Potsdam Institute for Climate Impact Research

# Climate Policy and Trumponomics


## Prof. Dr. Ottmar Edenhofer


**KlimaCampus Kolloquium**

**Hamburg**

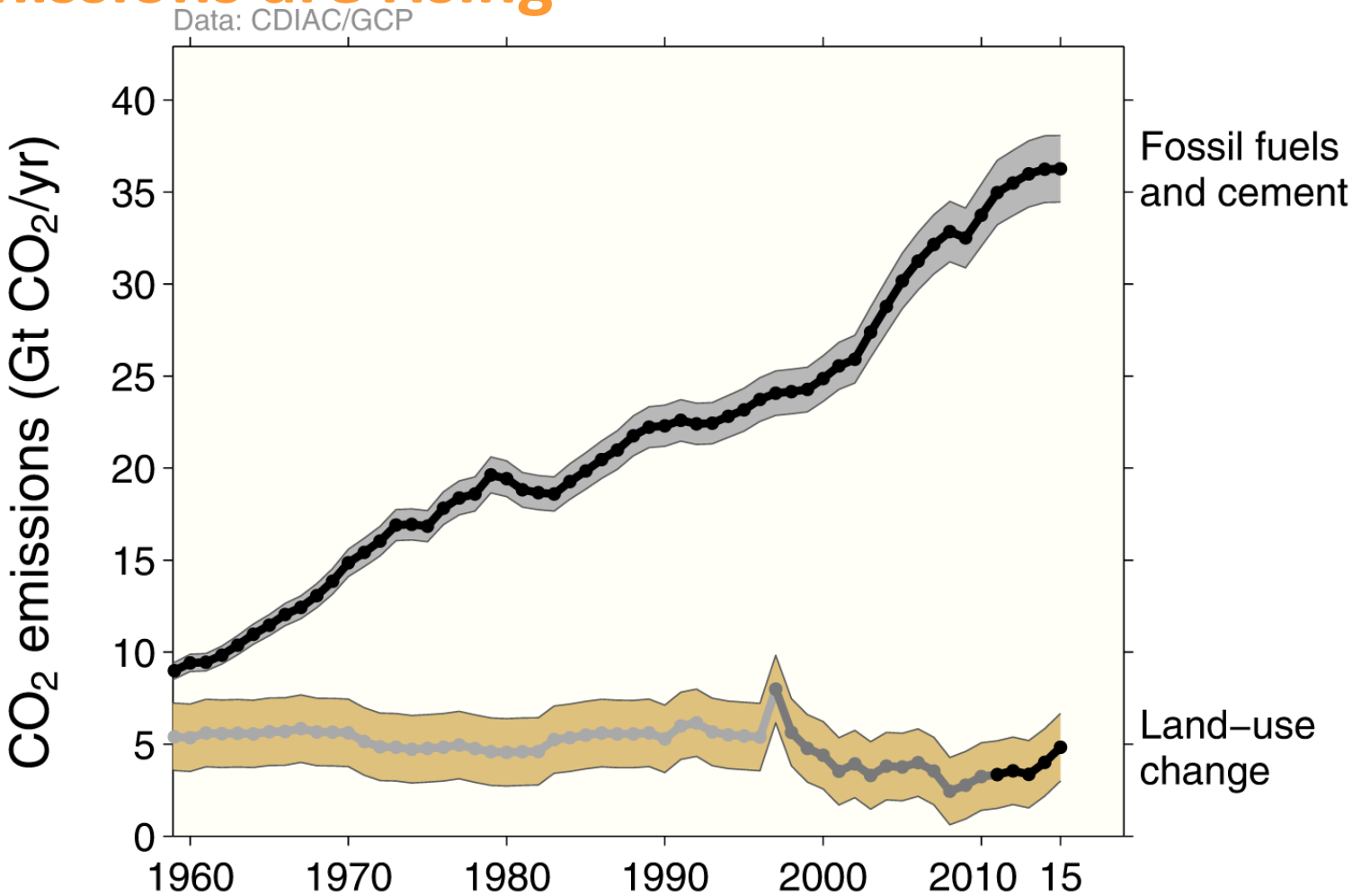
**19 January 2017**


Leibniz Gemeinschaft

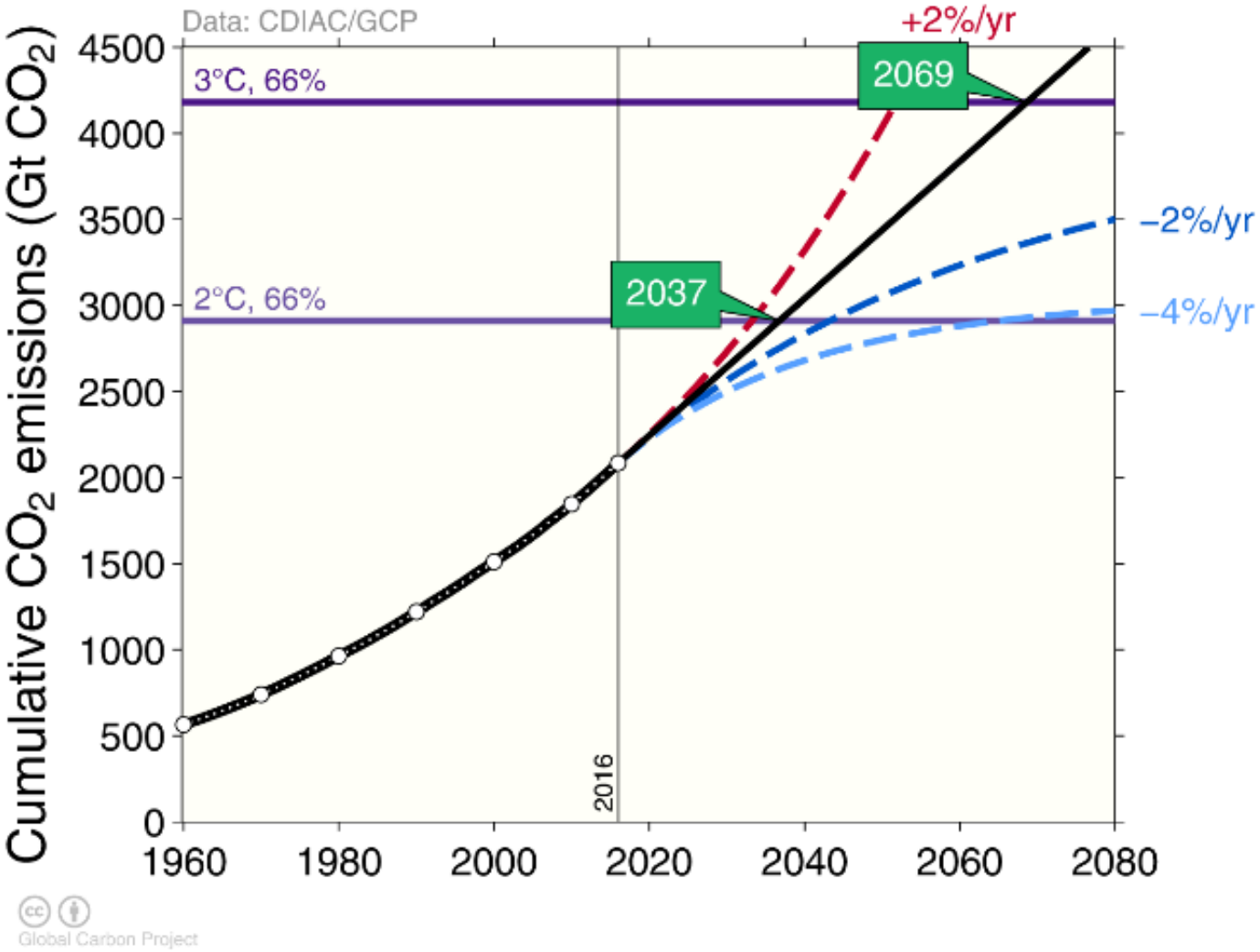
MCC Mercator Research Institute on Global Commons and Climate Change

