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KLIMAFOLGENFORSCHUNG

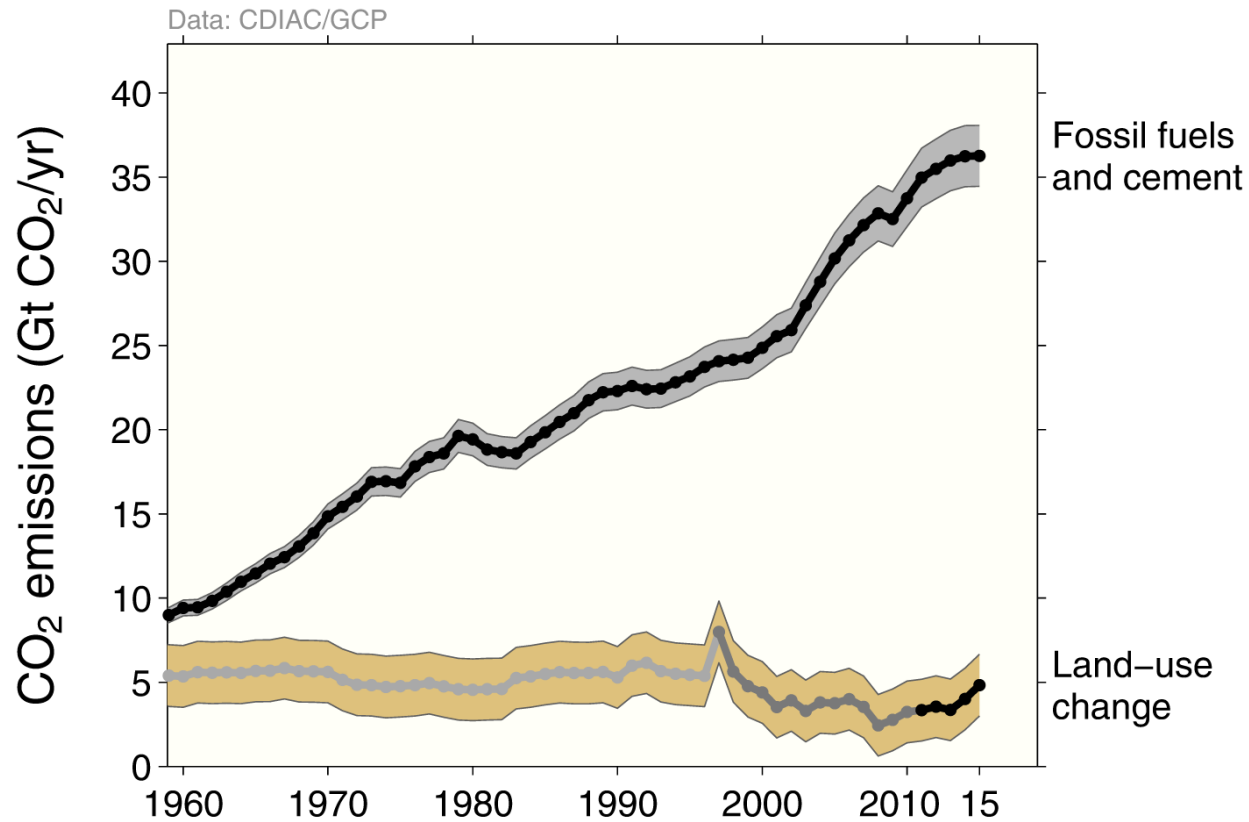
Carbon Pricing, Equity and the Paris Climate Goals

