Potsdam Institute for Climate Impact Research

Die Atmosphäre als globales Gemeinschaftseigentum

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27. September 2016

Leibniz Gemeinschaft

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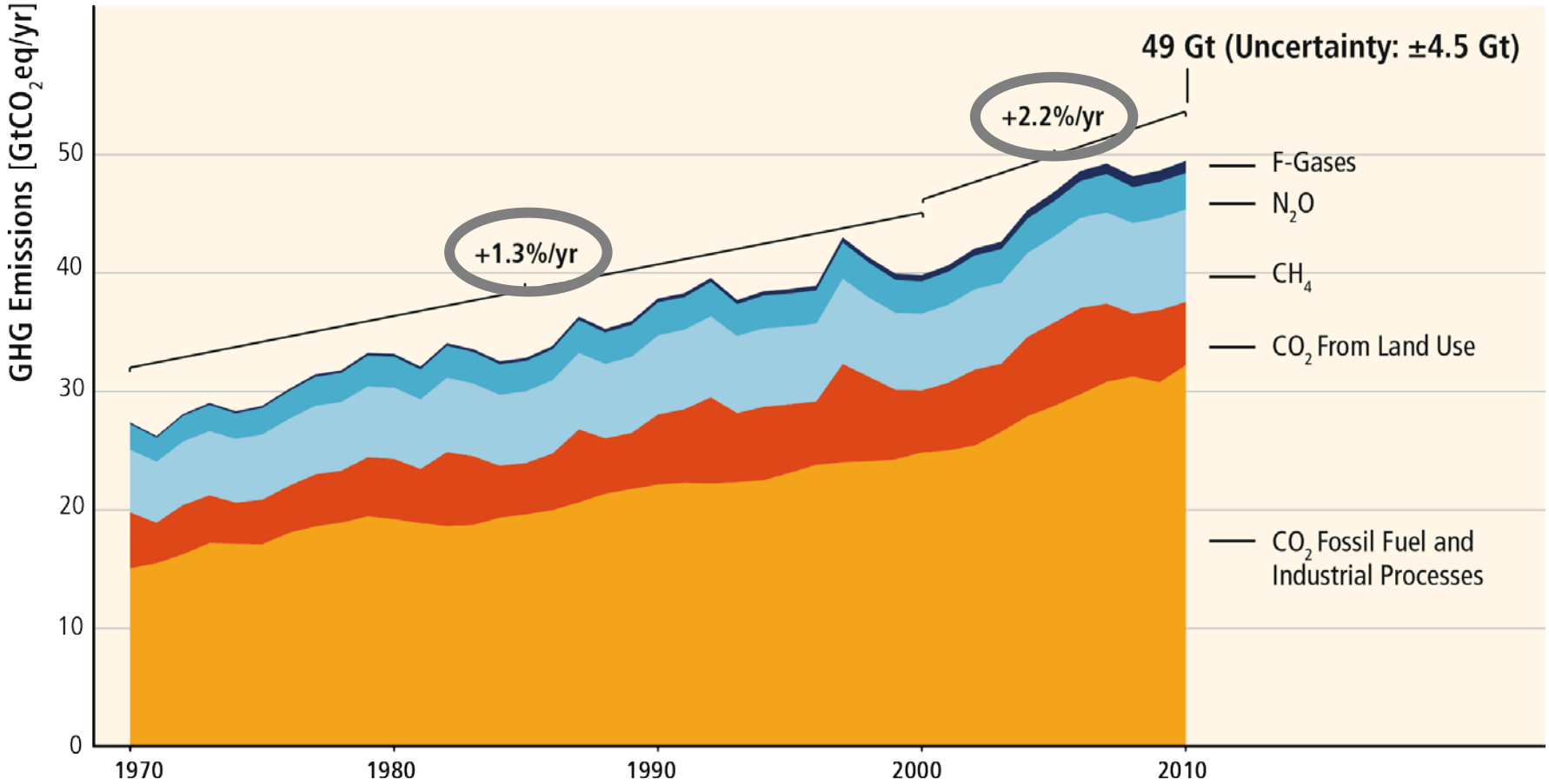
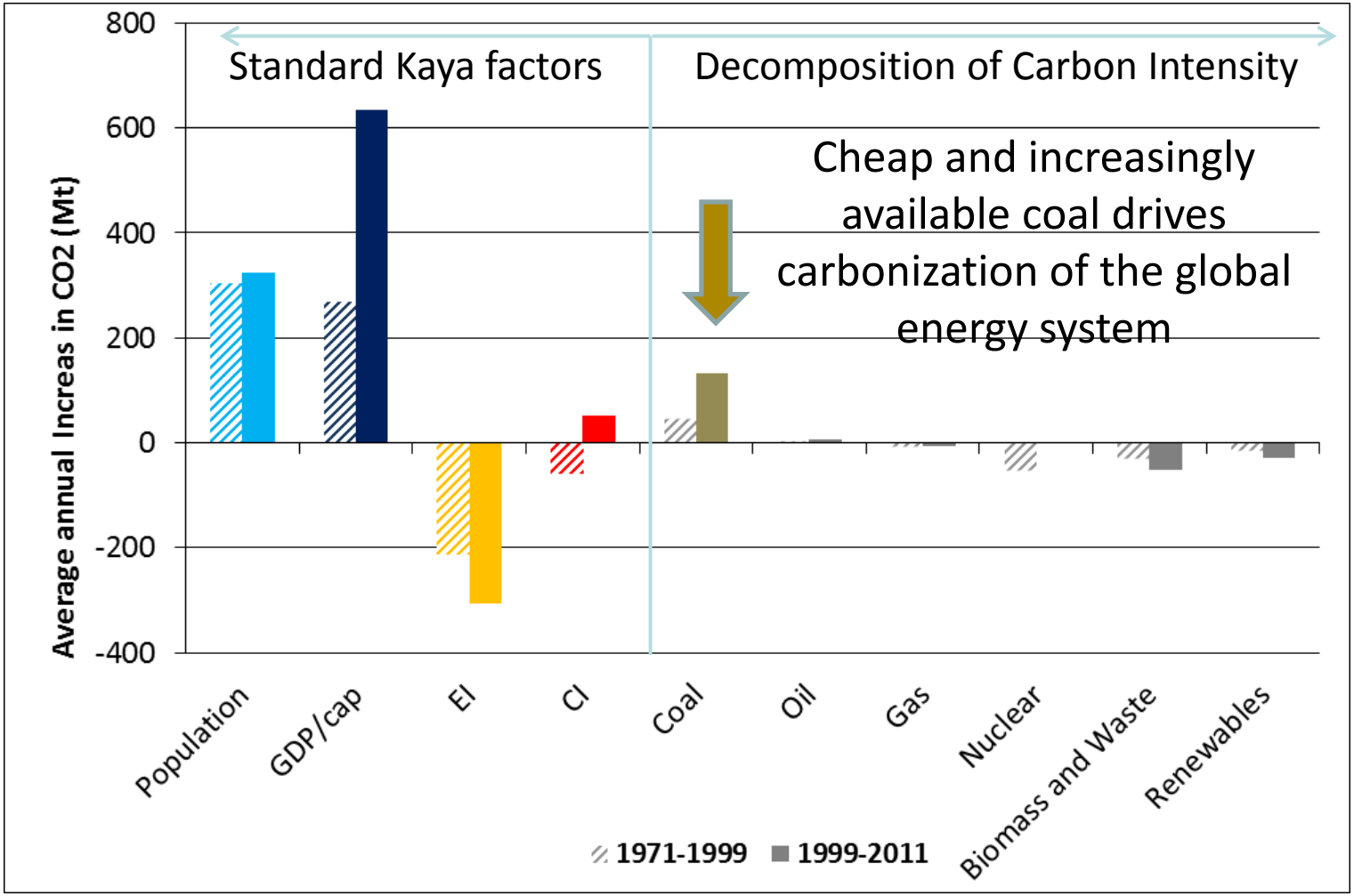
GHG emissions growth between 2000 and 2010 has been larger than in the previous decades.



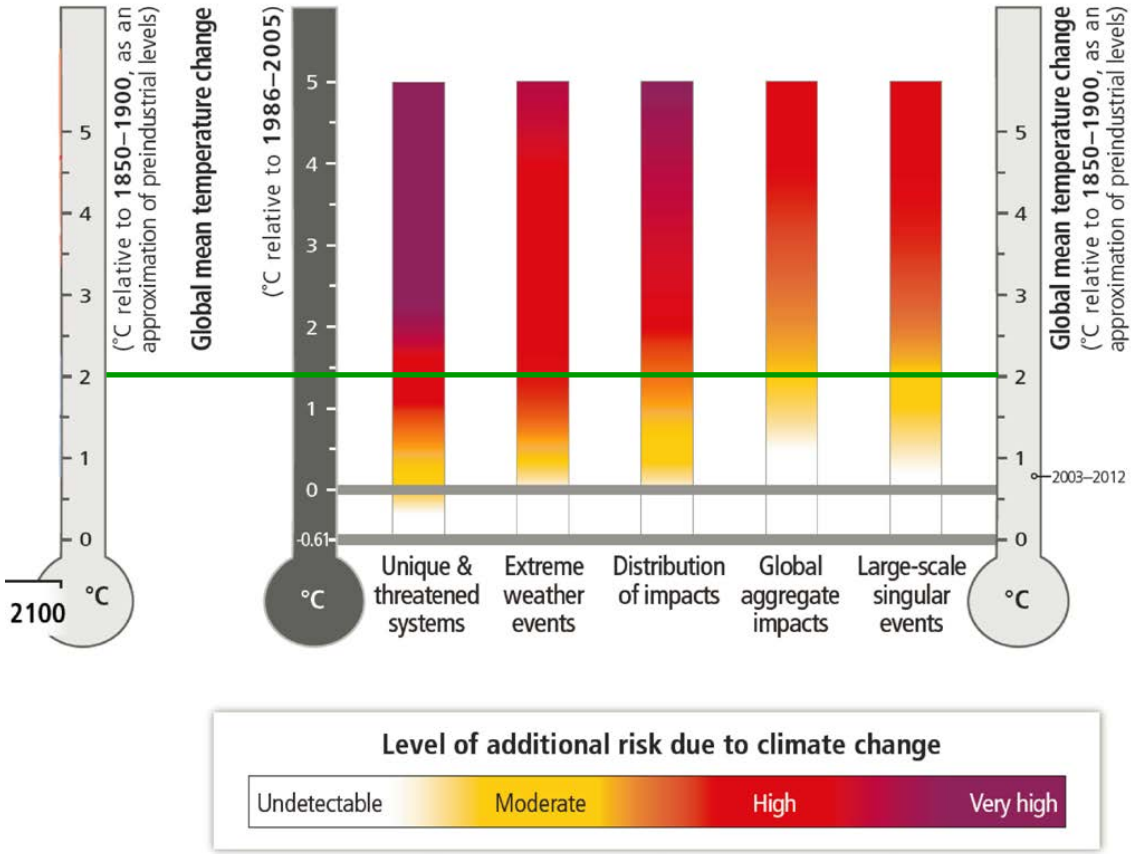
Based on Figure 1.3

A renaissance of coal drives the global carbonization.



