



POTSDAM INSTITUTE FOR  
CLIMATE IMPACT RESEARCH

# Requirements of Climate Stabilization

## Key results from the RoSE project

**Elmar Kriegler, Ioanna Mouratiadou, Gunnar Luderer,  
Ottmar Edenhofer, The RoSE Consortium**

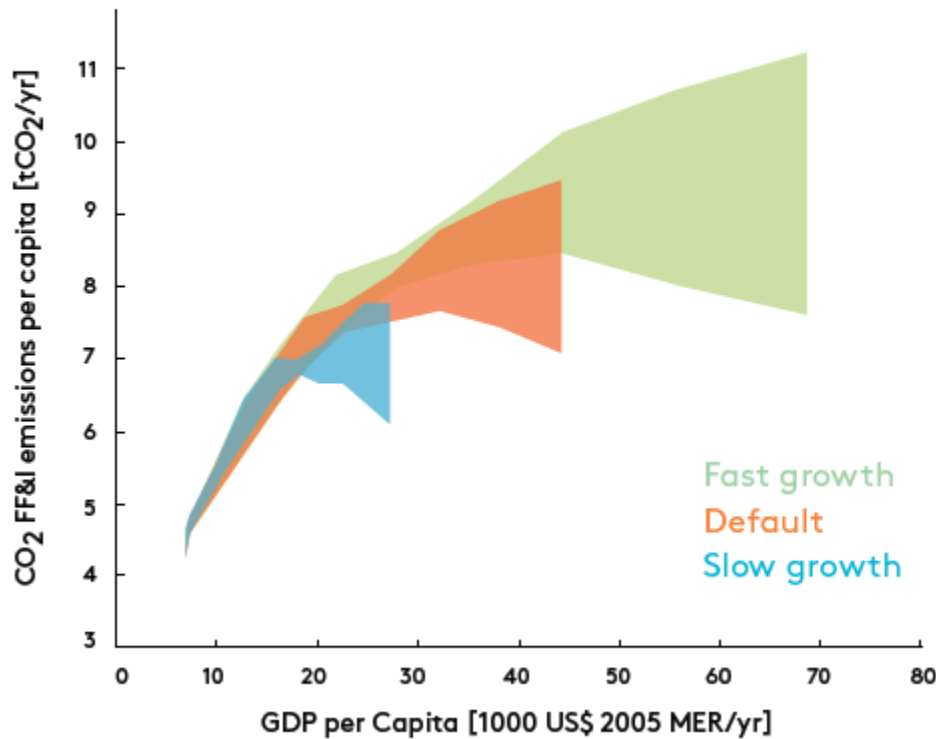
RoSE Side Event, UNFCCC SB38

Bonn, 13 June 2013

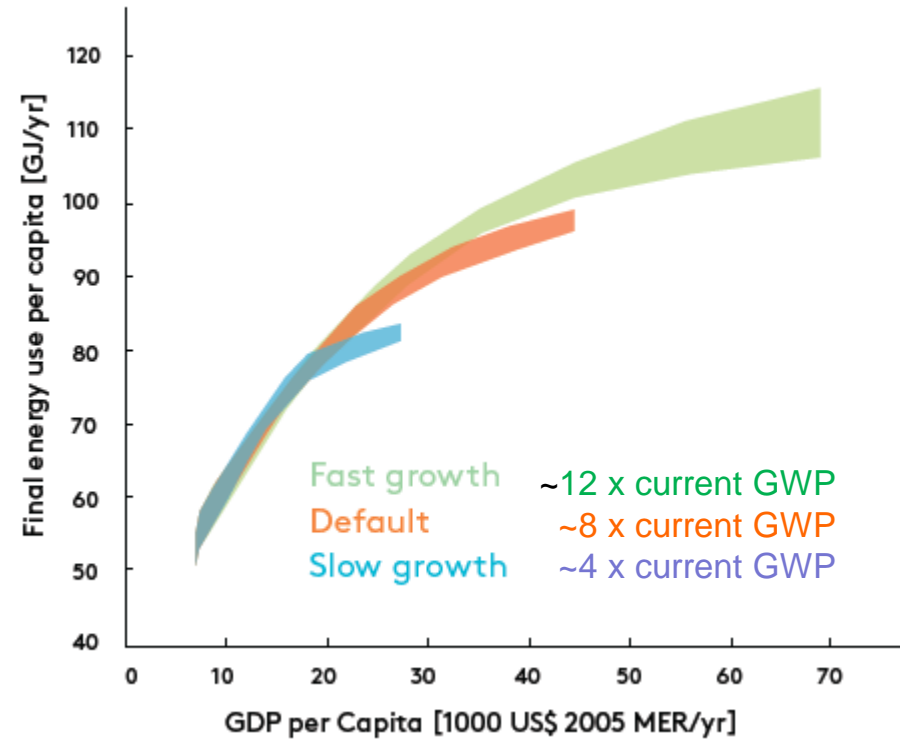
# Climate stabilization requires strong climate policy

