

GRACE: A model for integration of knowledge on climate change and policies

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Future Research Challenges: Hungarian–Norwegian Conference & Knowledge Exchange
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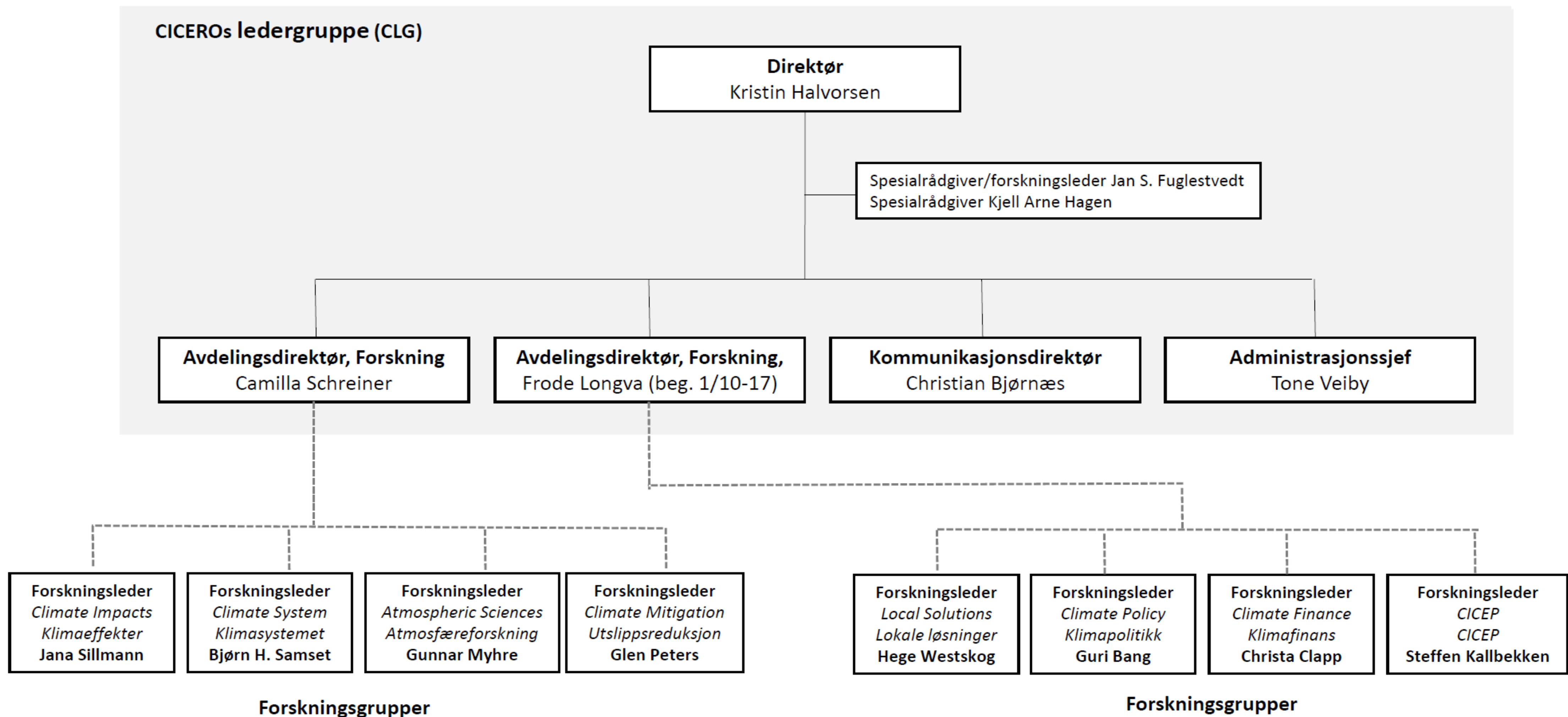
CICERO Center for International Climate Research

- An independent research center located in Oslo Science Park
- Founded in 1990 by the Norwegian government
- *Interdisciplinary*: Nice environment for **innovative thoughts**
- *Expertise include:*
 - ✓ *Effects of manmade emissions on the climate*
 - ✓ *Society's response to climate change*
 - ✓ *Formulation of international agreements*
- *Active in the IPCC since 1995*
- *Pioneer of climate finance research*



