The Importance of 2030 Action for Reaching the Paris Climate Goals

Where are we? The risk of carbon lock-in

The research presented in the top and bottom row was developed in the **ADVANCE project**

- International research collaboration (2013-2016)
- to develop a new generation of integrated assessment models:
  - Energy demand
  - Consumer heterogeneity
  - Technological change & uncertainty
  - Supply-side bottlenecks
- 14 European research institutes
- Coordinated by PIK
- Funded by the EU Framework Programme 7
- Visit www.fp7-advance.eu

- **Least cost 1.5°C and 2°C pathways suggest strengthening of 2030 climate action compared to Nationally Determined Contributions (NDCs)**
- **Following NDCs until 2030 induces a substantial carbon lock-in with long-lasting effects reaching beyond 2050.**
- **The carbon lock-in leads to ~90 $GtCO_2$ more emissions until 2030 and ~260 $GtCO_2$ more emissions until 2050 compared to least cost 1.5°C pathways**

- Seven integrated assessment models developed least cost 1.5°C pathways until 2100 as well as NDC pathways until 2030.
- They extended the NDC pathways until 2100 by assuming the same global carbon price as in the least-cost 1.5°C pathways from 2030 on.
- They analysed the excess emissions due to the fact that NDCs rather than least cost action was followed until 2030.
- Due to carbon-lock in, more excess emissions were generated after than before 2030. Peak warming was ~0.2°C higher.

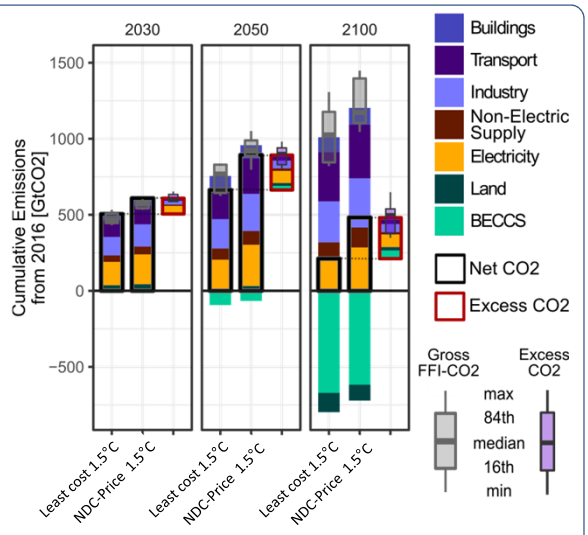

Fig. 1: Cumulated CO2 emissions in scenarios with early ("Least Cost 1.5°C") vs. delayed strengthening of mitigation action ("NDC Price 1.5°C").

Luderer et al., Residual fossil CO_2 emissions in 1.5-2°C pathways, forthcoming

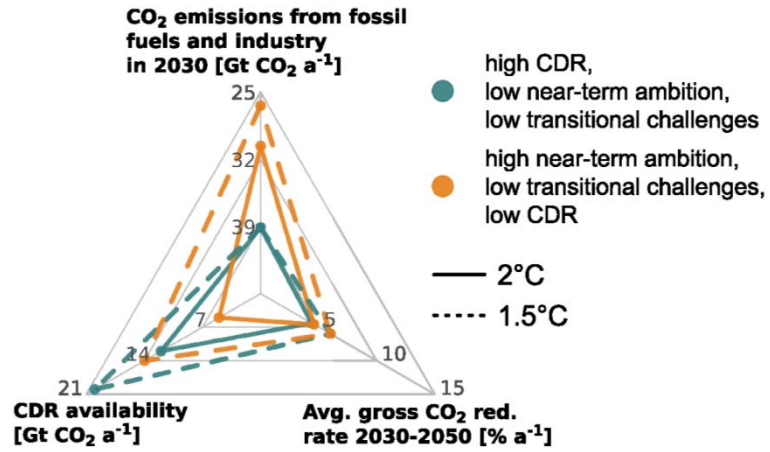

Fig 2: Trade-off between the three dimensions of short-term mitigation ambition, transitional challenges 2030-2050, and CDR availability for achieving 2 ◦C (solid lines) and 1.5 ◦C (dashed lines).