- In the absence of climate policy and with current trends in energy intensity, energy demand and CO<sub>2</sub> emissions will increase with per capita income

(c) CO<sub>2</sub> emissions from FF&I



(d) Final energy consumption per capita

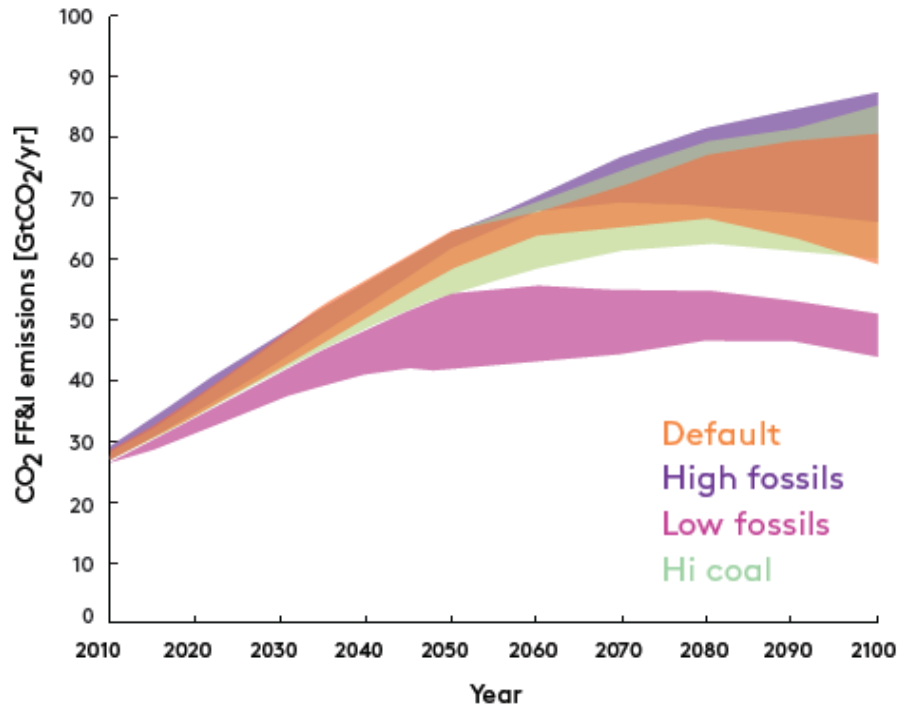


Kriegler, Mouratiadou et al. (2013)

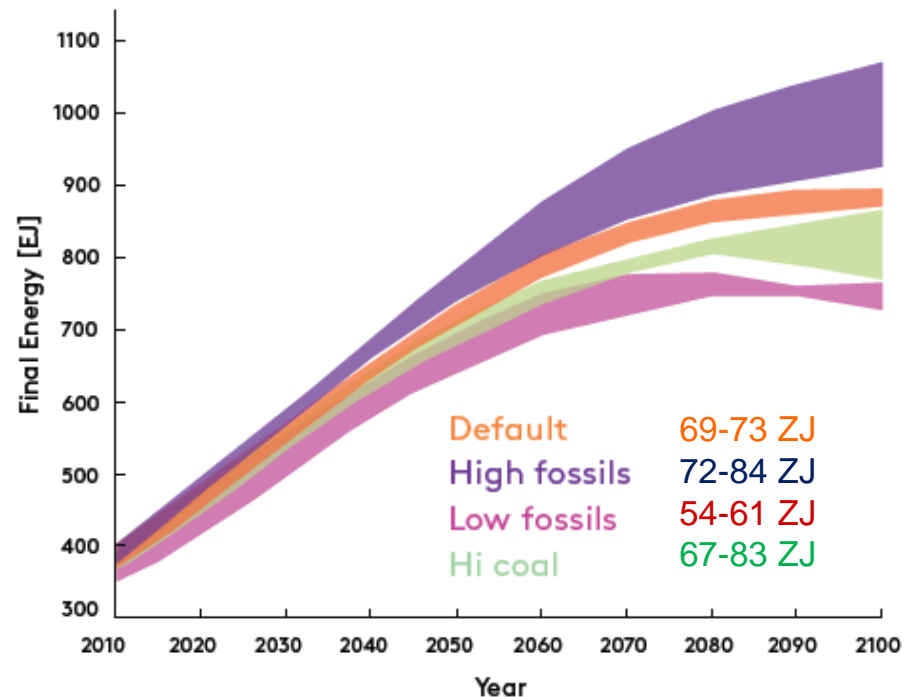
# Climate stabilization requires strong climate policy

