



POTSDAM INSTITUTE FOR  
CLIMATE IMPACT RESEARCH

# **„The Energy Transition in Germany after Paris – International and European Perspectives“**

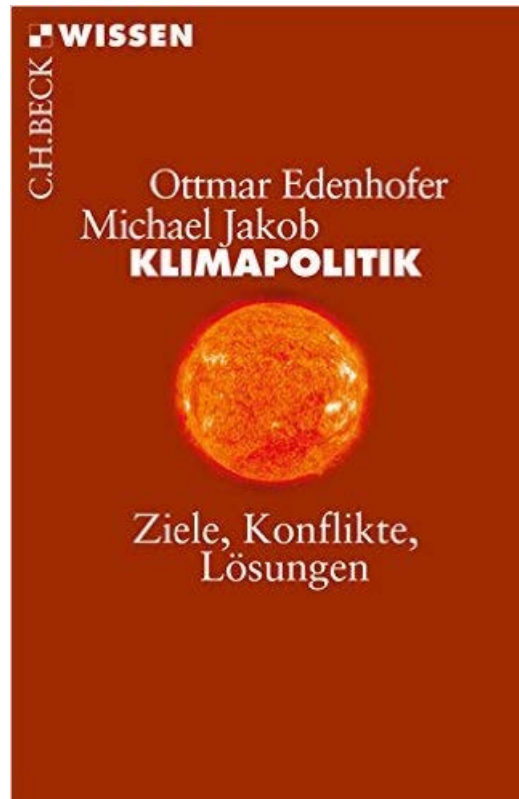
**Prof. Dr. Ottmar Edenhofer**

