



A·U·G·U·R  
Challenges for Europe in the world, 2030

## Working Package 5

# ***Scenarios to investigate the interplay between energy, environment and sustainable globalisation***

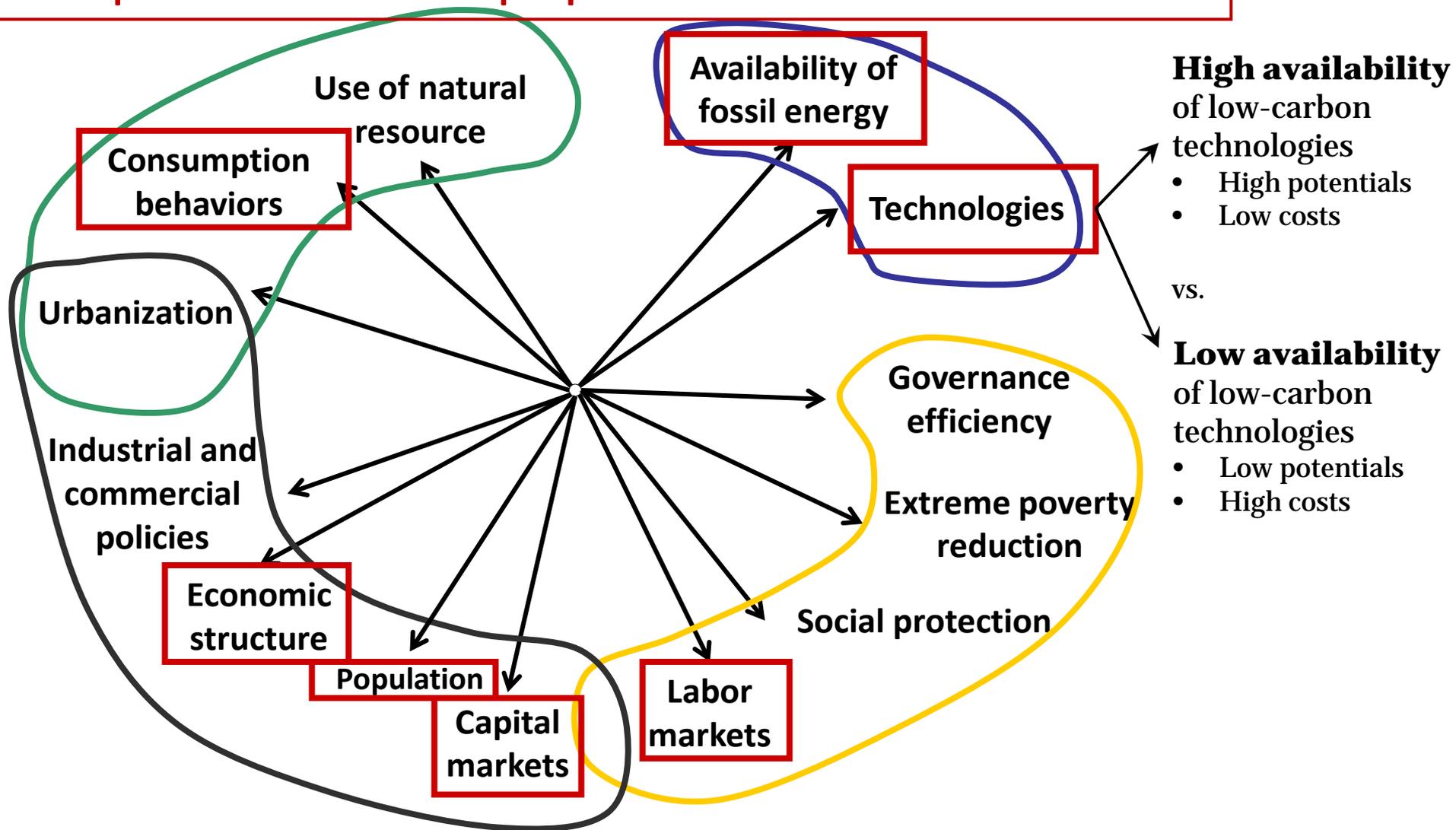
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# ***Long-term, irreversibilities and uncertainties call for specific scenarios***

- **Long-term**
  - Greenhouse gases in the atmosphere (decades/centuries)
  - Infrastructures in the energy system (decades for production capacities, to centuries for transportation infrastructures and urban forms)
- **Irreversibilities**
  - Non-linearities in the climate system
  - Path-dependencies in the technical/social/economical/institutional system
- 2030 has to be analyzed in terms of its legacy for future decision-makers options
- Detect long-standing implications of short-term development options
- **Large uncertainties**
  - Demography, Ultimate energy resources, Future technologies, Future lifestyles...
- Specific scenarios to explore the energy-climate change issues and interlinkages
- A database of scenarios (with Imaclim-R model) to explore the uncertainties
  - Linked to the framework of new scenarios for climate change research