- Fossil fuel scarcity alone is not sufficient to reduce CO<sub>2</sub> emissions

(c) CO<sub>2</sub> emissions from FF&I



(d) Final energy use



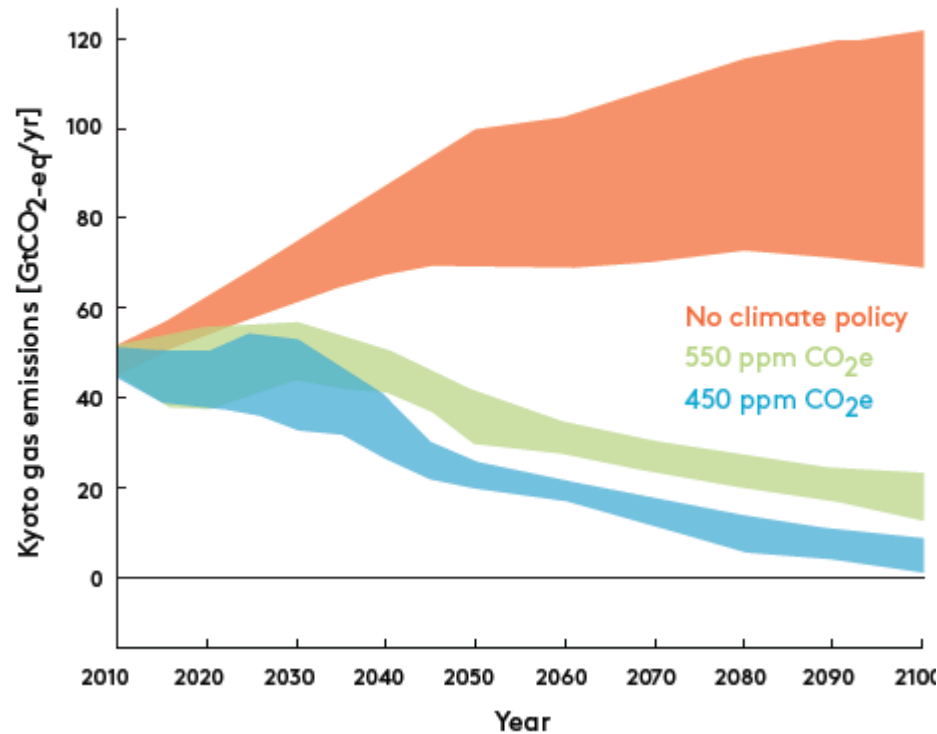
ca. 19 ZJ of fossil fuels burned until today  
ca. 36 ZJ of proven reserves today

Kriegler, Mouratiadou et al. (2013)

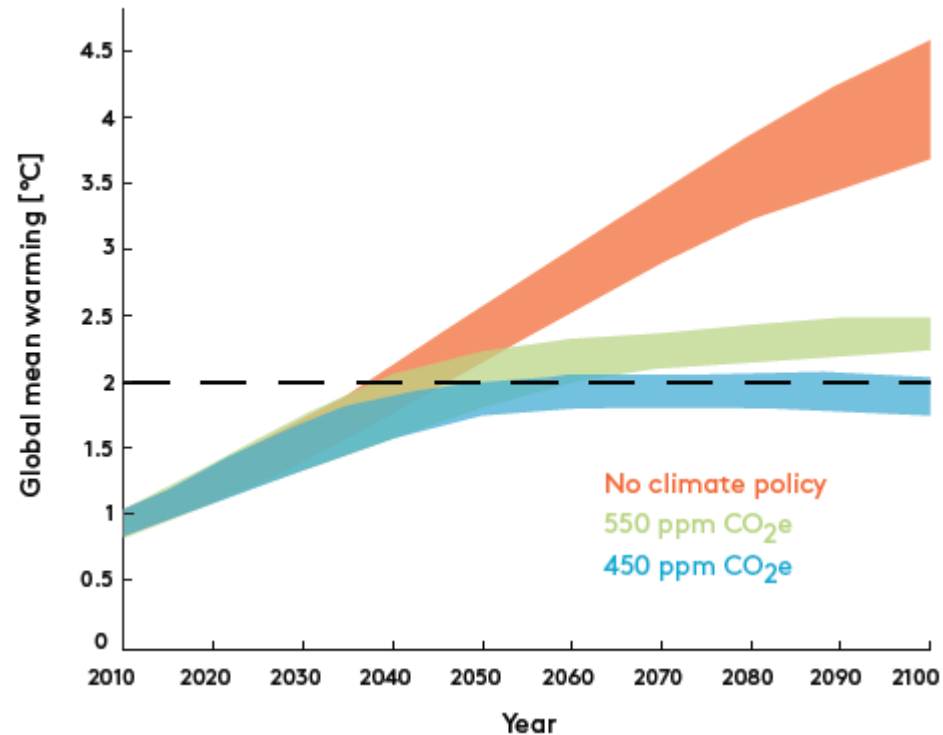
# Climate stabilization requires strong climate policy