**French-German Symposium**

**Berlin**

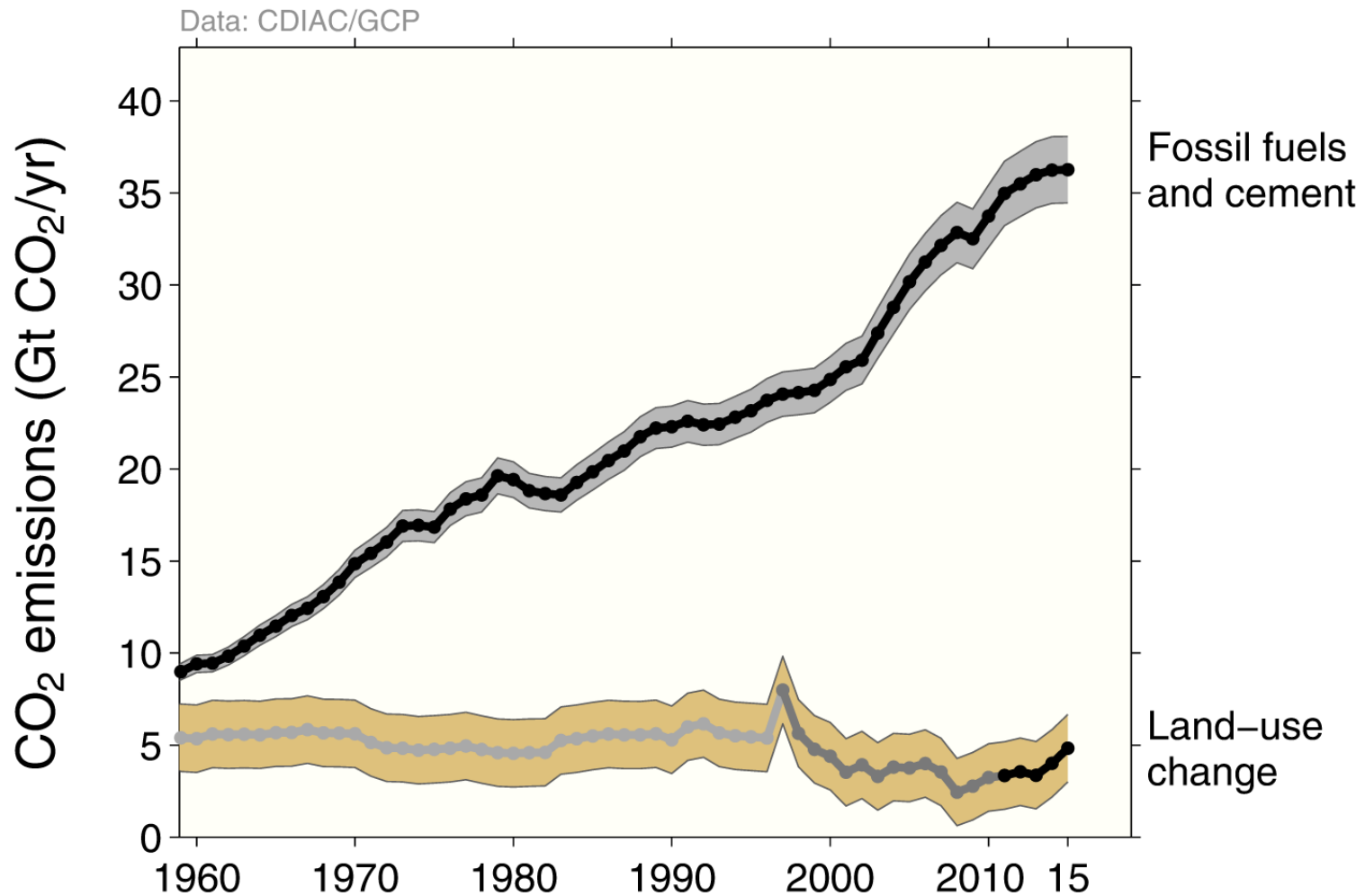
**12 September 2017**

available now:



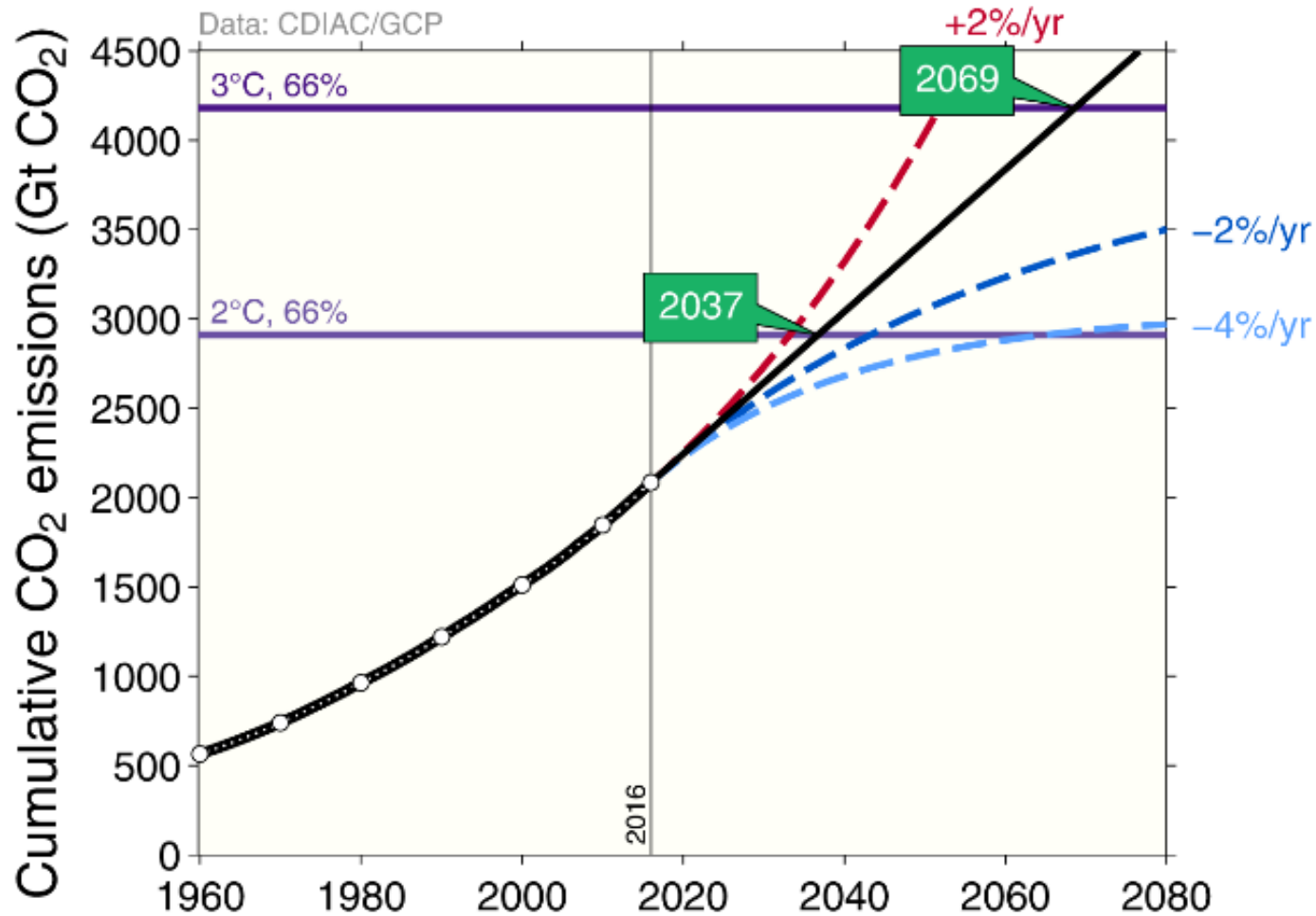
[www.mcc-berlin.net/klimabuch](http://www.mcc-berlin.net/klimabuch)