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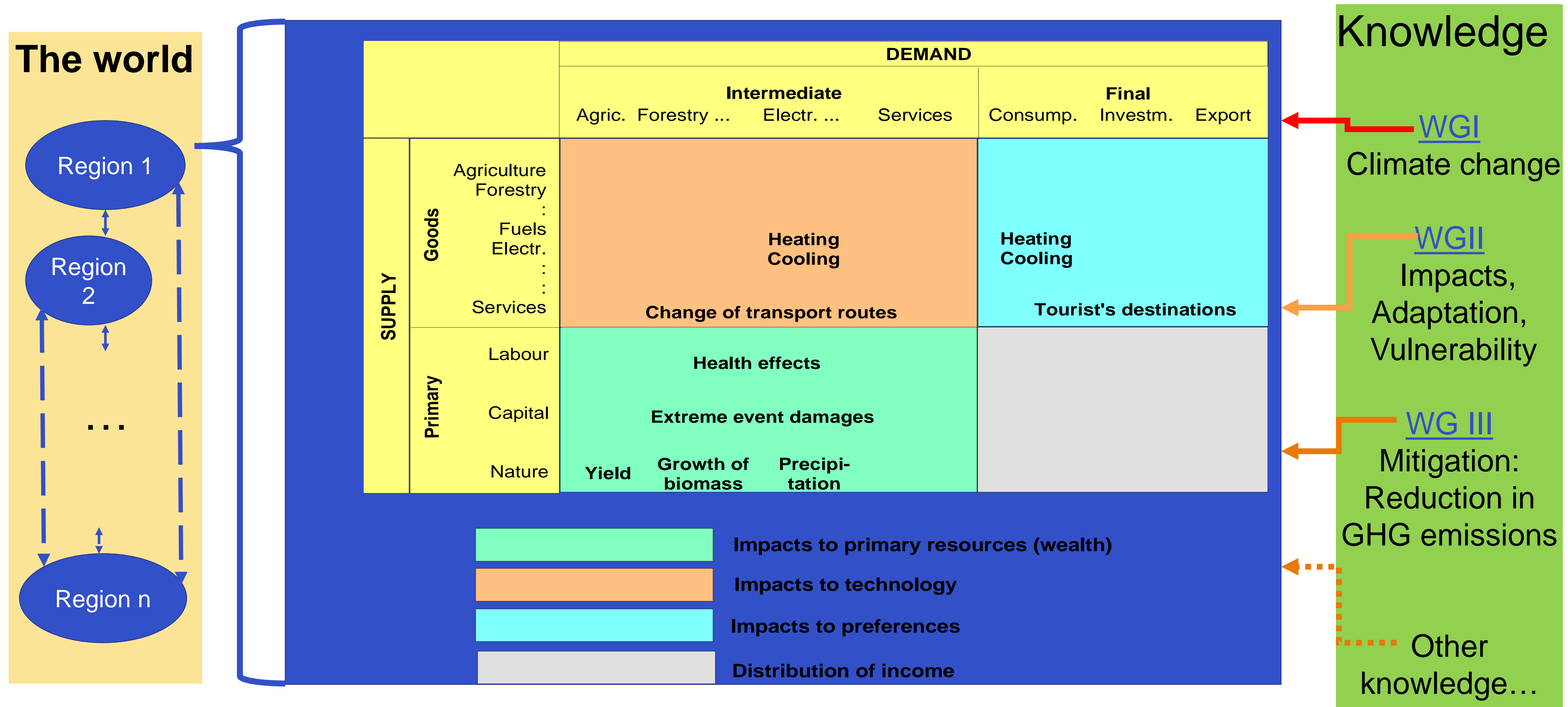
Organisasjonskart per 01.09.17



Climate change knowledge

- [Working Group I](#) - The Physical Science Basis
 - [Working Group II](#) - Impacts, Adaptation, and Vulnerability
 - [Working Group III](#) - Mitigation of Climate Change
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- How to integrate the knowledge in the three groups in a consistent framework for an overall picture?