- Emissions need to be phased out towards the end of the century (450 ppm) or in the first half of the 22nd century (550 ppm)

(b) Kyoto gas emissions



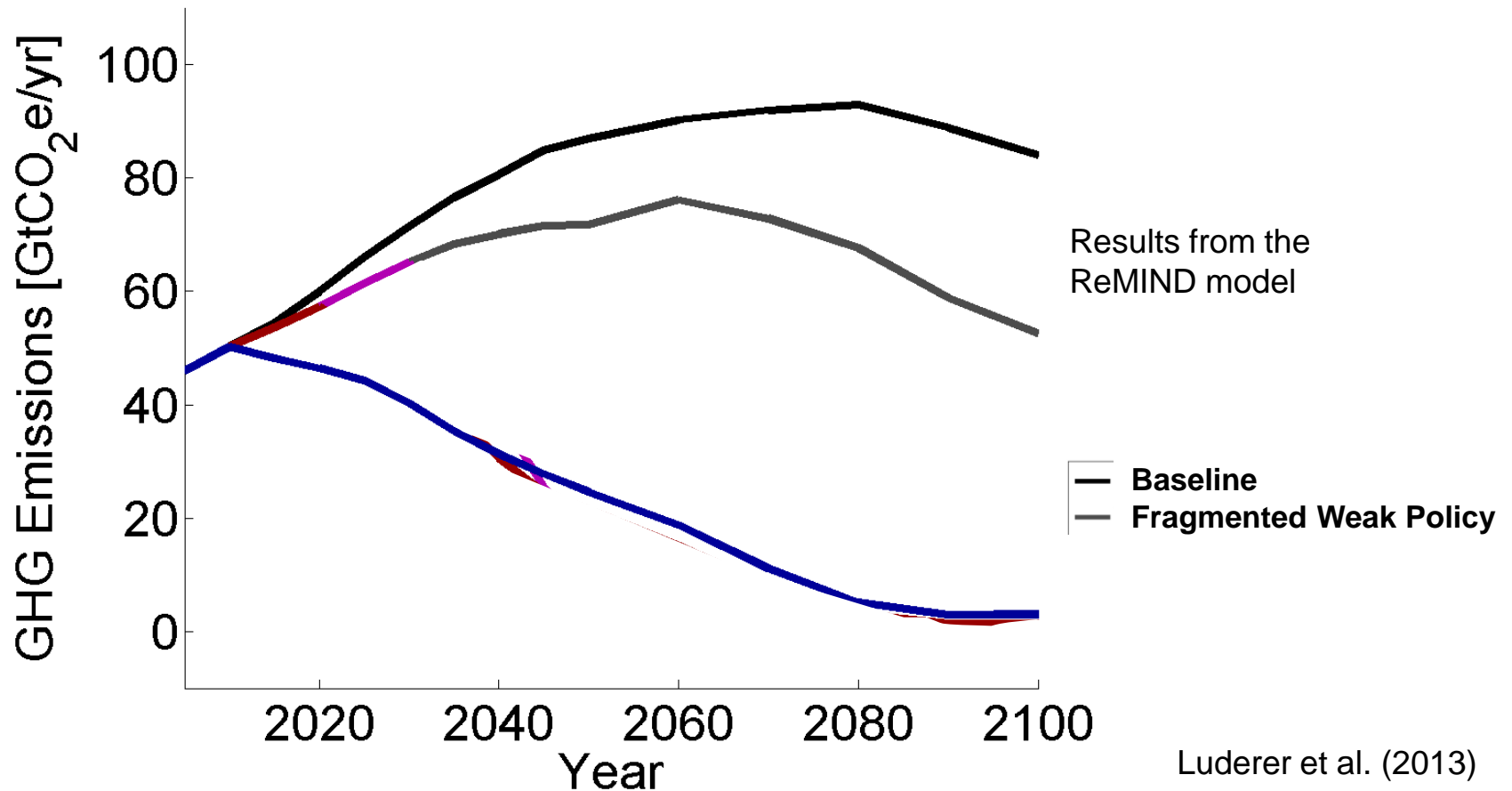
(d) Global mean temperature increase



Kriegler, Mouratiadou et al. (2013)