# Emissions are rising.

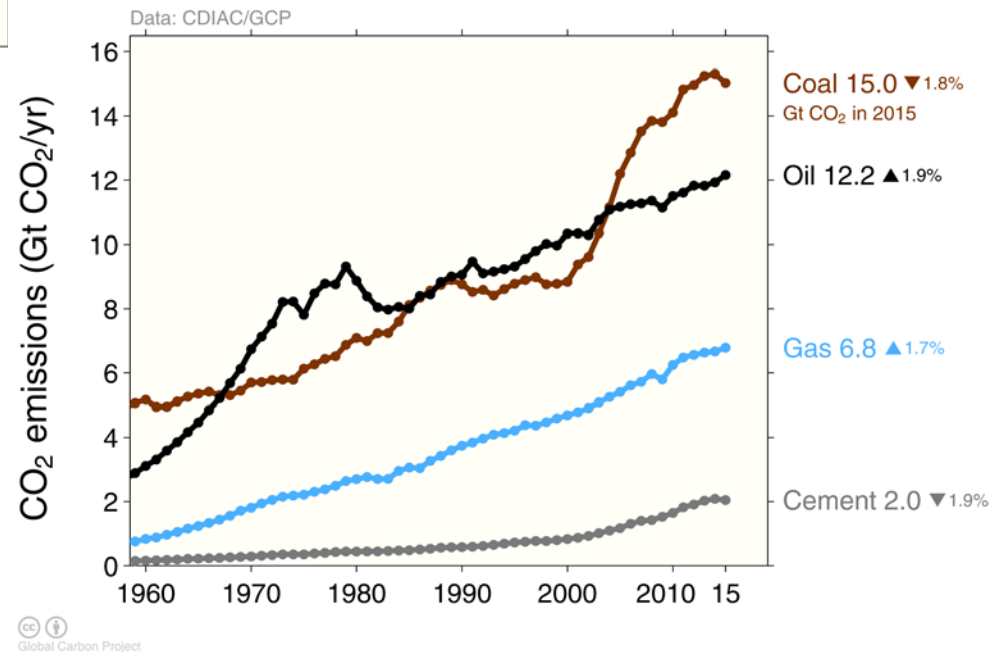
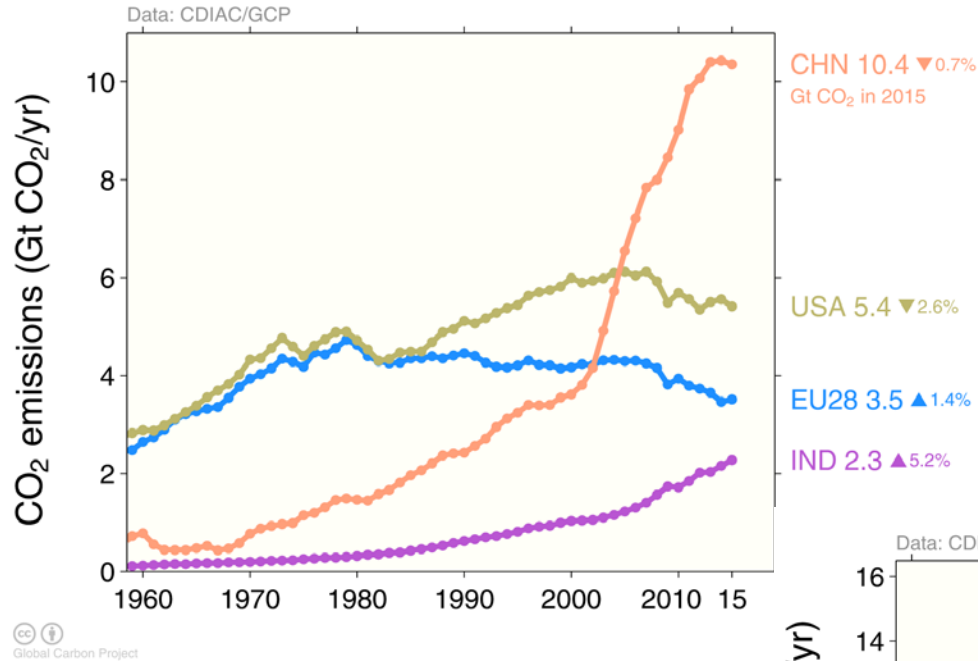