Technische Universität Berlin

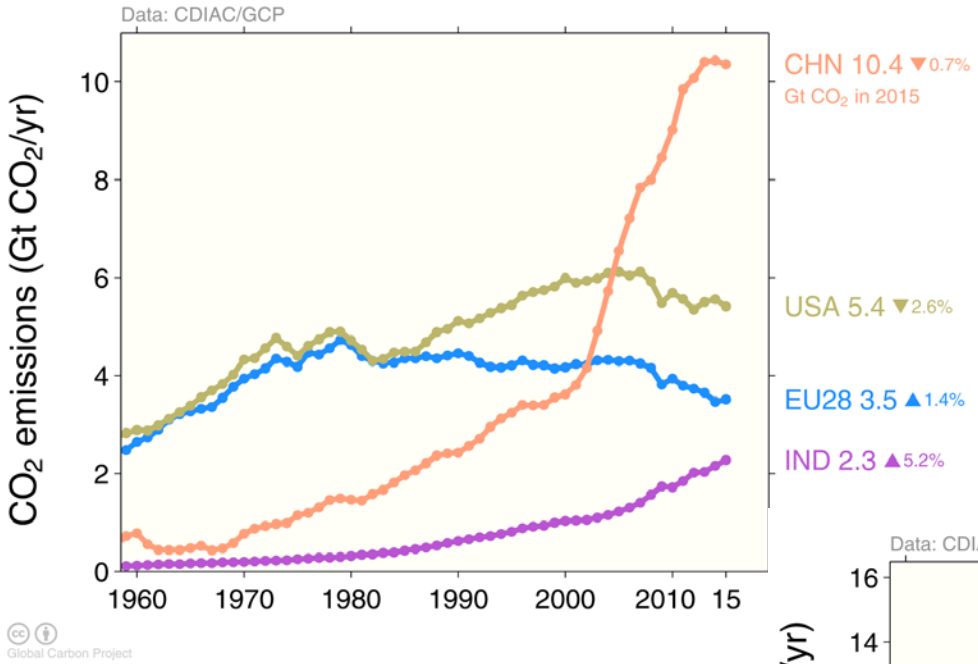
# Emissions are rising

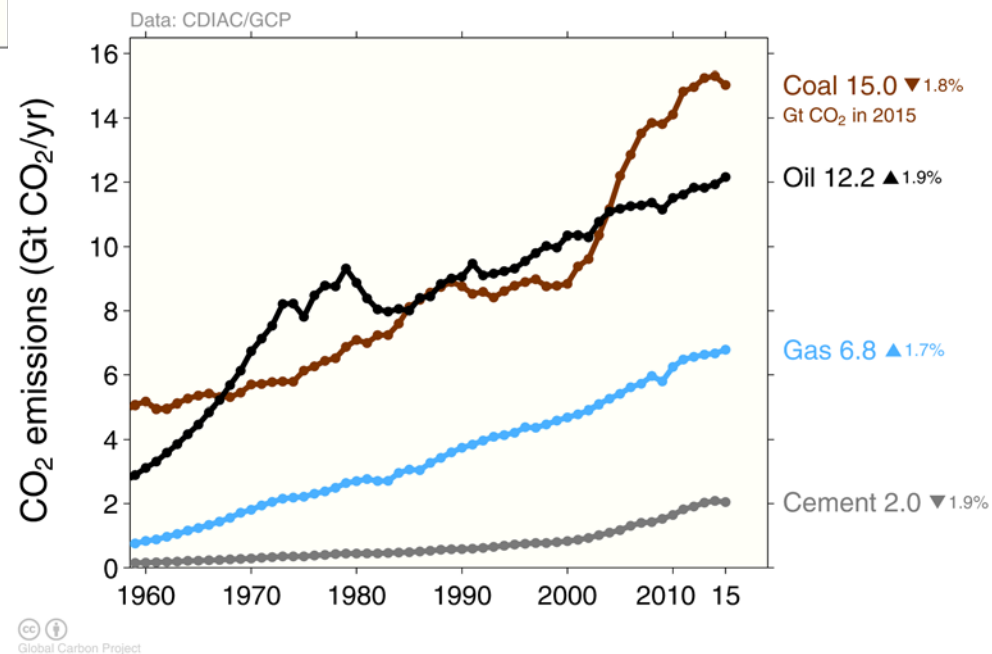


# Cumulative emissions – we are still not on track

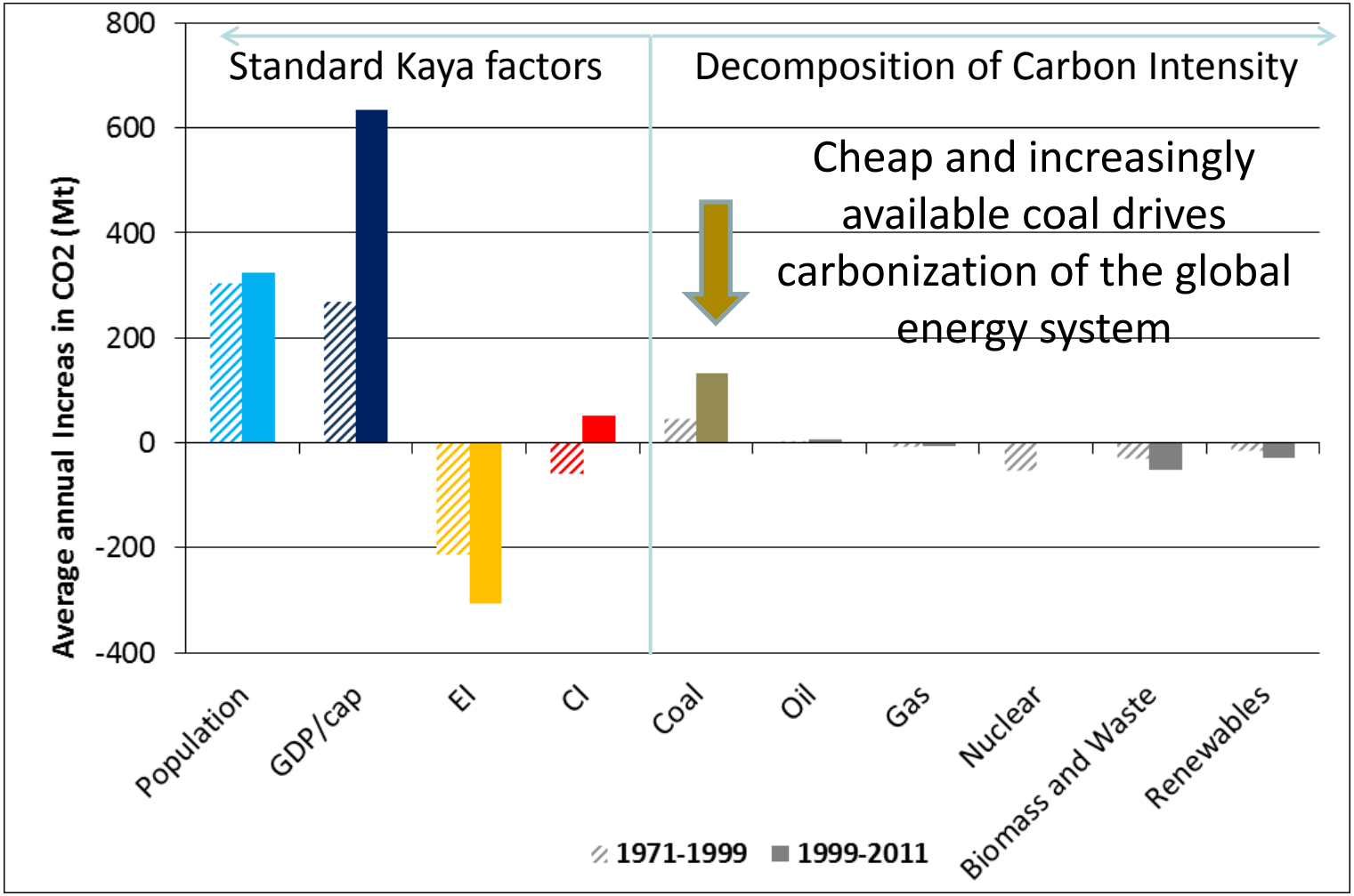


# What about the renaissance of coal?



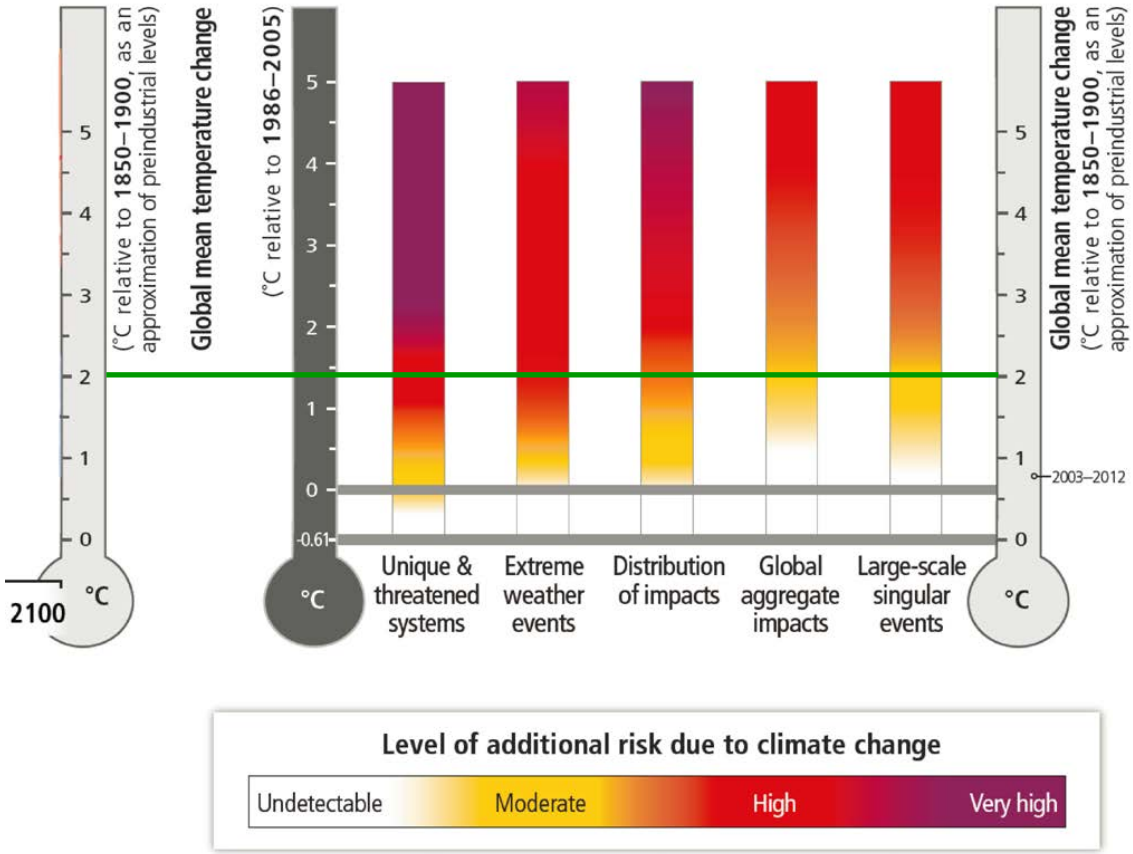



# A renaissance of coal drives the global carbonization.



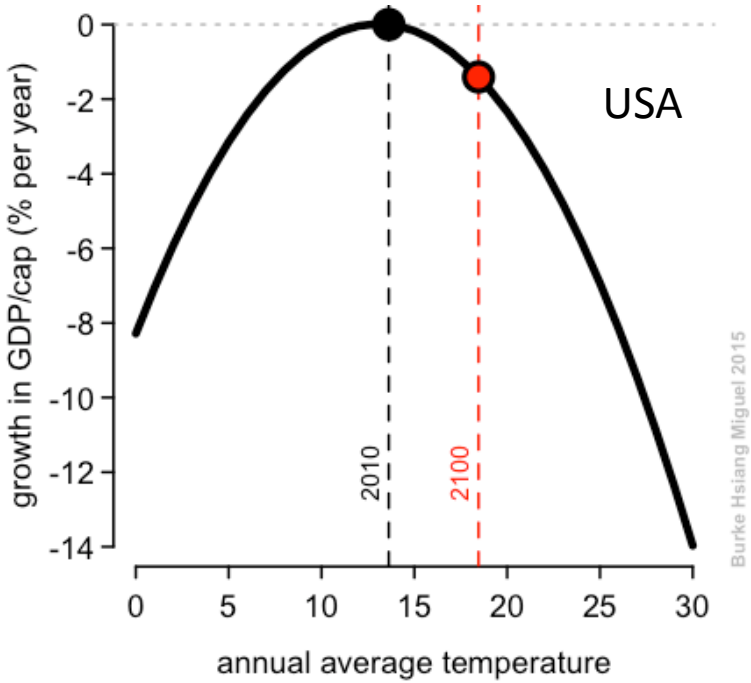

Steckel, Edenhofer and Jakob, in press

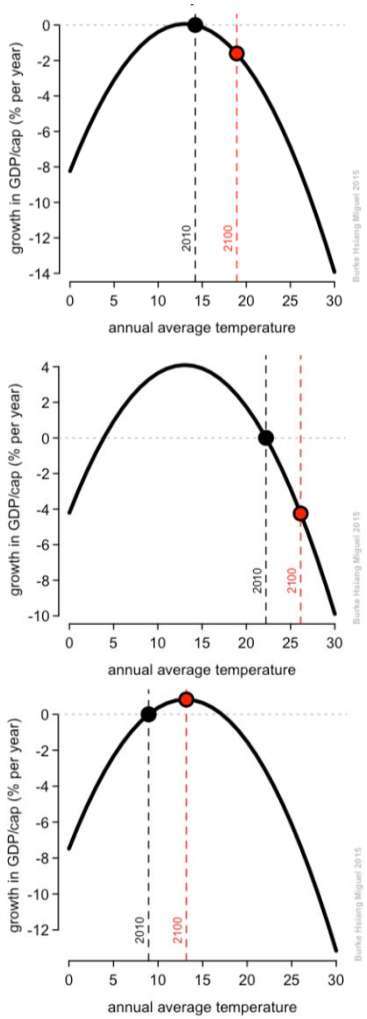
# Climate Projections and Associated Risks




Slide by H. J. Schellnhuber

# Growth vs. temperature




China

Brazil

Germany

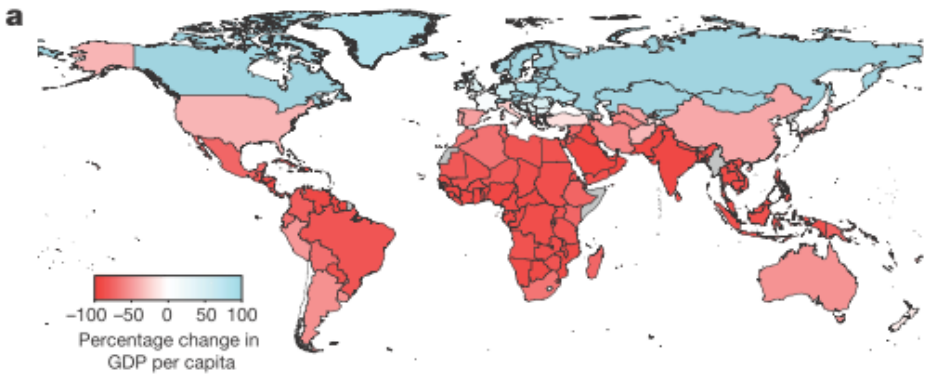
http://web.stanford.edu/~mburke/climate/map.php

