

# Can we sensibly assess the growth impacts of sustainability?

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# Will Sustainability Deter or Spur Economic Growth?





# Agenda

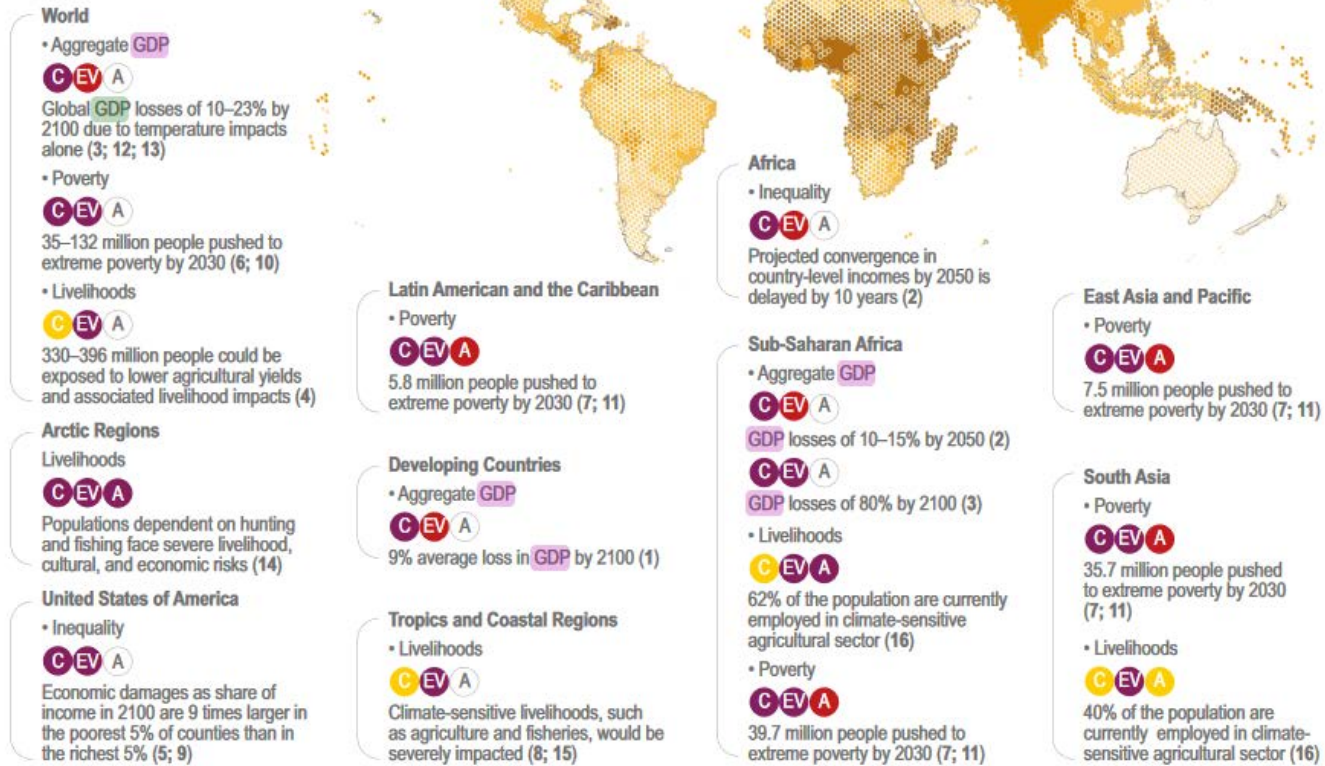
**Impacts of Climate Change**

**Impacts of Emission Reduction and Climate Policy**

# Impacts of Climate Change

# Impacts of Climate Change

Illustrative examples from individual studies of risks to living standards and the conditions under which they could become severe



# Impacts of Climate Change

„Estimates of the global effects of climate change on aggregate measures of economic performance and gross domestic product (GDP) range from negative to positive, in part due to uncertainty in how weather variability and climate impacts manifest in GDP (high confidence).“

“Under high warming (>4°C) and limited adaptation, the magnitude of decline in annual global GDP in 2100 relative to a non-global-warming scenario could exceed economic losses during the Great Recession in 2008–2009 and the COVID-19 pandemic in 2020.”