CC BY  
Global Carbon Project

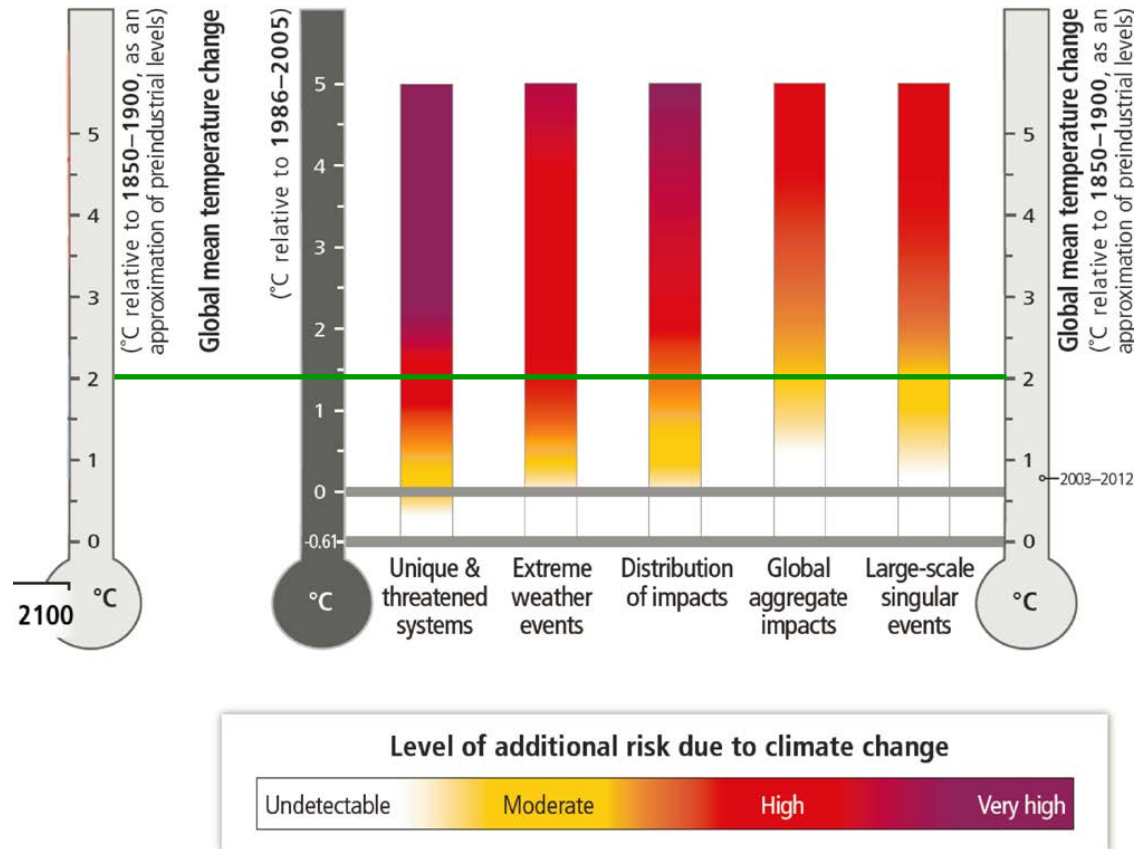
# We are not on track.