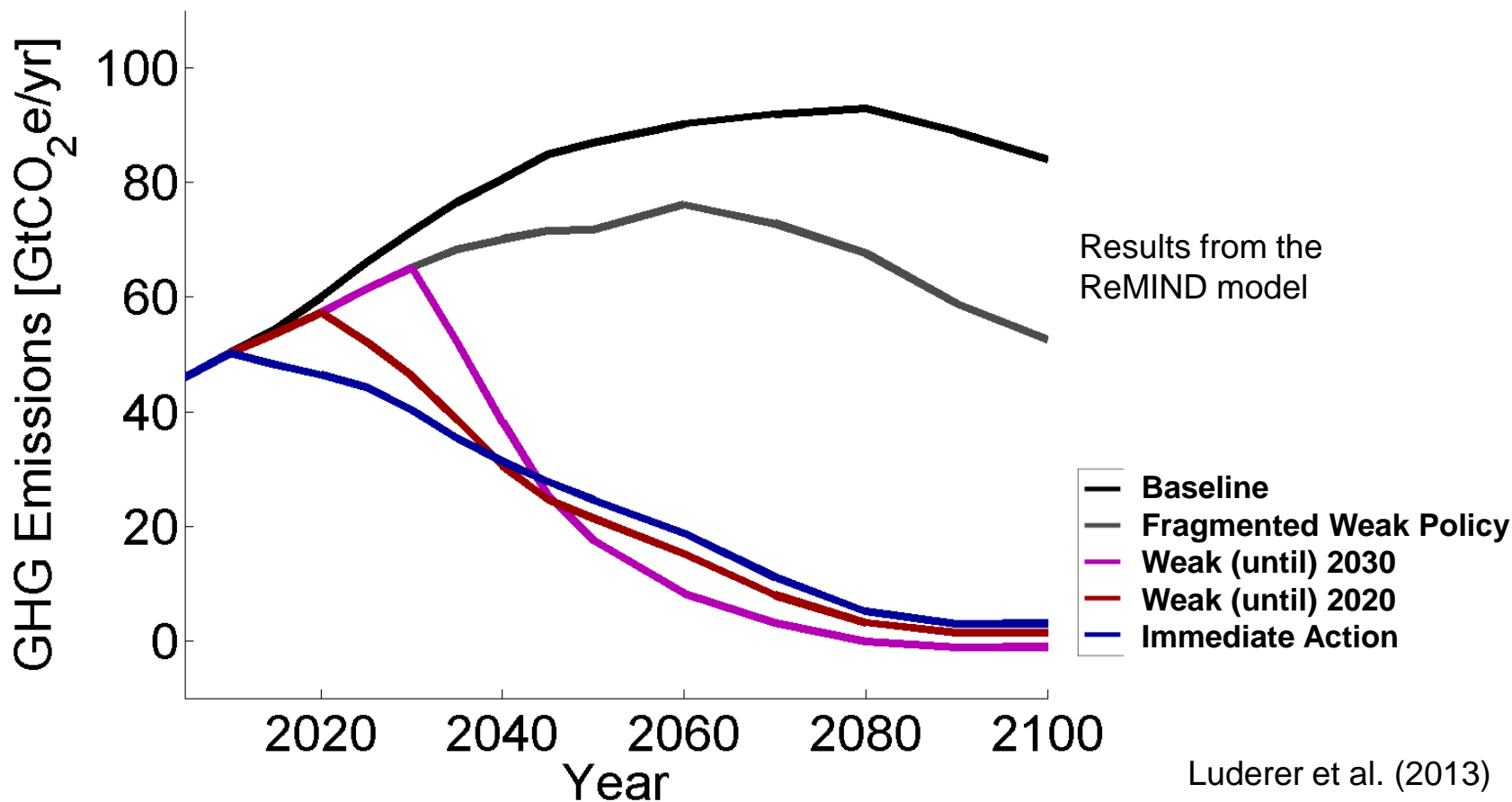
# Climate stabilization requires strong global action

- Extrapolating current pledges does not lead to climate stabilization



# Climate stabilization requires strong global action

- The later strong global action is enacted, the steeper midterm emissions reductions requirements for reaching the 2°C target