Prof. Dr. Ottmar Edenhofer

**COP 23 Side Event Global Equity
ETH Zurich / ACT Alliance**

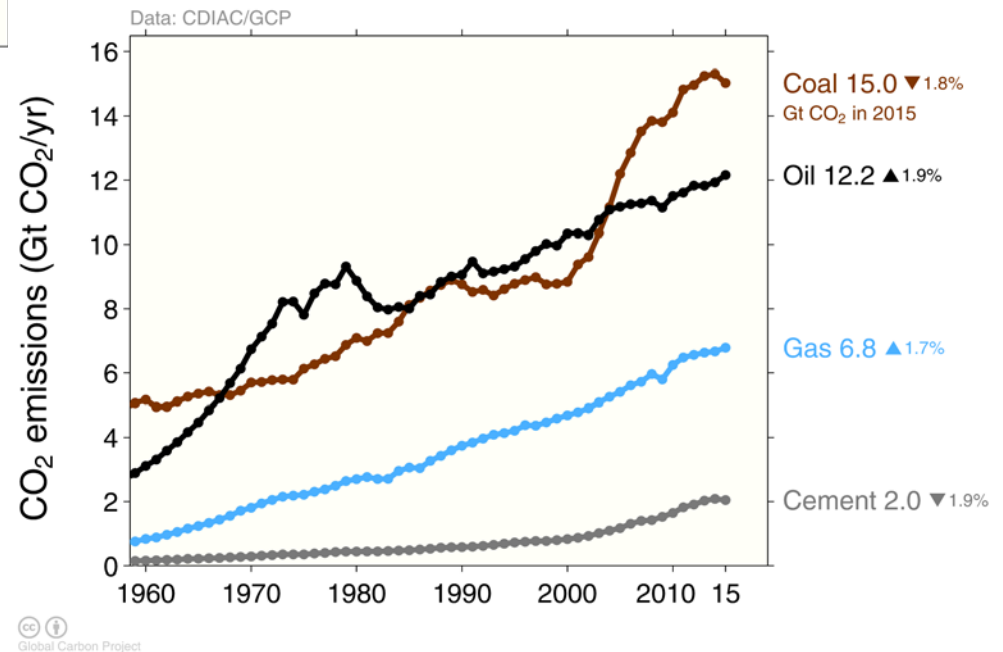
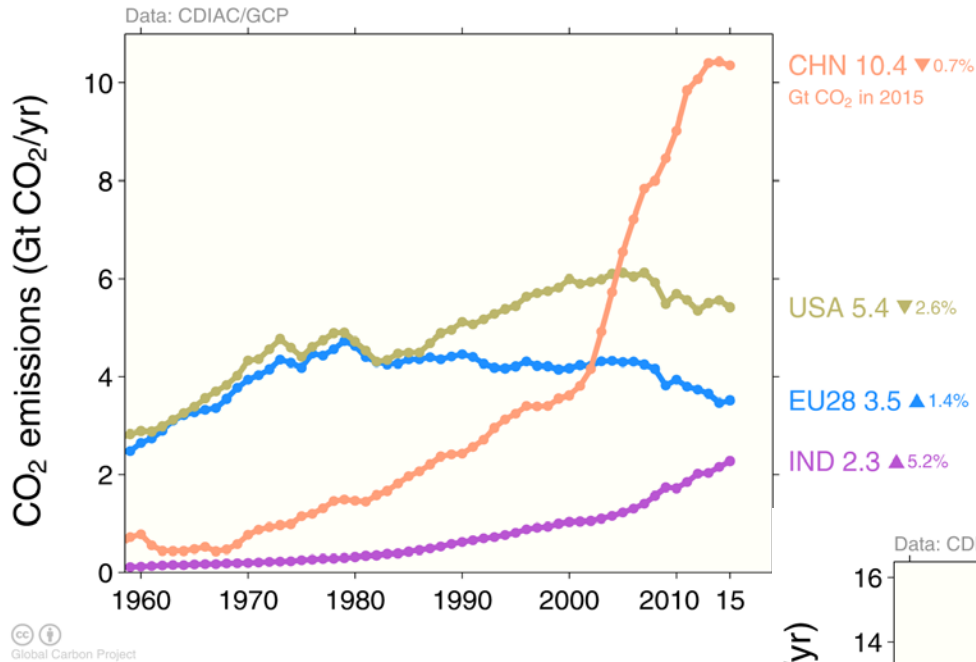
Bonn, 7 November 2017

Emissions are rising.

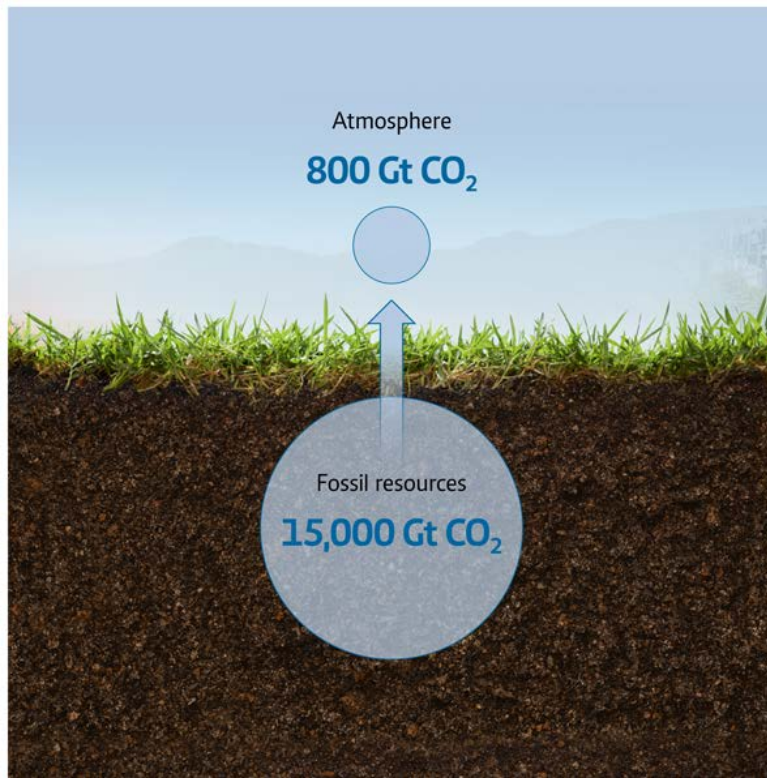


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Global Carbon Project

Does climate policy already show effects?