# Does climate policy already show effects?



# Climate Projections and Associated Risks



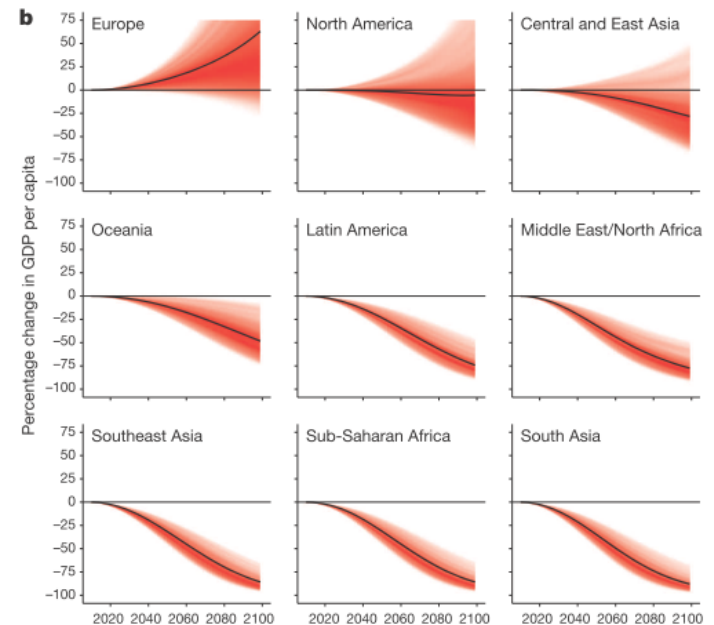
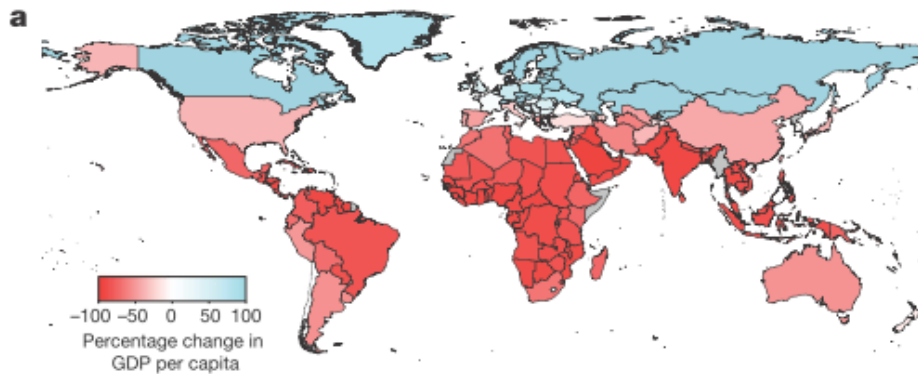
Source: Slide by H. J. Schellnhuber