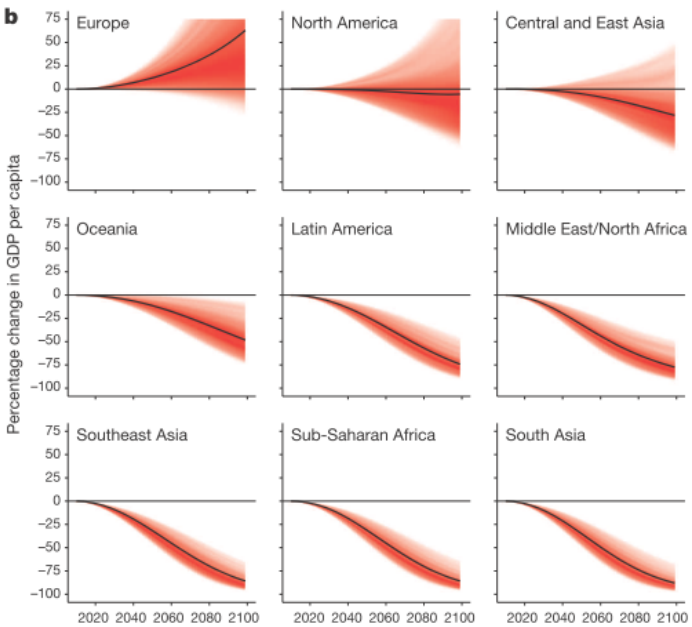
# LETTER

nature

## Global non-linear effect of temperature on economic production

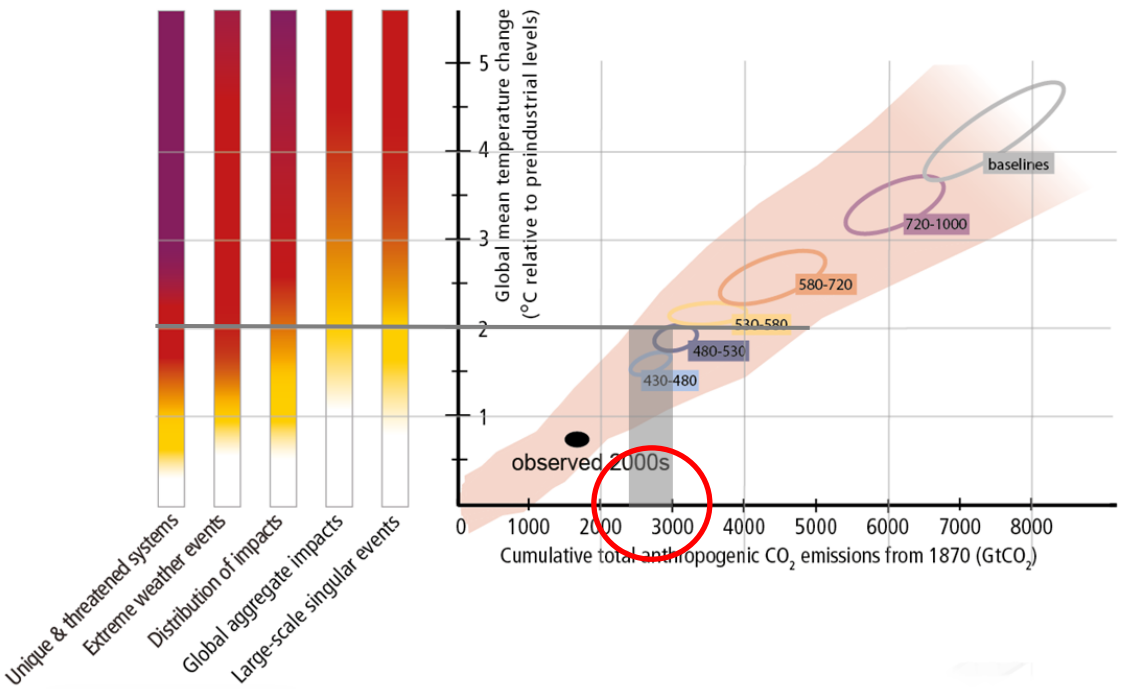
Marshall Burke[1,2]*, Solomon M. Hsiang[3,4]* & Edward Miguel[4,5]



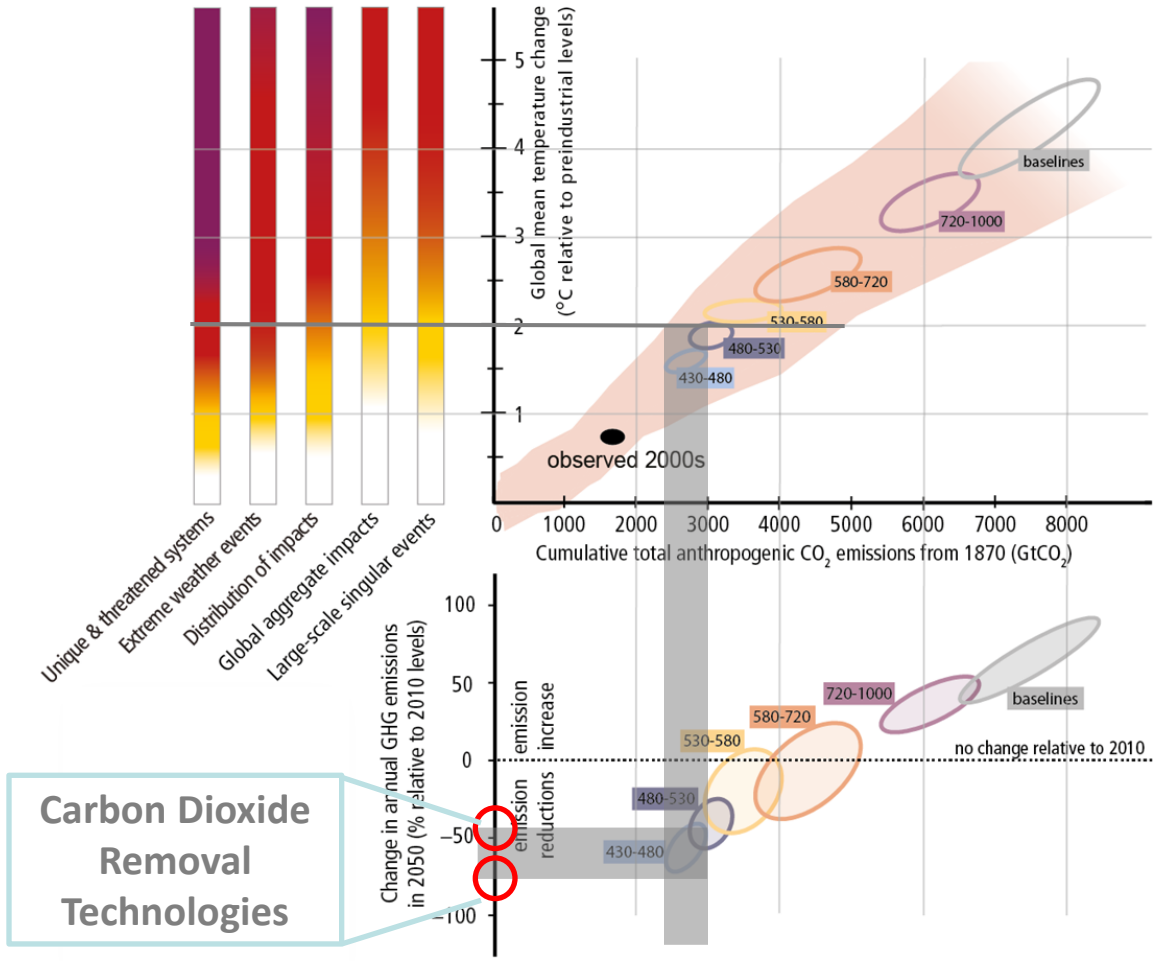

Quelle: Nature, doi:10.1038/nature15725

# 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.

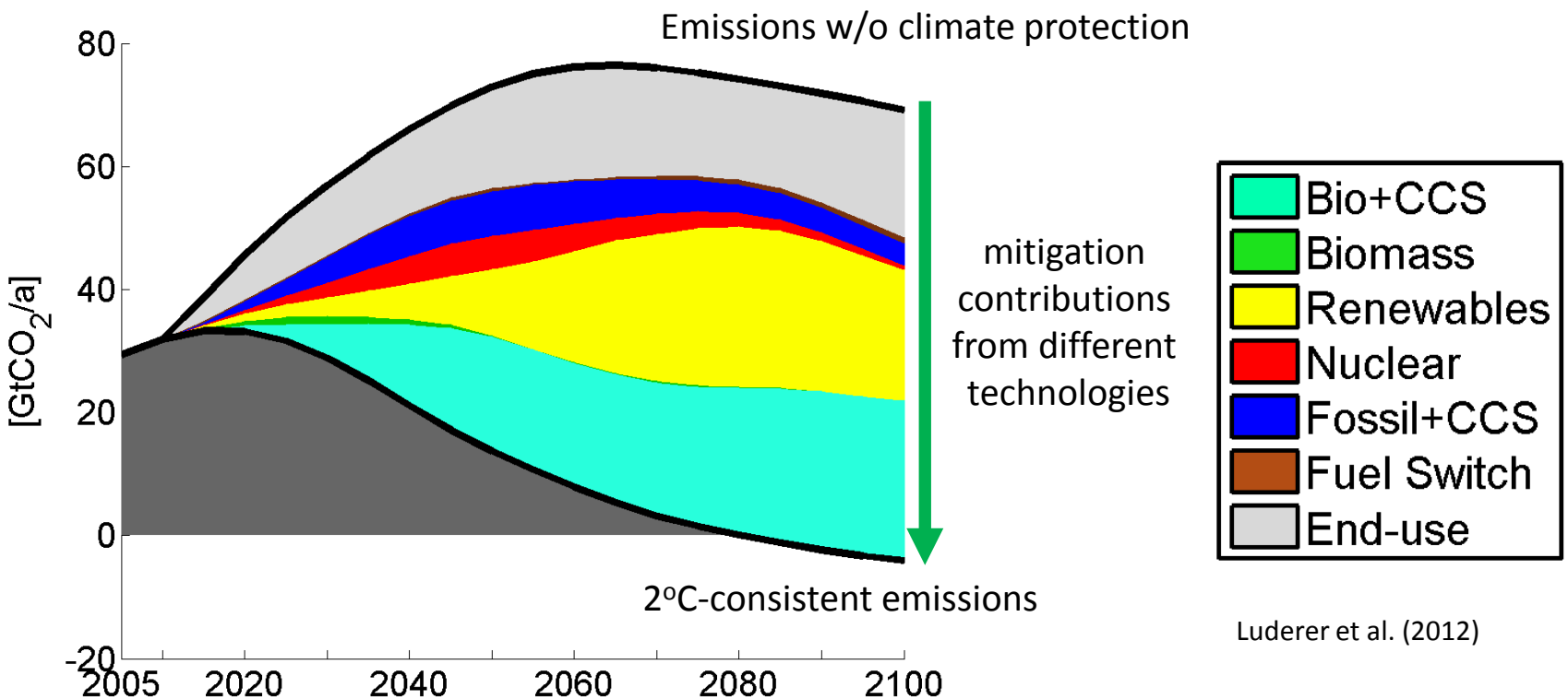



Basiert auf SYR IPCC AR5 Figure SPM.10

# What are the consequences for international energy and climate policy?

# The great transformation

**$CO_2$ emissions from fossil fuels**



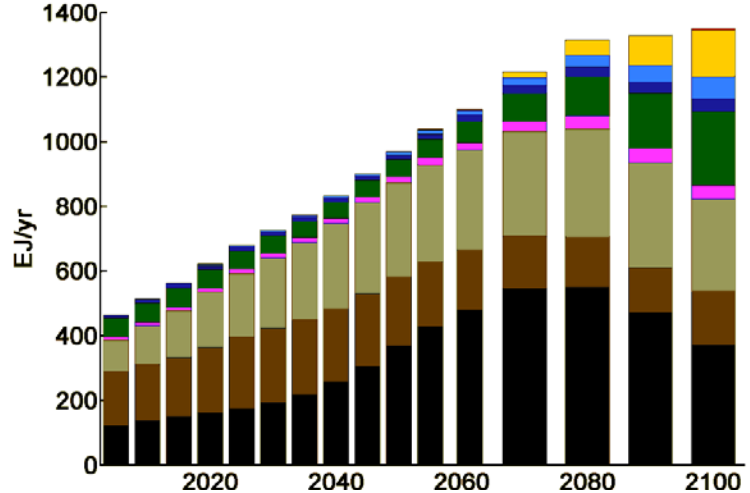

Luderer et al. (2012)

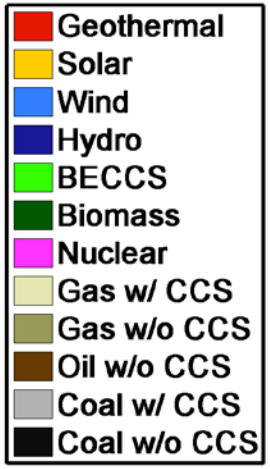
# Global energy system transformation pathways