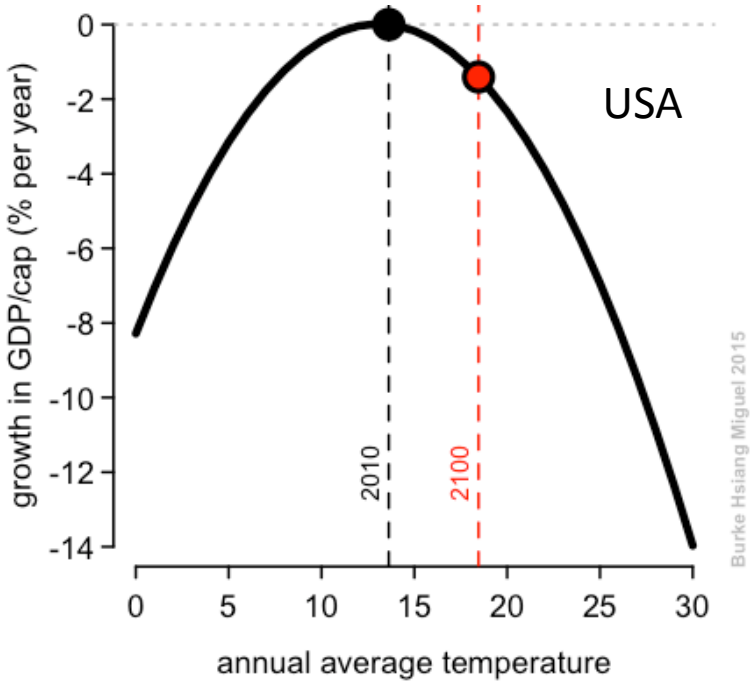
Steckel, Edenhofer and Jakob, in press

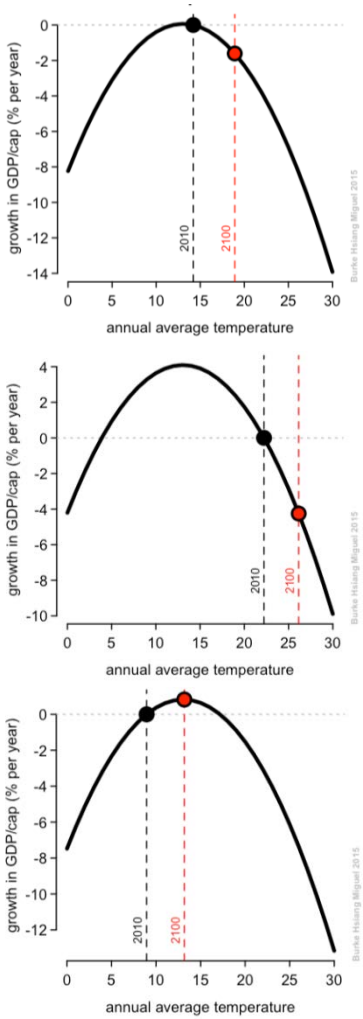
Climate Projections and Associated Risks



Slide by H. J. Schellnhuber

Growth vs. temperature





China

Brazil

Germany

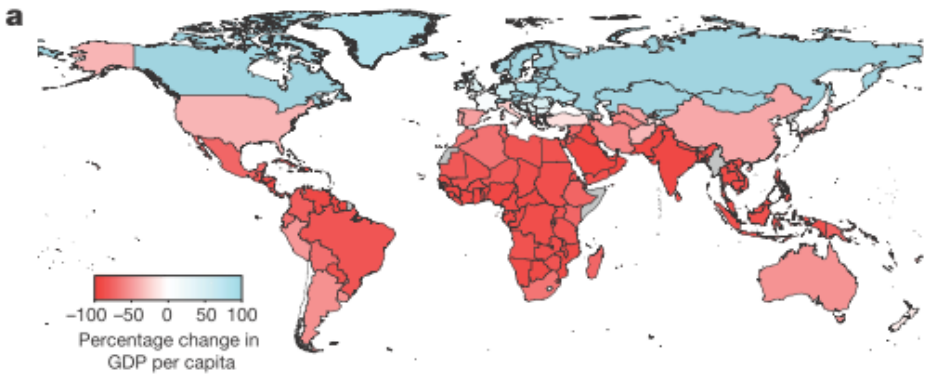
http://web.stanford.edu/~mburke/climate/map.php

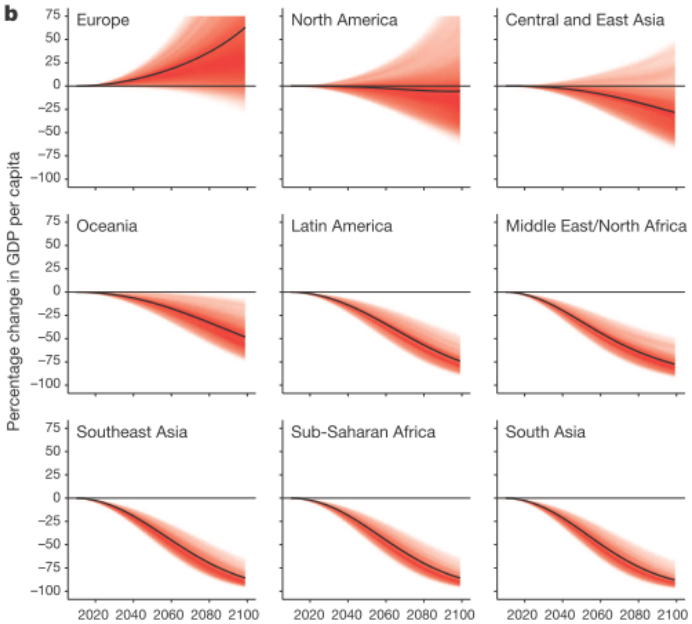
LETTER

nature

Global non-linear effect of temperature on economic production

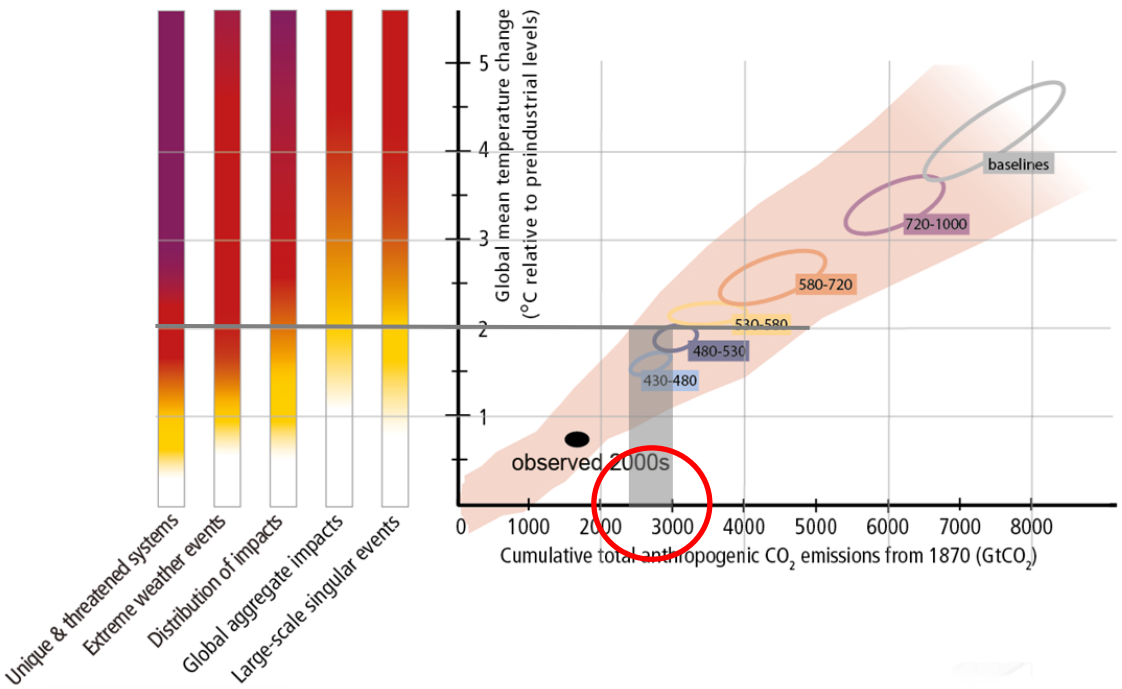
Marshall Burke[1,2]*, Solomon M. Hsiang[3,4]* & Edward Miguel[4,5]





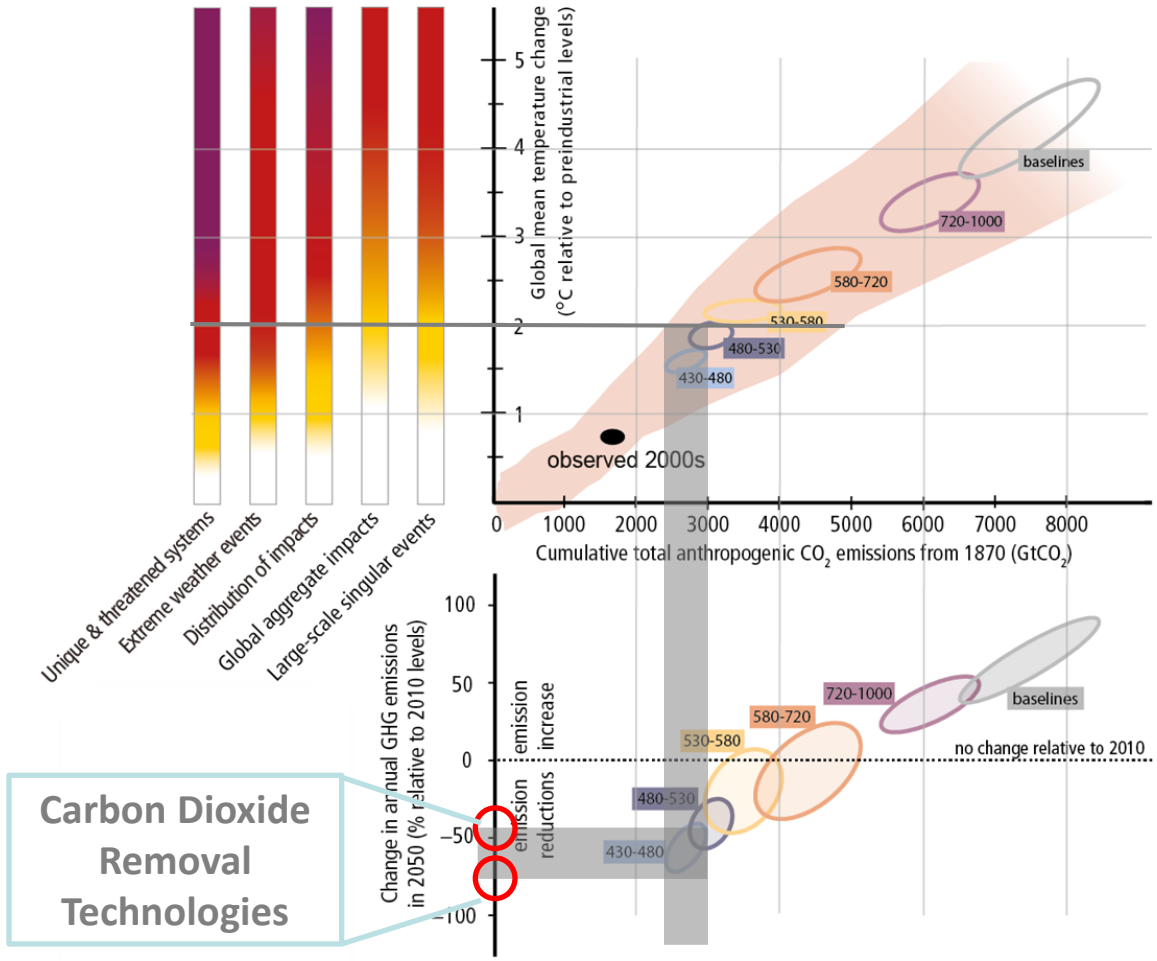
Quelle: Nature, doi:10.1038/nature15725

Risks from climate change depend on cumulative CO_2 emissions...



Based on SYR Figure SPM.10

…which in turn depend on annual GHG emissions over the next decades.

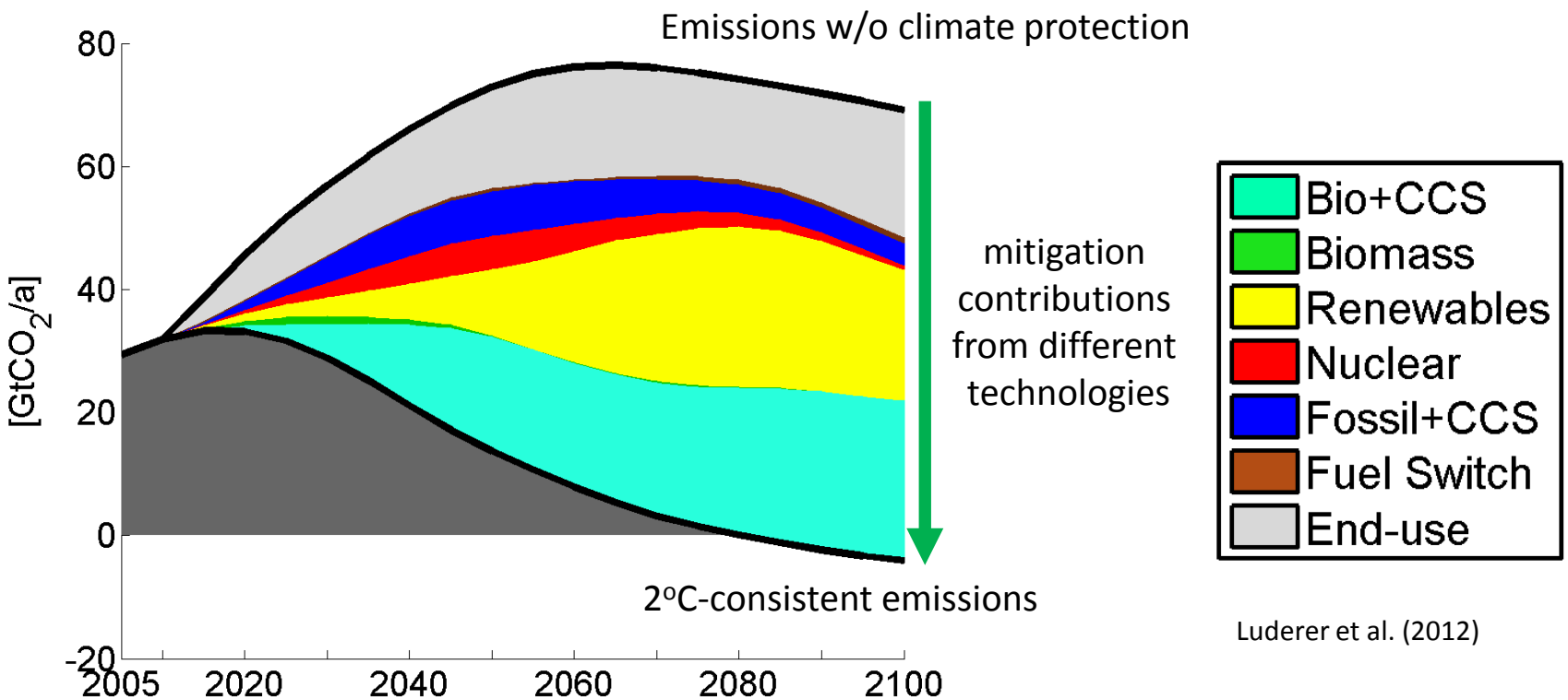


Basiert auf SYR IPCC AR5 Figure SPM.10

What are the consequences for international energy and climate policy?

