The transition in energy demand sectors to limit global warming to 1.5°C

Aurélie Méjean, Céline Guivarch, Julien Lefèvre, Meriem Hamdi-Cherif
mejean@centre-cired.fr

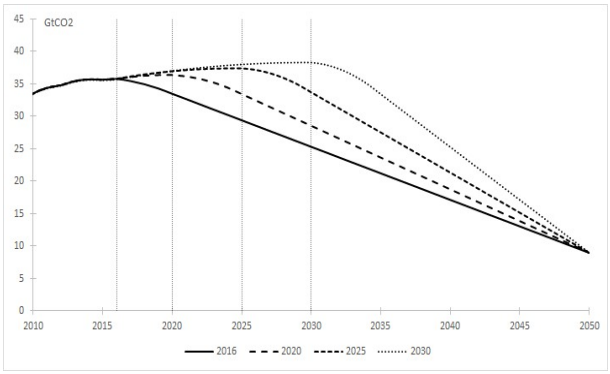
1. Context

- Achieving an emissions pathway compatible with the 1.5°C objective requires unprecedented changes in the economy
- We describe how such a transition may impact the dynamics of sectoral emissions, with or without sector specific policies to complement the carbon price

2. Model

- Integrated Assessment Model: IMACLIM-R World
- Interlinked evolution of economic growth, energy demand and technical systems
- 4 emission trajectories, 3 sets of key uncertain parameters

3. Scenarios

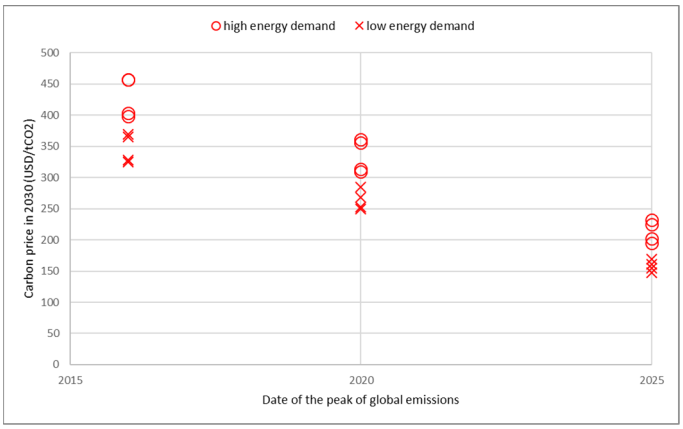


- **Scenario parameters**
  - ➢ Energy demand (low/high)
    - ❖ fast/slow energy efficiency improvements in productive sectors
    - ❖ low/high carbon intensity of development patterns
  - ➢ Fossil fuel resources (low/high)
  - ➢ Low carbon technologies (low/high)
  - ➢ 32 scenarios
  - ➢ Low energy demand scenarios correspond to scenarios with additional energy efficiency policies to complement a carbon price

4. Results

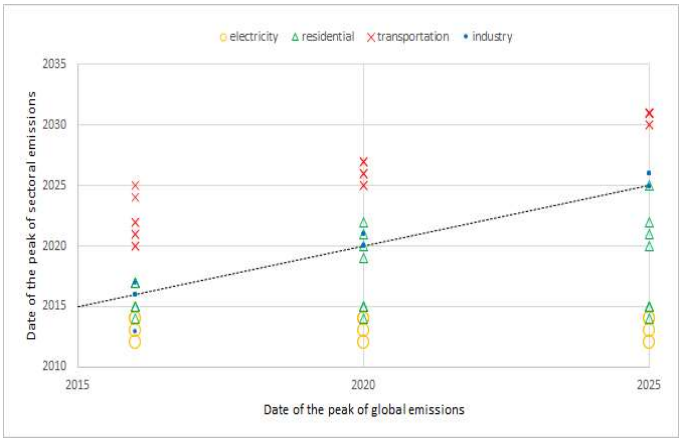
High energy demand and the difficulty of reaching the 1.5°C objective

- ➢ The peak of global emissions cannot be delayed until 2030 while reaching a level of emissions in 2050 that would be compatible with the 1.5°C target
- ➢ For all feasible scenarios, the level of the carbon price required in high energy demand scenarios is between 25% and 50% higher in 2030 than in low energy demand scenarios
- ➢ This points out to the role of energy demand levers for the feasibility of stringent mitigation pathways



Sectoral implications of shifting the peak of global emissions

- ➢ Bringing forward the peak of global emissions does not lead to a homothetic adjustment in all sectors
  - ❖ Immediate peak of electricity emissions
  - ❖ Earlier, lower emission peaks in energy-demand sectors
- ➢ Later peak of emissions in transportation than in industry
  - ❖ Sector constrained by existing infrastructure, urban forms; demand for mobility/freight coupled to GDP
- ➢ With additional energy efficiency policies, the fast decarbonisation of industry allows for the emissions peak in transportation to be delayed
- ➢ Sector-specific policies to improve energy efficiency are paramount to achieve the 1.5°C objective while keeping carbon prices at socially acceptable levels



Published in *Energy Efficiency* (2018) - Interactive visualization app: https://imaclim.shinyapps.io/TransitionInEnergyDemandSectors//