POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

Implications of the INDCs for reaching long-term climate policy objectives

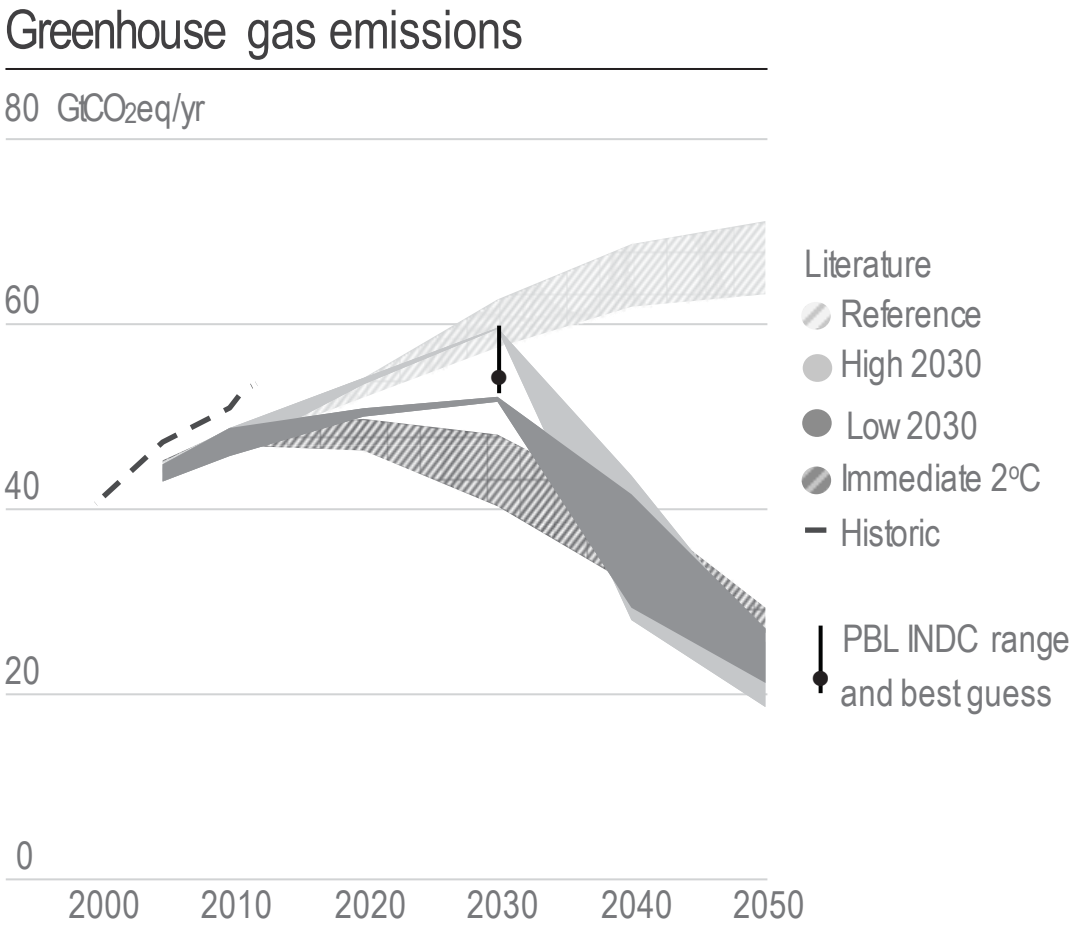
Insights from IAM scenarios

Christoph Bertram, Gunnar Luderer, Elmar Kriegler, and many others

IAMC meeting, Potsdam, 16.11.2015

Leibniz Association

INDCs and delayed scenario literature



Source: EDGAR (JRC/PBL, historical emissions), PBL INDC Tool calculations (www.pbl.nl/indc) and IPCC AR5 scenario database

2030 emissions implied by INDCs are in the range of delayed scenario literature:

LIMITS (Tavoni et al. 2014, Kriegler et al. 2013, etc.)

AMPERE (Riahi et al. 2015, Kriegler et al. 2015, etc.)

RoSE (Luderer et al. 2013)

Various single-model studies (Rogelj et al. 2012, 2013, Luderer et al. 2013, Bertram et al. 2015, etc.)