GRACE: A flexible framework



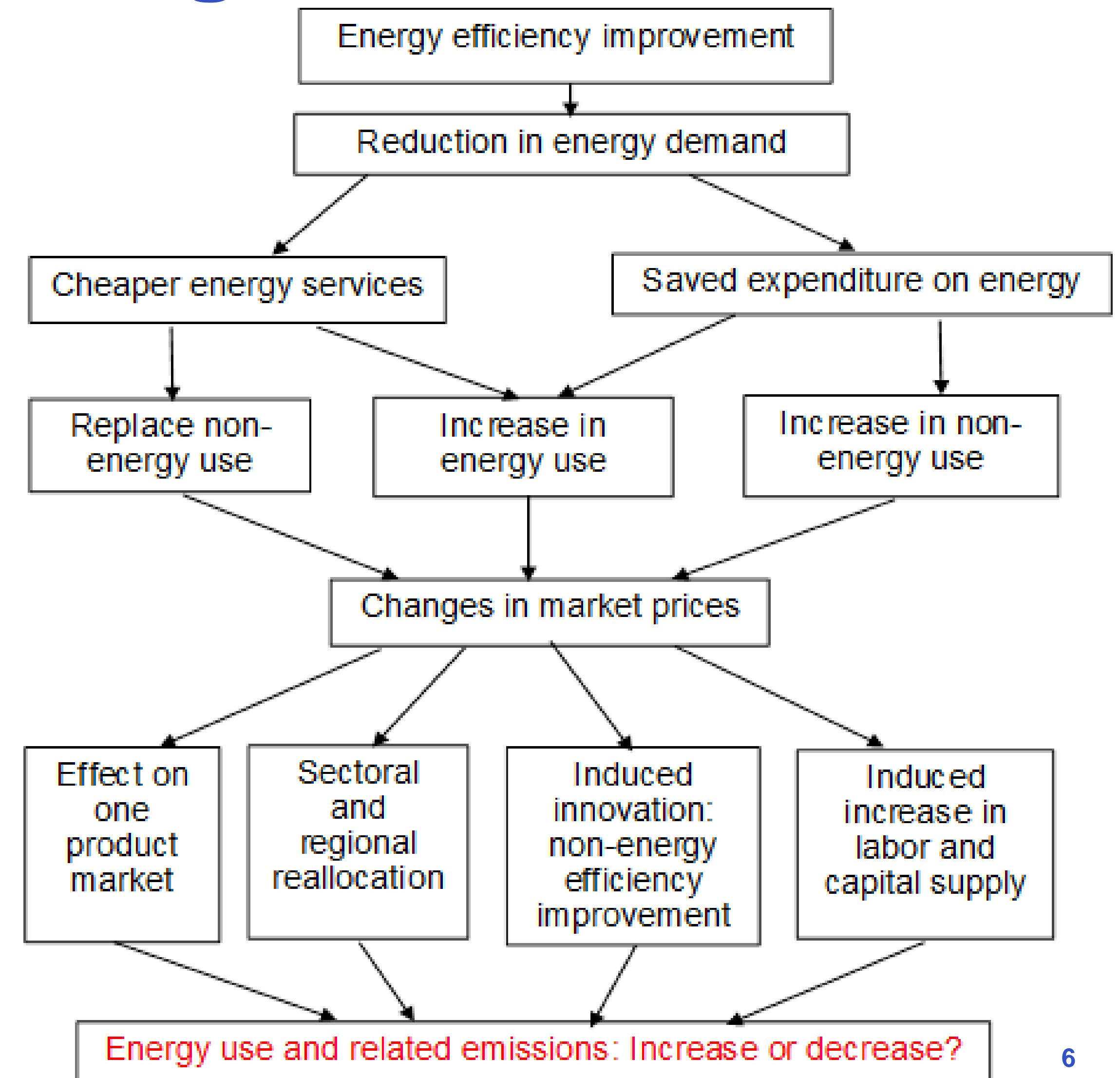
Example: Energy efficiency improvement: Is it reliable for climate mitigation?