“Regional estimates of GDP damage vary ... Severe risks are more likely in (typically hotter) developing countries...”

# GDP Impact of Non-Sustainability

Highly likely to be **negative**.

Extent: Depends on

- success in reducing climate change etc.
- technological options/choices and regulation

**Also:**

Mostly not considered when assessing GDP effects of climate policies.

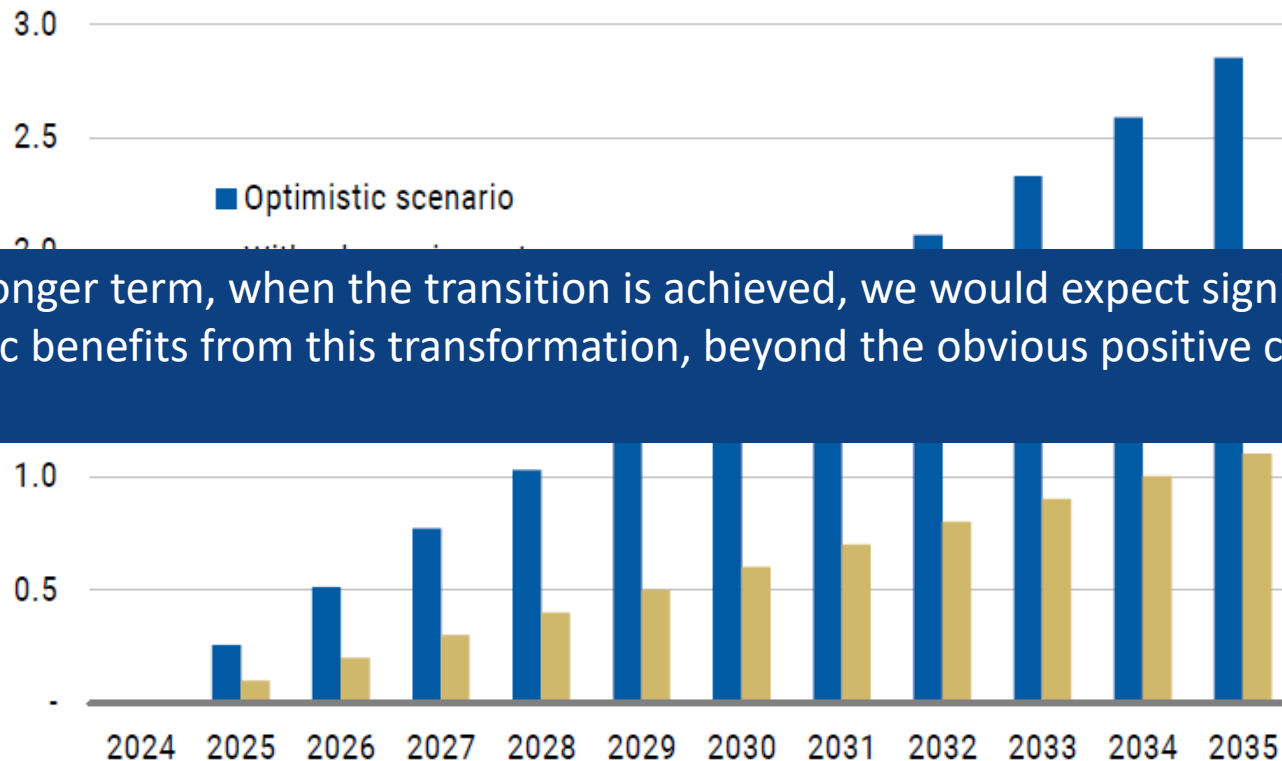
Impact on welfare beyond GDP?

