pure” climate variables anchor, and in-house modelling for bounding uncertainty

## SET OF REPRESENTATIVE SCENARIOS



## BBVA RESEARCH APPROACH TO CLIMATE RISKS

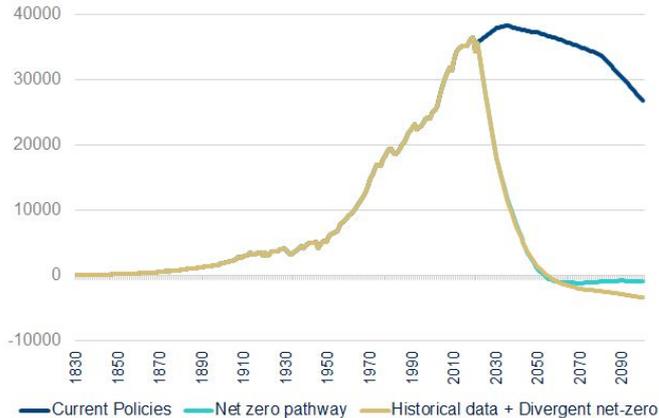


## Takeaways on main challenges to assess climate and sustainability risks

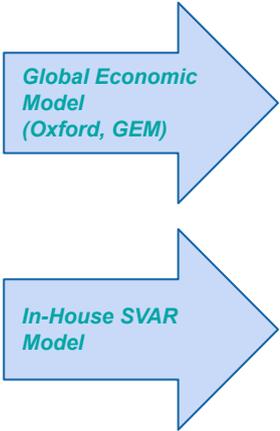
- **Uncertainty** is the signature feature of climate change in measurement, modelling, and in deriving economic impacts on the economy.
- **The challenge: Defining a workable playing field for the economic analysis of climate.** The **multiplicity** of alternative climate scenarios and the **complexity** of integrated climate modeling (IAMs) make it necessary to delimit both the options to be analyzed and the range of explanatory ambition. **The NGFS climate scenarios provide a very useful public good for common understanding.**
- **As a practitioner:** Scenarios anchored on industry-accepted climate variables, limited to "economic variables" to **limit complexity**, and with alternative modeling or severity of shocks to **incorporate and delimit uncertainty**.
- **In short: be humble.** A **learning-by-doing process** in pace with measurement improvements, modeling developments and climate policies implementation.

# Climate transition risk: the same impulse, different responses depending on modelling venues, a way to show (and delimit) uncertainty

## WORLD. CO2 EMISSIONS (GigaTM)

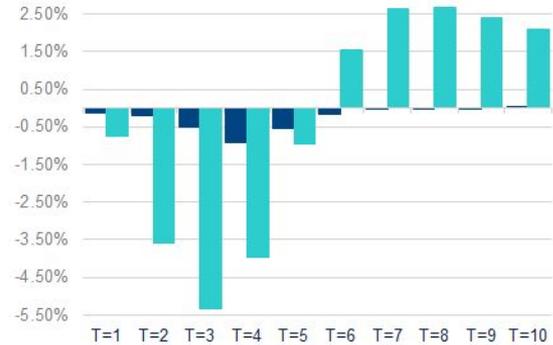


Source: BBVA Research from [NGFS Climate Scenarios for central banks and supervisors](#)

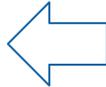
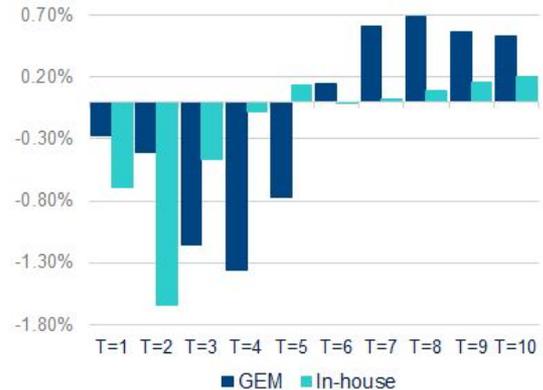


Source: BBVA Research

## Economy A, growth gap (pp)

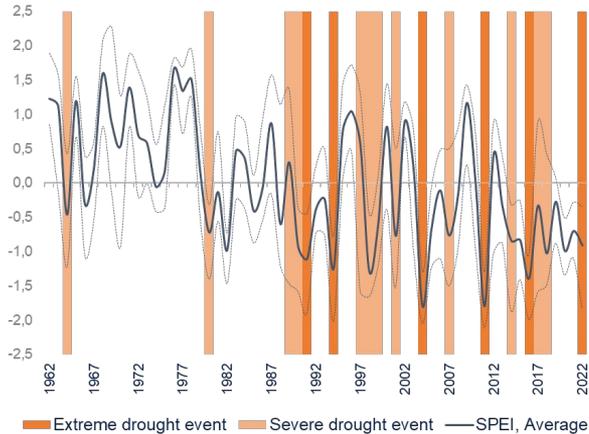


## Economy B, growth gap (pp)



# Climate physical risk: Impulse-response to catastrophic climate events such as droughts

## SPAIN. SPEI, DROUGHT SYNTHETIC INDEX (Standardized Precipitation Evapotranspiration Index)



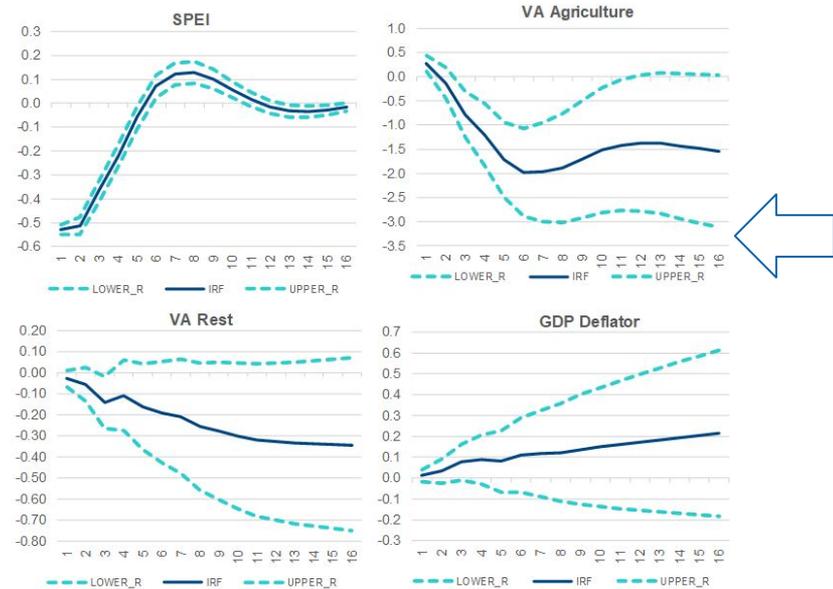
Source: BBVA Research, data from [EM-DAT database](#) and [WB Climate Change Knowledge Portal](#). SPEI details can be found: [A High Resolution Dataset of Drought Indices for Spain](#). Lower levels imply a more severe drought.

(\*) A VARX model, with Cholesky decomposition, has been used to capture the impact of an exogenous SPEI shock on Agriculture, GDP and inflation (GDP deflator).

*In-House SVAR Model (\*)*

## Droughts. Impulse Response Functions

One standard deviation -negative- shock on SPEI.  
Quarterly data. Percentage deviation from the baseline.



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