The climate problem at a glance

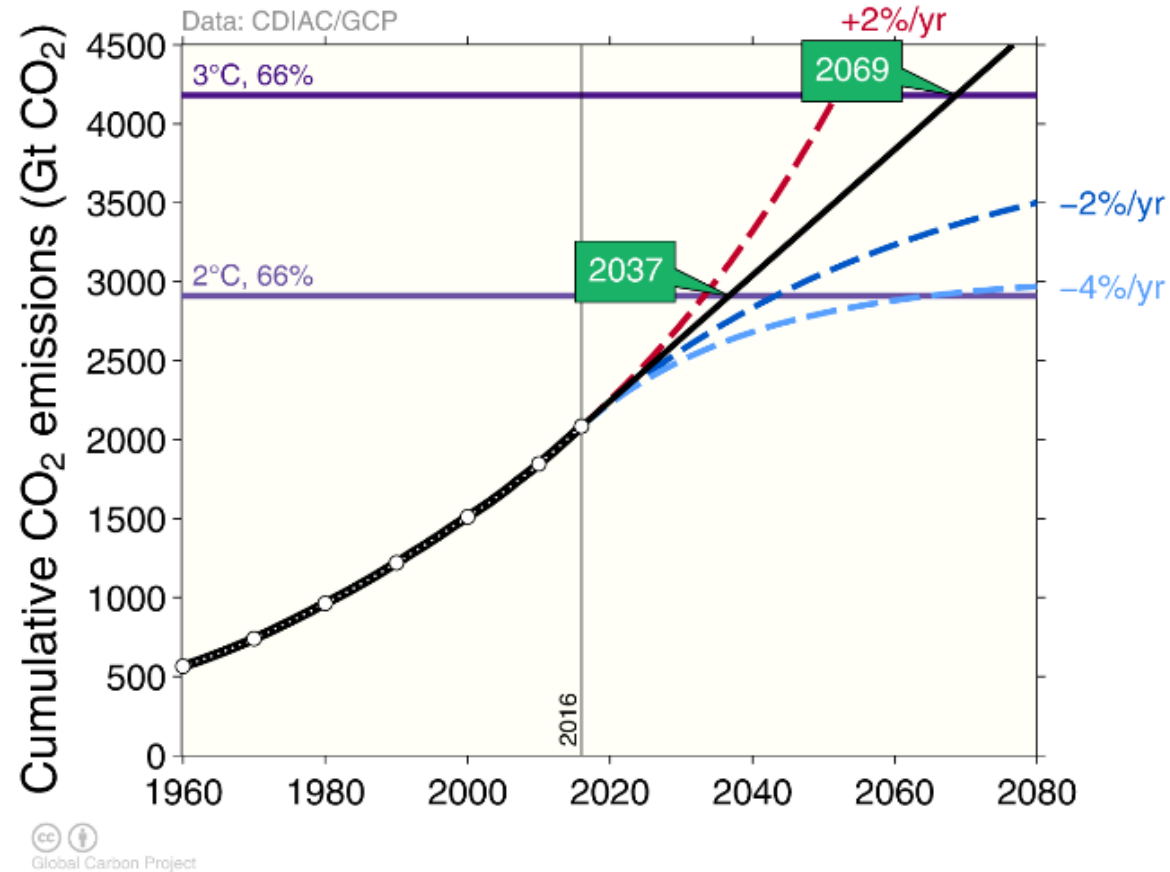


Resources and reserves to remain underground until 2100 (median values compared to BAU, AR5 Database)