→All but the most recent assessed in IPCC AR5 WGIII (Chapter 6: Clarke et al. 2014, SPM: IPCC 2014)

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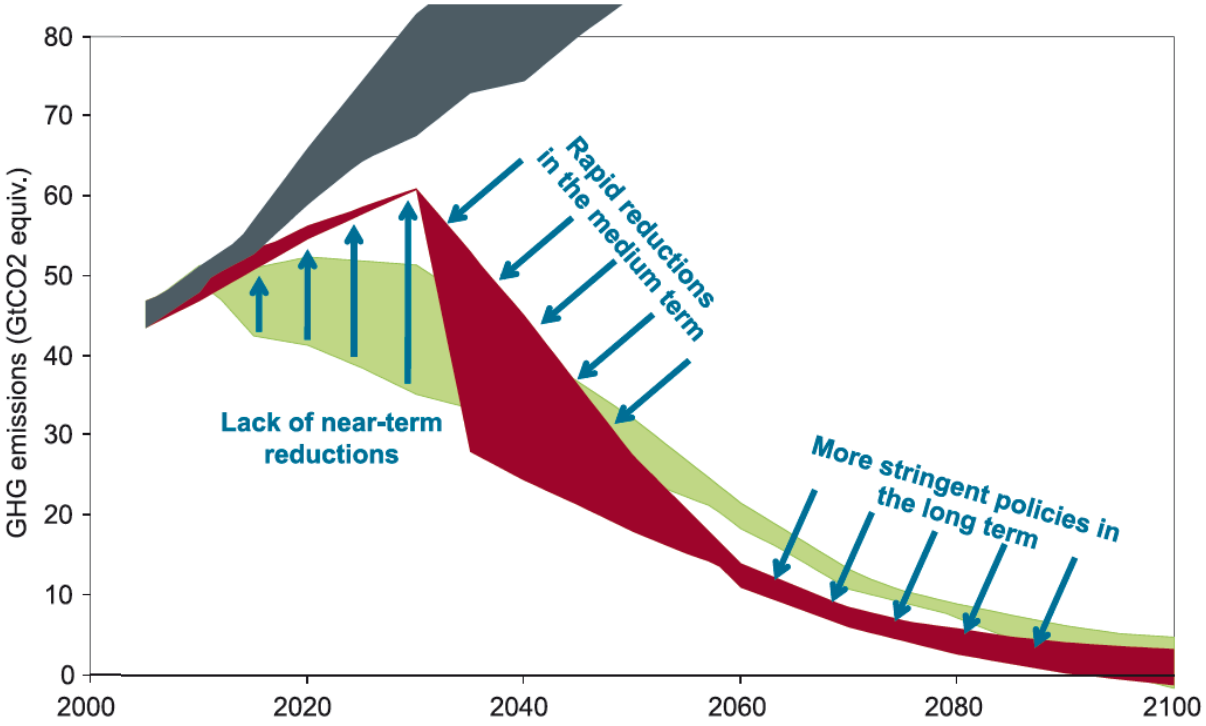
Figure D of the policy report „Beyond the numbers: Understanding the Transformation Induced by INDCs", October 2015, by the MILES project consortium

Challenges of delayed policy scenarios



- Short-term excess emissions, compensated by even lower emissions
- Rapid emission reduction in the medium term
- Negative emissions become even more crucial
- Inertia in energy system: carbon lock-in and insufficient ramp-up of alternatives
- Reduced co-benefits of climate policy, faster warming
- Overall higher economic implications and political and institutional requirements

Riahi et al. (2015): Locked into Copenhagen pledges — Implications of short-term emission targets for the cost and feasibility of long-term climate goals, *Tech Forecast Soc Change* **90A**.