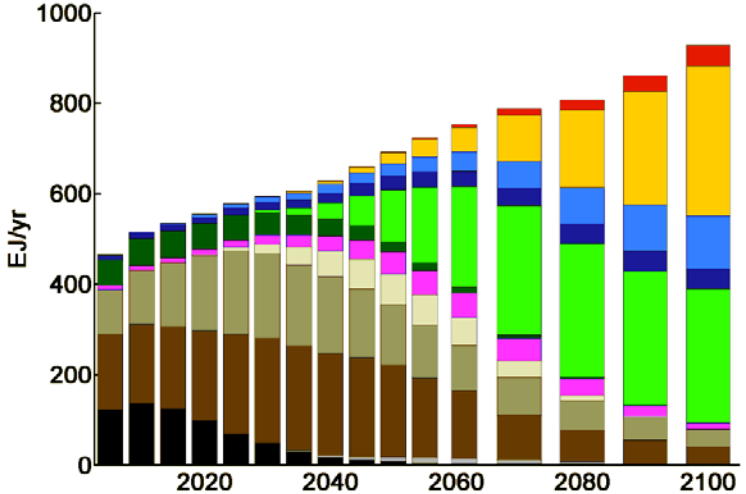
**Baseline**

**Climate Policy**
2°C (50% likelihood)

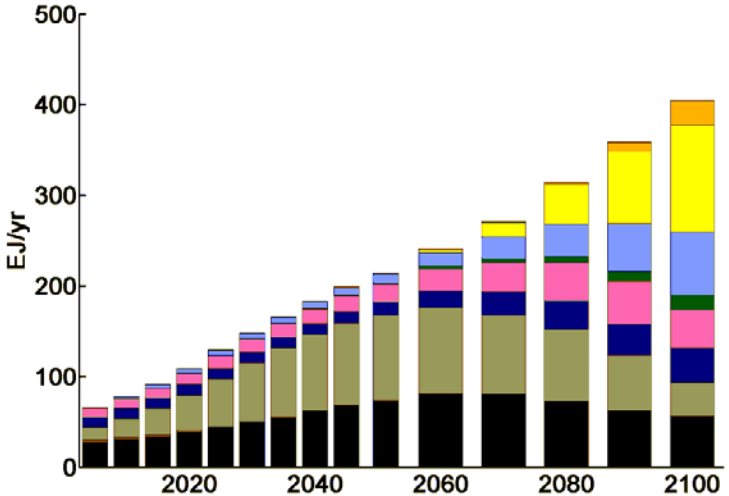
**Primary Energy**

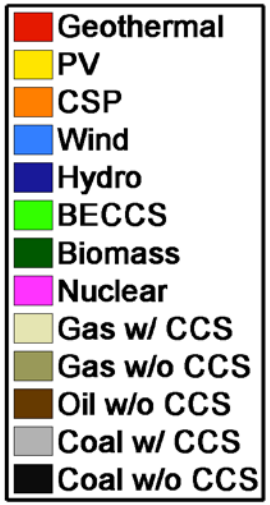


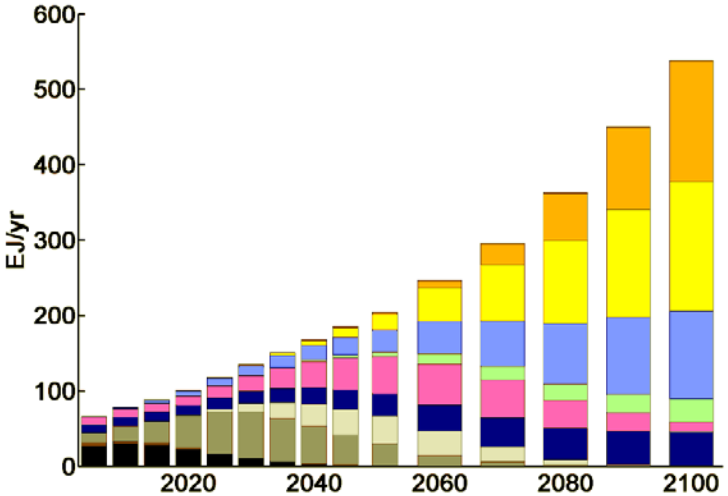



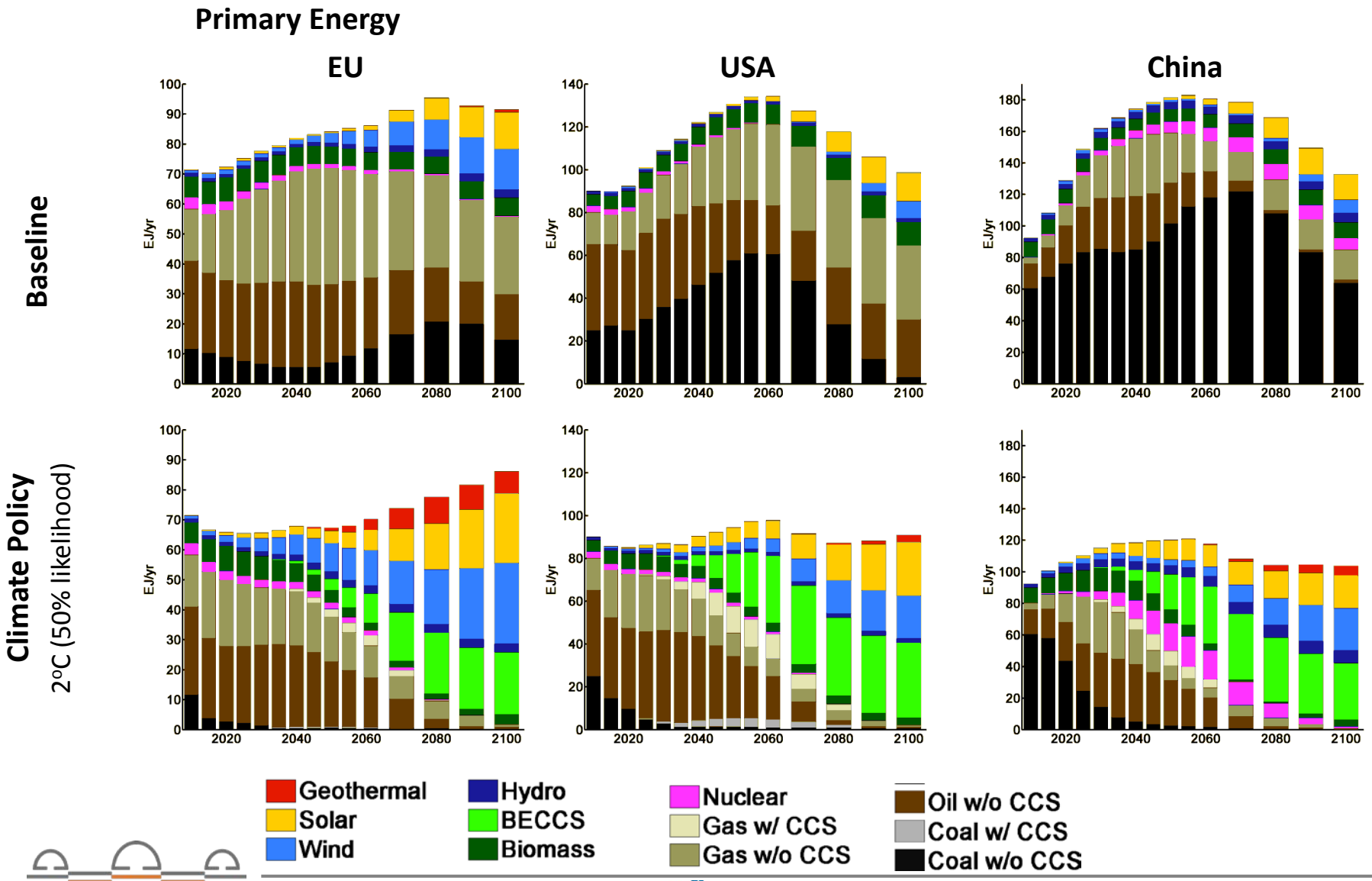

**Electricity**



# All regions see radical transformation of their energy system

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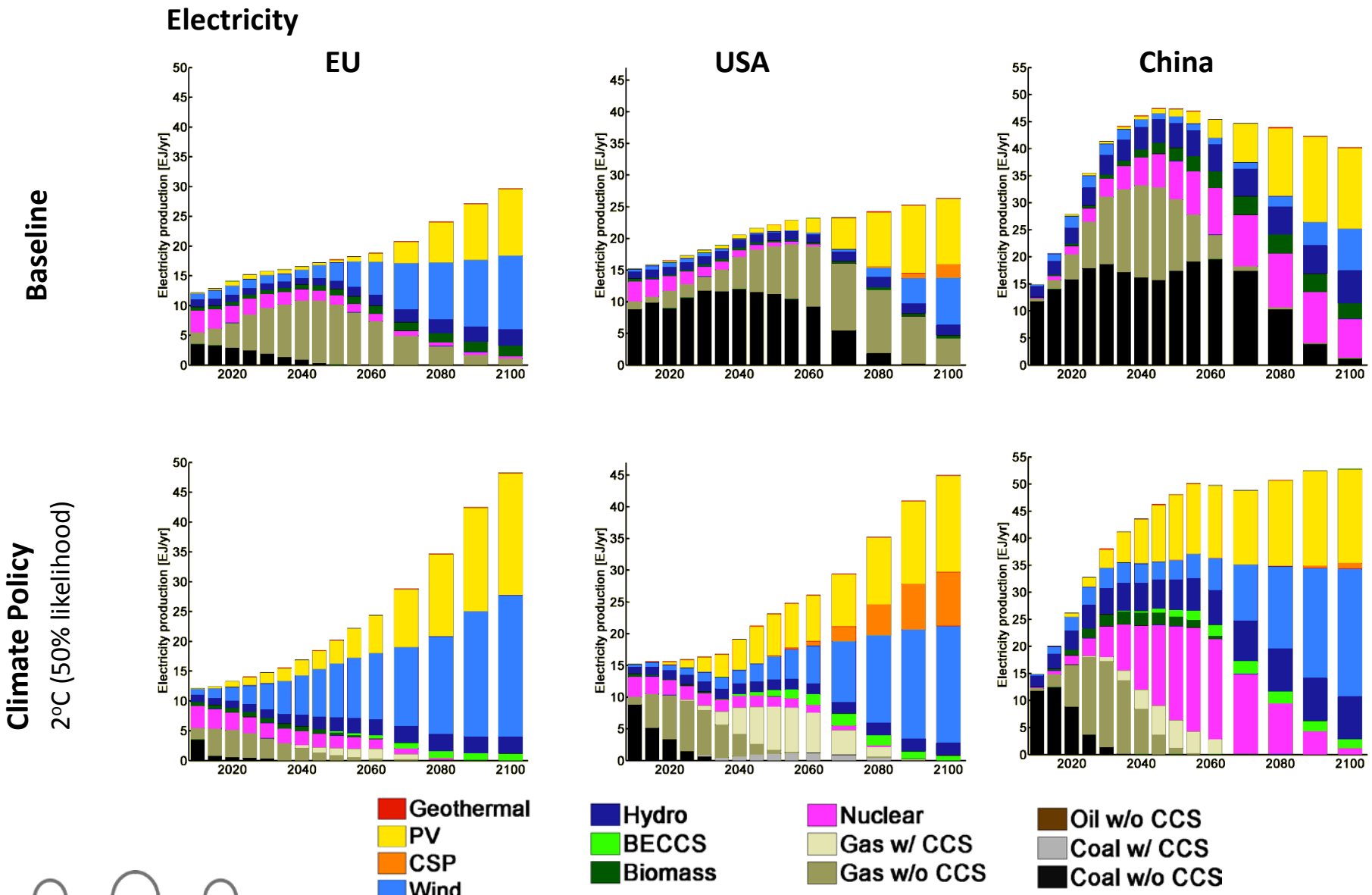
# All regions see radical transformation of their power system