Until 2100	With CCS [%]	No CCS [%]
Coal	70	89
Oil	35	63
Gas	32	64

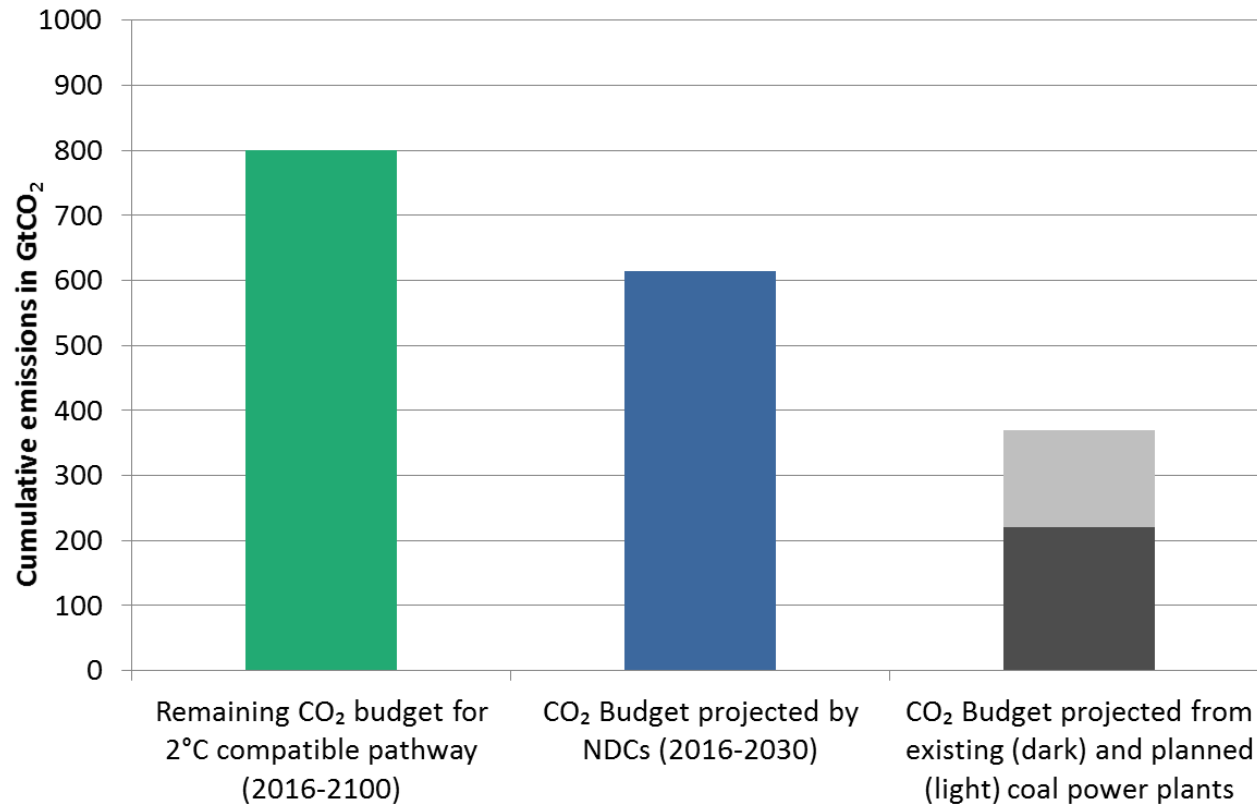
Source: Bauer et al. (2014); Jakob, Hilaire (2015)

We are not on track.



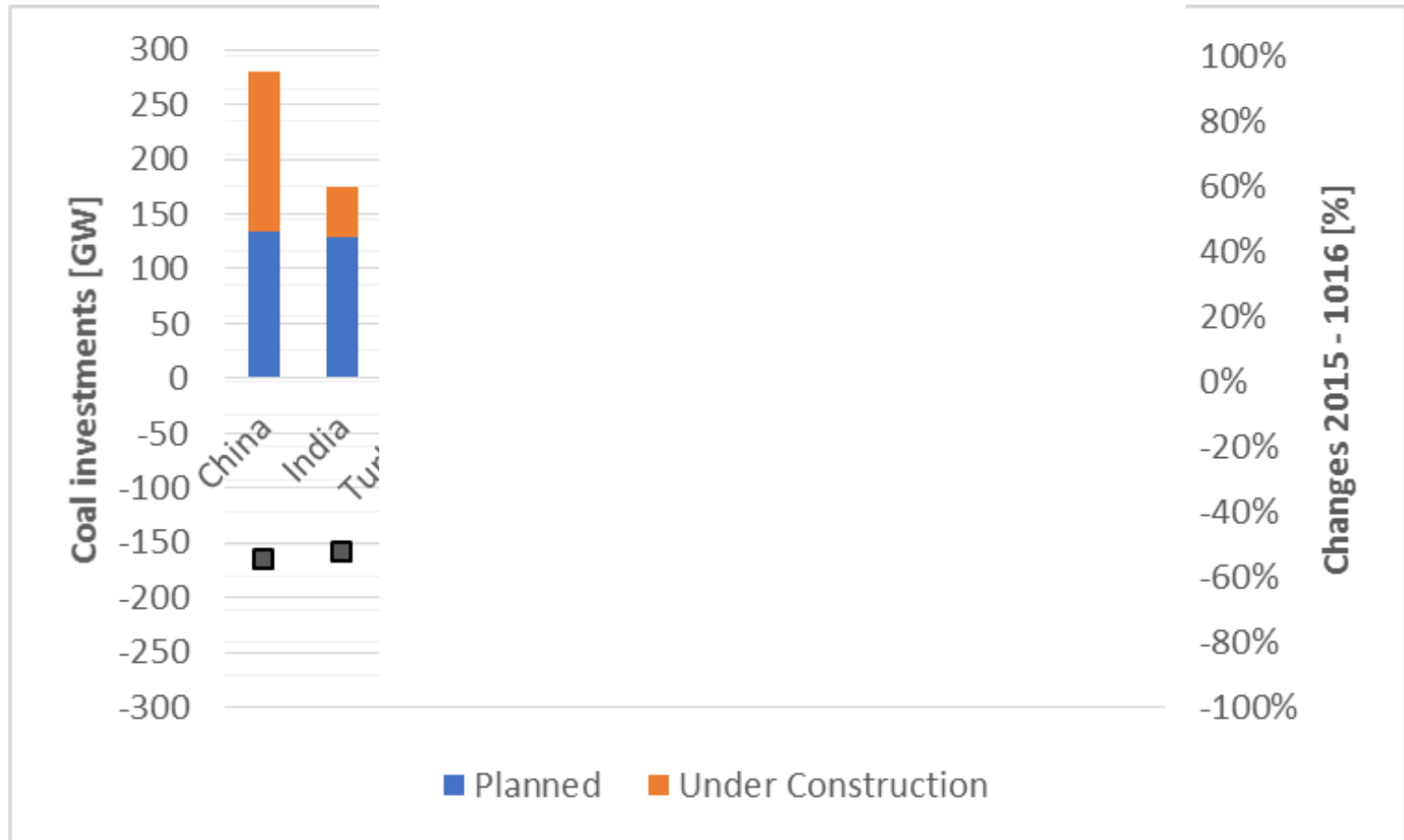
The 2°C budget does not leave any leeway