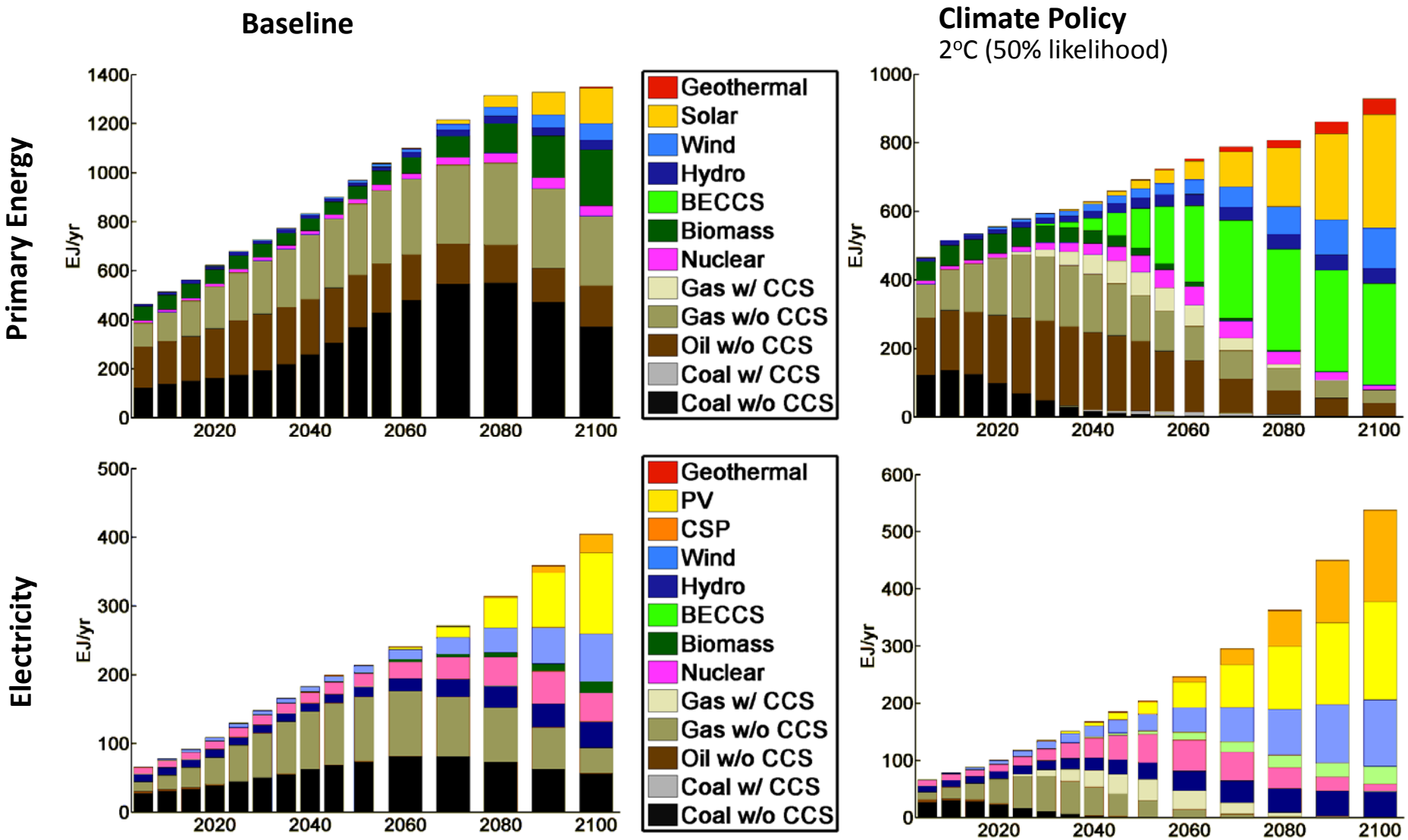
The great transformation

CO_2 emissions from fossil fuels

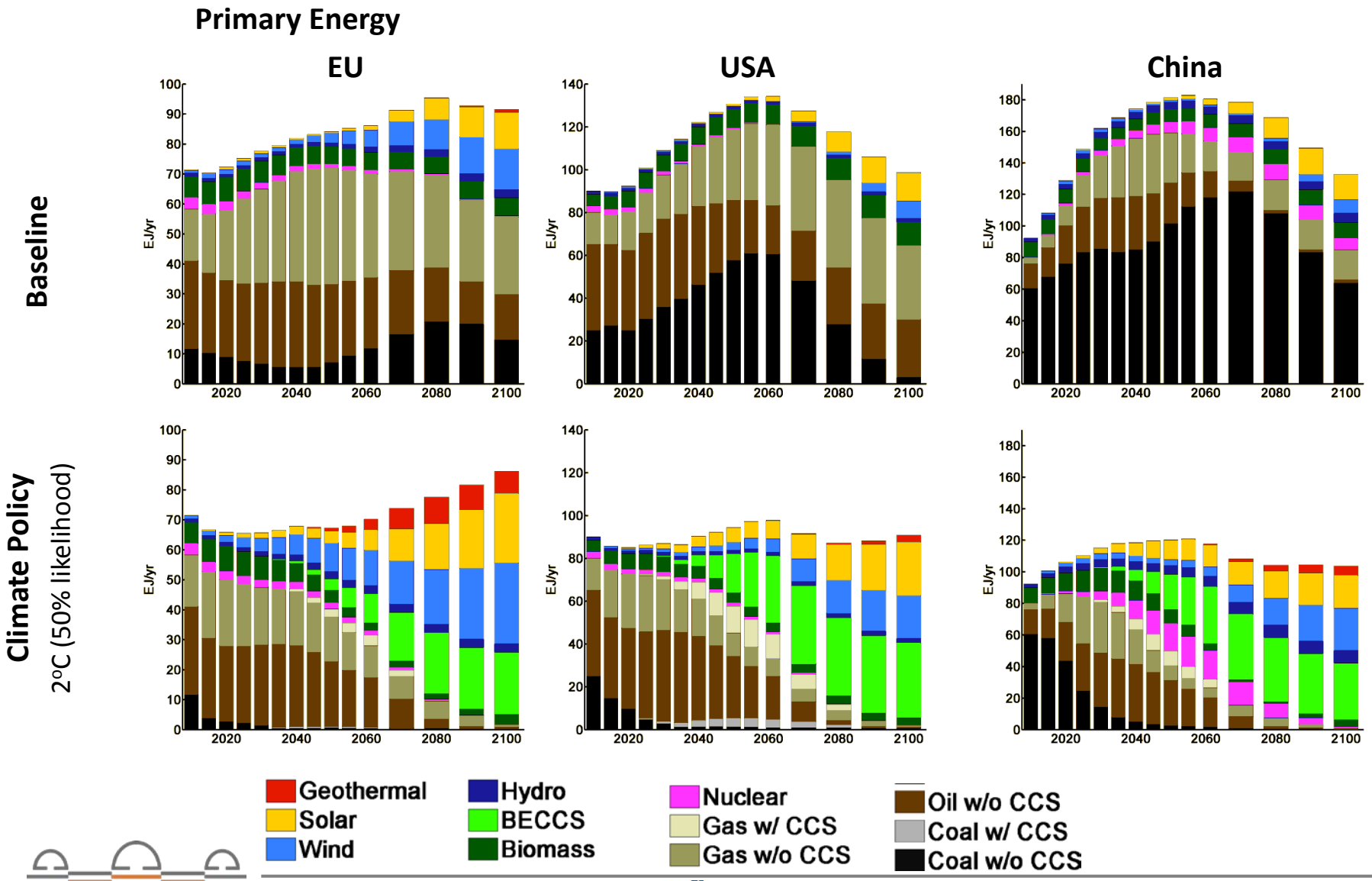


Luderer et al. (2012)

Global energy system transformation pathways



All regions see radical transformation of their energy system



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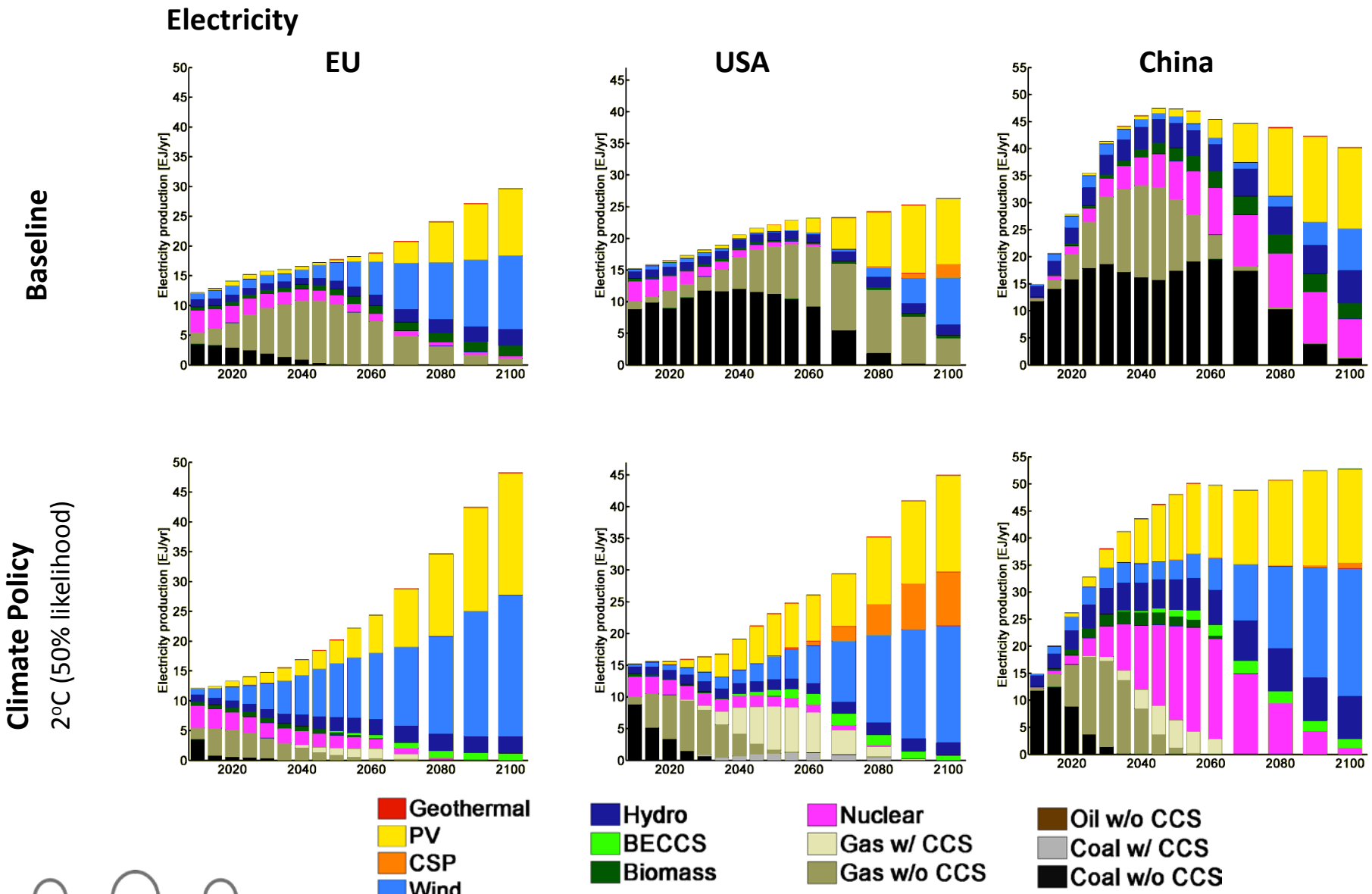
All regions see radical transformation of their power system