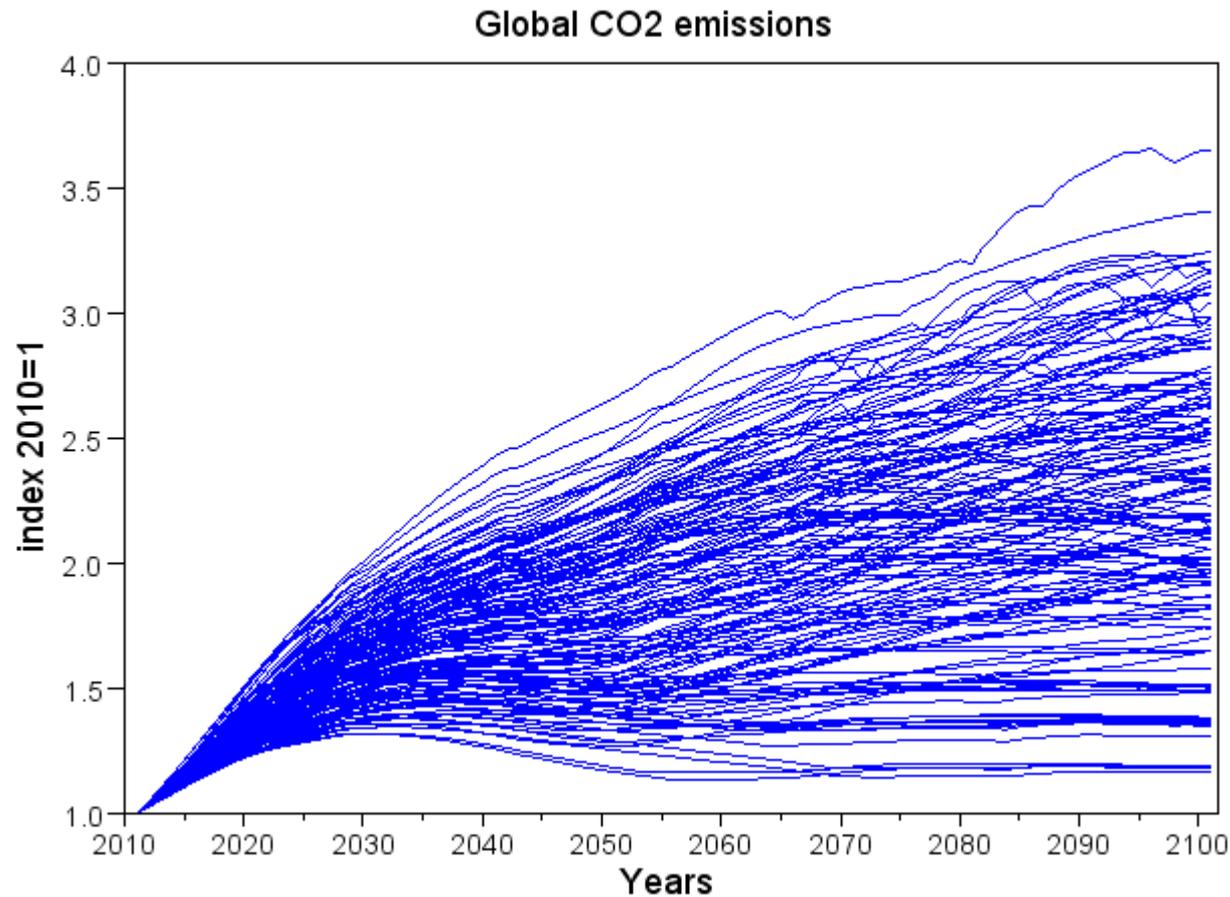
# Building a database of long-term scenarios