Cheap and abundant coal is the driver of a „re-carbonisation“ of the energy system in some parts of the world



*All budgets are subject to considerable uncertainty, see Edenhofer et al. (2016)

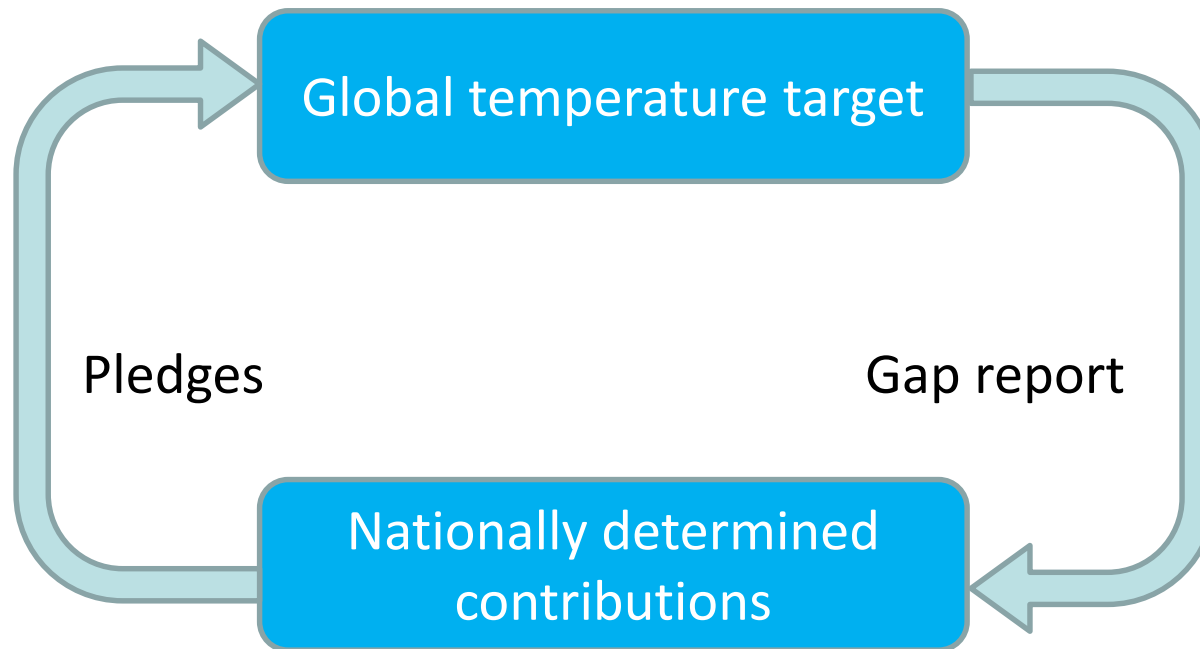
The coal pipeline in 2016



840 GW of coal fired capacity is in the pipeline across the globe. >85% is covered by 12 countries.

The Paris Agreement relies on voluntary emission reductions

- Does not allocate remaining budget
- Countries decide individually to what extent they reduce emissions
- **Incentives to free-ride**