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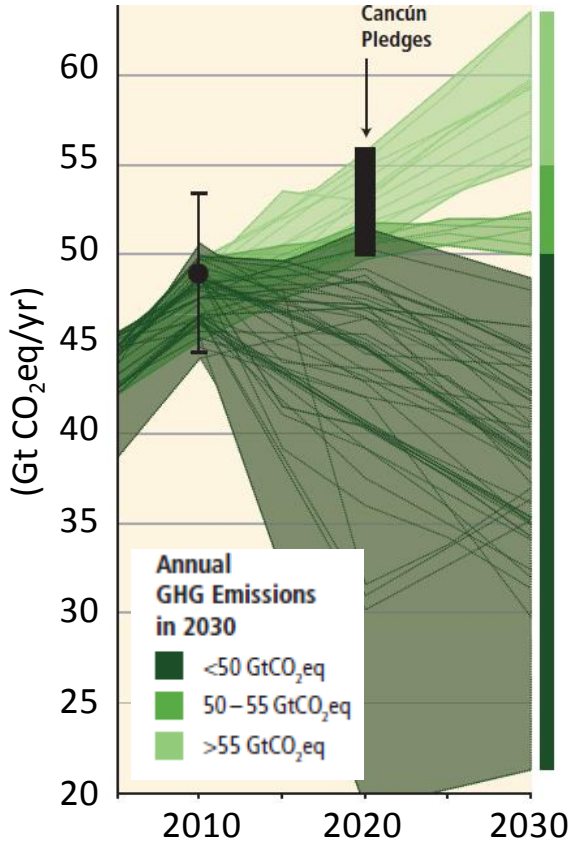
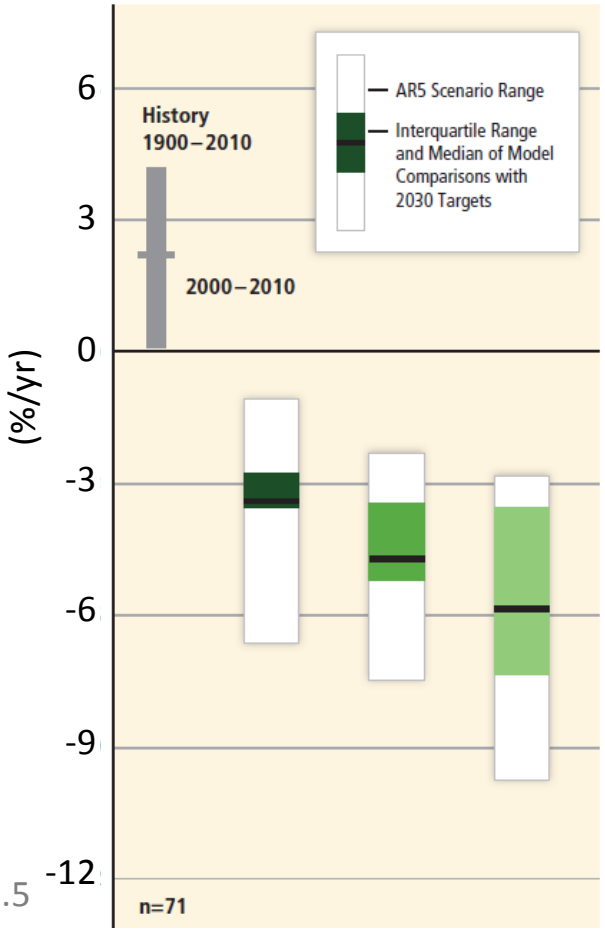
Fast decarbonization & fast low-carbon up-scaling without much preparation