Shares of realized expectation may be

- 30% for energy use
- 10% for fossil-related emissions

Why?

- Economic growth
- Substitution between energy and other goods
- Labor movement across activities



Example: Impacts and adaptation to climate change in European economies

- Europe is divided into **84 sub-regions**
- CC impacts considered for a sub-region
 1. Agriculture
 - 2. Forest**
 3. Fishery
 - 4. Electricity supply and demand**
 5. Tourist
 - 6. Extreme events**
 7. Sea level rise

Results

- The overall impacts are small for the +2 °C world
- At +4 °C,
 - **impacts are notable**. GDP decline 0.1-0.7%y⁻¹, Particularly in southern Europe
 - Some sectors suffer from lower market prices
 - **Migration of workers** from south to North.

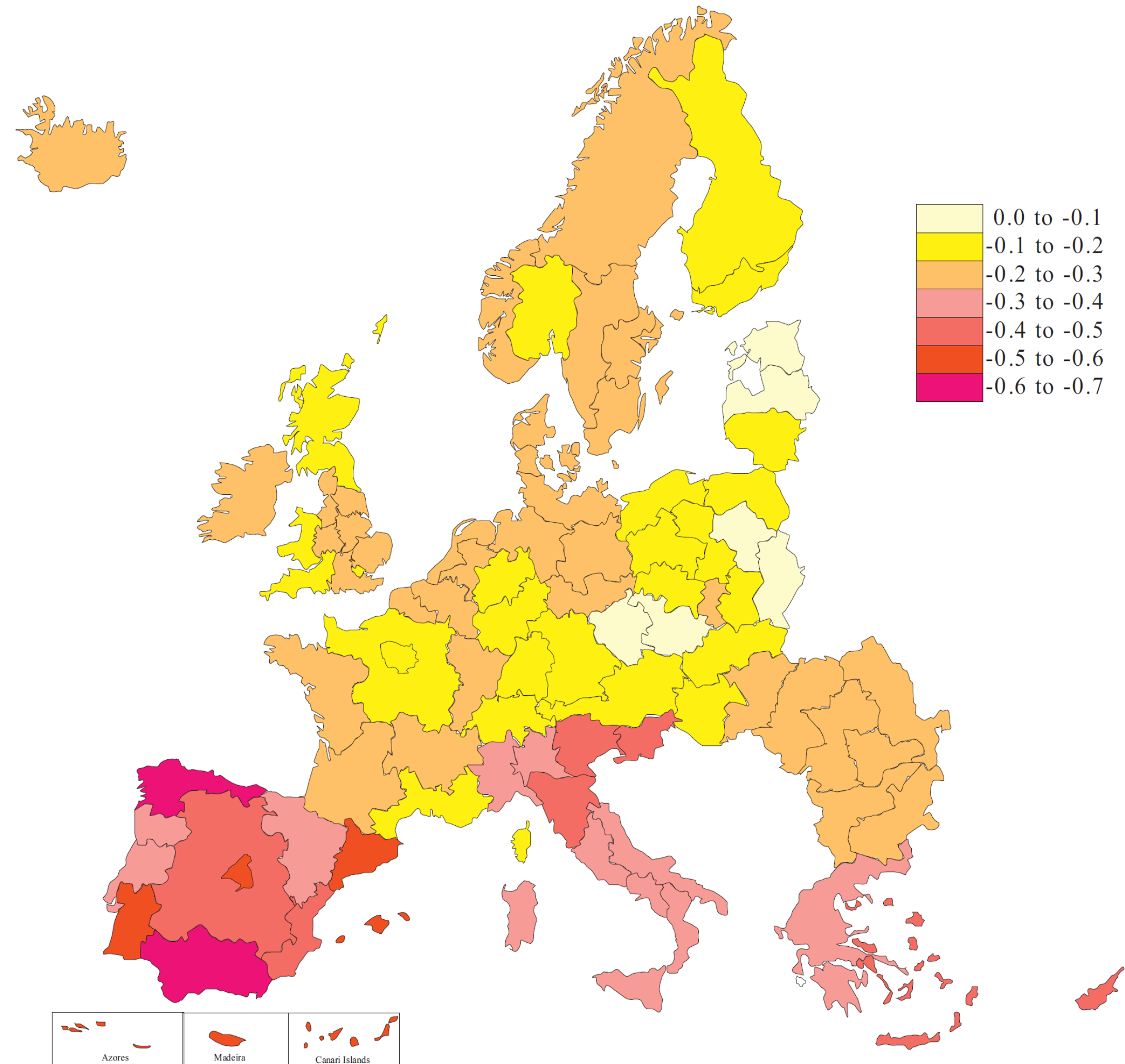


Fig. 3. Estimated percent reductions in GDP by sub-region in Europe under a +4 °C increase in global mean temperature.

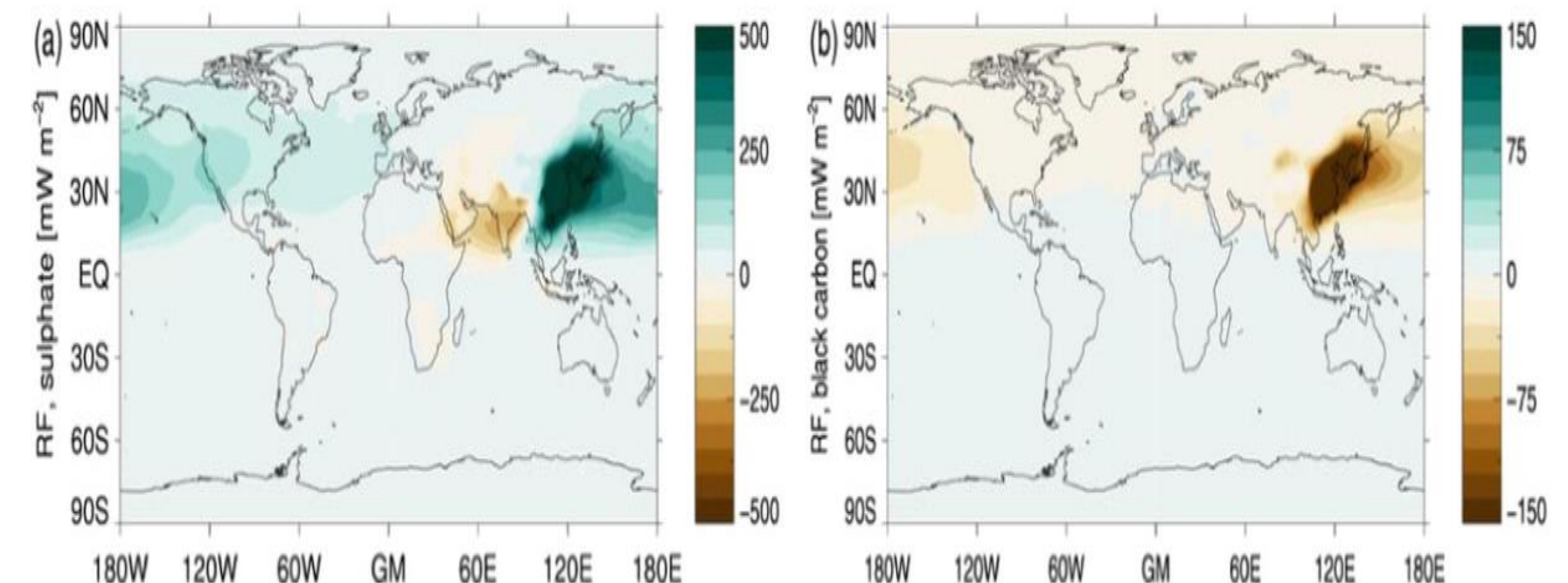
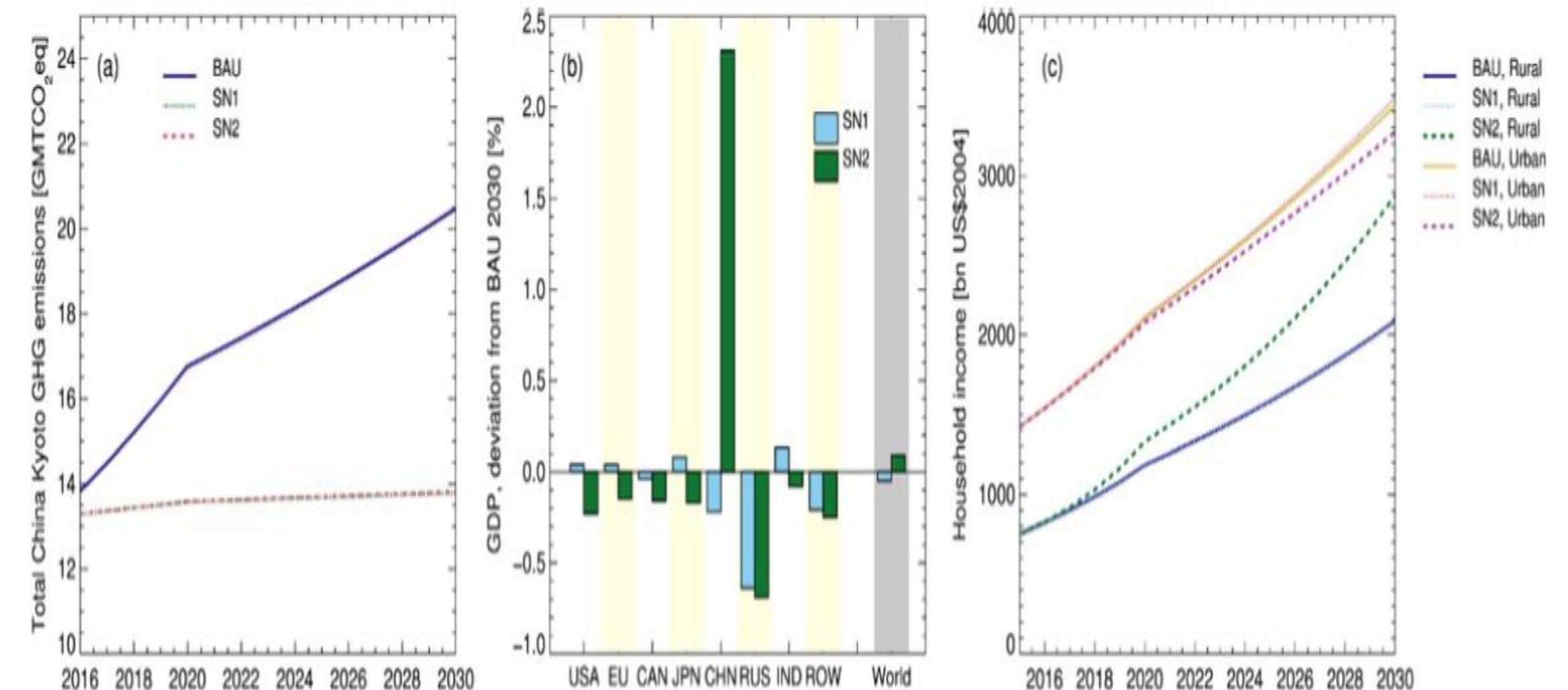
Example: A warmer policy for a colder climate: Can China both reduce poverty and cap carbon emissions?