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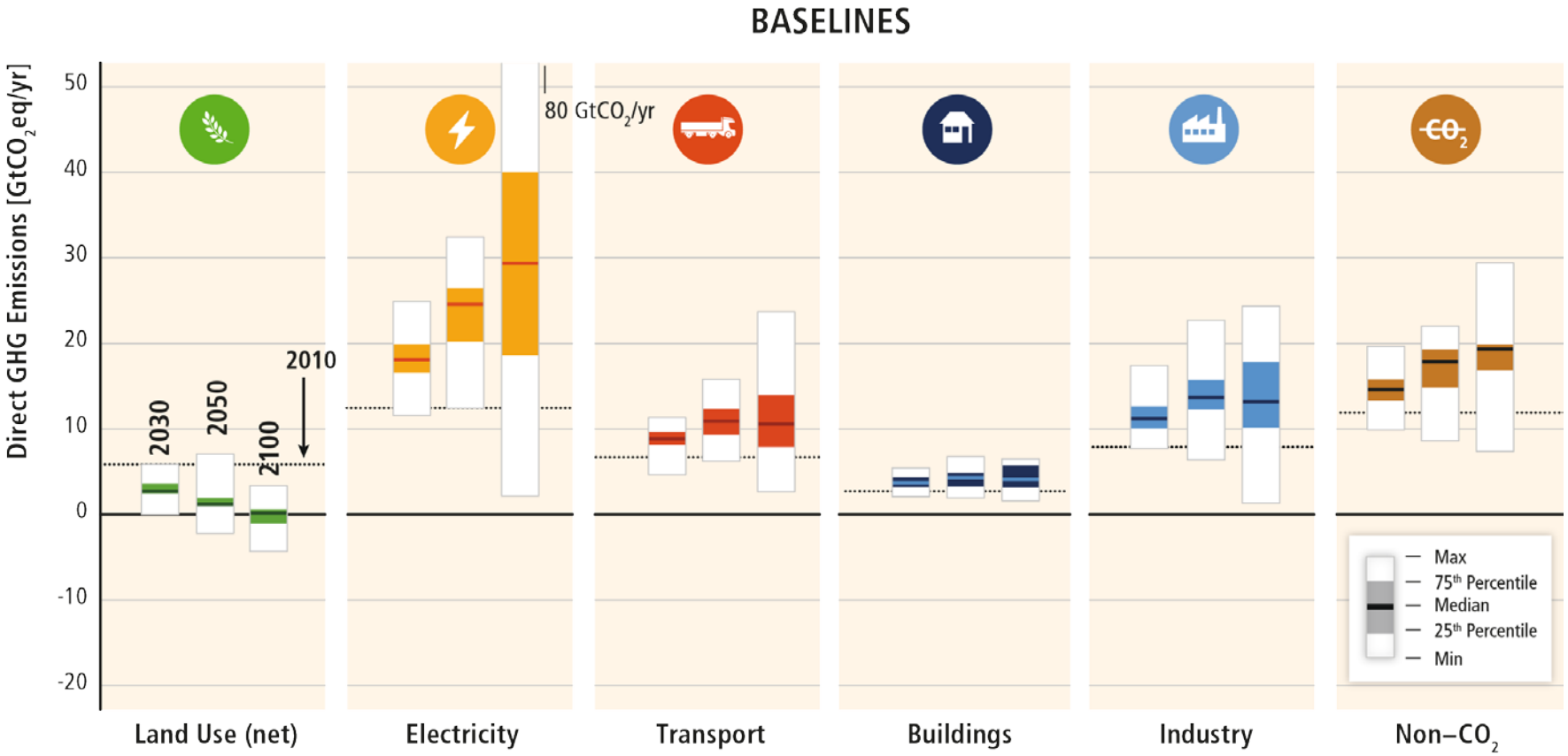
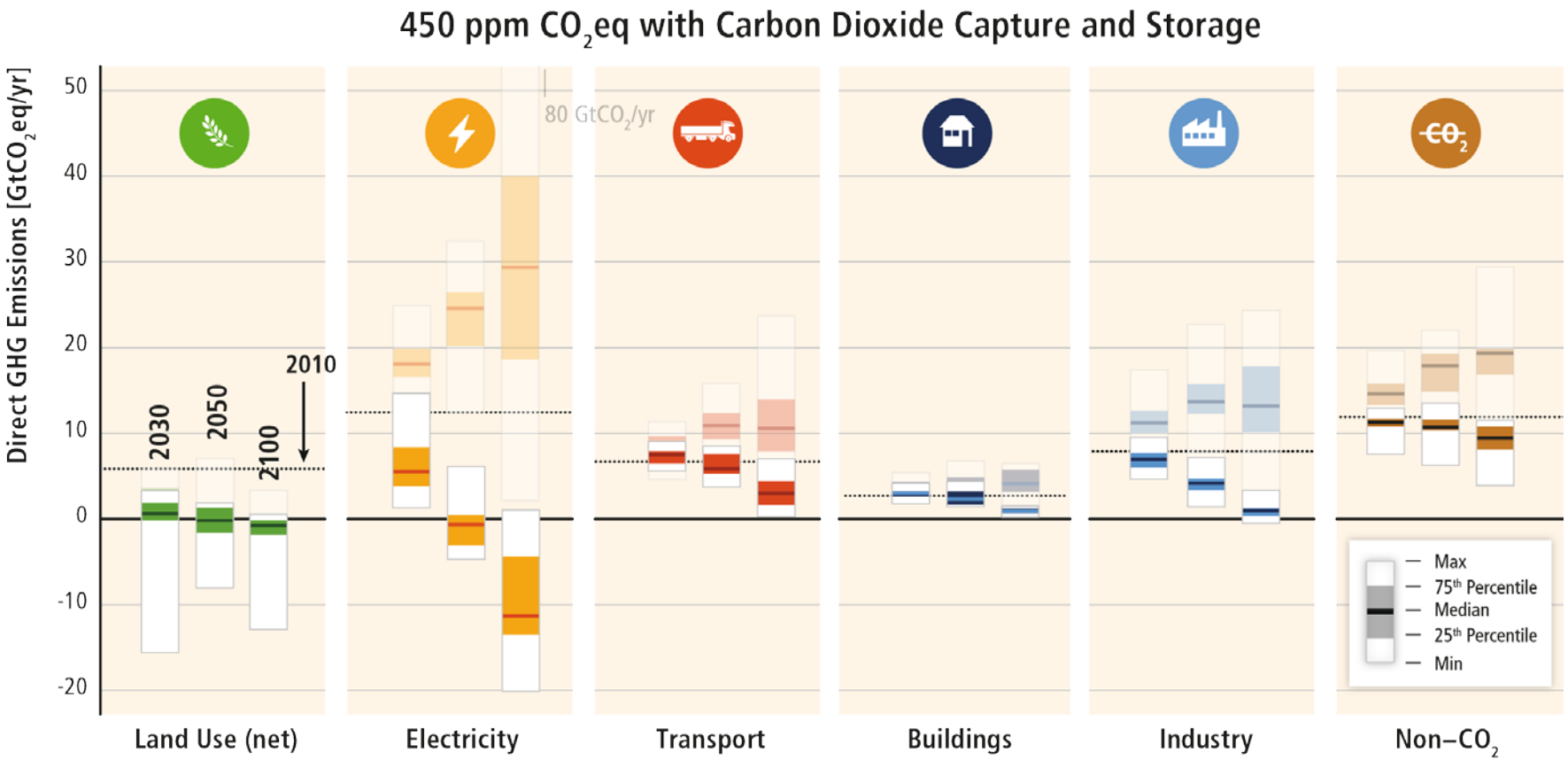
Sectoral Emissions



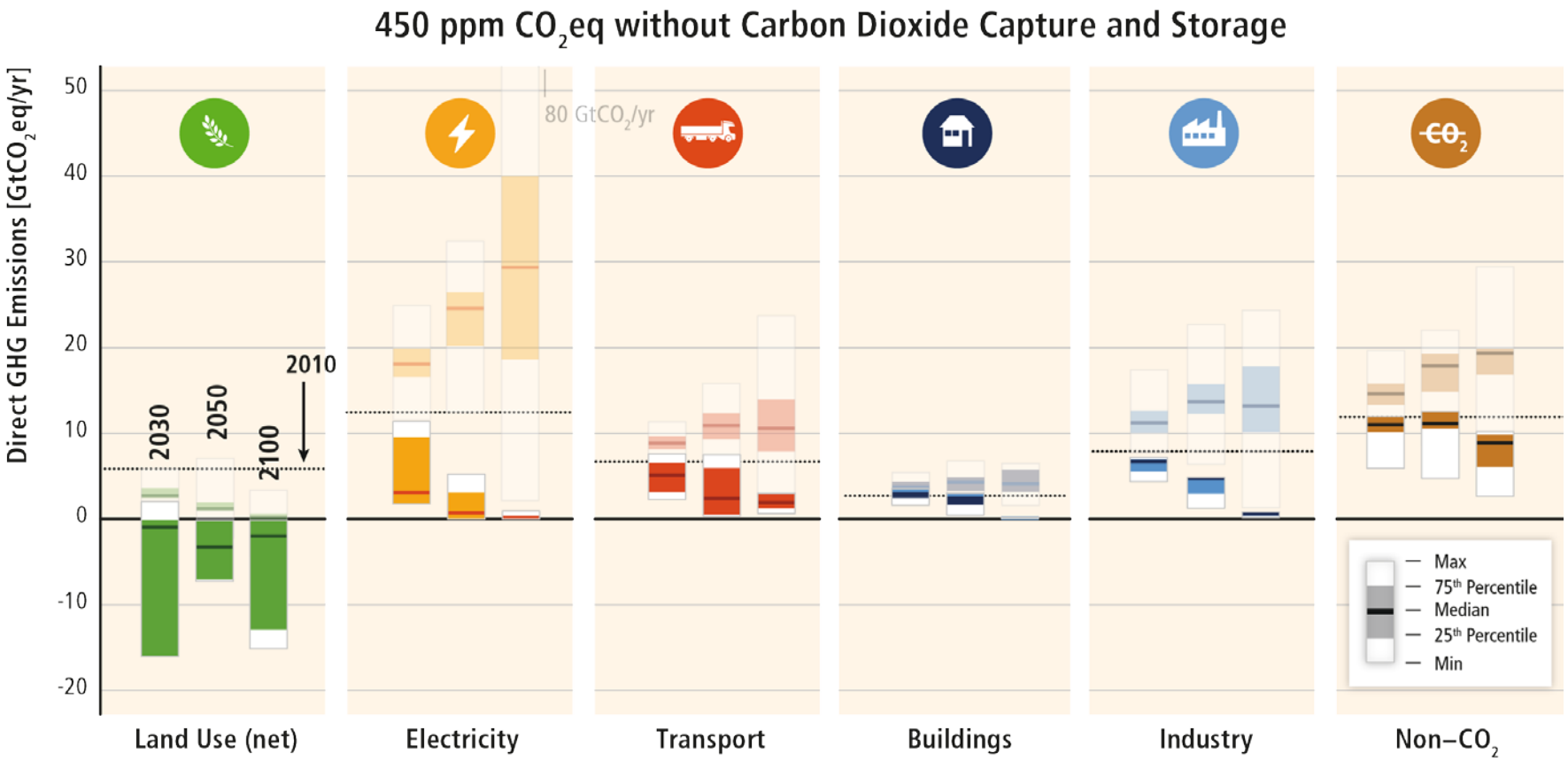
Based on IPCC AR5 WGIII Figure TS.17

Each Sector has to contribute – The power sector most



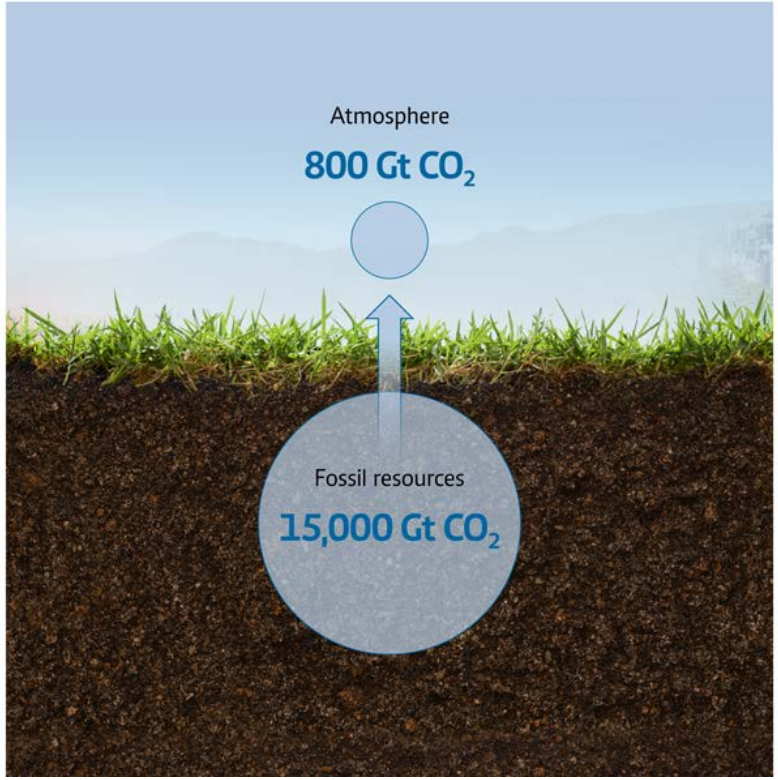
Based on IPCC AR5 WGIII Figure TS.17

Afforestation becomes important when CCS is not available



Based on IPCC AR5 WGIII Figure TS.17

The climate problem at a glance.