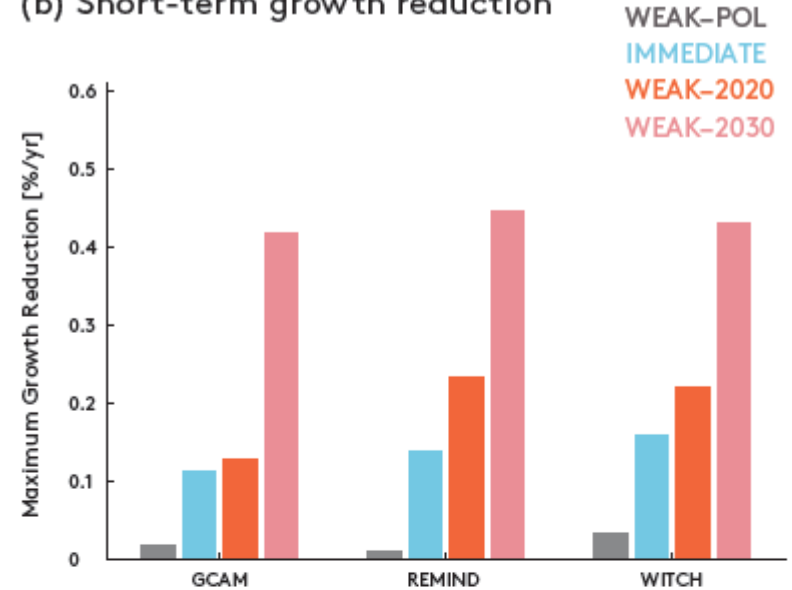


# Economic impact of later action

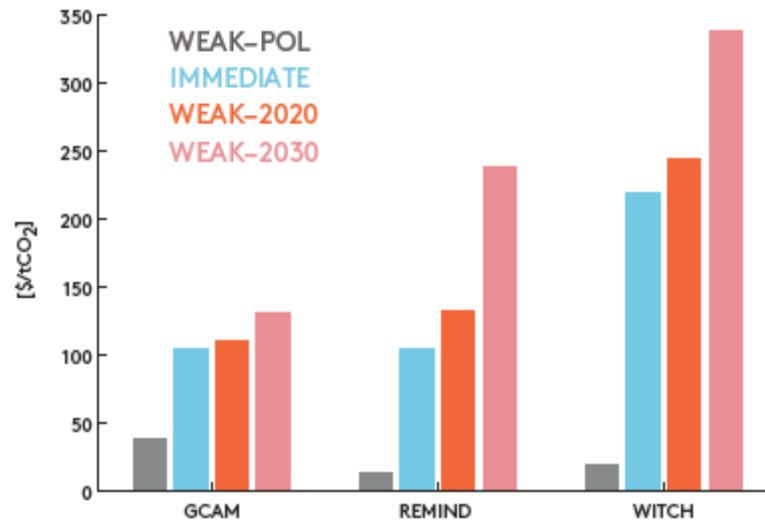
- Later action implies greater economic and institutional challenges for reaching 2°C

Luderer et al. (2013)