Descriptors translated into input parameters of the IMACLIM-R model



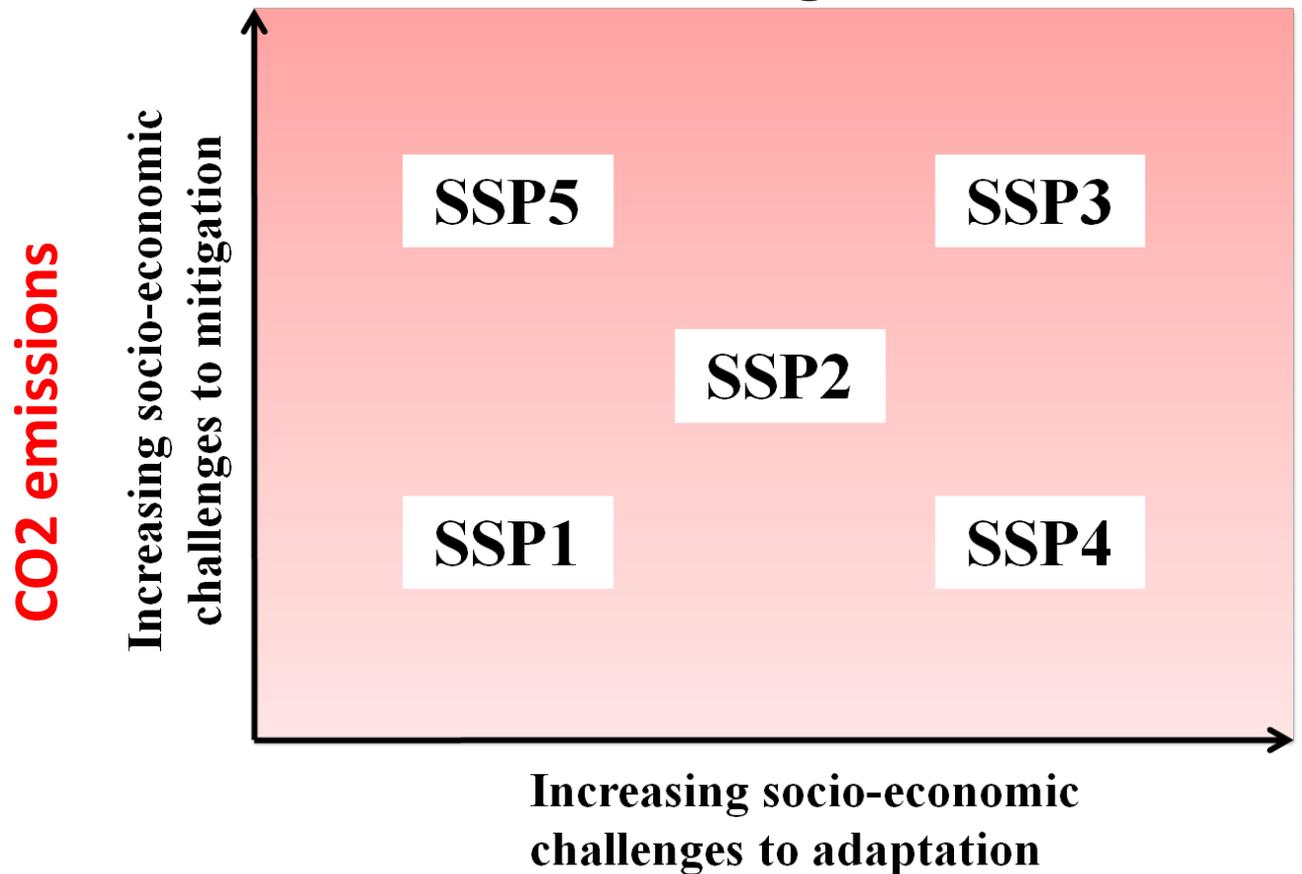
# Building a database of long-term scenarios