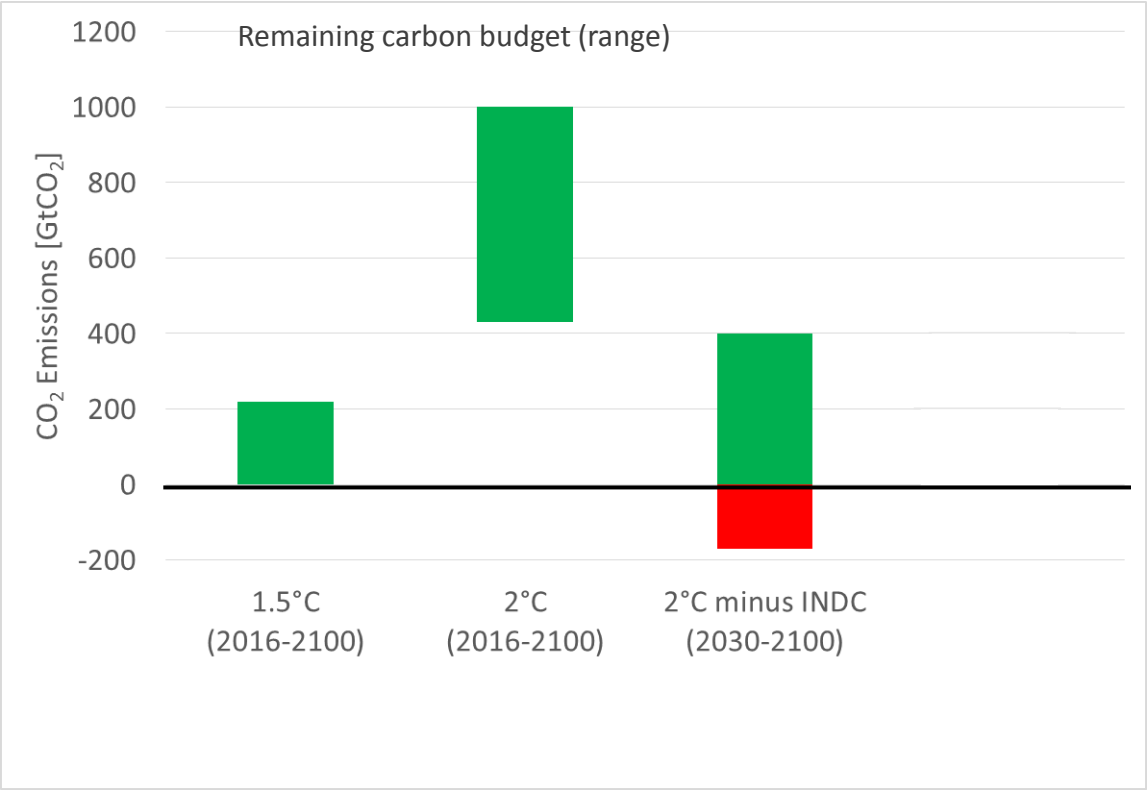
Resources and reserves to remain underground until 2100 (median values compared to BAU, AR5 Database)

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

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

The Paris agreement: INDCs

- Intended Nationally Determined Contributions are inconsistent with the temperature target.



Data sources: Le Quere et al. (2015), Rogelj et al. (2015), Luderer et al. (2015); Fig. adapted from Jan Minx 2016

The Paris agreement: INDCs

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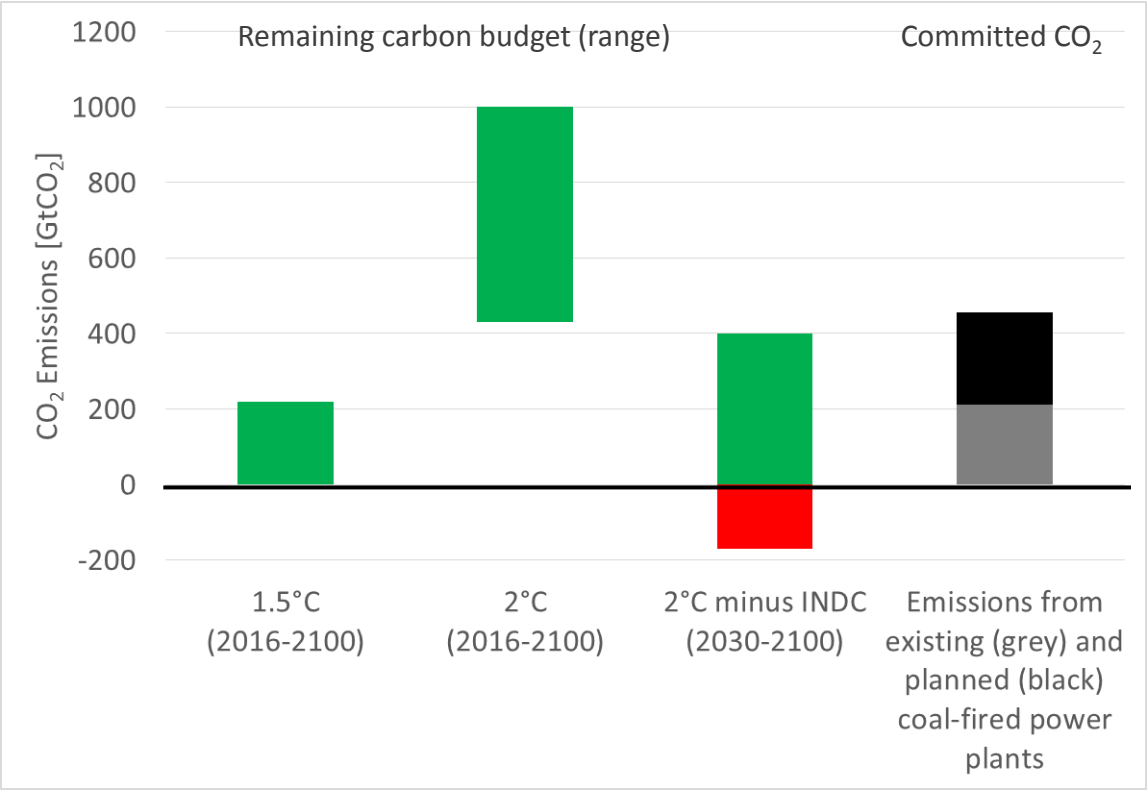
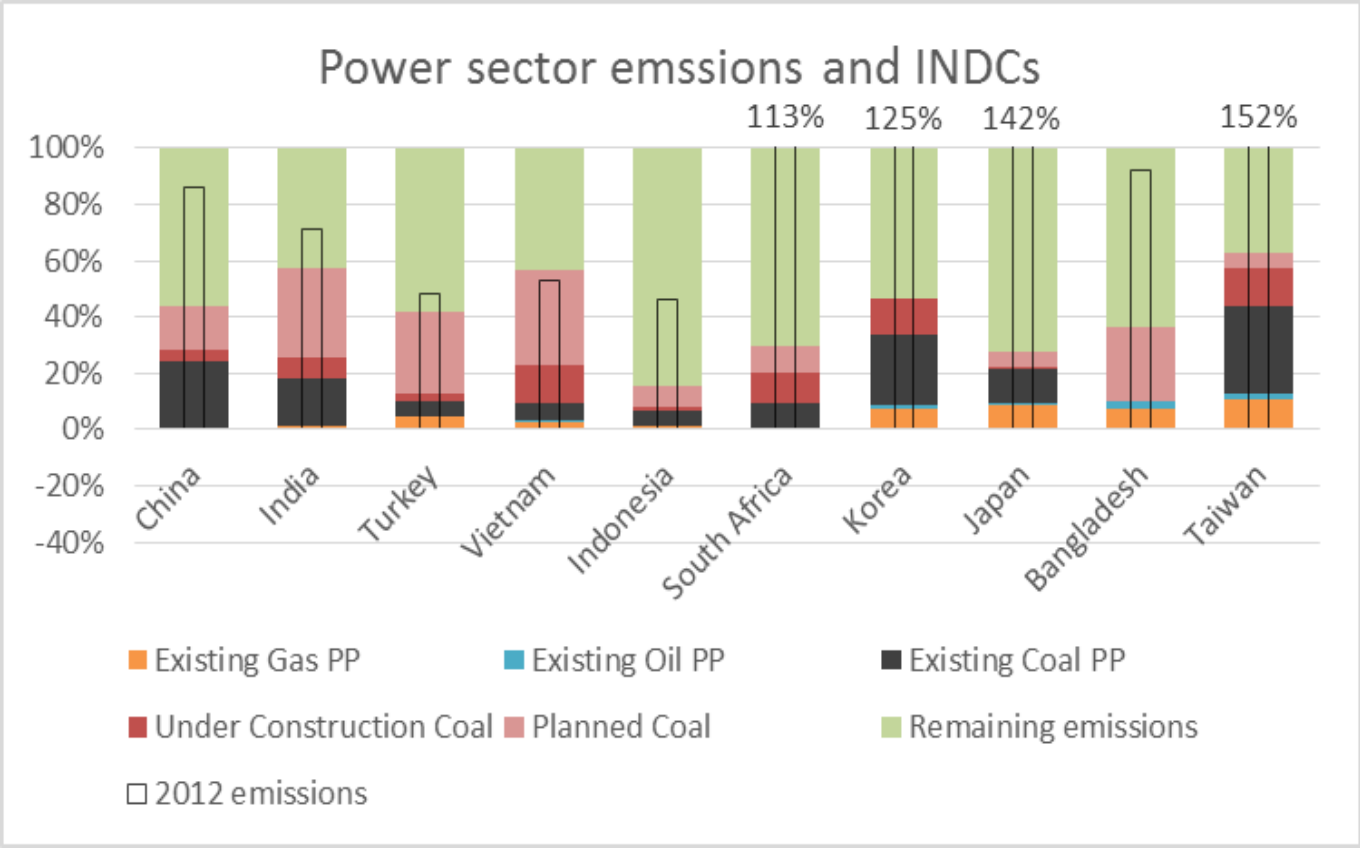


Data sources: Le Quere et al. (2015), Rogelj et al. (2015), Luderer et al. (2015); Fig. adapted from Jan Minx 2016