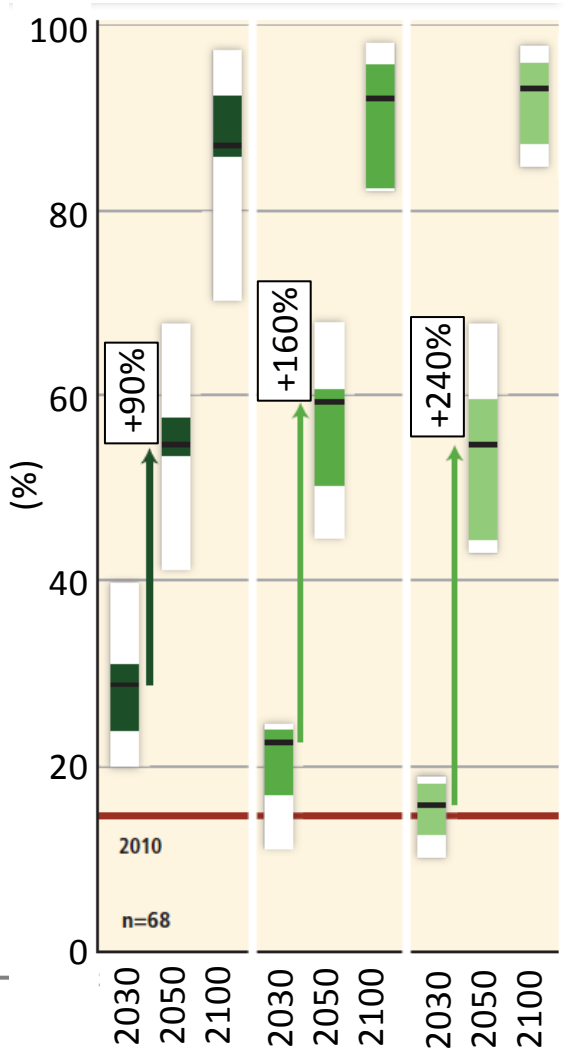
Annual GHG emissions



Annual rate of change in CO_2 emissions 2030-2050



Low-carbon energy share of Primary Energy



Adapted from IPCC AR5 Figure SPM.5

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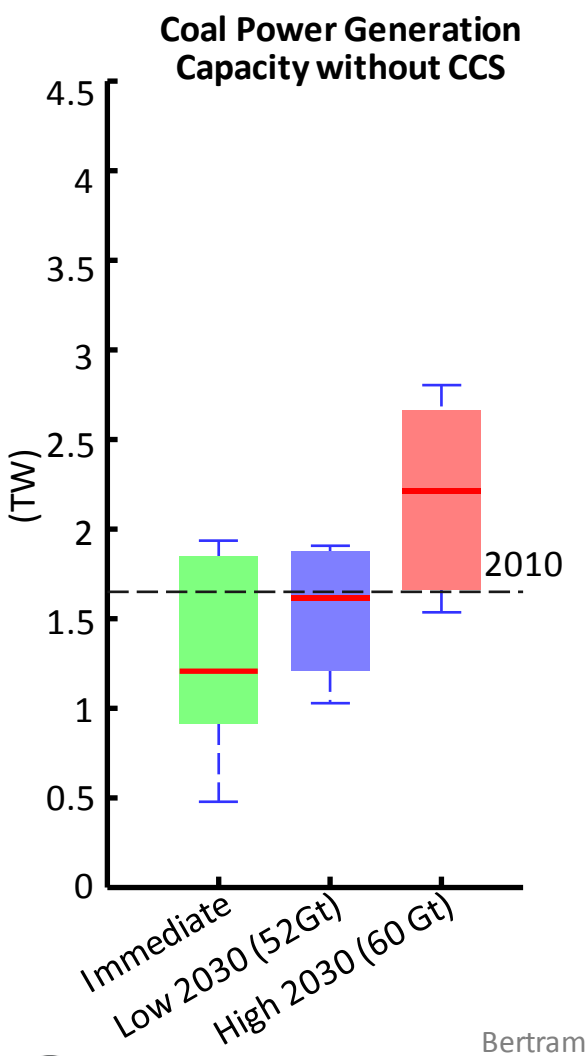
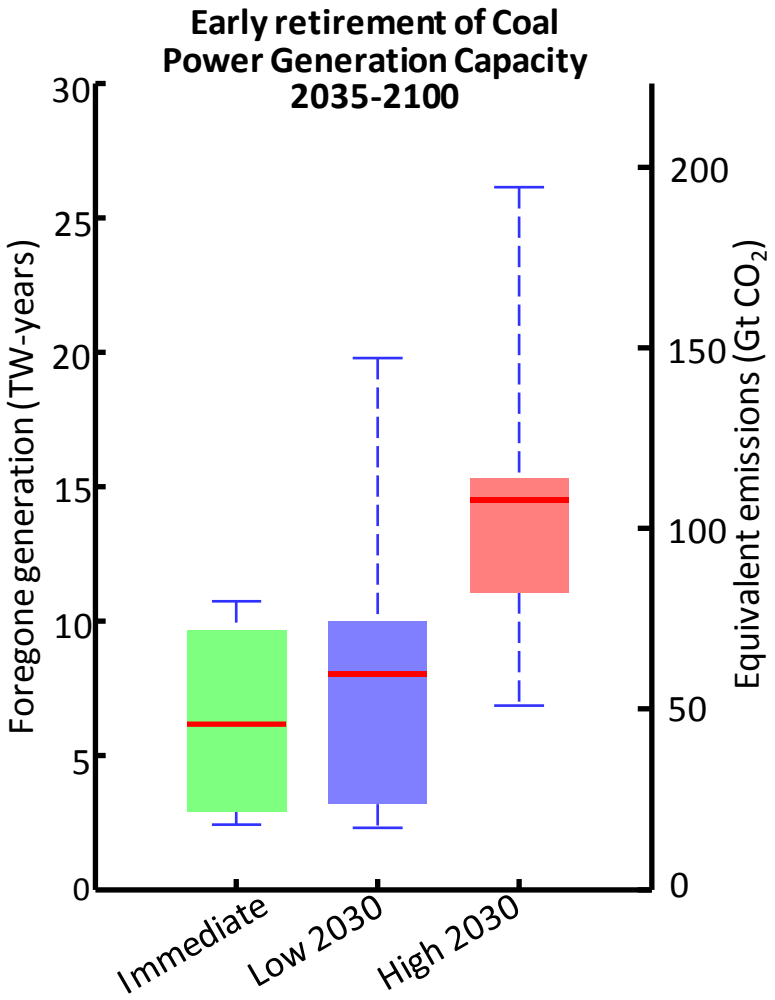
Carbon lock-in





Bertram C, et al (2015) Carbon lock-in through capital stock inertia associated with weak near-term climate policies. *Technol Forecast Soc Change* **90 A**: 62–72.