National emission reduction targets have to pay off internationally

The Nationally Determined Contributions are not **transparent**

- Countries determine targets with different means and different reference years

The Nationally Determined Contributions are not **comparable**

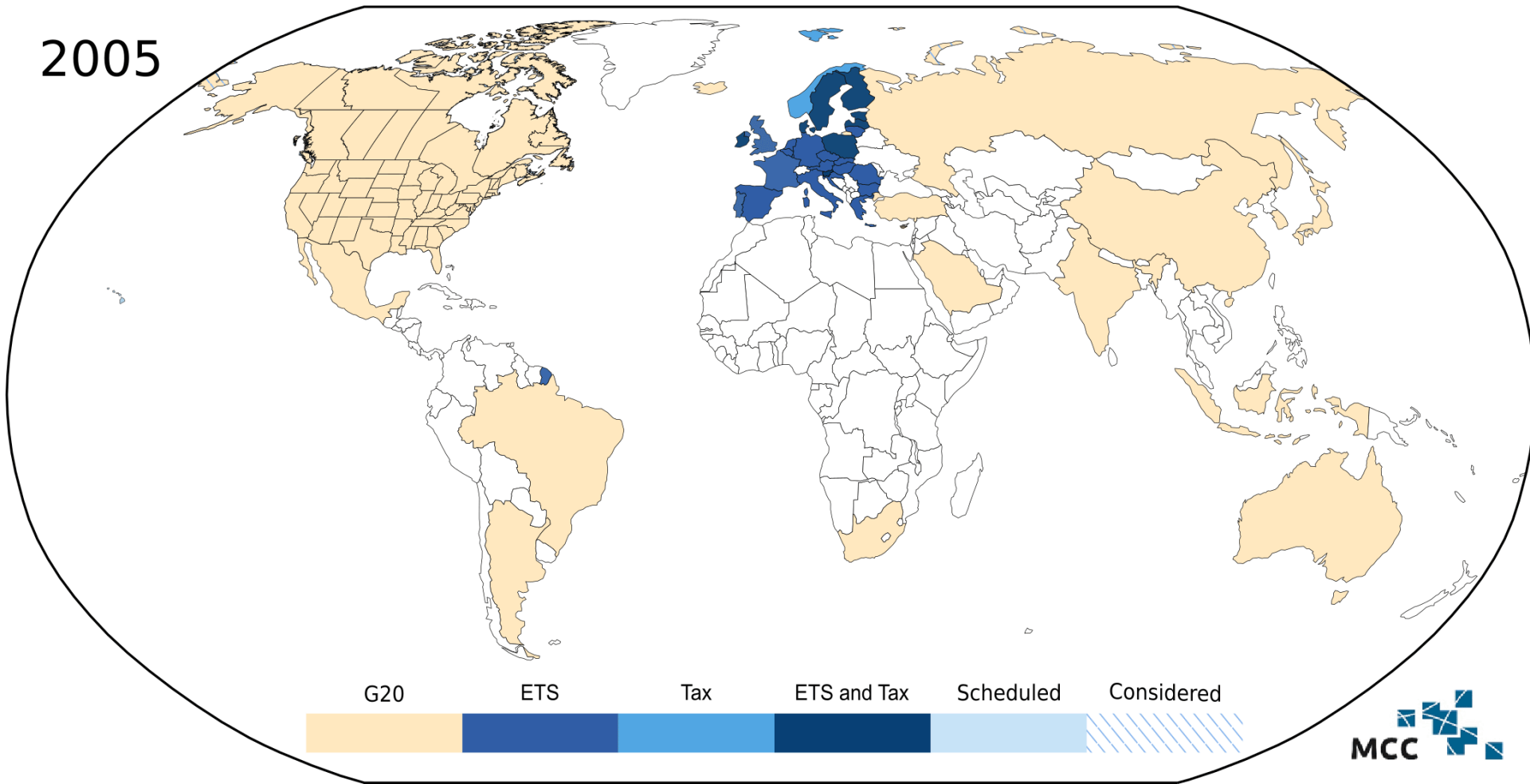
- Emission reduction targets based on the same year mean very different efforts depending on developmental stage of country

The Nationally Determined Contributions are not **represented** in energy policy

- Lack of attractive policy instruments
 - Feed-in-tariff not an option in many countries
 - Fixed emission targets not an option in many countries