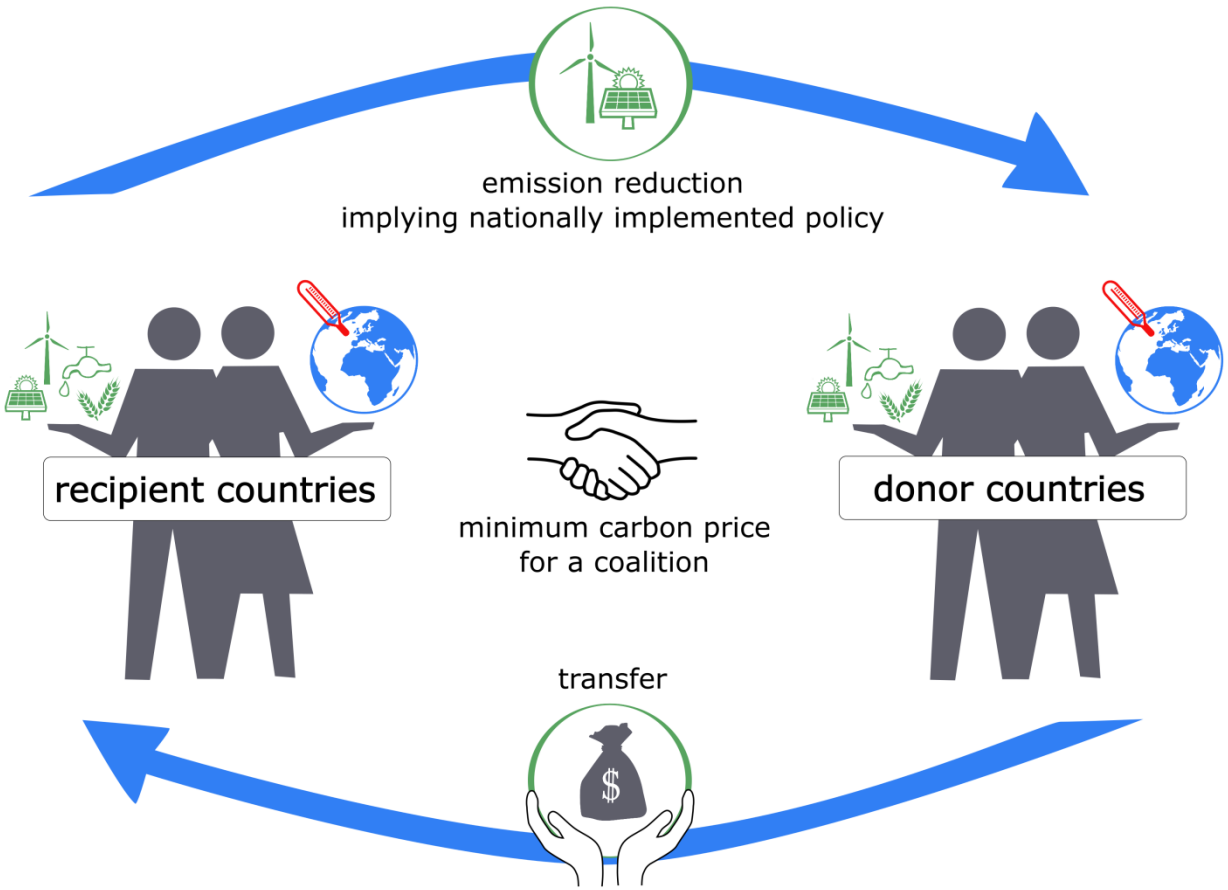
The INDCs are inconsistent



Edenhofer et al. submitted (Science)

Countries with highest ongoing and planned coal investment

Minimum Carbon Price and Transfers



Global Minimum Carbon Price and Transfers

Ausweg aus der Klima-Sackgasse

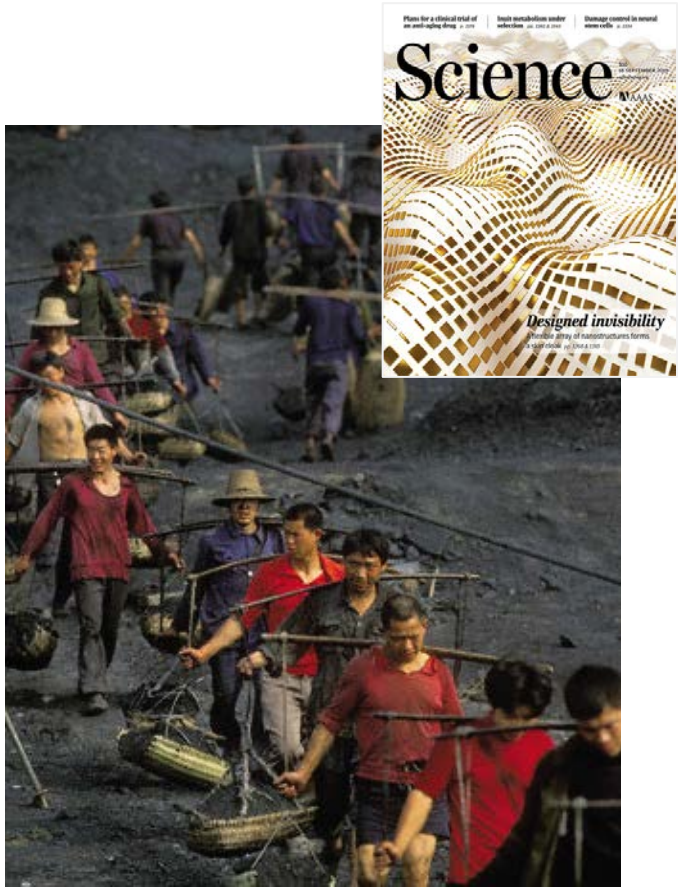
Die Treibhausgasemissionen müssen sinken. Aber sie steigen. Ein Durchbruch ist auf dem Klimagipfel in Paris nicht in Sicht. Dabei ist kluge Klimapolitik ganz einfach.

26.10.2015, von OTTMAR EDENHOFER UND AXEL OCKENFELS

Source: Frankfurter Allgemeine Zeitung, online, 26.10.2015

Renaissance of Coal

Social Costs vs subsidies



Source: Science, 18 September 2015, Vol 349, Issue 6254, 1286ff

ENERGY

September 2015

King Coal and the Queen of Subsidies

The window for fossil fuel subsidy reform is closing fast

By **Ottmar Edenhofer**

Coal is the most important energy source for the Chinese economy (see the photo). Other rapidly growing economies in Asia and Africa also increasingly rely on coal to satisfy their growing appetite for energy. This renaissance of coal is expected to continue in the coming years (*1*) and is one of the reasons that global greenhouse gas (GHG) emissions are increasing despite the undisputed worldwide technological progress and expansion of wide emissions are expected to continue to rise. After all, a reduction in coal demand in one region reduces world market prices, incentivizing an increasing demand in other regions (*6*).

What explains this renaissance of coal? The short answer is the relative price of coal. The price of coal-based electricity generation remains much lower than that of renewable power when the costs of renewable intermittency are taken into account.

As a result of technological progress and economies of scale, the costs of generating

"one ton of CO_2 receives, on average, more than 150 US$ in subsidies "

Climate Policy and Poverty reduction - A contradiction?

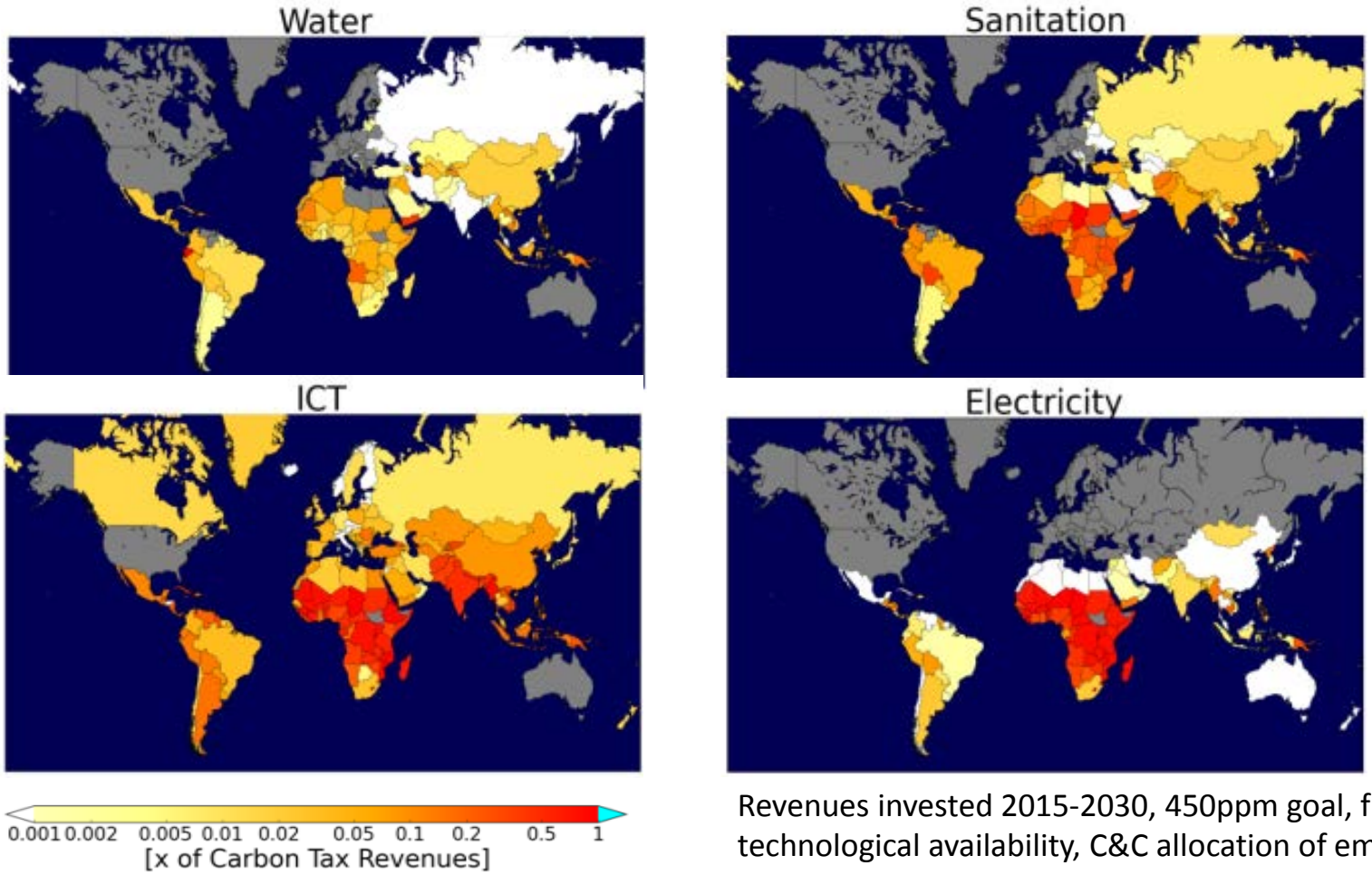
Water availability

Sanitation

Telecommunication

Access to electricity

Carbon pricing revenues to close infrastructure gaps



Source: Jakob et al., in press

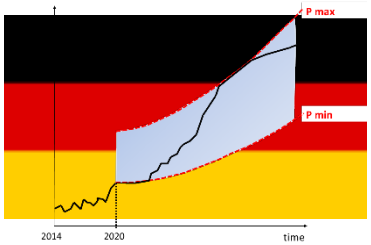
Revenues invested 2015-2030, 450ppm goal, full technological availability, C&C allocation of emission permits

Options for a coal phase-out in Germany

„Coal Commission“:
Should explore alternative options with respect to costs, distributional questions, energy security, regional structural change, implication on EU level

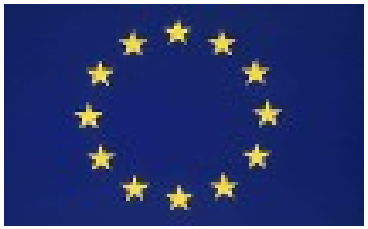
Regulation (as for nuclear phase-out)

National floor price (or „Klimabeitrag“)