IPCC AR5 cost implication of delay

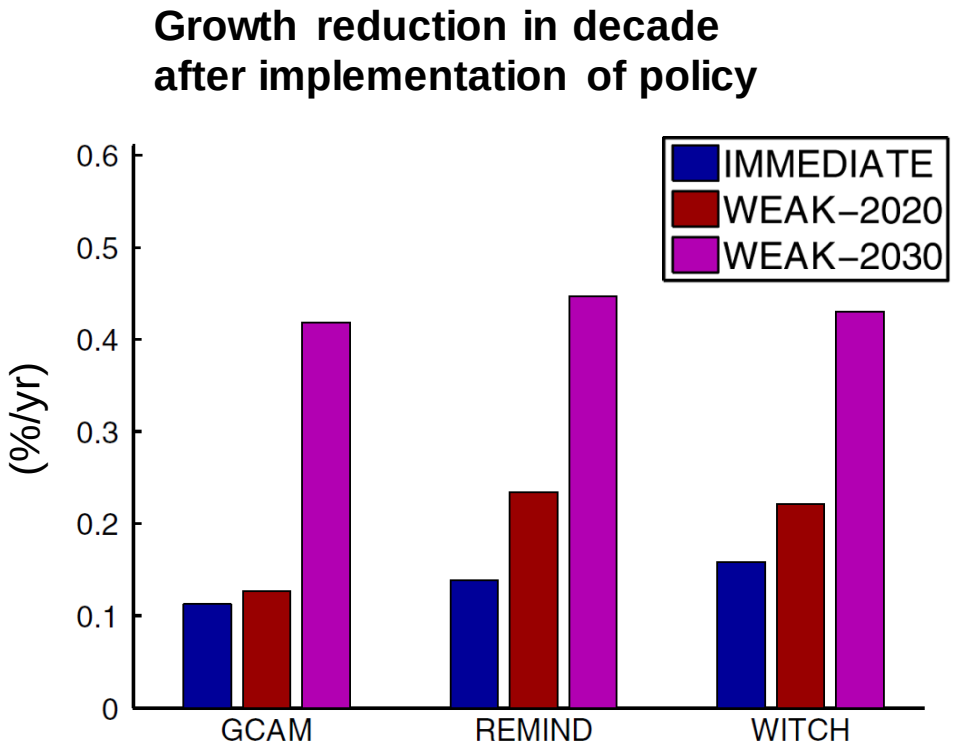
- Rather small impact on aggregated costs
- Problem of taking infeasible models into account

2100 Concentration (ppm CO_2eq)	% increase in mitigation costs due to delay relative to immediate mitigation			
	≤ 55 $GtCO_2$eq		>55 $GtCO_2$eq	
	2030–2050	2050–2100	2030–2050	2050–2100
450 (430–480)	28 (14-50) [N: 34]	15 (5-59)	44 (2-78) [N: 29]	37 (16-82)
500 (480–530)				

IPCC AR5 WGIII Table SPM.2 (part.)

Transitional costs much more sensitive to delay

- Factor 3 higher short-term impact
- Robust result across 3 different energy-economy models



Luderer, G., Bertram, C., Calvin, K., Cian, E. D. & Kriegler, E. Implications of weak near-term climate policies on long-term mitigation pathways. *Climatic Change* 1–14 (2013).

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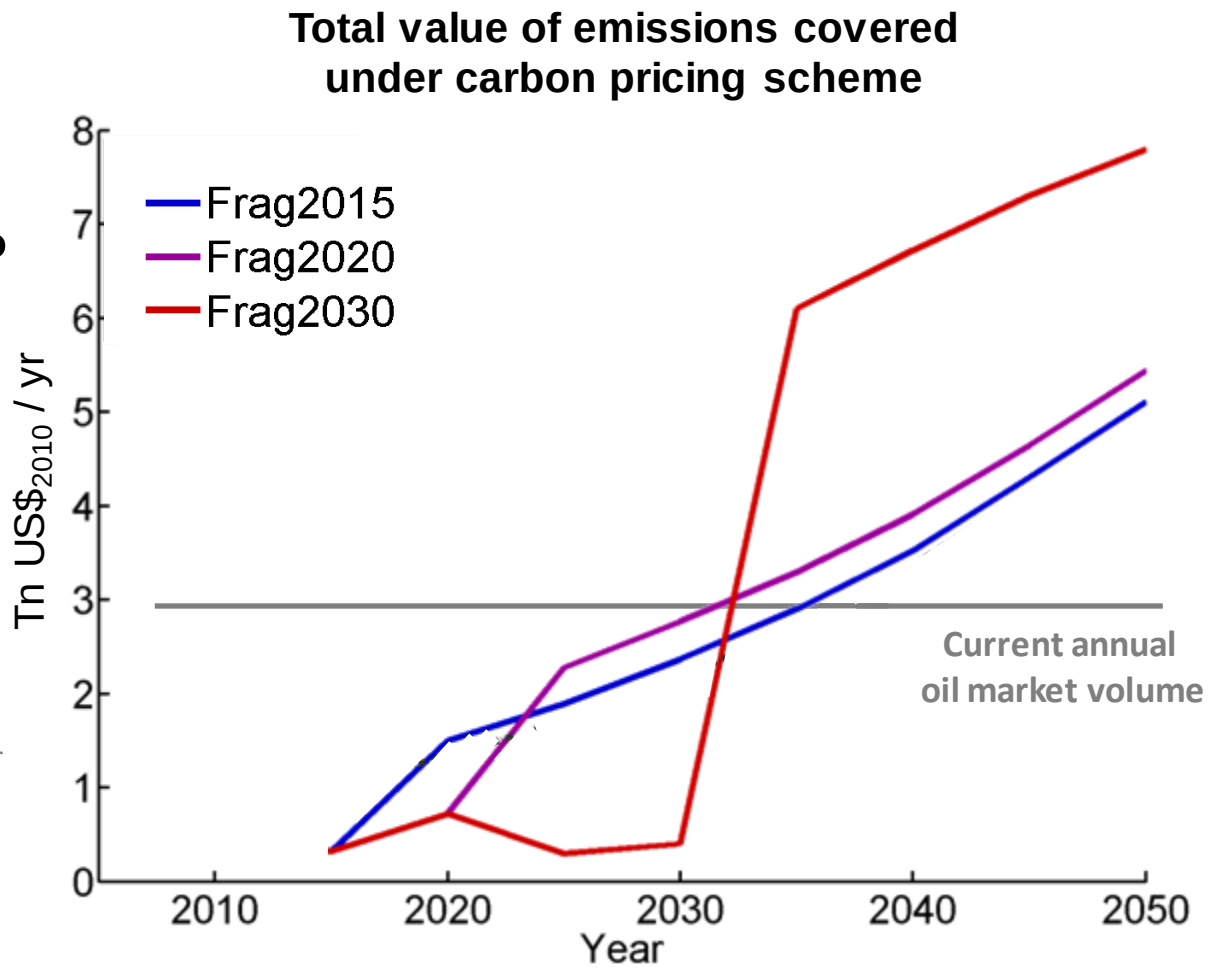
Carbon market value