# LETTER

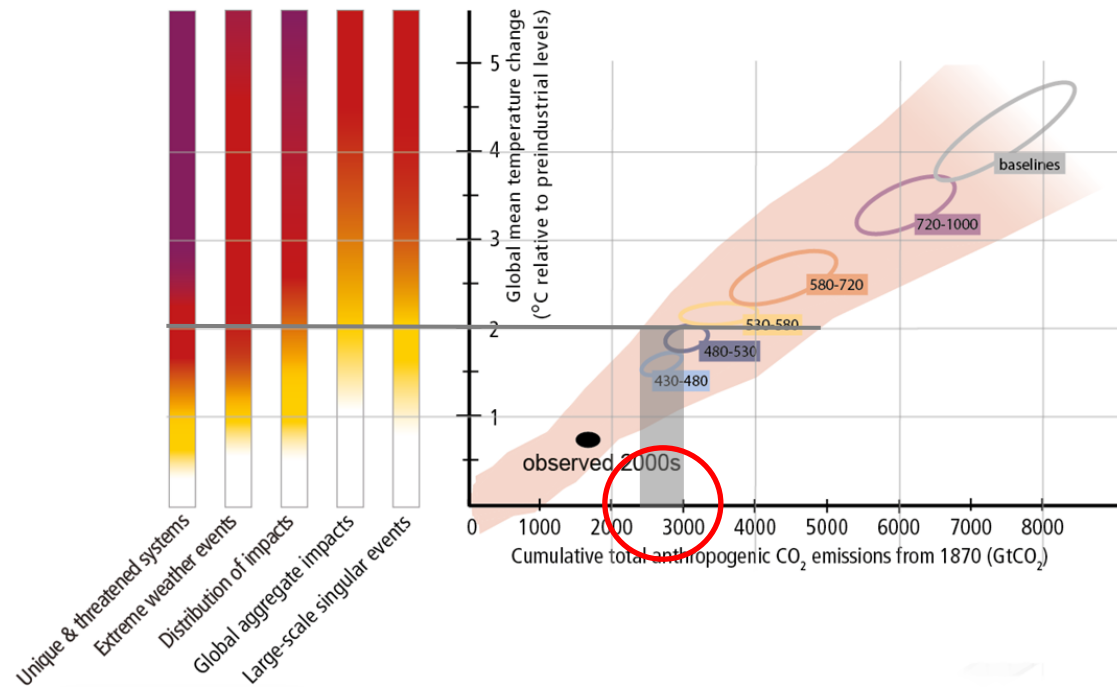
## Global non-linear effect of temperature on economic production

Marshall Burke<sup>1,2\*</sup>, Solomon M. Hsiang<sup>3,4\*</sup> & Edward Miguel<sup>1,5</sup>