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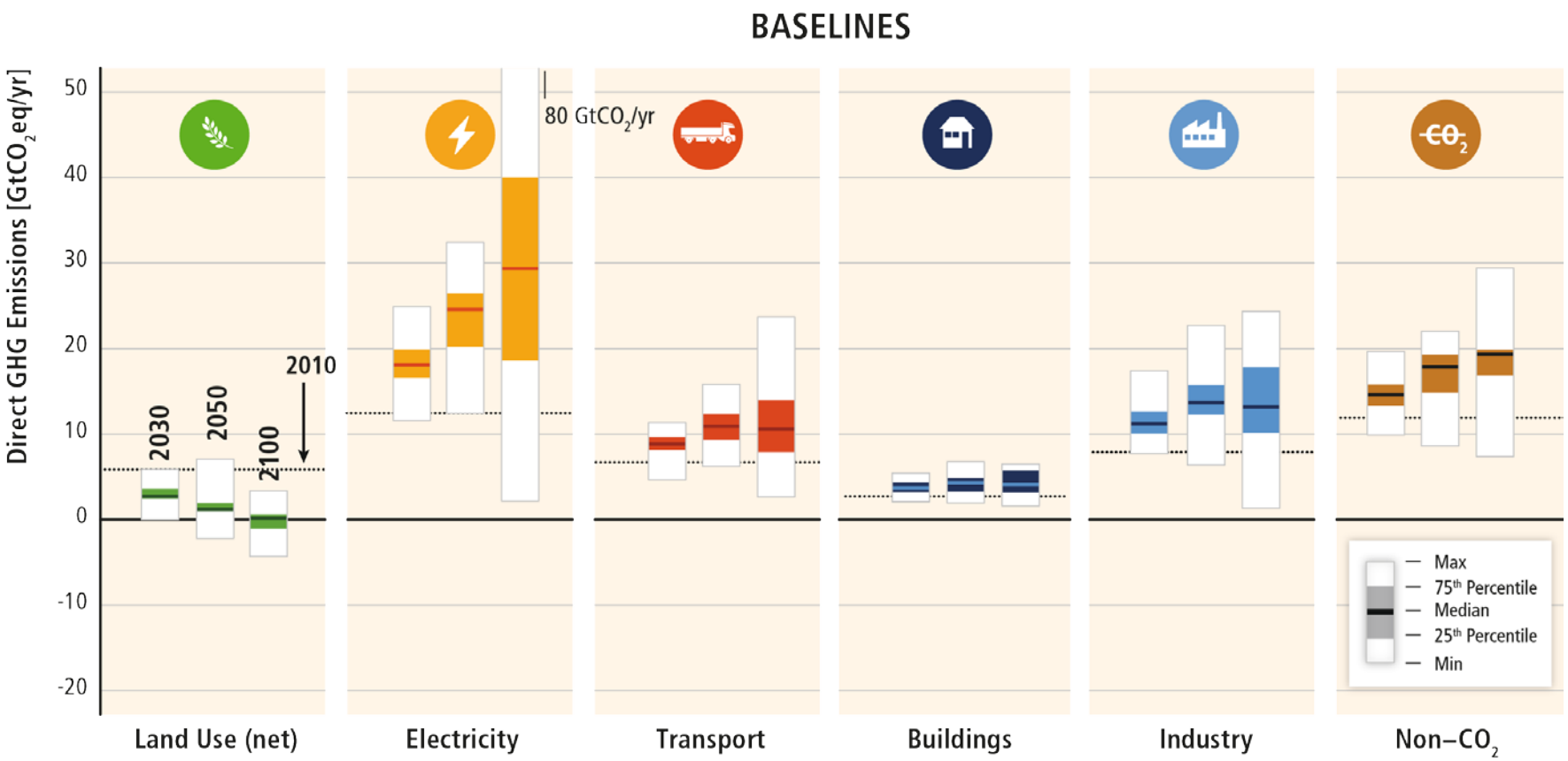
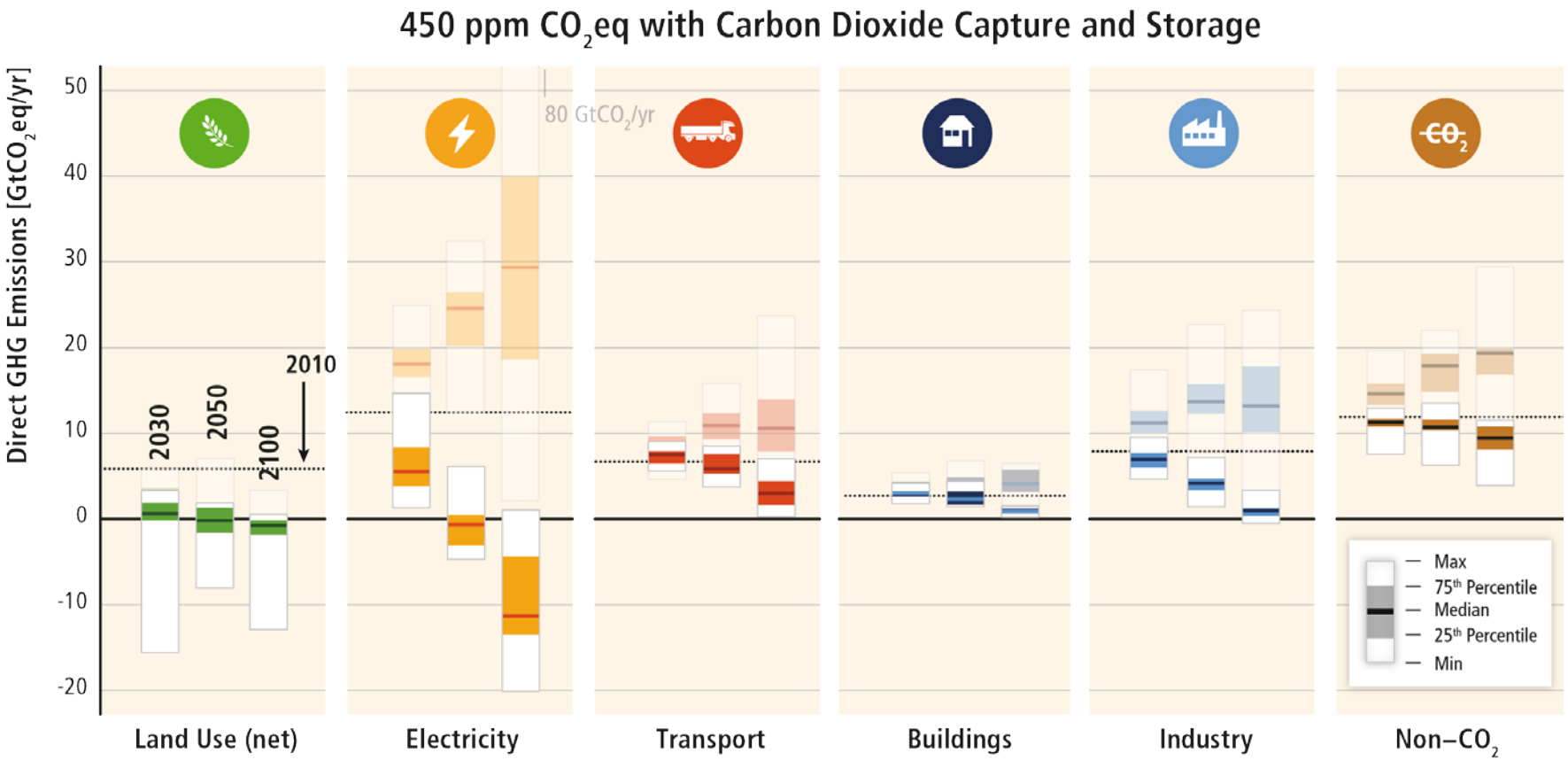
# Sectoral Emissions