- Massive institutional challenge
- Political feasibility?

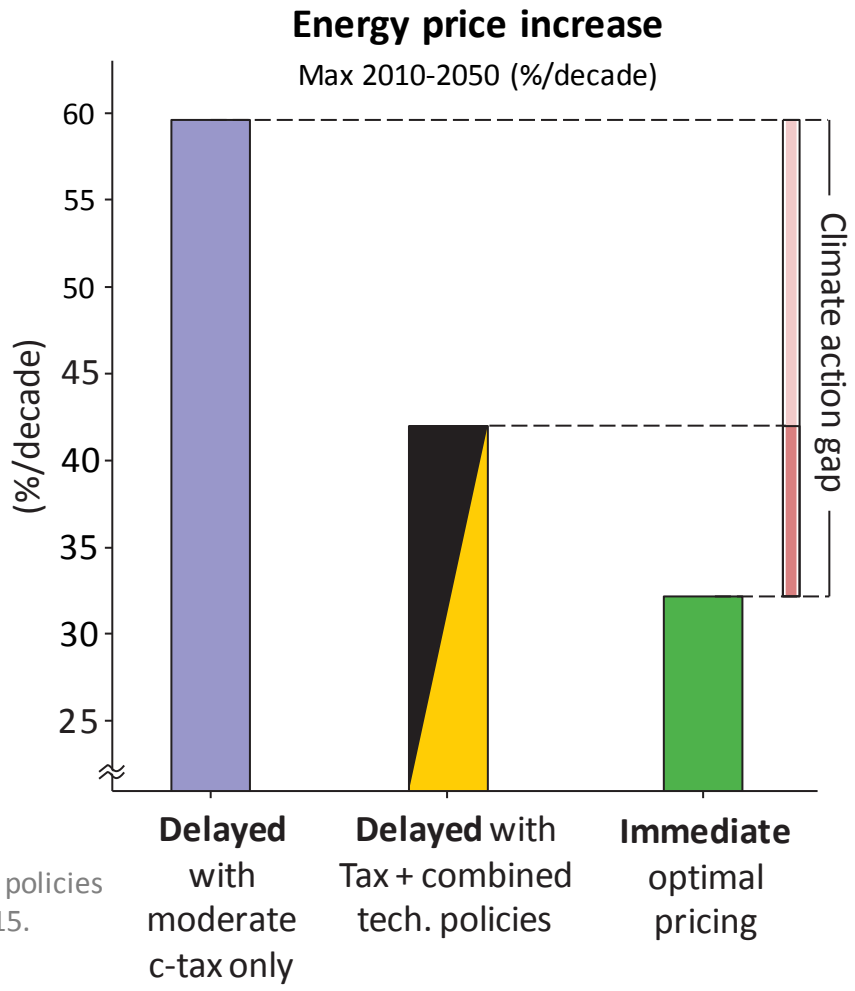


Luderer G, et al (2013) Economic mitigation challenges: how further delay closes the door for achieving climate targets. *Environ Res Lett*.