# Impacts of Emission Reduction and Climate Policy



# Impacts of Climate Policy

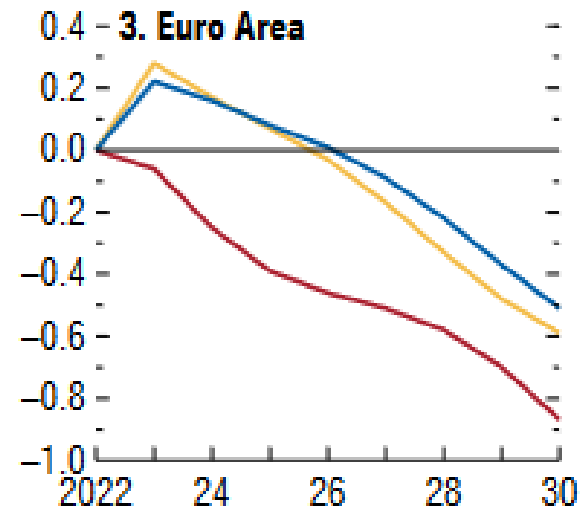
## Forecasts for the EU: GDP impact of the energy transition



“In the longer term, when the transition is achieved, we would expect significant economic benefits from this transformation, beyond the obvious positive climate impact.”

# Climate Policy Choice

Real GDP  
(Percent deviation from baseline)



Package 1	Package 2	Package 3
Gradual GHG price increase from 2023 to 2030	Gradual GHG price increase from 2023 to 2026	Gradual GHG price increase from 2023 to 2030
Two-thirds of revenue used to reduce labor taxes	One-third of revenue used to reduce labor taxes	GHG revenue rebated at the sectoral level (electricity generation, manufacturing, services)
One-third of revenue transferred to households	One-third of revenue transferred to households	GHG revenue from households' activities (residential energy and individual transportation) transferred back to households
	One-third of revenue used to subsidize low-emission sectors:	Regulation of share of electric vehicles
	<ul style="list-style-type: none"> <li>• Renewables investment</li> <li>• Nuclear and hydro power plants</li> <li>• Electric-vehicle purchase</li> </ul>	

# Current (EU) Bottlenecks

- Expansion of renewable energies (and energy prices)
- Market development (green) hydrogen
- Decarbonization of industry
- Decarbonization of buildings and transport
- Expansion and conversion of infrastructure (power grids, charging stations,...)
- ...