Competitive bidding process for exit payments

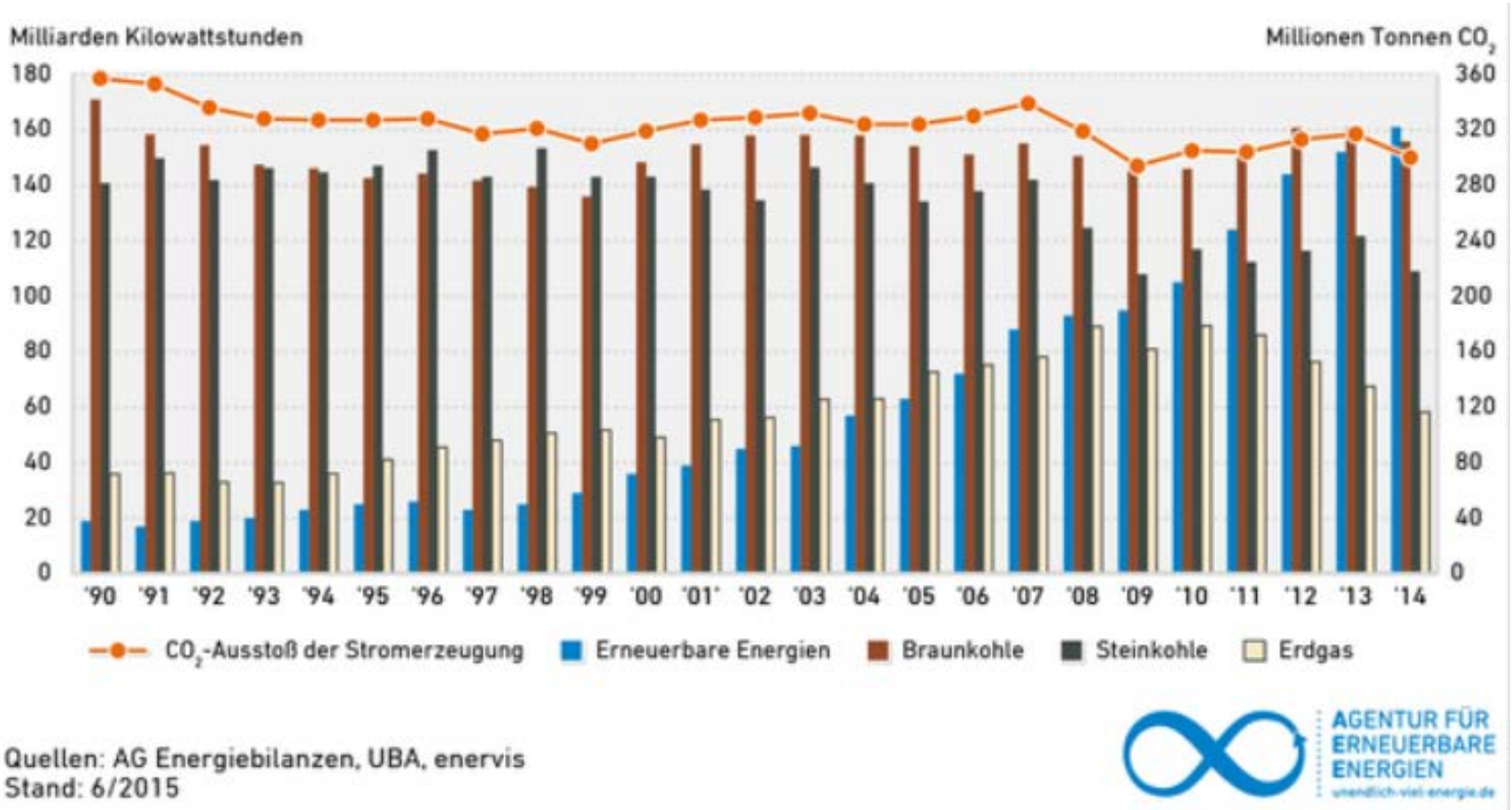
Reform of EU-ETS with EU-wide floor price



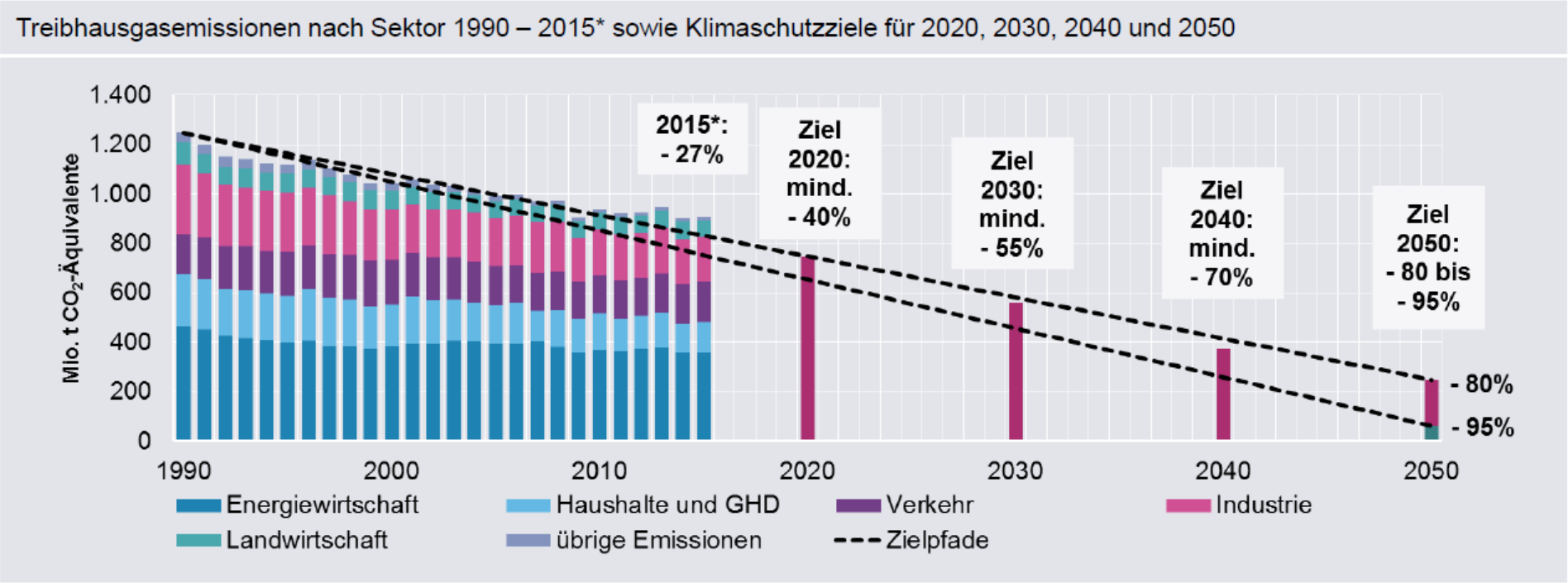
Knopf (2016)

CO_2 emissions from power sector stagnate despite increasing deployment of renewables.

- **Main reason: emissions from lignite (due to low carbon price in EU ETS)**



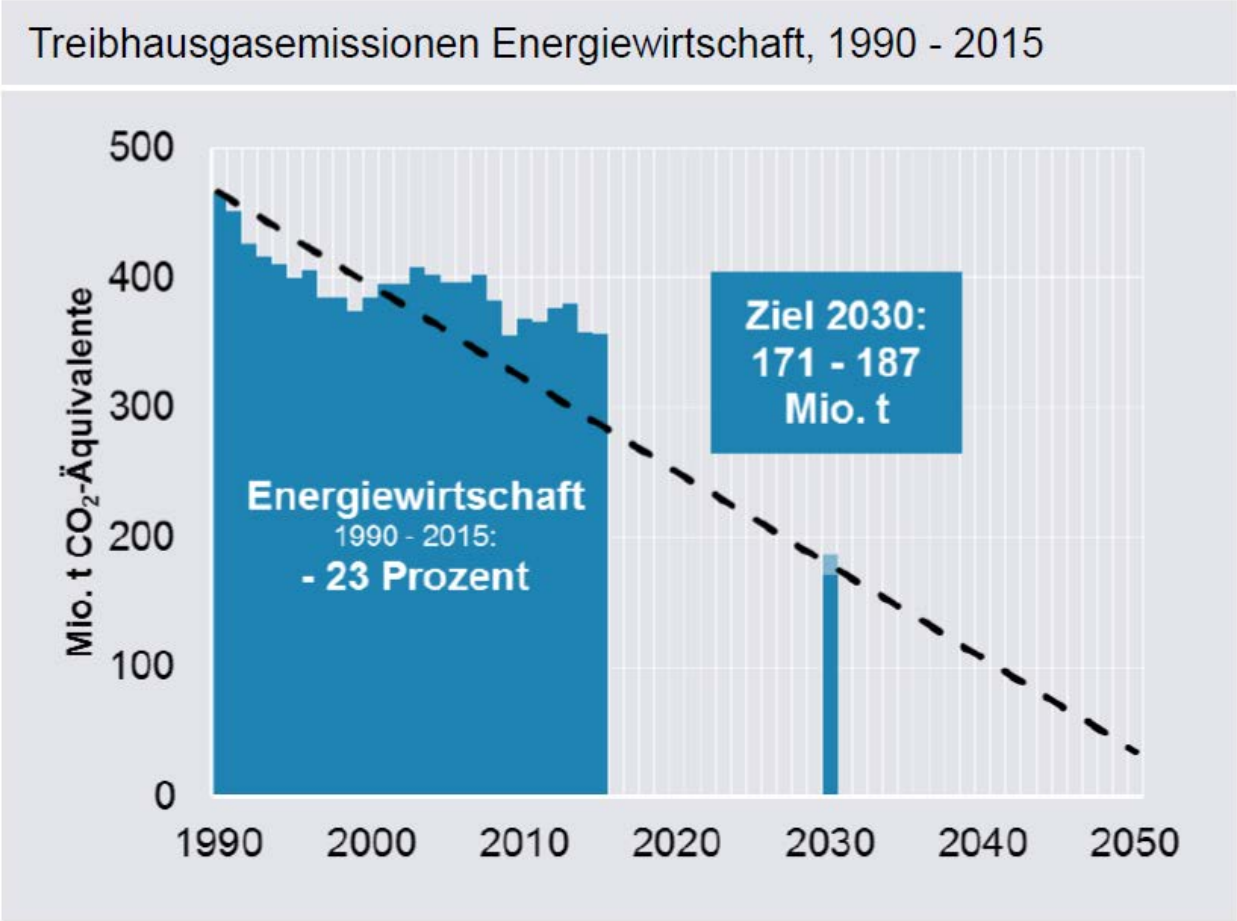
Germany is not on track.



Source: UBA (2016), Agora calculation

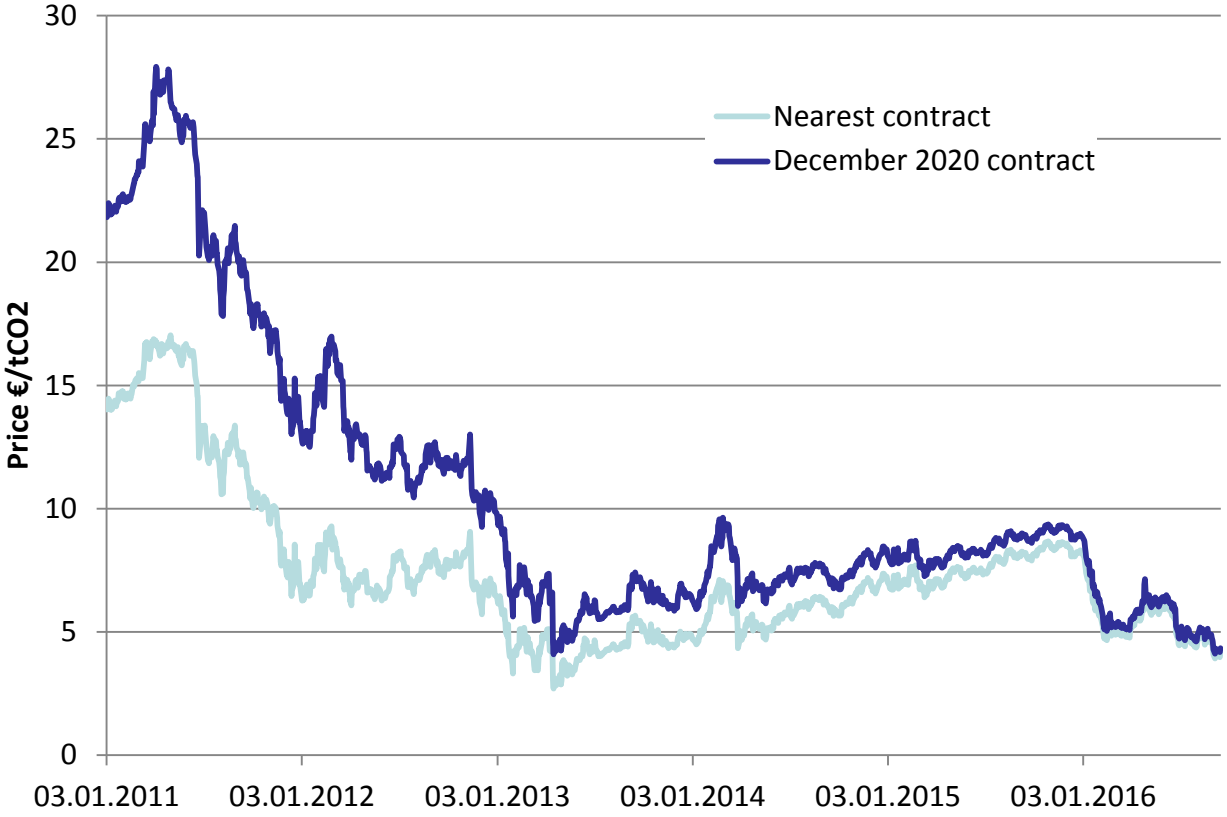
* temporary

The energy sector has not performed.



Source: UBA (2016), Agora calculation; target range: -92,5% till 2050

ETS lacks dynamic cost efficiency.