## 288 scenarios with Imaclim-R



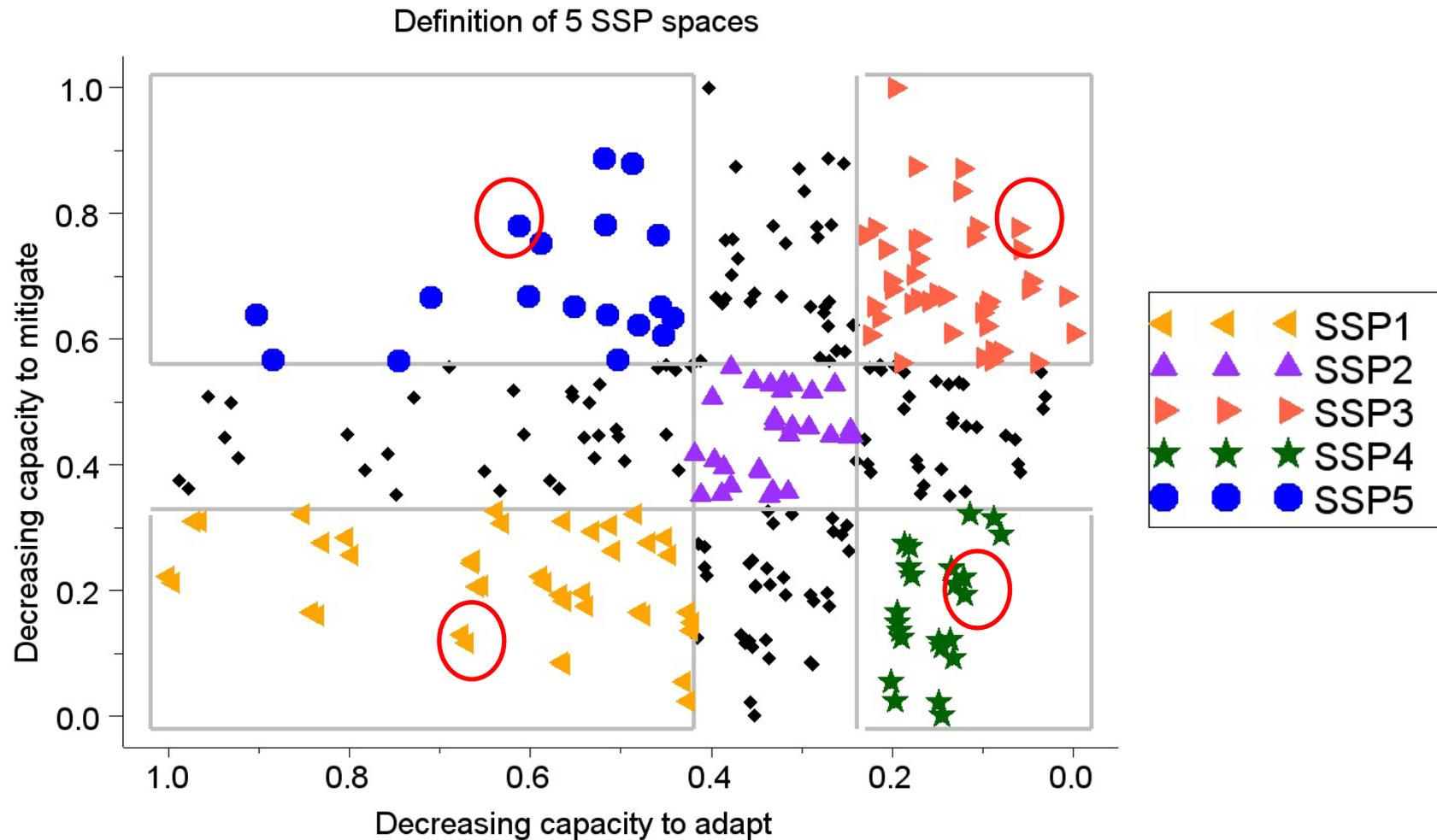
# Selecting a few contrasted archetype scenarios

## The framework of the new socioeconomic pathways for climate change research



**GDP per capita of the low income countries**

# Selecting a few constrained archetype scenarios

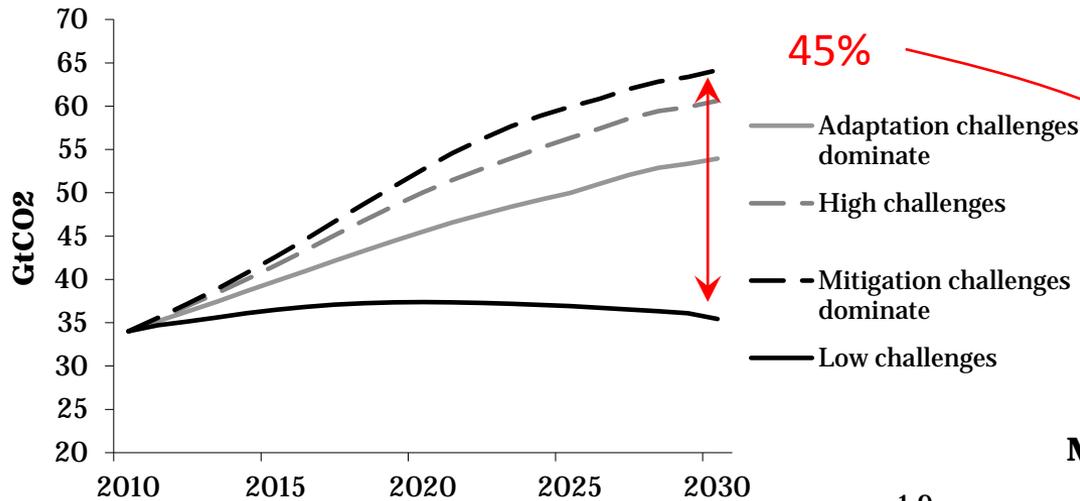


# Drivers for the “archetypes” scenarios chosen for SSP1, SSP3, SSP4 and SSP5.

	SSP1	SSP3	SSP4	SSP5
	Low challenges	High challenges	Adaptation challenge dominates	Mitigation challenge dominates
<b>Equity</b>	Improved	Worsen	Worsen	Improved
<b>Convergence</b>	Fast	Medium	Slow	Fast
<b>Energy sobriety</b>	High	Low	High	Low
<b>Availability of low carbon technologies</b>	High	Low	Low	High
<b>Availability of fossil fuels</b>	High	High	High	High
<b>Population</b>	Medium	Medium	Medium	Medium
<b>Capital markets</b>	Reduced imbalances	Reduced imbalances	Continued imbalances	Reduced imbalances