Policy to cap CO₂-emissions at 2015 level

- A tax on fossil fuel consumption to finance rural households by a subsidy on farmland

Results

- China can cap CO₂-emissions at 2015 level with economic growth and poverty reduction
- One year of the global emissions avoided
- The global mean temperature is reduced by 0.03 (± 0.02) °C



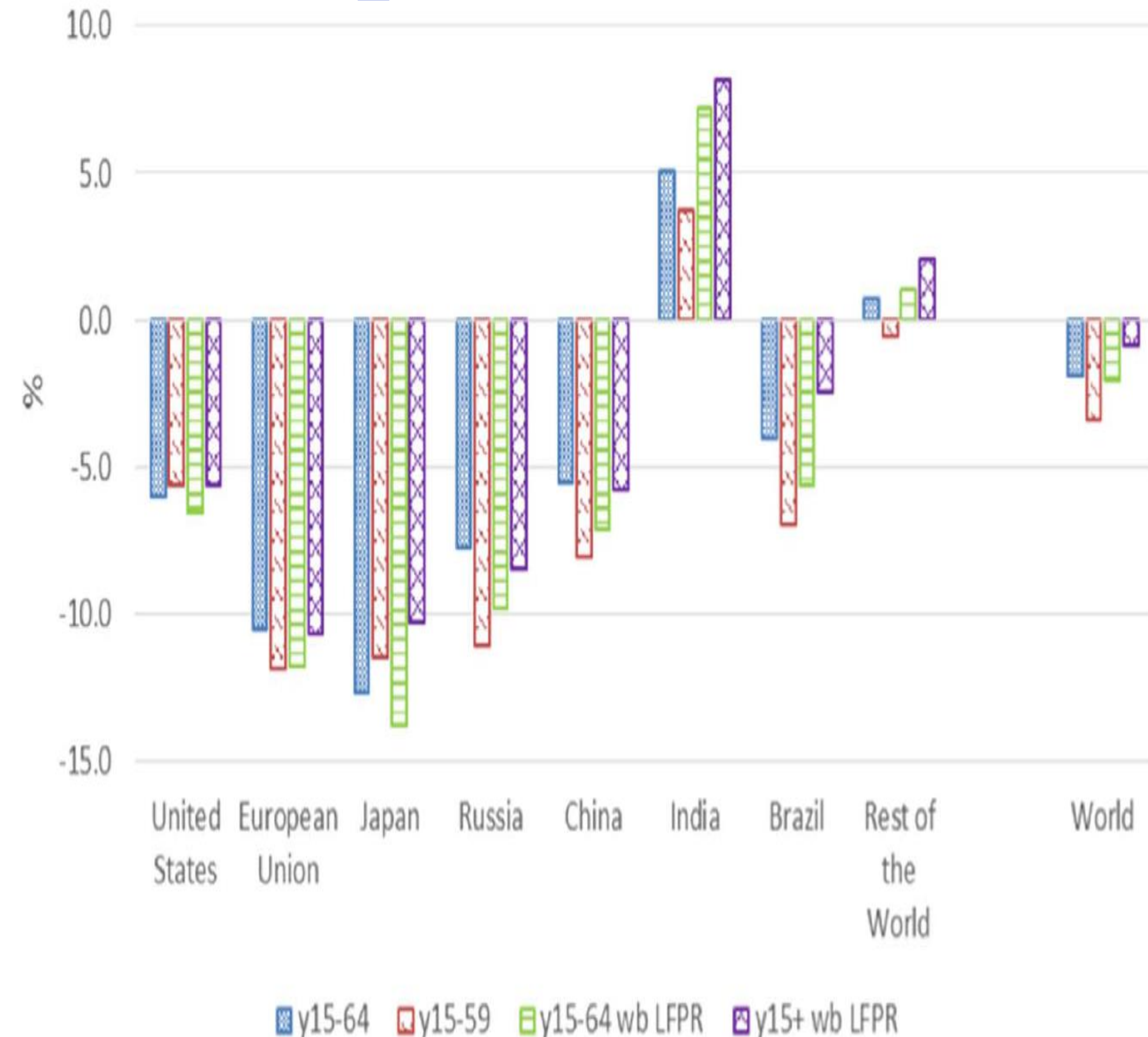
Example: How will labor force participation rates matter for global economy and CO₂ emissions?

Labor supply differ from population size

- Consider age-gender-specific labor force participation rates (LFPRs) by region

Results

- Underestimate economic growth and emissions in India, but overestimate in the key aging regions of US, EU, Japan, Russia and China, if LFPRs are NOT considered
- Participation of the elderly in labor market may considerably mitigate the negative impact of aging on the economy



Example: Extreme weather, food security and the capacity to adapt - the case of crops in China

Three extreme weather scenarios: consider a year when every province has precipitation corresponding to the