nature

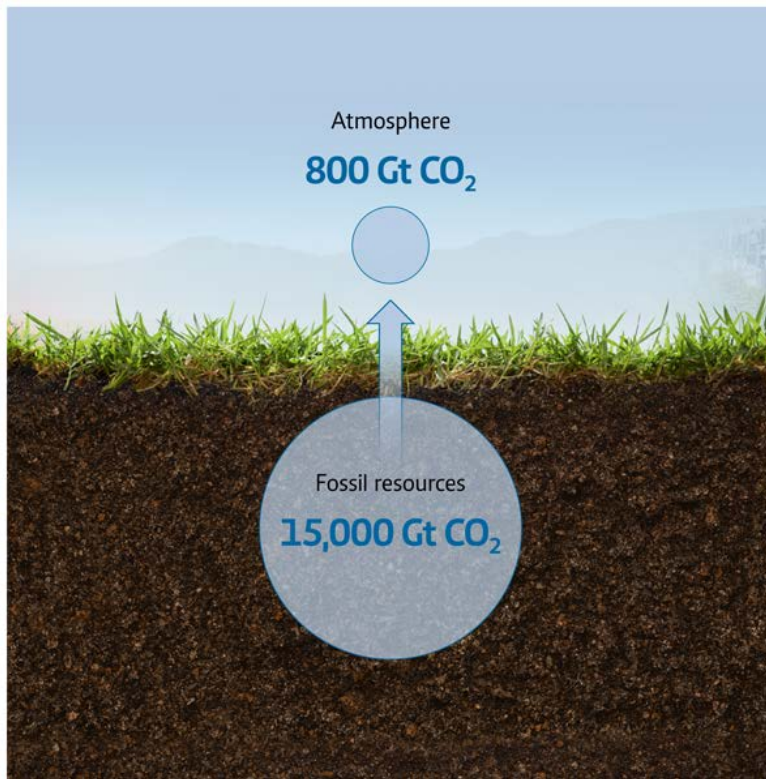


# Risks from climate change depend on cumulative CO<sub>2</sub> emissions...





# The climate problem at a glance

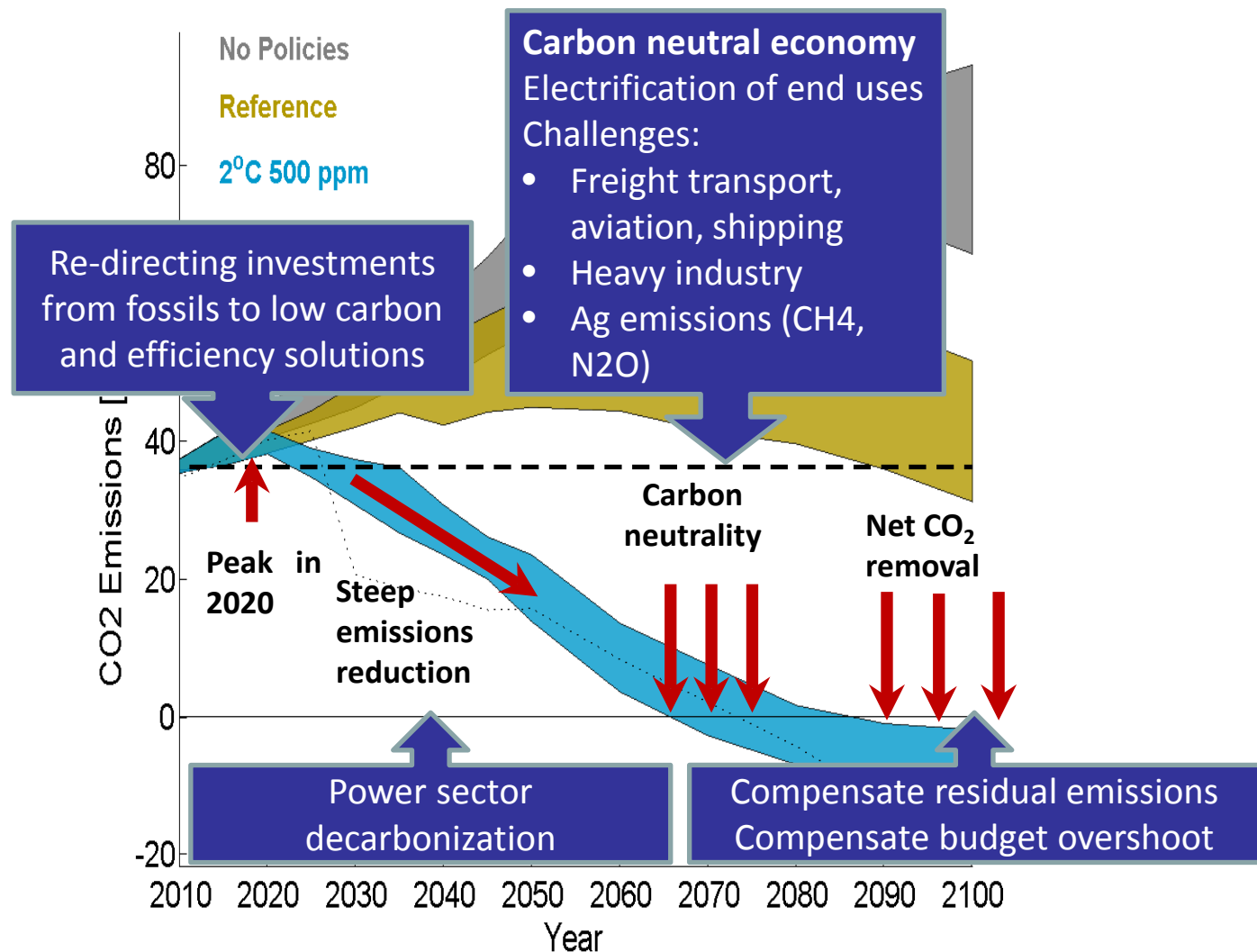


**Resources and reserves to remain underground until 2100 (median