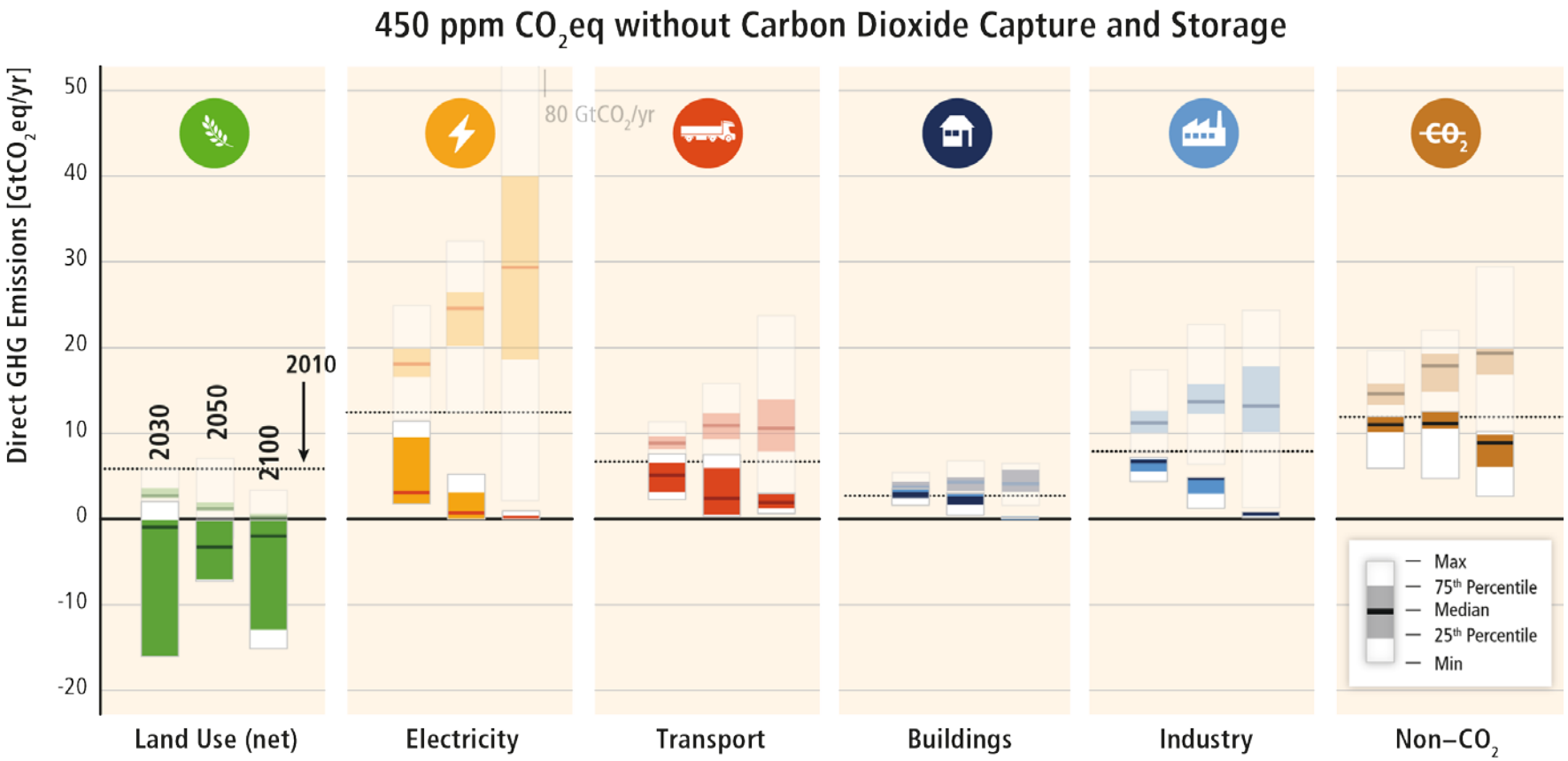

Based on IPCC AR5 WGIII Figure TS.17

# Each Sector has to contribute – The power sector most



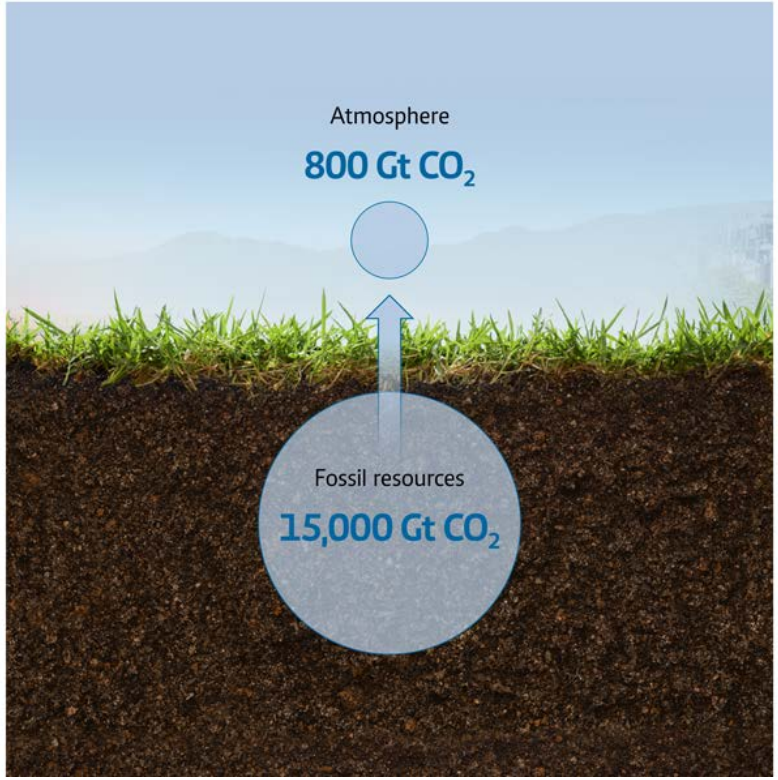

Based on IPCC AR5 WGIII Figure TS.17

# Afforestation becomes important when CCS is not available




Based on IPCC AR5 WGIII Figure TS.17

# The climate problem at a glance.

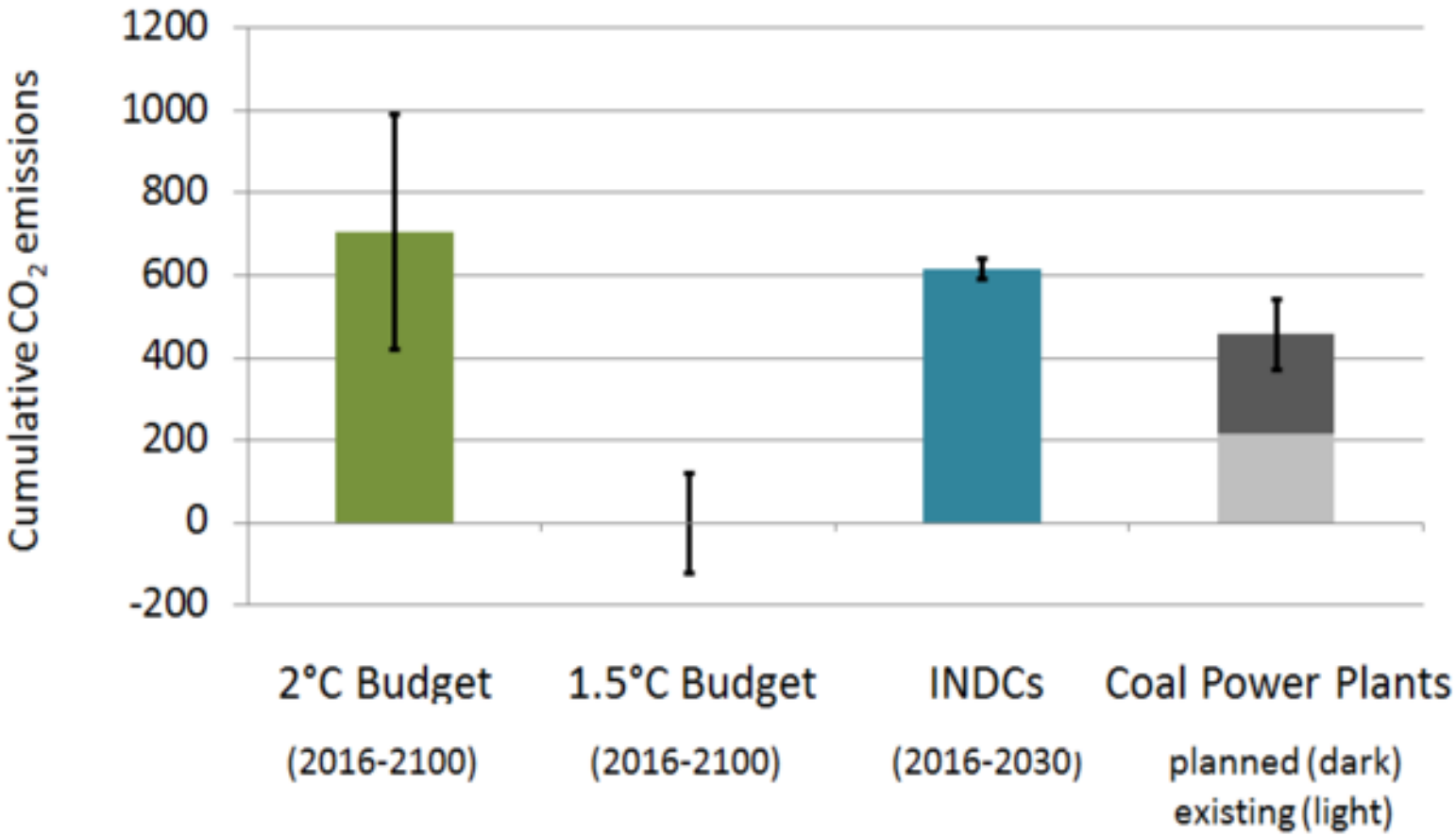



**Resources and reserves to remain underground until 2100 (median values compared to BAU, AR5 Database)**

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

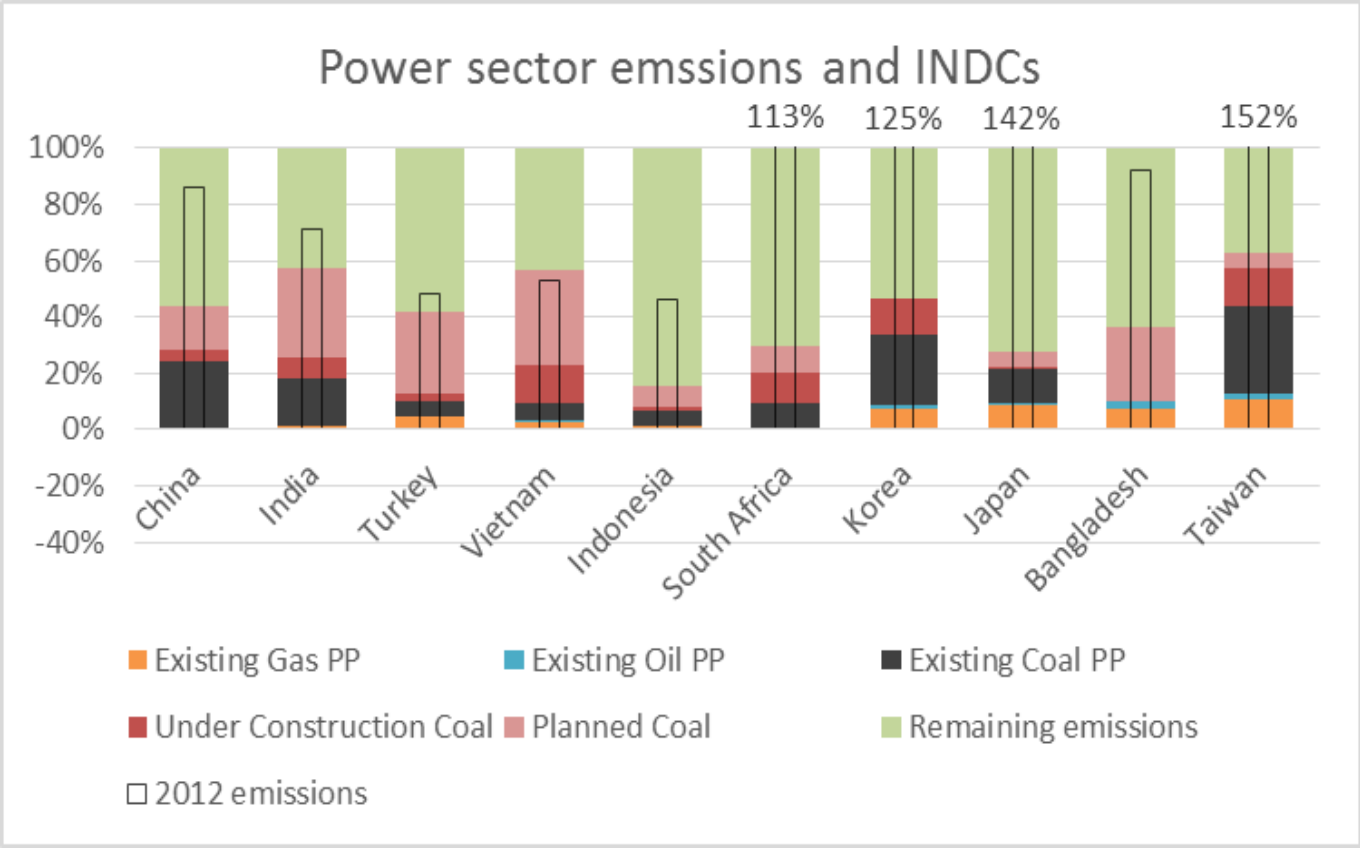
Source: Bauer et al. (2014); Jakob, Hilaire (2015)

# The 2°C budget does not leave any leeway




Edenhofer et al. (2016)

# The INDCs are inconsistent




Edenhofer et al. submitted (Science)

Countries with highest ongoing and planned coal investment

# Global Minimum Carbon Price and Transfers

## Ausweg aus der Klima-Sackgasse

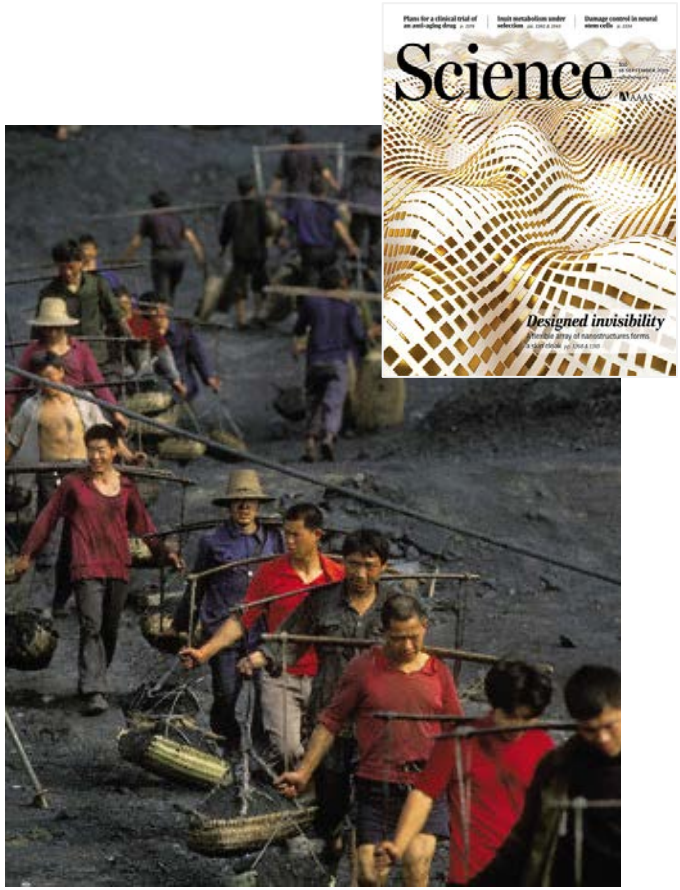
Die Treibhausgasemissionen müssen sinken. Aber sie steigen. Ein Durchbruch ist auf dem Klimagipfel in Paris nicht in Sicht. Dabei ist kluge Klimapolitik ganz einfach.

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?