# Emissions and temperature increase: a story of inertias

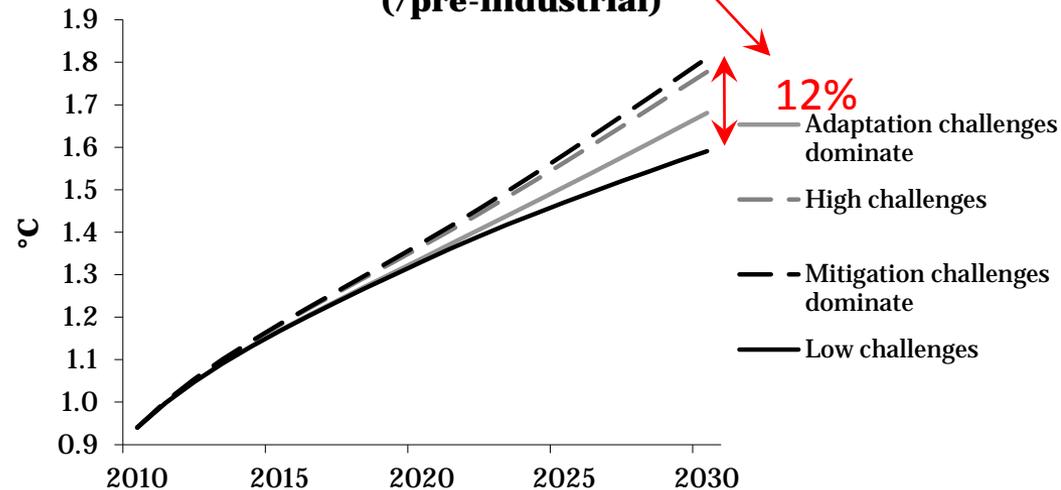
### Global CO2 emissions



### 2 layers of inertia:

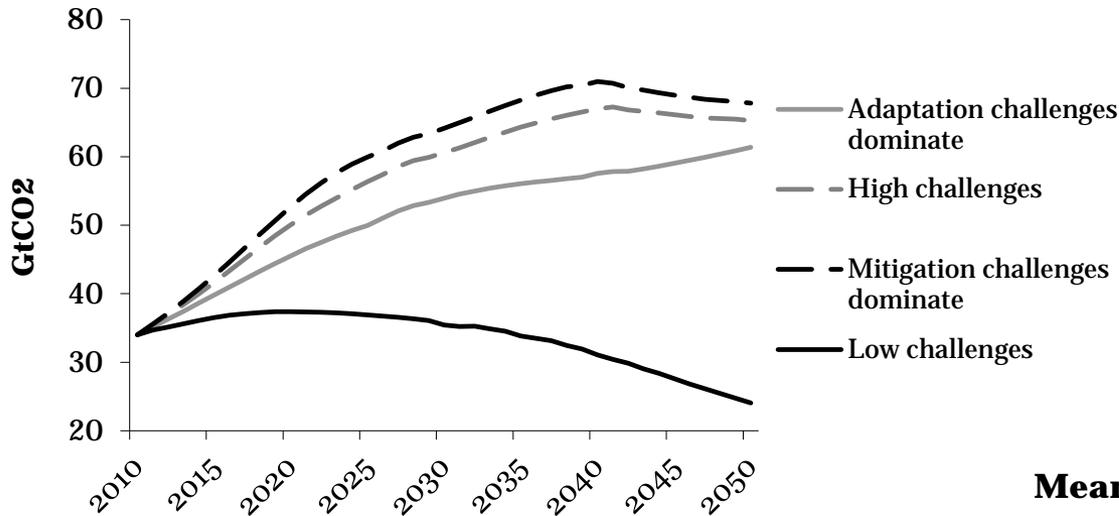
- Carbon cycle: from emissions to atmospheric concentration
- Climate system: from radiative forcing to temperature change