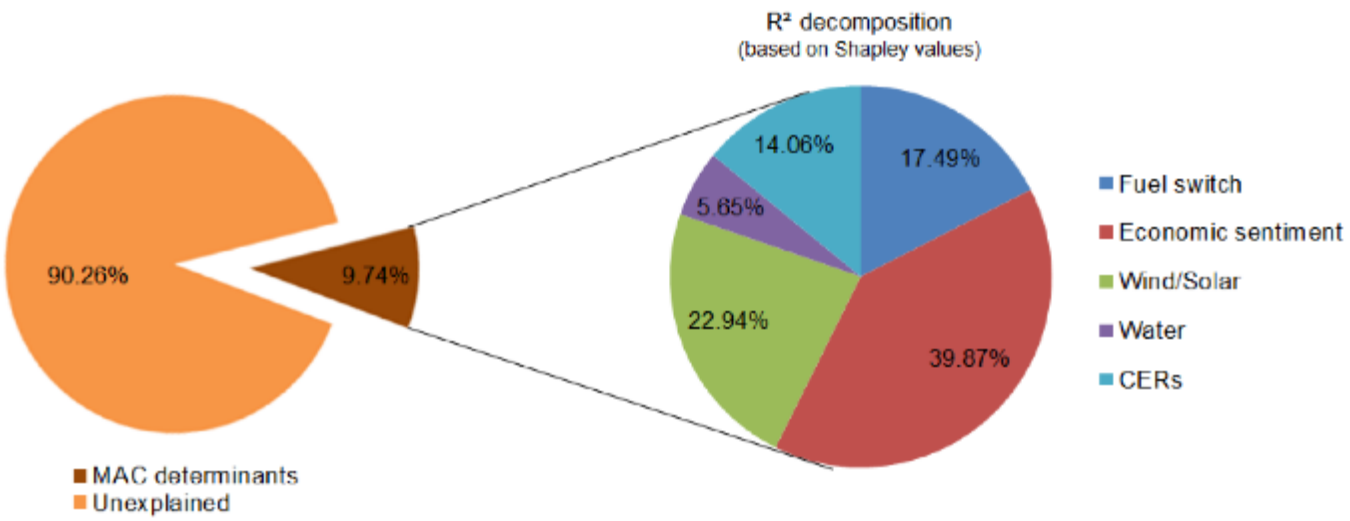


Source: ICE Futures Europe

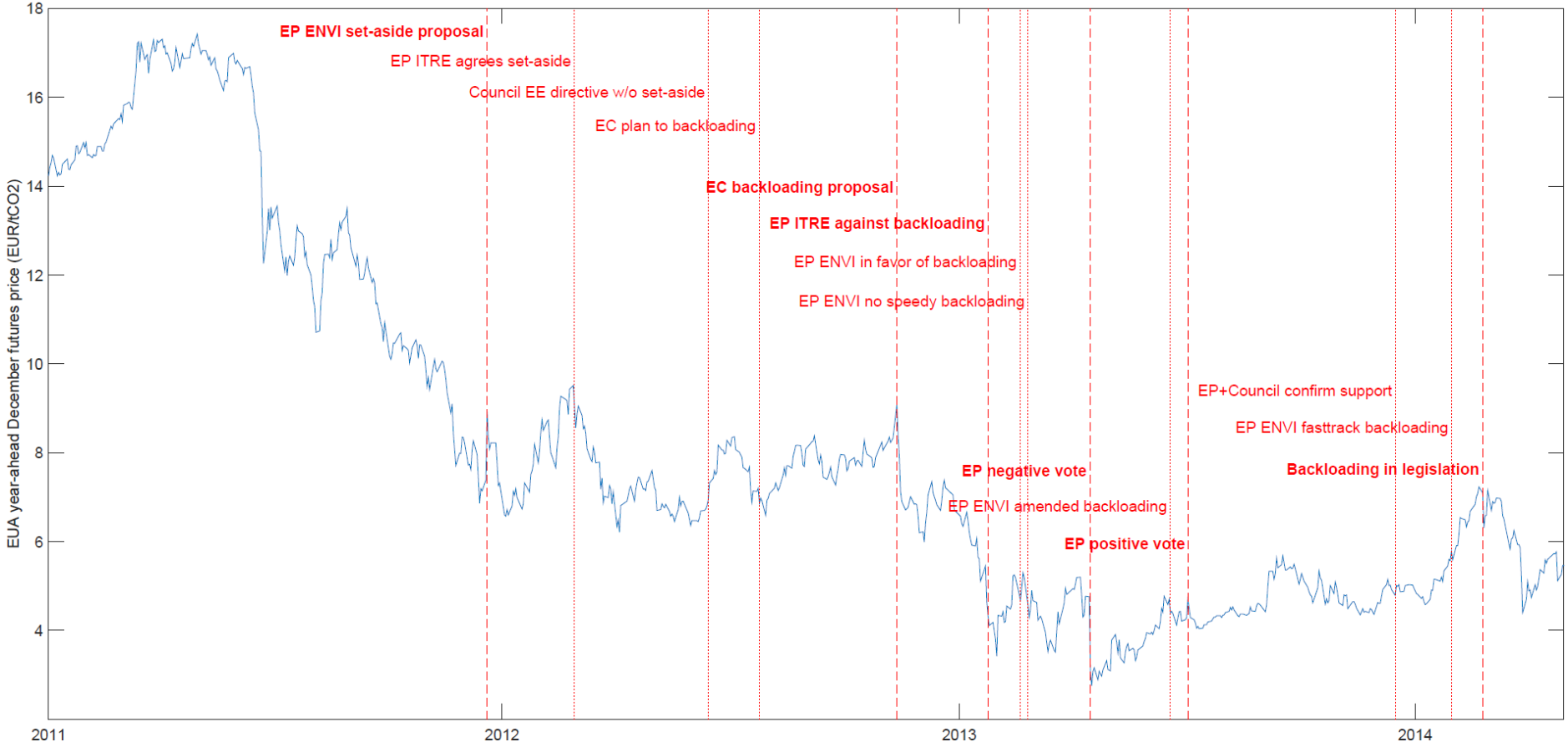
- **Falling CO_2 price**
- **No increase expected before 2020**
- **Market Stability Reserve will be implemented, but effect might be limited**

Empirical evidence: demand shock

- Consensus that carbon prices are driven to *certain extent* by demand-side fundamentals related to abatement cost (Hintermann 2010)
- But: EUA price dynamics cannot be solely explained by demand-side fundamentals (Koch et al. 2014)



EU ETS betting shop for political decisions

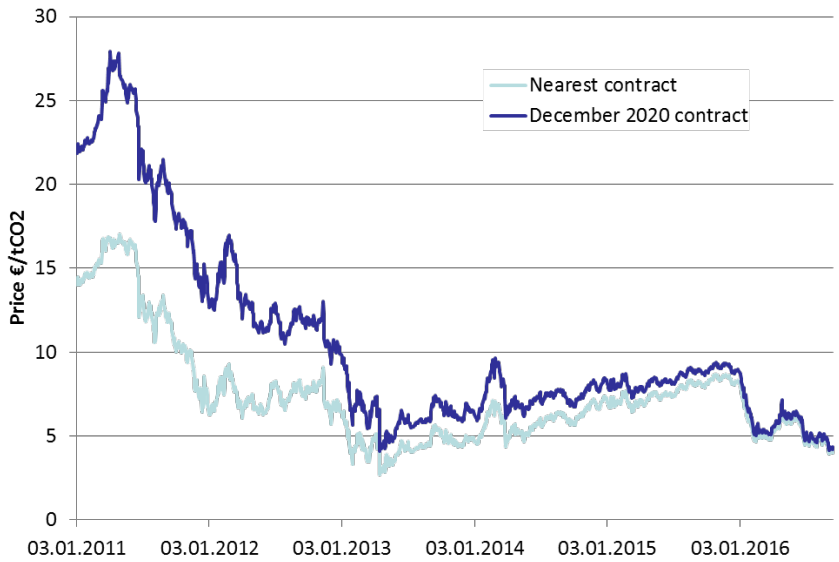


Koch et al. (2016)

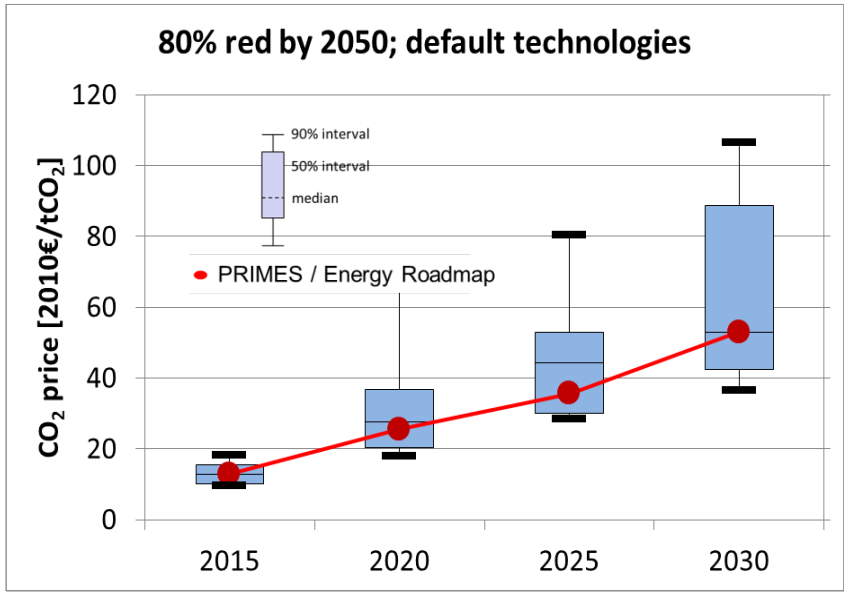
ETS lacks dynamic cost efficiency.

- The price expectations for 2020 can serve as a benchmark for the evaluation of the dynamical cost efficiency of the ETS
- There is a gap between expectations and models showing a cost-efficient price of more than 20 €/t CO_2 in 2020

EUA Nearest Contract and Futures



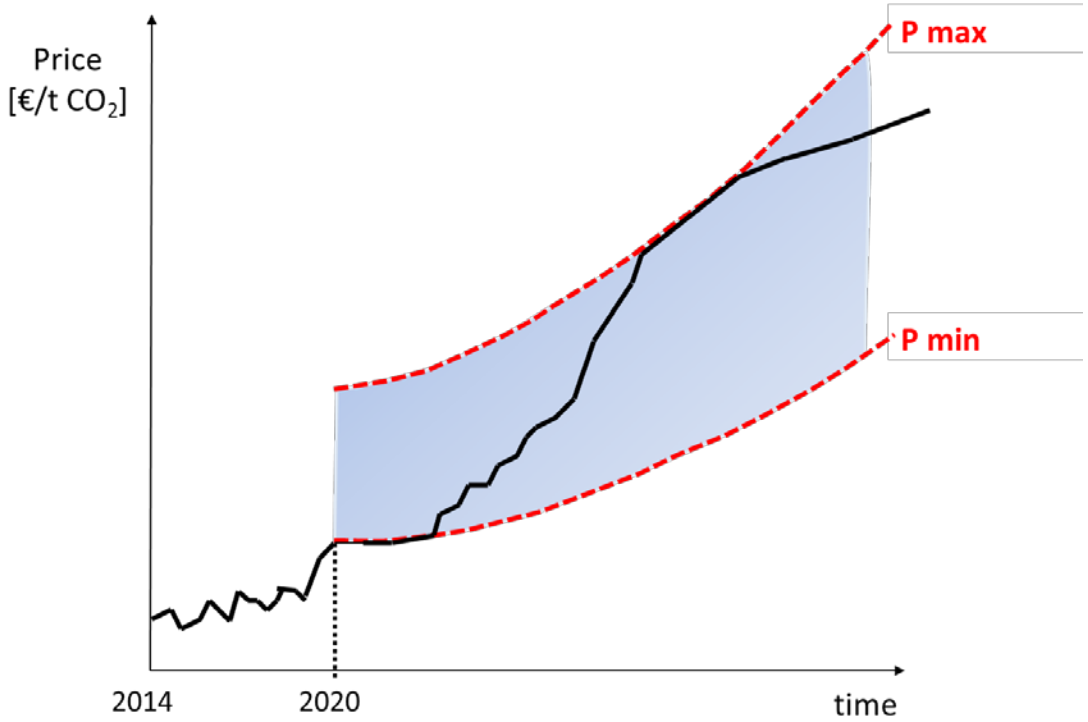
Cost-efficient CO_2 price from models



Knopf et al. (2013)

Introduction of a price corridor

- Reliable environment for investment decisions
- Instrument: Introduction of an auction reserve price



Thank you for your attention!