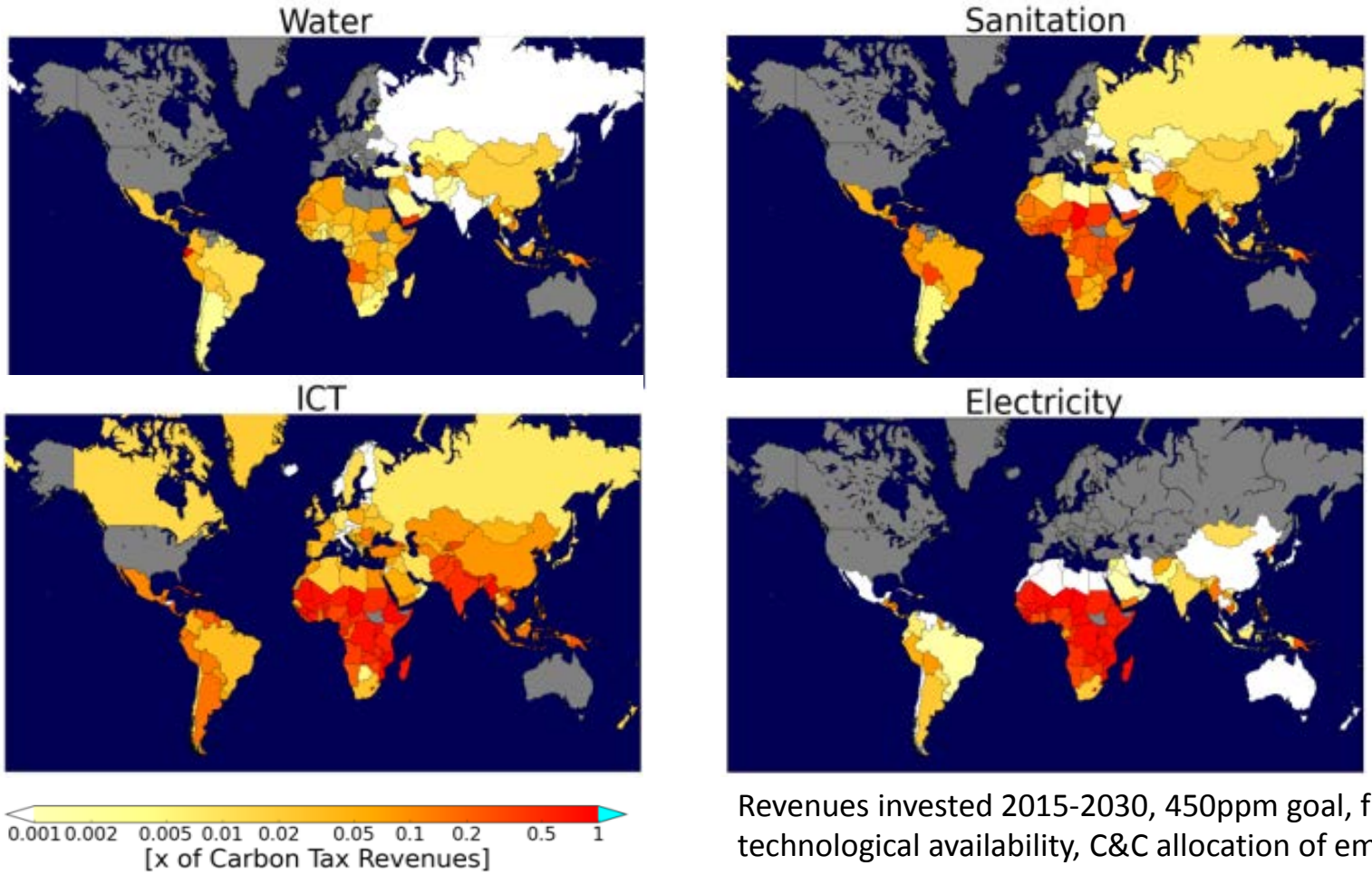
**Water availability**

**Sanitation**

**Telecommunication**

**Access to electricity**

# Carbon pricing revenues to close infrastructure gaps

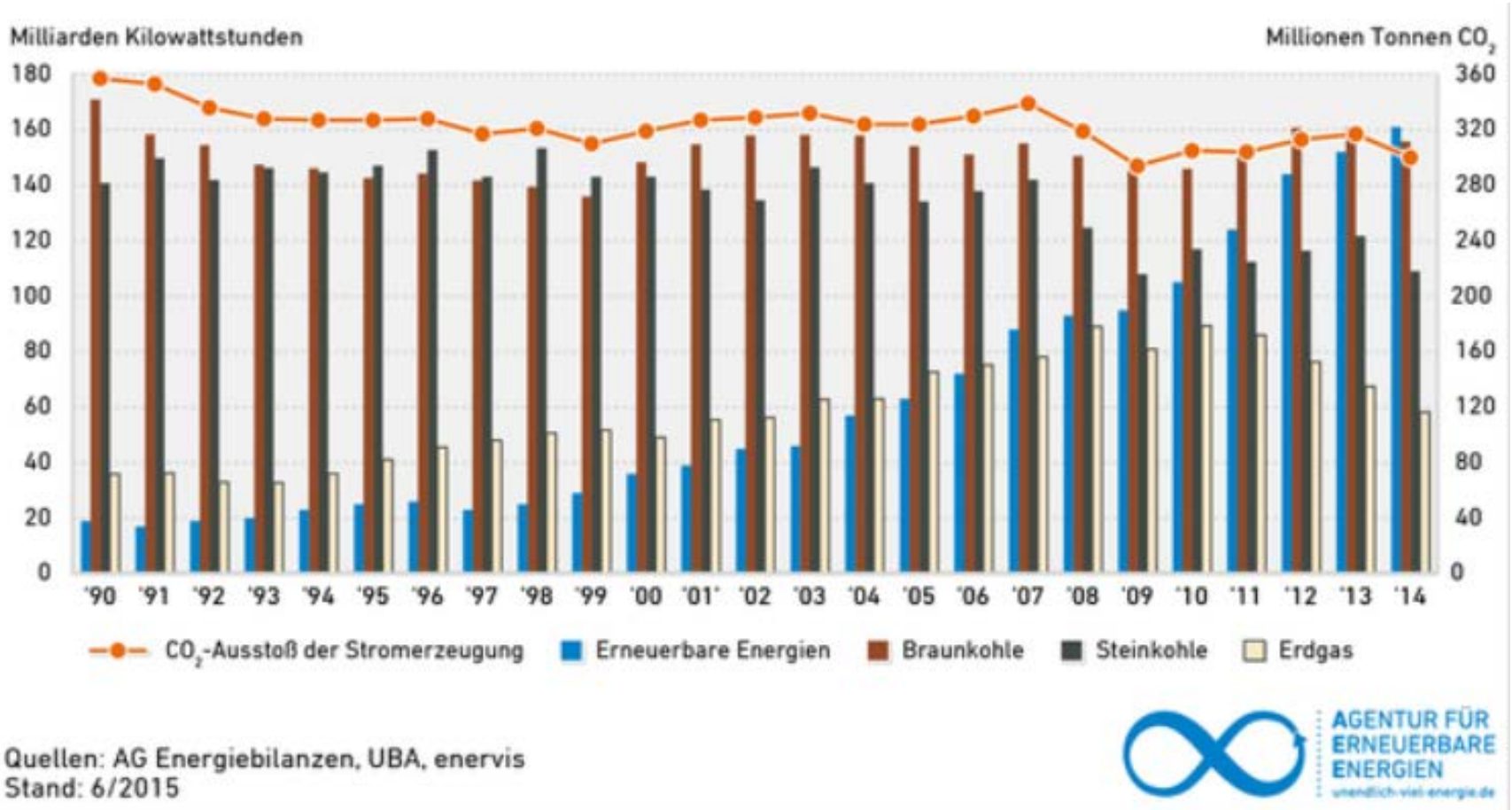



Source: Jakob et al., in press

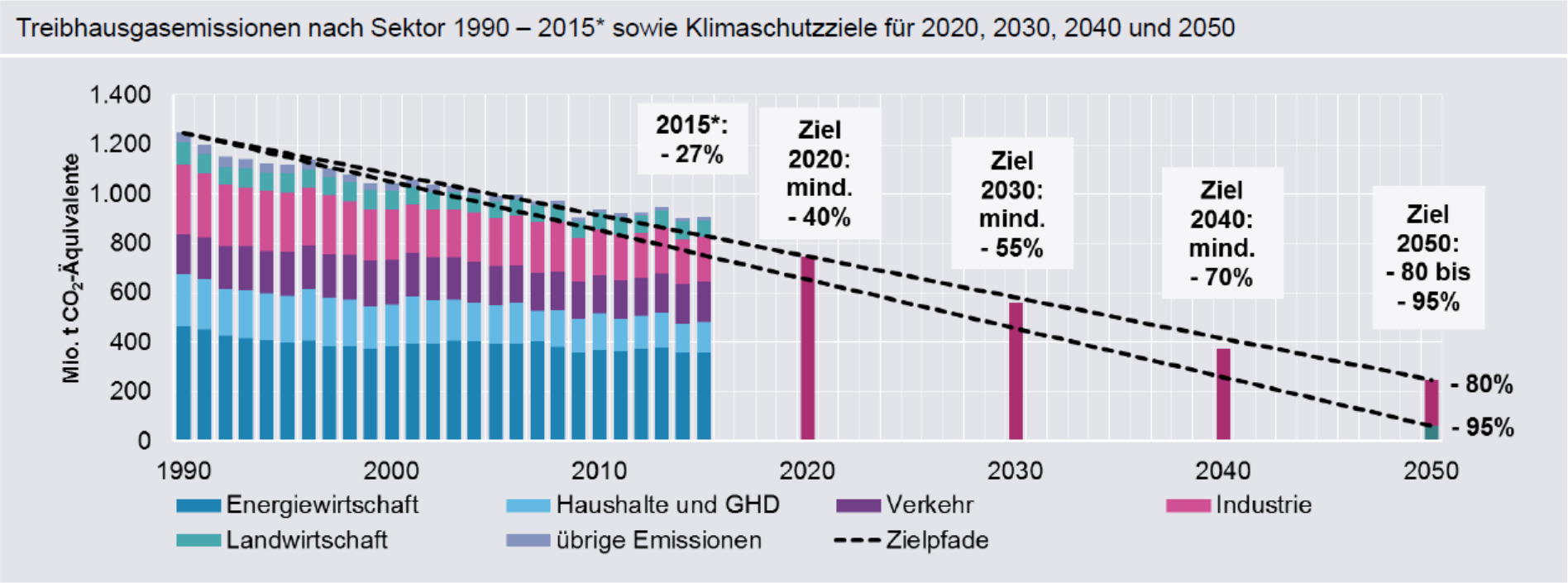
Revenues invested 2015-2030, 450ppm goal, full technological availability, C&C allocation of emission permits

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

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



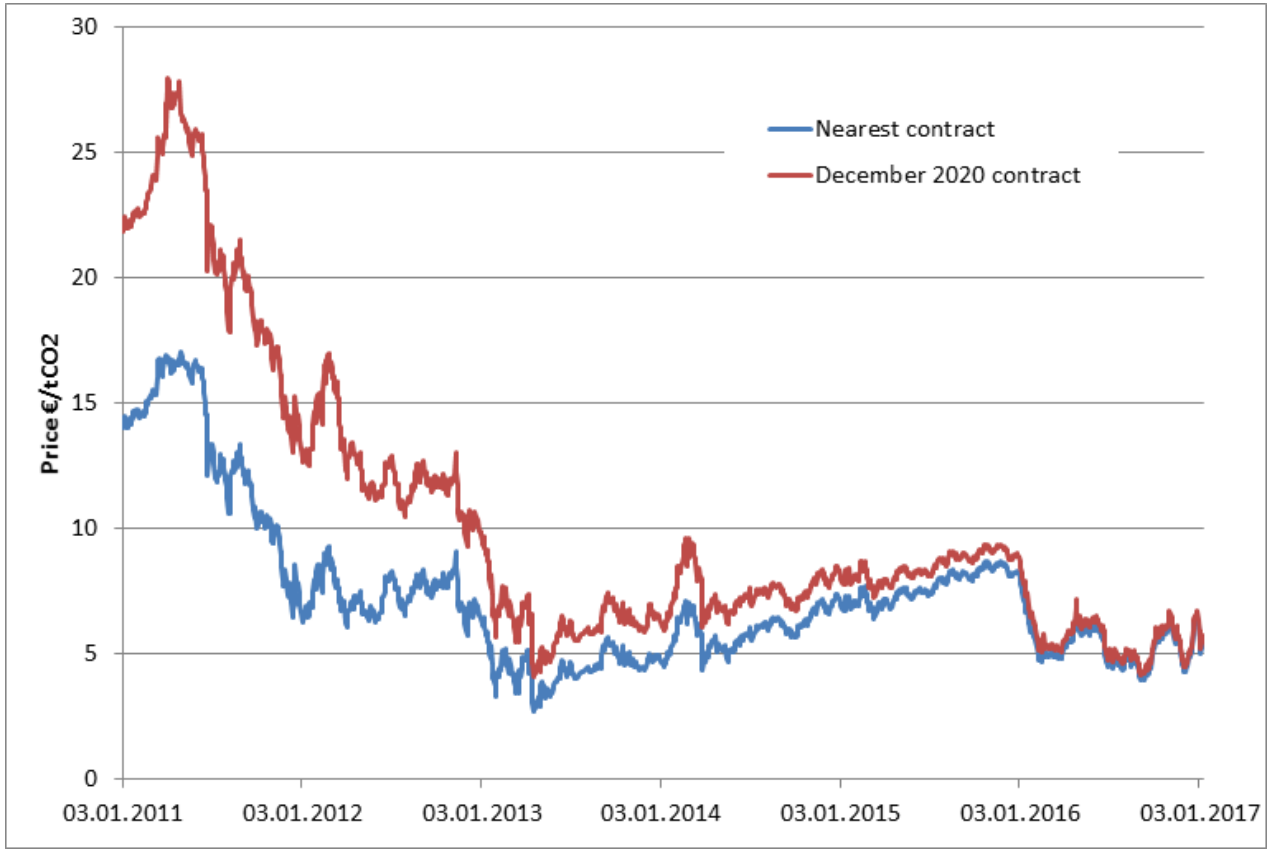
# Germany is not on track.