### Mean global temperature increase (/pre-industrial)

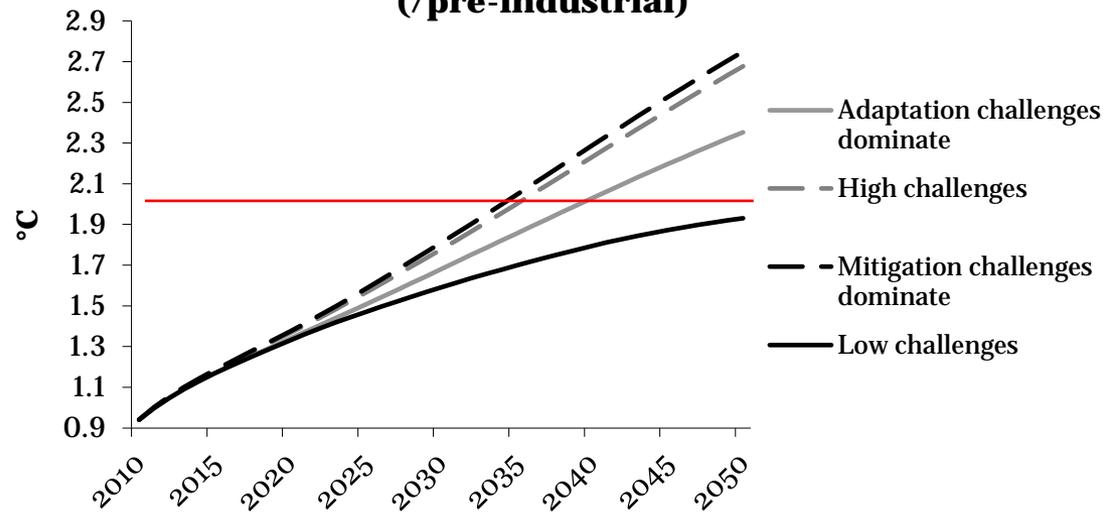


# Emissions and temperature increase: Looking beyond 2030

## Global CO2 emissions



## Mean global temperature increase (/pre-industrial)



# The future legacy of the two coming decades and the 2°C target

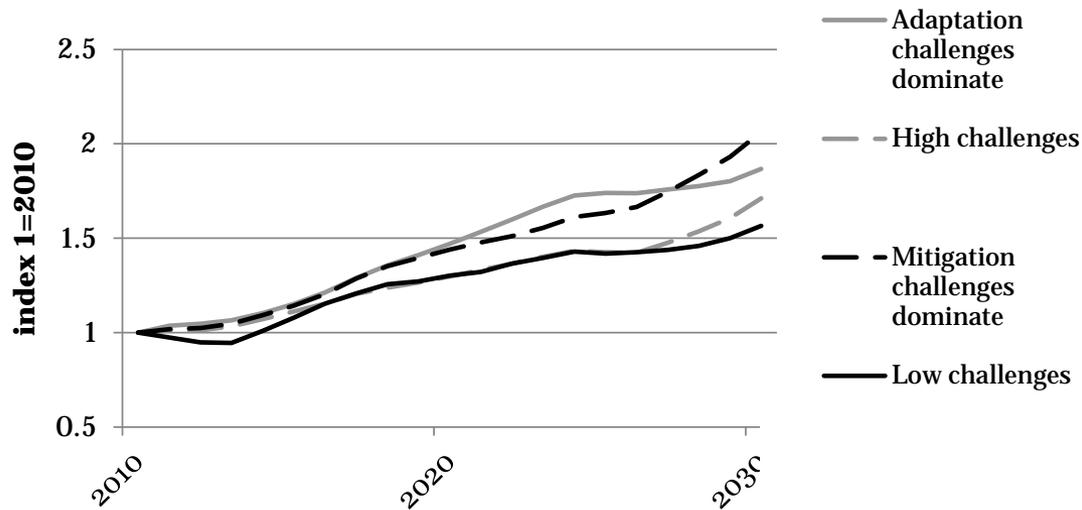
	2010-2030 carbon budget	remaining budget to have 50% chances to reach the 2°C target		annual decrease of emissions over 2030-2050 to reach the 2°C target
		in GtCO <sub>2</sub>	in number of years of 2030 emissions	
Adaptation challenges dominate	912	318	6	16%
High challenges	1005	225	4	26%
Mitigation challenges dominate	1077	153	2	42%
Low challenges	722	508	15	3%

For comparison:

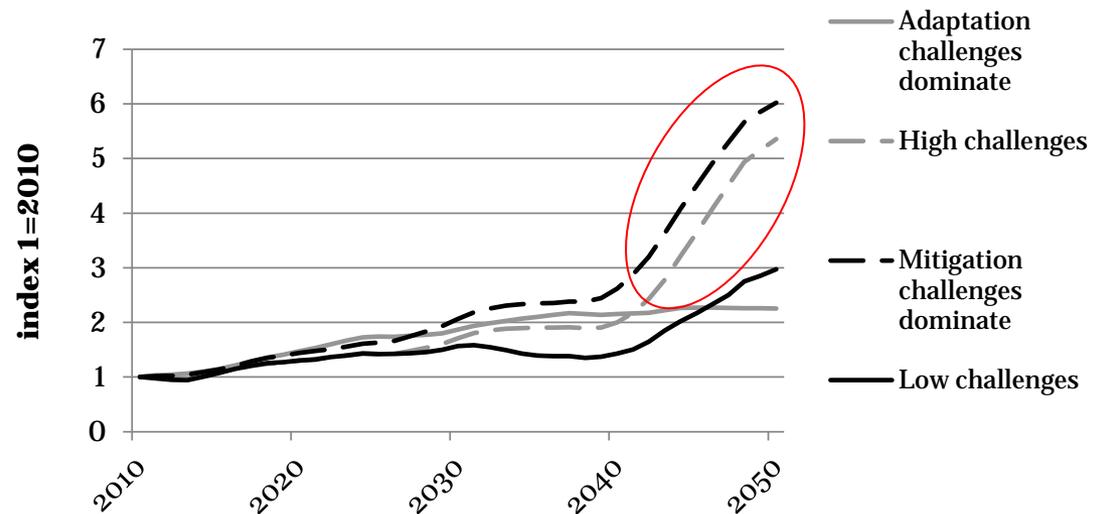
- highest rate of CO<sub>2</sub> emissions reductions historically observed in any industrialized country over a five-year period : 4.6% (France, 1980-85)
- “committed” emissions due to existing infrastructure in 2010: for 3.2% to 5.7% depending on assumptions (Davis et al, 2010, Guivarch and Hallegatte, 2011), if early capital retirement is avoided.
- Once again, a story of **inertia**; here the inertia of technical systems, infrastructures, location choices, behaviors. But one should also consider the inertia of institutions.