**Mostly an expression of underlying challenges**

# Challenges Behind the Bottlenecks



international  
competitiveness



financing and  
investments



support for climate  
policy

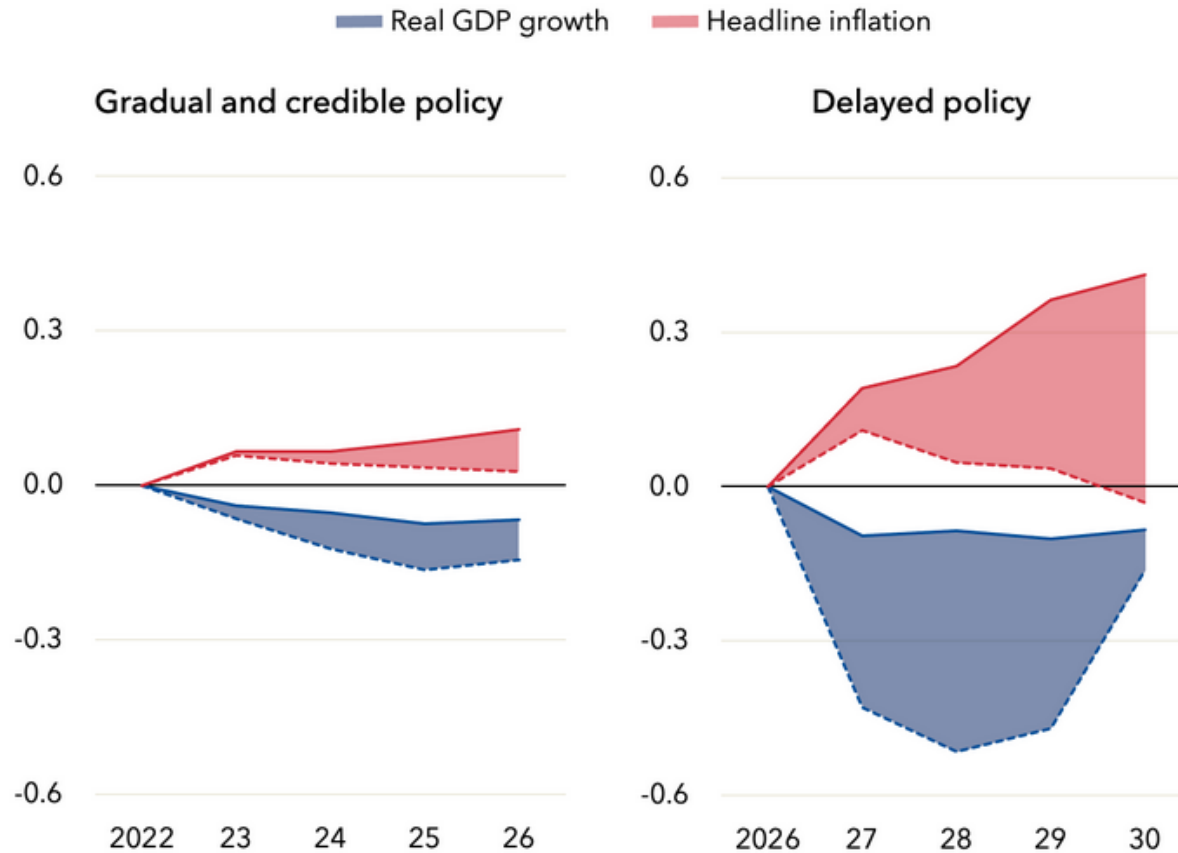


shortage of skilled  
workers



bureaucracy and approval  
processes

# Delay of Climate Policy



# The long term: Technologies for Climate Neutrality

Technology readiness level of technologies along the low-carbon electricity value chain

## Low-carbon electricity generation

- Hydropower
- Geothermal
- Nuclear
- Solar PV
- Solar thermal
- Wind
- Coal with CCUS
- Ocean energy
- Large-scale heat pumps
- Natural gas with CCUS
- Biomass with CCUS
- Hydrogen turbines

## Electricity infrastructure

- Flexible high-voltage or alternating current transmission
- Ultra high-voltage transmission
- Fast frequency response
- Fast charging
- Dynamic charging
- Smart charging
- Demand response
- Mechanical storage
- Battery storage

## Electricity use in transport

- Electric trains
- Electric light-duty road vehicles
- Electric heavy-duty road vehicles
- Electric ships
- Electric aircraft

## Electricity use in industry

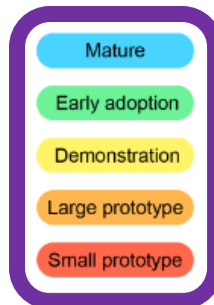
- Electrified primary aluminium
- Electrified primary steel
- Electrified chemicals
- Electrified cement