Source: UBA (2016), Agora calculation

* temporary

# ETS lacks dynamic cost efficiency.

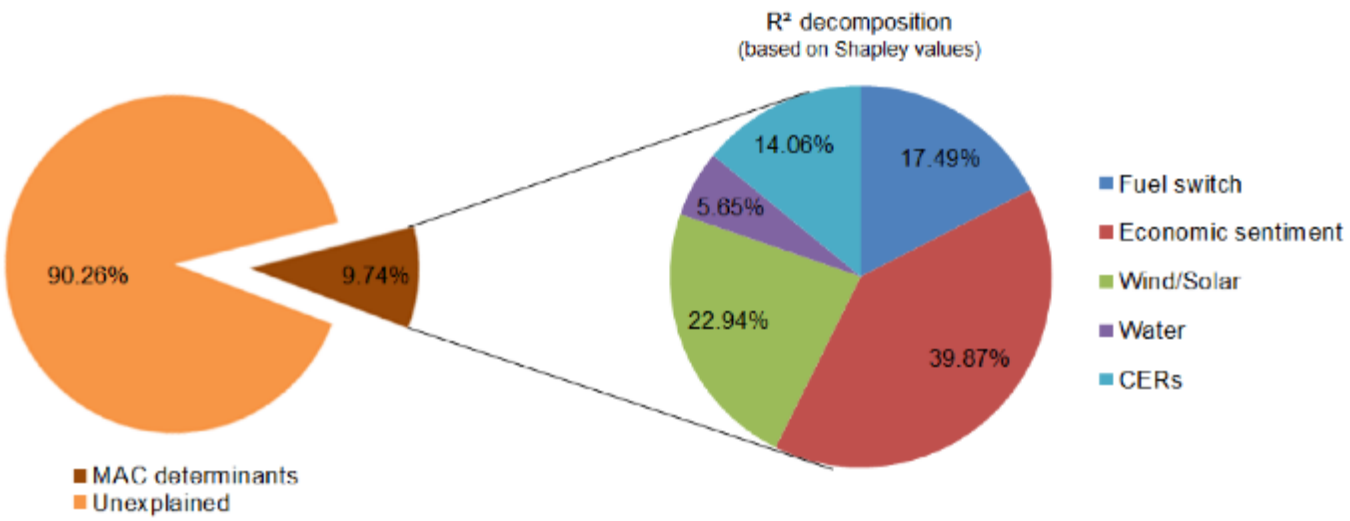



Source: ICE Futures Europe

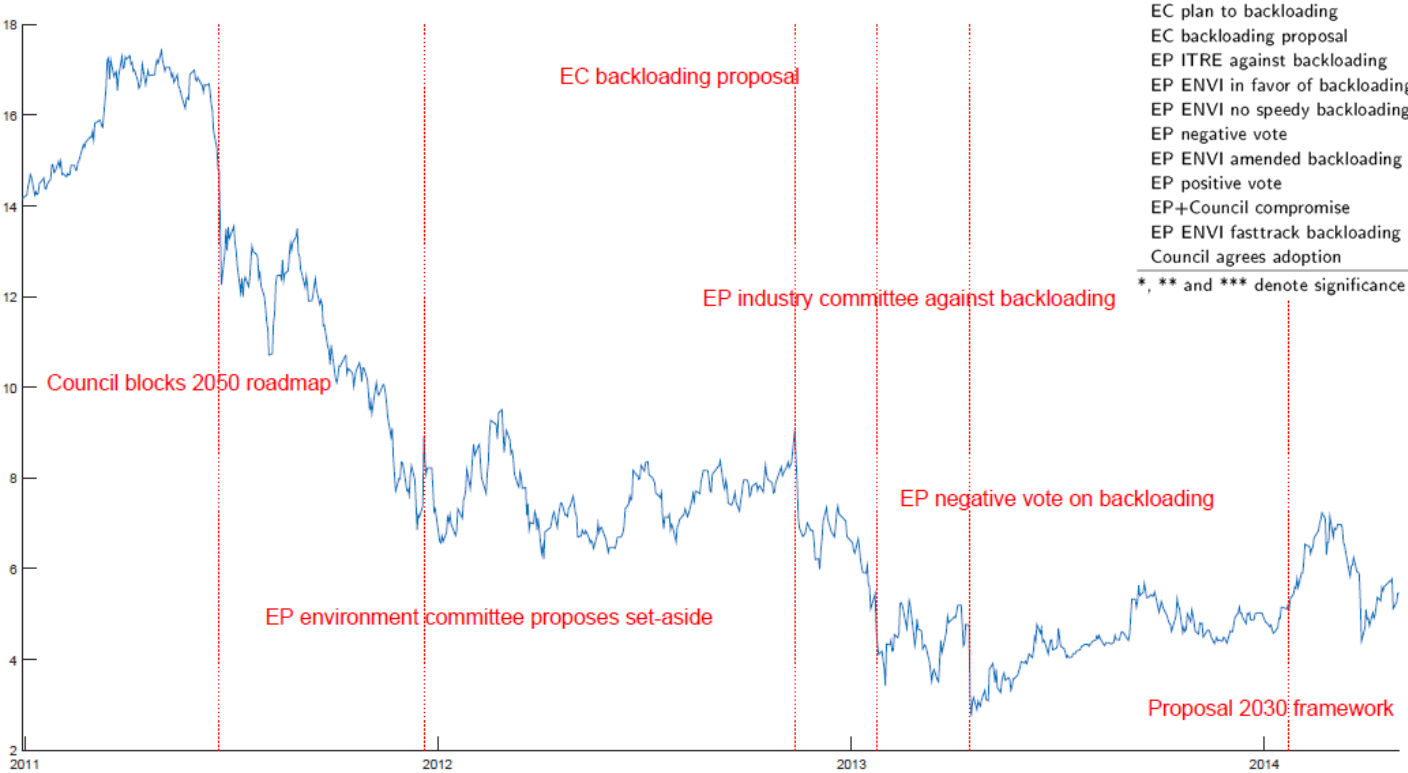
- Falling $CO_2$ price
- No increase expected before 2020
- Market Stability Reserve will be implemented, but effect might be limited

# 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




| Event day (window) | -3;-1 | 0 | +1;+3 | -3;+3 |
|---|---|---|---|---|
| EP ENVI set-aside proposal | 4.22% | 17.97%*** | 0,48% | 22.67%*** |
| EP ITRE agrees set-aside | 3,60% | -5.43%** | 2,32% | 0,50% |
| Council EE directive w/o set-aside | 0,16% | 1,44% | 7,08% | 8,68% |
| EC plan to backloading | 2,80% | -4.70%*** | 0,92% | -0,98% |
| EC backloading proposal | -1,14% | 8.19%*** | -30.27%*** | -23.21%*** |
| EP ITRE against backloading | -19.20%*** | -5.79%*** | -5.45%*** | -30.43%*** |
| EP ENVI in favor of backloading | 13.01%*** | -10.36%*** | 8.88%*** | 11.53%* |
| EP ENVI no speedy backloading | 8.88%*** | -13.35*** | -0,20% | -4,67% |
| EP negative vote | 7.48%** | -42.96%*** | 4,47% | -31.02%*** |
| EP ENVI amended backloading | 13.36%*** | -6.24*** | -3.98%** | 3,14% |
| EP positive vote | -4.12%** | 4.42%*** | -9.58%*** | -9.28%** |
| EP+Council compromise | -5.56%*** | -2.16%*** | 4.37%*** | -3,34% |
| EP ENVI fasttrack backloading | 1,11% | 3.37%*** | -1,57% | 2,91% |
| Council agrees adoption | 4,50% | -3.20%*** | -10.78%*** | -9,49% |

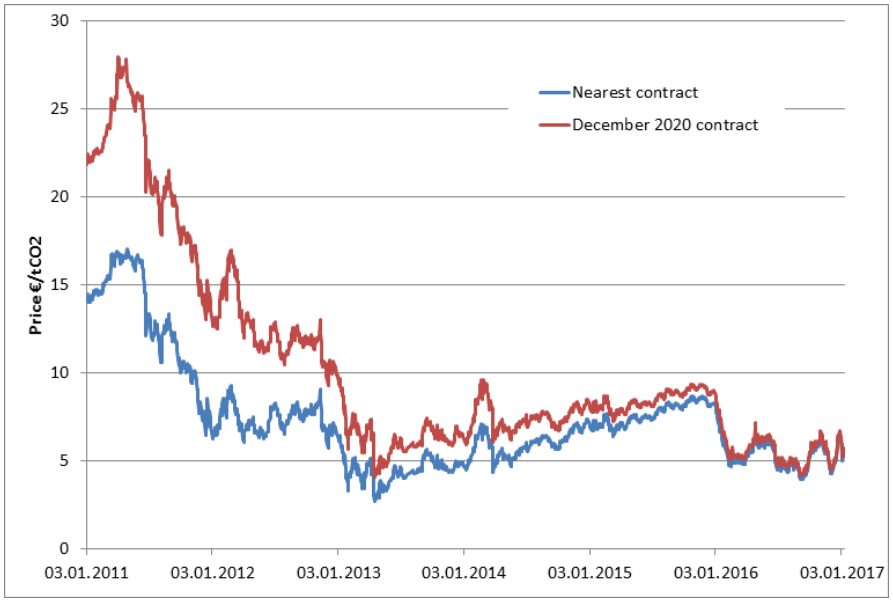
*, ** and *** denote significance at 10%, 5%, and 1%, respectively

source: Koch et al. 2016

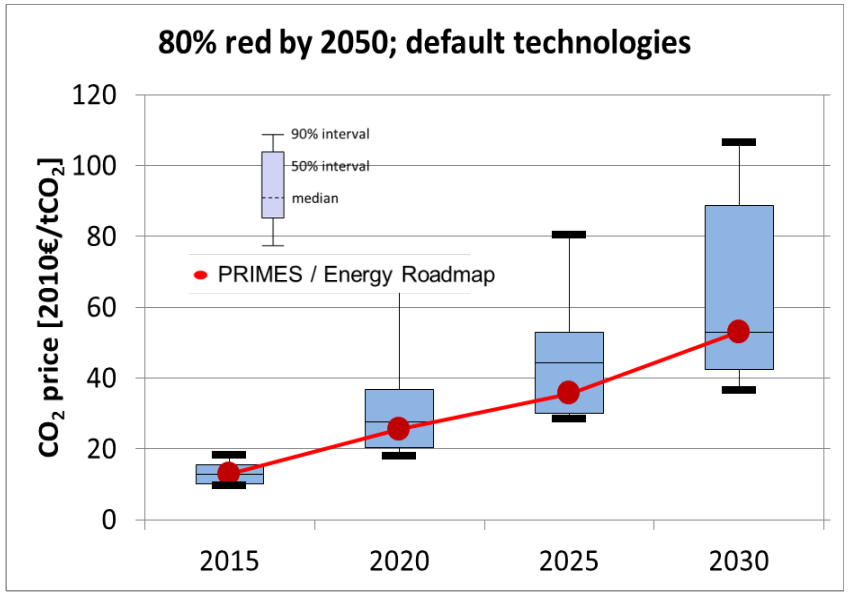
# ETS lacks dynamic cost efficiency.

- 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