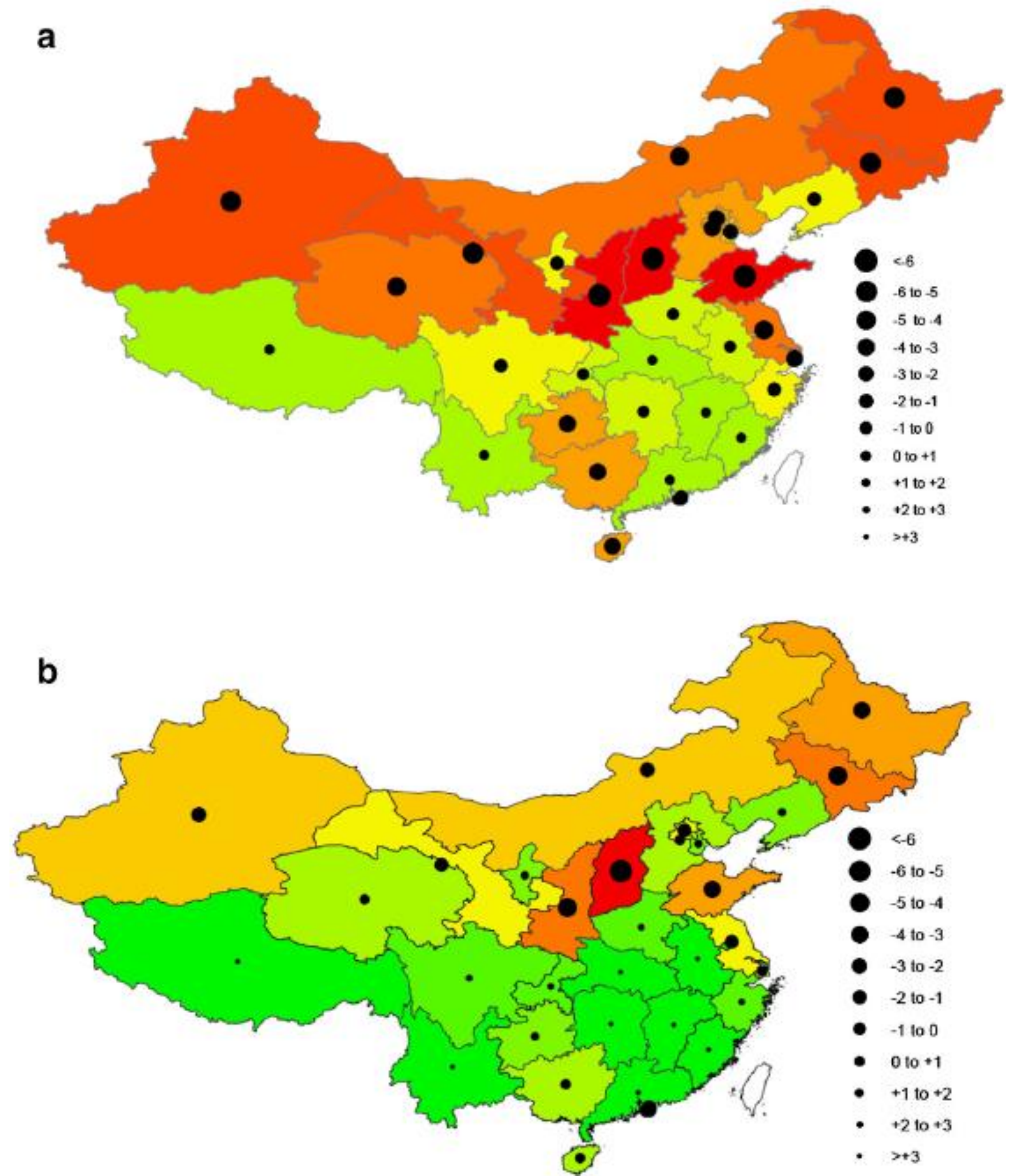
- lowest
- highest
- most harmful

level experienced in the province over the last 30 years

Results

After **adaptation**,

- Extreme impacts are NOT serious at national level
- **Maize harvest suffers the most** by 1-4% reduction
- Impacts within a province may be serious and even become worse with adaptation
- **Good harvests might not make farmers better off** due to lower crop prices even though consumers benefit
- **The ability to adapt may NOT occur in short term**



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