## Electricity use in buildings

- Electric cooking
- Heat pumps
- Evaporated cooling
- Solid state cooling

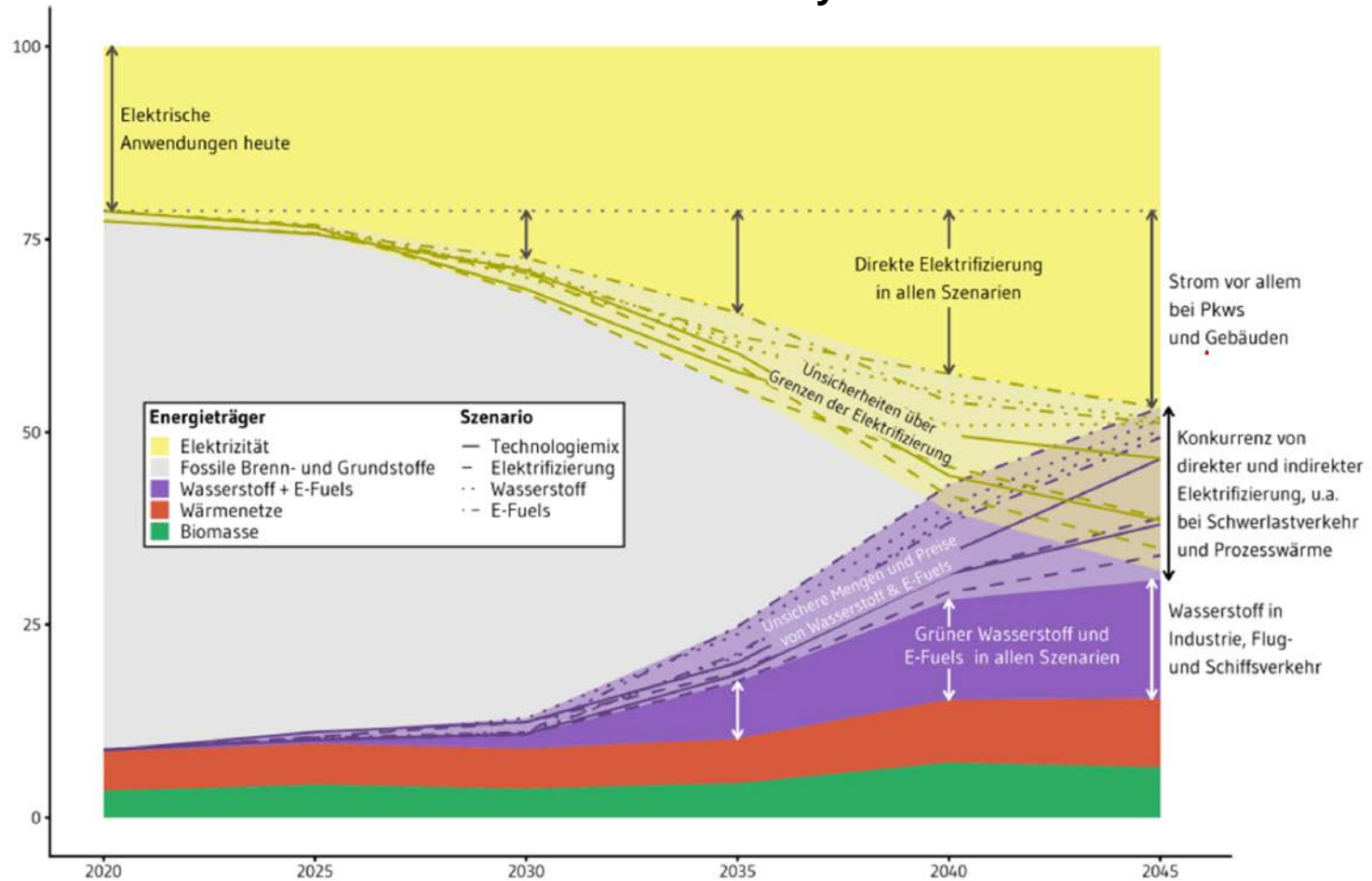
## Electricity use in fuels transformation

- Hydrogen from water electrolysis



# The long term: Path to Climate Neutrality

## Assessment for Germany



# 6 Propositions

1. Climate policy must use the potential of the market.
2. Climate policy must use sectoral, regional and temporal flexibilities and set reliable framework conditions.
3. Climate policy must be politically enforceable and immediately take distributional effects into account.
4. Climate policy must flank CO<sub>2</sub> prices with targeted measures so that they have their full effect.
5. Climate policy must mobilize private investment on a large scale.
6. Climate policy must be designed internationally.



# Thank you for your attention!

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