# Oil prices pathways: when the bad surprise comes after 2030

## International oil prices

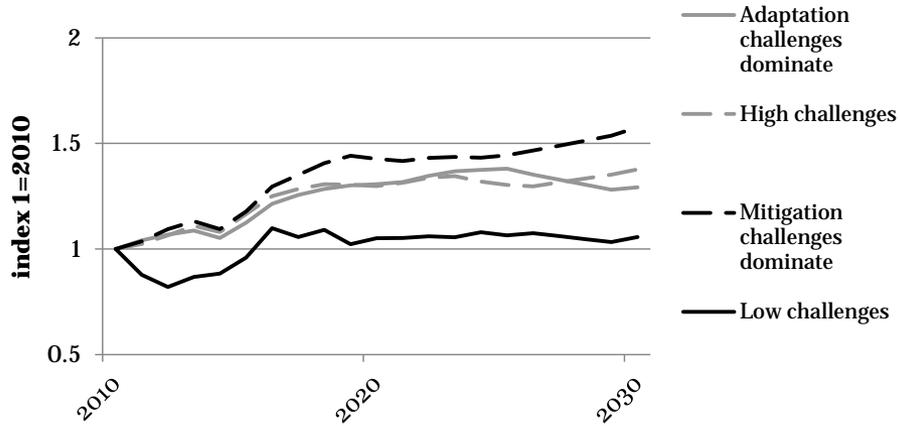


## International oil prices

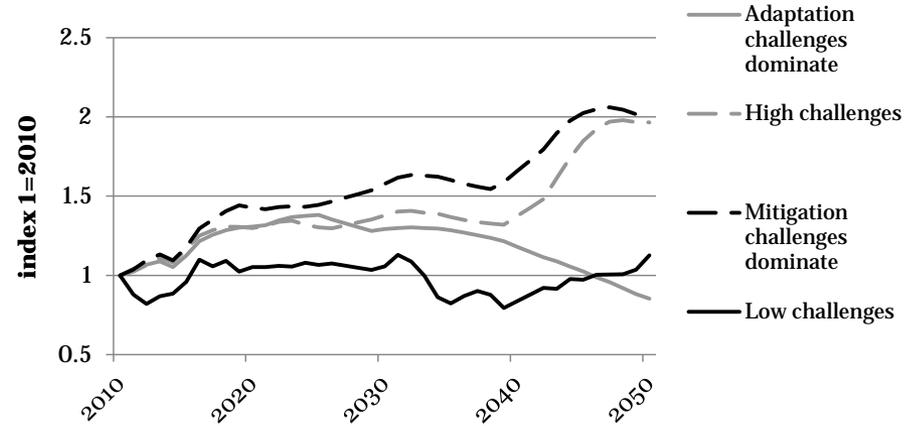


# The risks of carbon/oil lock-ins of our economies

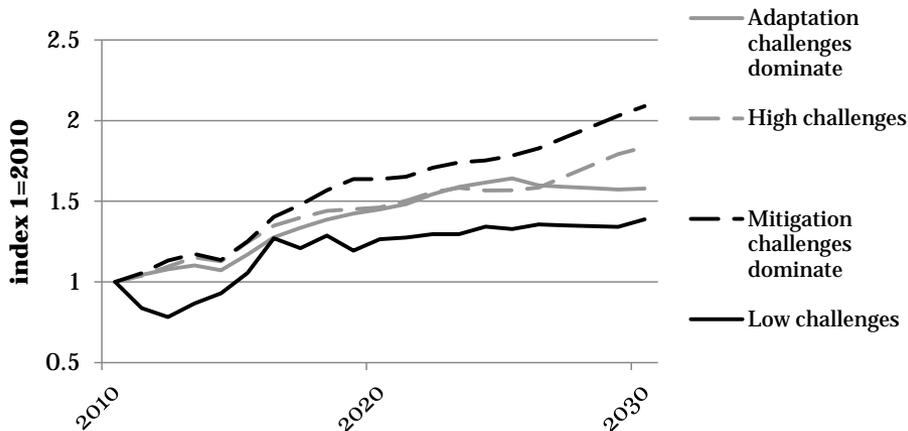
## Share of oil imports in GDP (Europe)



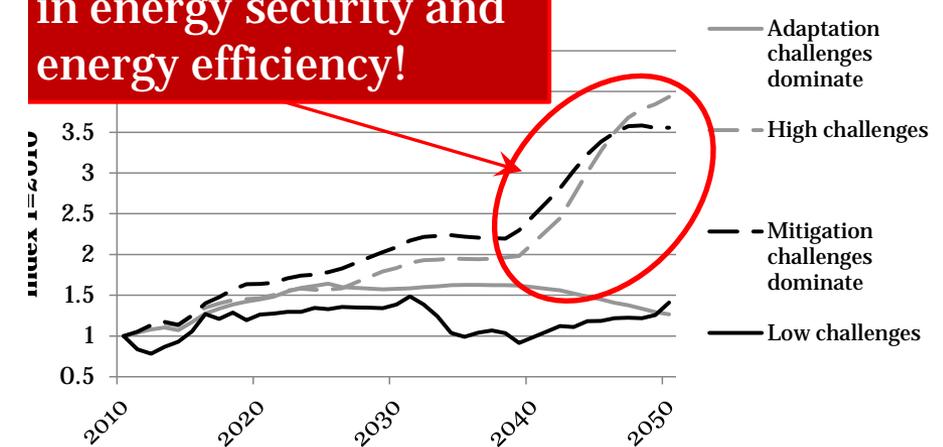
## Share of oil imports in GDP (Europe)



## Share of oil imports in GDP (China)



**China has high interest in energy security and energy efficiency!**



# Mapping AUGUR global governance scenarios into the framework of the new socioeconomic pathways for climate change research

		Archetype scenarios from the SSP framework			
		Low challenges	High challenges	Adaptation challenges dominate	Mitigation challenges dominate
AUGUR global governance scenarios	S1 Reduced government	Unlikely	<b>Likely</b>	<b>Very likely</b>	Unlikely
	S2 China and US intervention	Unlikely	<b>Likely</b>	Unlikely	<b>Unlikely?</b>
	S3 Regionalisation	<b>Possible?</b>	Unlikely?	Unlikely	<b>Very likely</b>
	S4 Multipolar collaboration	<b>Likely?</b>	Possible	Possible	Possible

# Conclusions

- Both climate change and energy security issues are **long-term issues**, for which the main challenges may arise after the 2030 horizon.
- However, the two coming decades are crucial for these issues since the directions taken over this short-/medium-term **risk to create lock-ins** of the economies in carbon and/or oil dependency.
- Indeed, **inertias** in the technical systems, the behaviors and the institutions make the transformations away from oil consumption and/or away from carbon intensive economies a slow process.
- If these transformations are **not started early**, during the coming two decades, it creates the risks that (i) economies are **vulnerable to oil prices shocks** that may happen when producers reach depletion constraints (possibly after 2030, as in our scenarios), (ii) it would be **unfeasible or extremely costly to limit climate change to the 2°C target**.

# Policy implications

- Europe cannot solve alone the climate issues
- Breaking the climate negotiations deadlock
  - Re-open to broader issues (energy security, local environment...), looking for synergies and co-benefits
  - Re-integrate development issues
  - Finance might well be the key
- The 2°C target is becoming increasingly difficult to achieve
  - What status of the target?
  - Adaptation is also an issue: different vulnerabilities and adaptation challenges between European regions: European mechanisms necessary?