Way forward: internationally harmonized carbon prices

2005



Way forward: internationally harmonized carbon prices

A price on carbon is **transparent**

- Implementation as a carbon tax or cap and trade system

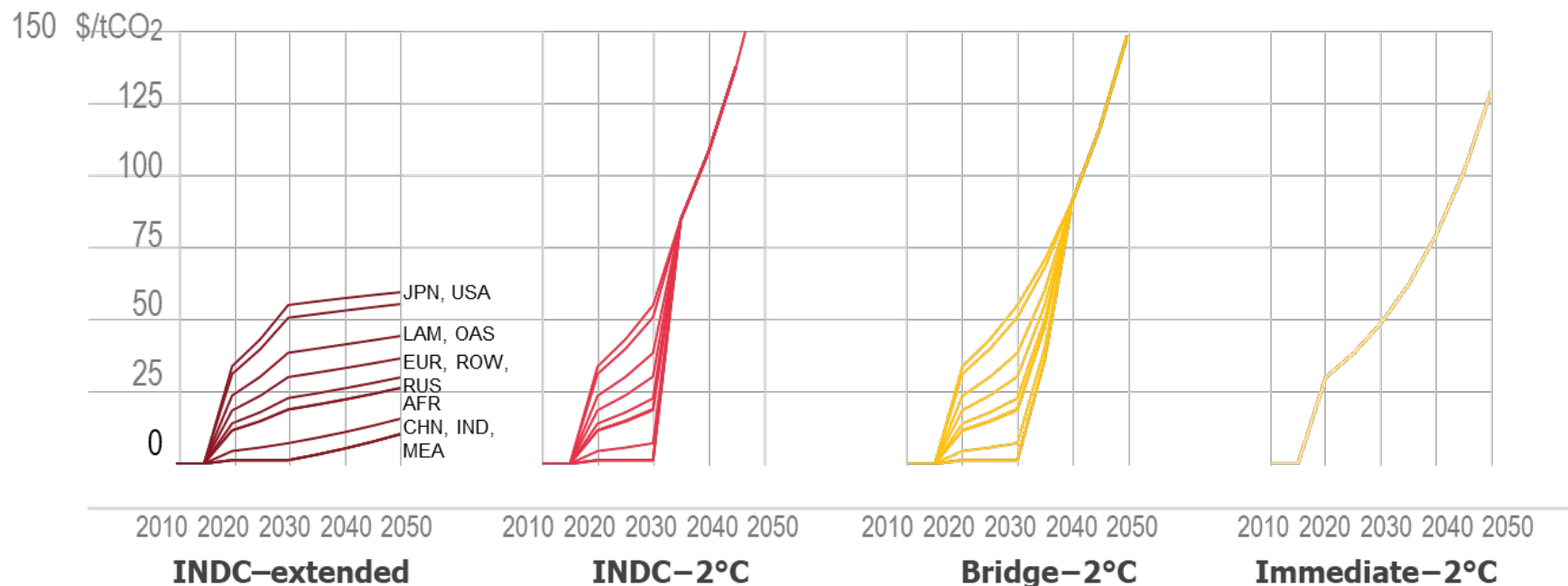
A price on carbon is **comparable**

- Same metric for all countries
- Measures to counteract free-riding as principle of reciprocity can be implemented

A price on carbon **drives** energy investments

- Makes more emission intensive ways of production more costly and less attractive

Comparability of NDCs through implicit CO₂ prices



Note: The implicit carbon prices shown here do not reflect the stringency level of the overall INDC of a region, as for some regions, additional policies are represented in the modelling that depress the prices shown here (see table 1 in the annex). As all countries are likely to implement dedicated technology policies, actual carbon prices in a trading scheme or a carbon tax scheme will be lower for regions for which the complementary policies are not yet represented. Monetary values are given in \$US-2012. REMIND 2005 monetary values are scaled by 1.18 for conversion to 2012.

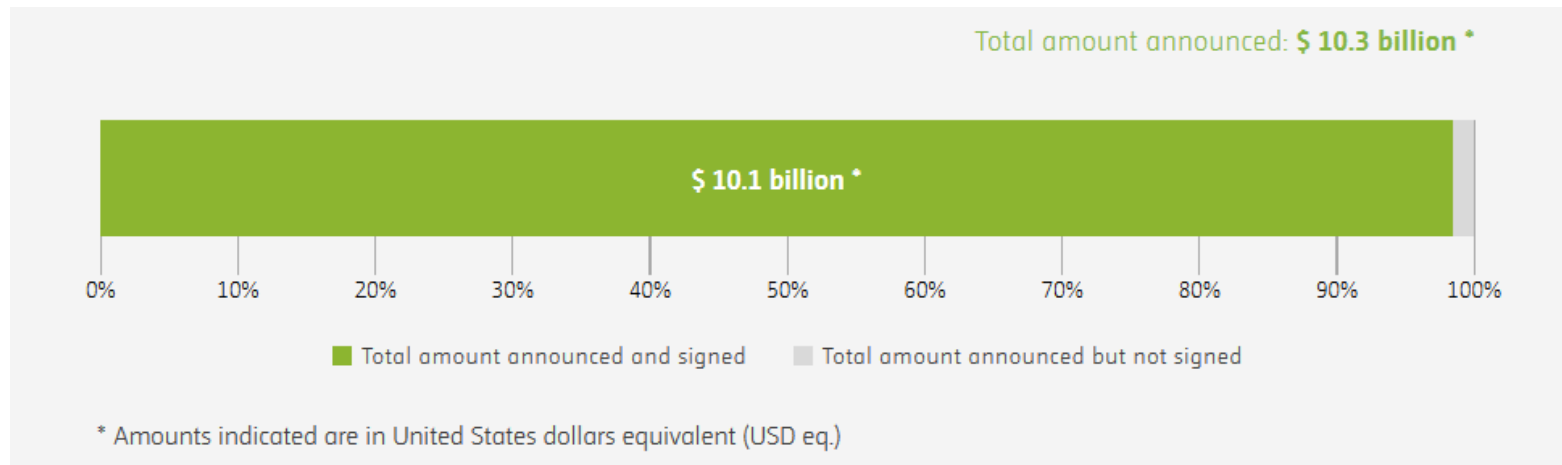
Source: REMIND model analysis

* Figure A1 of the policy report „Beyond the numbers: Understanding the Transformation Induced by INDCs“, October 2015, by the MILES project consortium