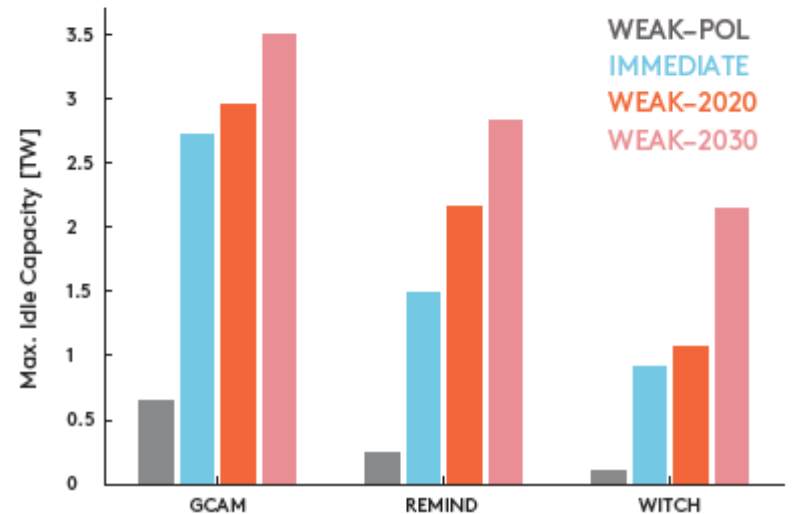
(b) Short-term growth reduction



(c) Carbon Price in 2040



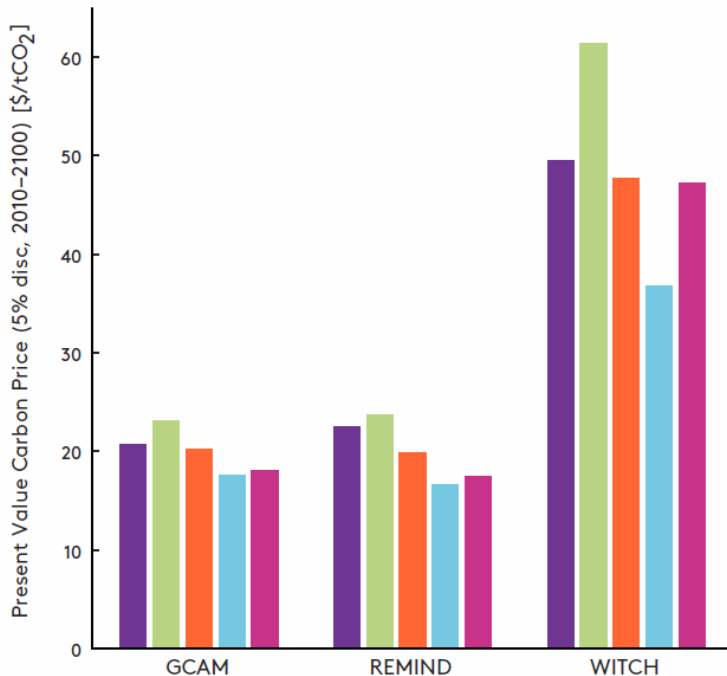
(d) Unused fossil capacities (max 2010-2050)



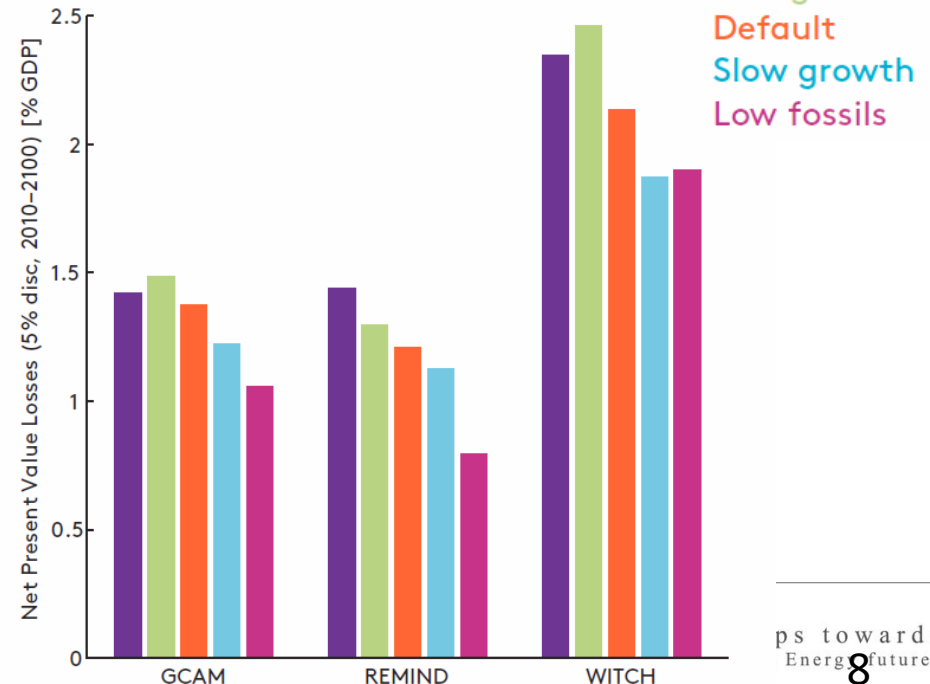
# Carbon prices and mitigation costs 2010-2100

- Estimates for „idealized immediate global action scenarios“!
  - Only direct costs of climate mitigation. No benefits, co-benefits or adverse side-effects included
- Costs vary by 25-80% with economic growth and fossil fuel assumptions
- Costs approximately double from 550 to 450 ppm CO<sub>2</sub>e

(a) Carbon prices (450 ppm)



(b) Mitigation costs (450 ppm)