Policy instrument mix to keep targets within reach

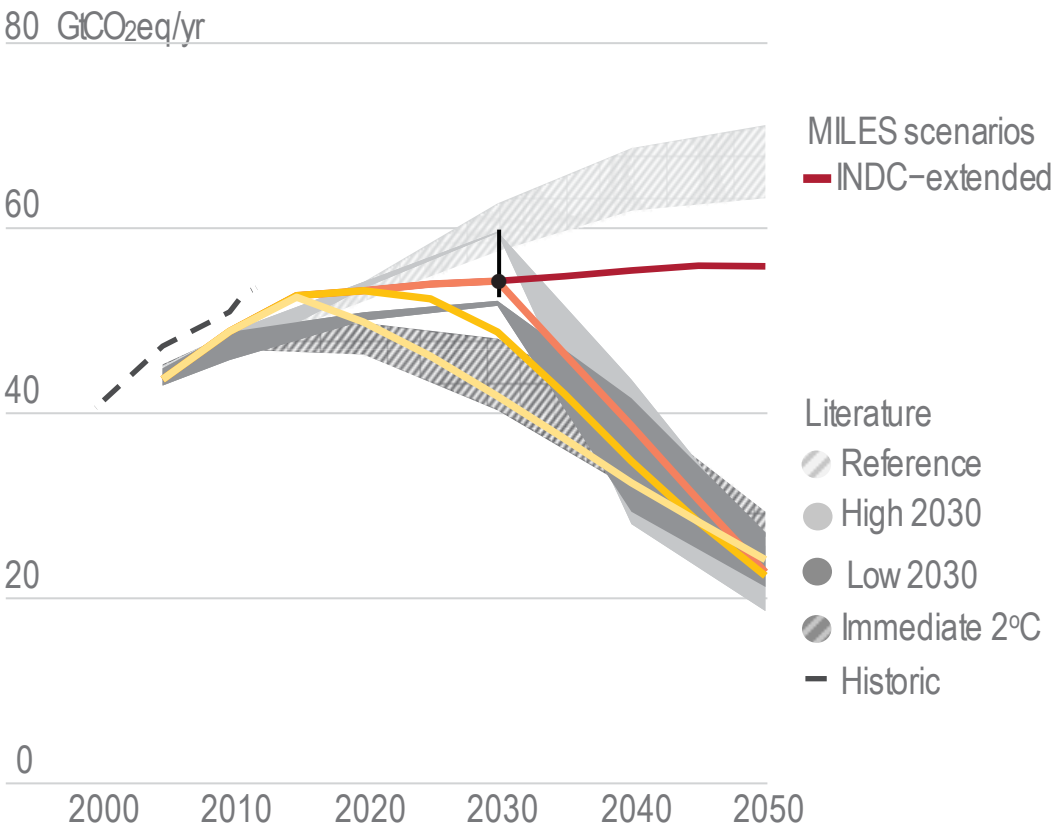
High positive effect of dedicated technology policies in combination with carbon tax

- Support for low-carbon technologies
- Regulation of high-carbon (coal power without CCS)
- Phase-out of fossil fuel subsidies and introduction of transport fuel taxes



Bertram C et al (2015): Complementing carbon prices with technology policies to keep climate targets within reach. *Nature Clim Change* **5**, March 2015.

Global INDC scenarios



Source: REMIND model calculations, EDGAR (JRC/PBL, historical emissions), PBL INDC Tool calculations (www.pbl.nl/indc INDC range and best estimate, vertical black line and circle) and IPCC AR5 scenario database

INDCs:

- Lots of low-carbon support
- Some regulation of high carbon
- Carbon pricing?

Key advantages of explicit carbon price signal:

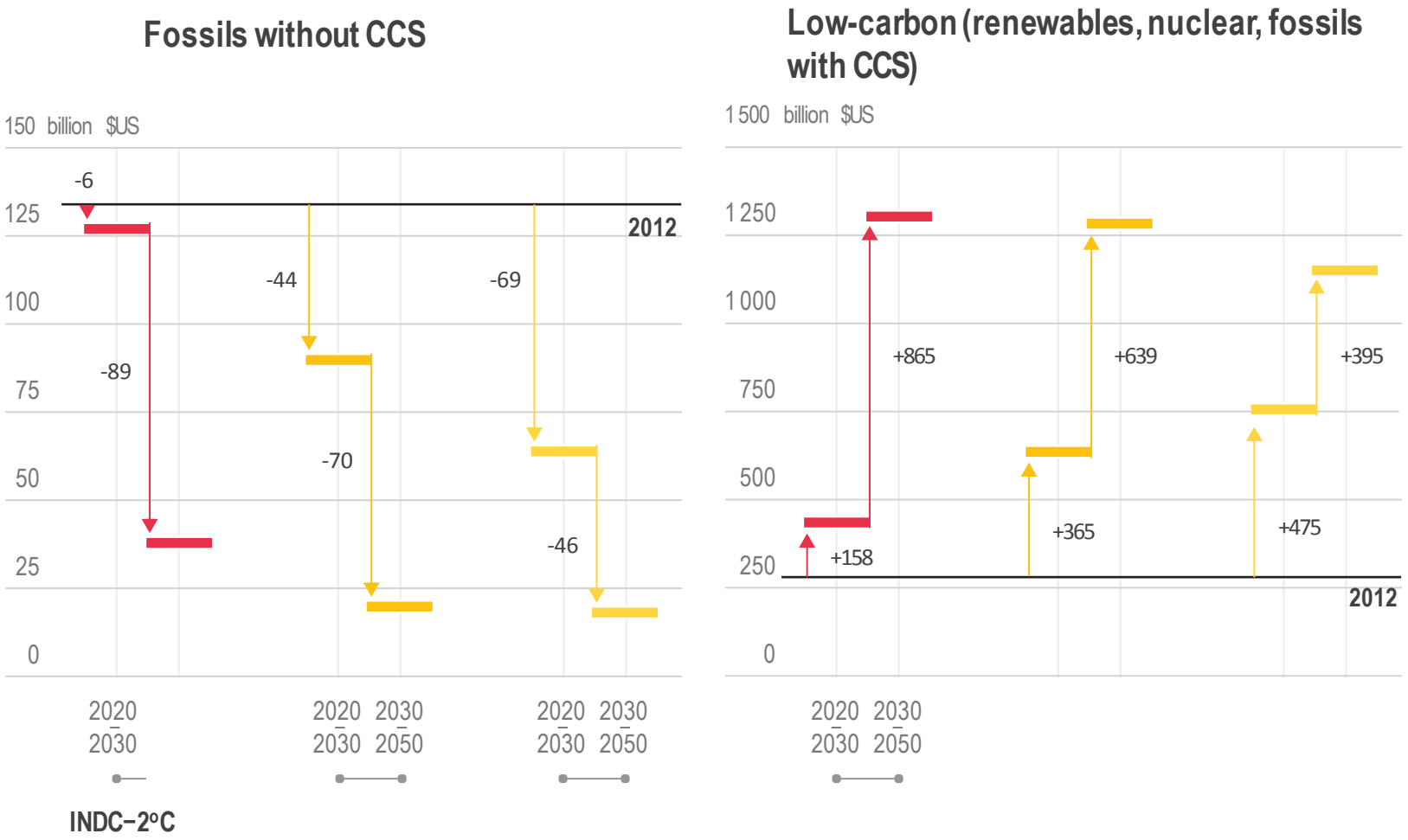
- Long-term requirement, so experience is crucial
- Potential source for predictable climate finance
- Easier comparability of effort and cooperation

Bridge-2°C: anticipation of high carbon prices after 2030 already from 2020 onwards, but INDC policies until 2030

→ smooth emissions trajectory

Immediate restructuring of investments

Average annual investment into power generation capacity



Horizontal lines in the background mark the respective 2012 historic value (IEA 2014b)

Source: REMIND model analysis and IEA

Figure 49 of the policy report „Beyond the numbers: Understanding the Transformation Induced by INDCs", October 2015, by the MILES project consortium

Conclusion

- Importance of policies implied by INDCS
- Long-term target only kept within reach if dedicated carbon phase-out and long-term carbon pricing are prepared for

Thank you!

bertram@pik-potsdam.de

Literature (graphs)

- Bertram C, Johnson N, Luderer G, et al (2015a) Carbon lock-in through capital stock inertia associated with weak near-term climate policies. *Technol Forecast Soc Change* 90, Part A:62–72. http://dx.doi.org/10.1016/j.techfore.2013.10.001
- Bertram C, Luderer G, Pietzcker RC, et al (2015b) Complementing carbon prices with technology policies to keep climate targets within reach. *Nature Clim Change* 5:235–239. http://dx.doi.org/10.1038/nclimate2514
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- Luderer G, Pietzcker RC, Bertram C, et al (2013b) Economic mitigation challenges: how further delay closes the door for achieving climate targets. *Environ Res Lett* 8:034033. http://dx.doi.org/10.1088/1748-9326/8/3/034033
- MILES consortium (2015) Beyond the numbers: Understanding the transformation induced by INDCs, IDDRI Studies N° 05/2015, http://www.iddri.org/Publications/Collections/Analyses/MILES%20report.pdf
- Riahi K, Kriegler E, Johnson N, et al (2015) Locked into Copenhagen pledges — Implications of short-term emission targets for the cost and feasibility of long-term climate goals. *Technol Forecast Soc Change* 90, Part A:8–23. http://dx.doi.org/10.1016/j.techfore.2013.09.016