Harmonizing carbon prices among unequal countries

Climate finance to foster cooperation

- 100 bln promised in Paris decision
- Green Climate Fund operative



Equity principle „equal-effort“ establishes cooperation

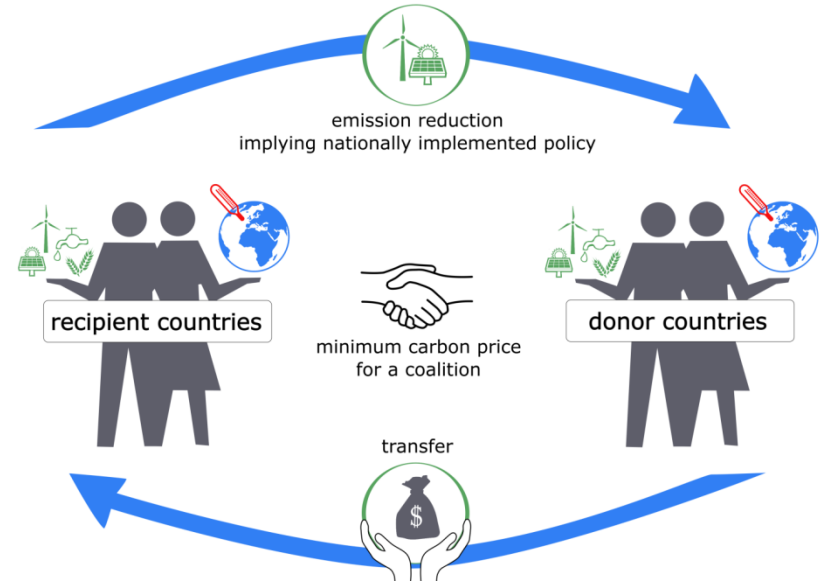
- transfers conditional on carbon pricing level p_i (Kornek und Edenhofer 2016)
- Compensating differences in mitigation costs:

$$\underbrace{T_i}_{\text{Magnitude of compensation}} = T \cdot \underbrace{\left(c_i(p_i) - \frac{1}{N} \sum c_j(p_j) \right)}_{\text{Differences in costs } C \text{ between countries}}$$

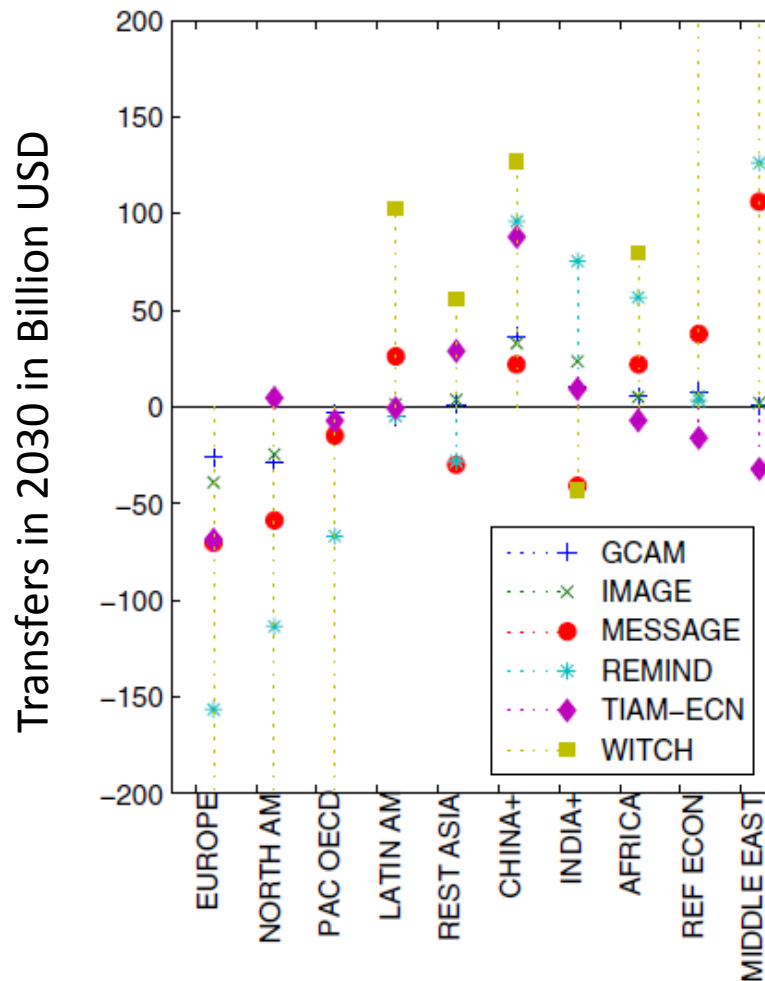
Magnitude of compensation

Differences in costs C between countries

- Cooperation established: a recipient is compensated for additional costs of reducing emissions
→ „equal effort“ principle as in Tavoni et al. 2014



Equity principle „equal-effort“ establishes cooperation



- Scenario: 450 ppm CO₂-eq in carbon market
→ we do not require equalized carbon prices among countries
- Payments from Europe and North America ensure equal effort