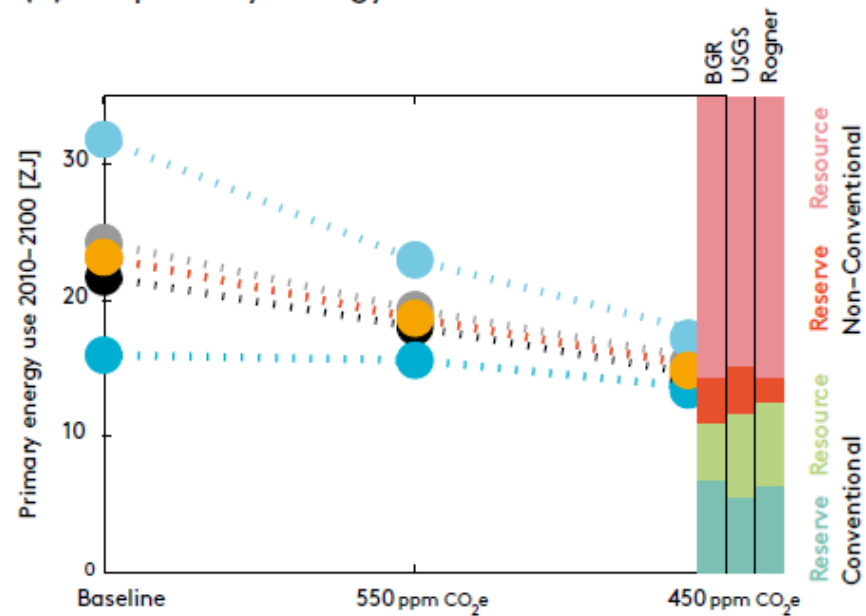


# Mitigation strongly impacts fossil fuel markets

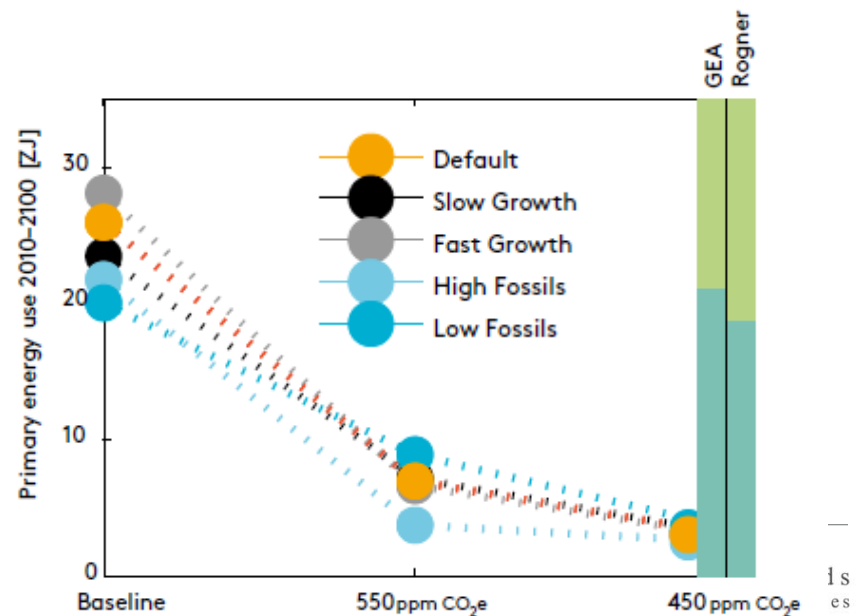
- Strong reduction of coal use
- Only moderate reduction of oil use (conventional reserves & resources are still being used)
- Climate mitigation effectively limits uncertainty about future fossil fuel use

Bauer et al. (2013)

(a) Oil primary energy use



(c) Coal primary energy use



# Mitigation strongly impacts fossil fuel markets

- Mitigation improves energy security by diversifying energy supply (Cherp et al., 2013)
- Mitigation reduces fossil fuel rents.
- This is overcompensated by the emerging carbon rent.

Fossil fuel rent = (Price - Production costs) \* Fuel; Carbon rent = CO<sub>2</sub> price \* Emissions



Bauer et al. (2013)

# Publications

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- RoSE work has been submitted to a special issue in Climate Change
- Presented work synthesized from four papers:
  - Kriegler et al. (2013). Will economic growth and fossil fuel scarcity help or hinder climate stabilization? Overview of the RoSE multi-model study.
  - Luderer et al. (2013) Implications of weak near-term climate policies on long-term climate mitigation pathways
  - Bauer et al. (2013) Global fossil energy markets and climate change mitigation: An analysis with ReMIND.
  - Cherp et al. (2013) Evaluating energy security implications of different assumptions on economic growth, fossil fuel availability and climate mitigation.
- Publication of the special issue anticipated in Fall or Winter 2013
- Publication of the RoSE model scenario database in Fall 2013
- Policy brief available

For more information on the RoSE study: [www.rose-project.org](http://www.rose-project.org)

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