Strefler et al., Between Scylla and Charybdis: Delayed mitigation narrows the passage between large-scale CDR and high costs, Env. Res. Letters 13(4)

Where are we? The risk of overly relying on carbon dioxide removal from the atmosphere

- **Trade-offs exist between mitigation ambition until 2030, transitional challenges 2030-50, and carbon dioxide removal (CDR) requirements**
- **Delayed short-term mitigation results in higher reliance on CDR**
- **Strengthening the NDCs reduces costs as well as technical and climate risks**

- Scenario setup: Different levels of climate action until 2030, followed by least cost pathways to stay below 1.5°C or 2°C warming for different levels of CDR availability after 2030
- 1.5°C requires a combination of all three efforts: high near-term ambition, fast emission reduction 2030-2050, and a certain level of CDR. 2030 emissions should be reduced by at least 30% compared to NDCs.
- Research performed in the CEMICS project of the DFG priority programme (SPP) 1689

Where do we want to go and how do we get there?

Strengthening 2030 action is key for keeping Paris goals in reach

- **Strengthened near term action in least cost 1.5°C / 2°C pathways leads to ~40% / ~23% reduction of fossil fuel CO_2 emissions from 2015 levels**
- **Over the full 21st century, residual fossil fuel CO_2 emissions are kept to 1000 $GtCO_2$ in 1.5°C pathways.**
- **A robust decarbonization strategy emerges for 1.5°C and 2°C pathways:** Early and sustained reductions of energy demand, power sector decarbonisation by 2050, almost full-scale accelerated electrification and more limited substitution of residual fossil fuel use with low carbon alternatives in the transport and industry sectors.
- **Strengthened emissions reductions from 2°C to 1.5°C pathways mostly come from additional measures in energy end use sectors.**
- **The remaining gap to 1.5°C consistent carbon budgets is filled by carbon dioxide removal.**

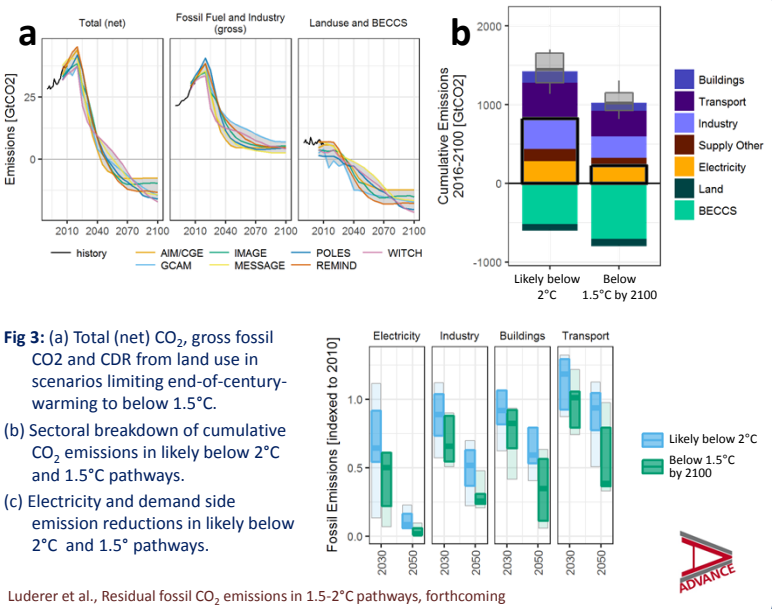

Fig 3: (a) Total (net) CO_2, gross fossil CO2 and CDR from land use in scenarios limiting end-of-century-warming to below 1.5°C.
(b) Sectoral breakdown of cumulative CO_2 emissions in likely below 2°C and 1.5°C pathways.
(c) Electricity and demand side emission reductions in likely below 2°C and 1.5° pathways.

Luderer et al., Residual fossil CO_2 emissions in 1.5-2°C pathways, forthcoming

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