values compared to BAU, AR5 Database)**

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

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

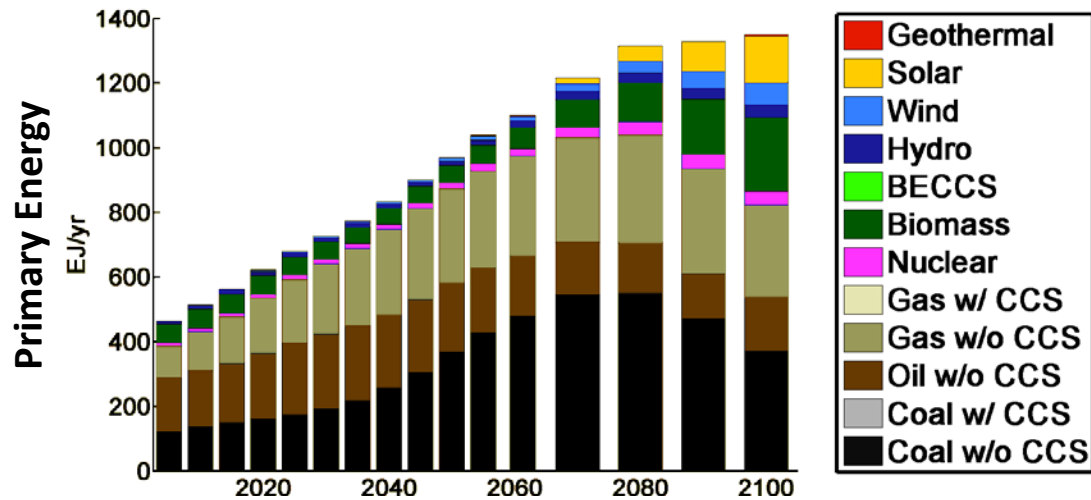
# General structure of mitigation pathways



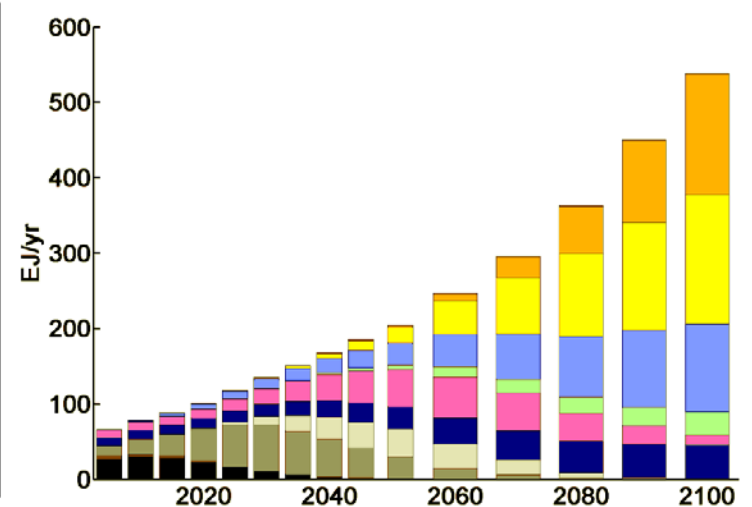
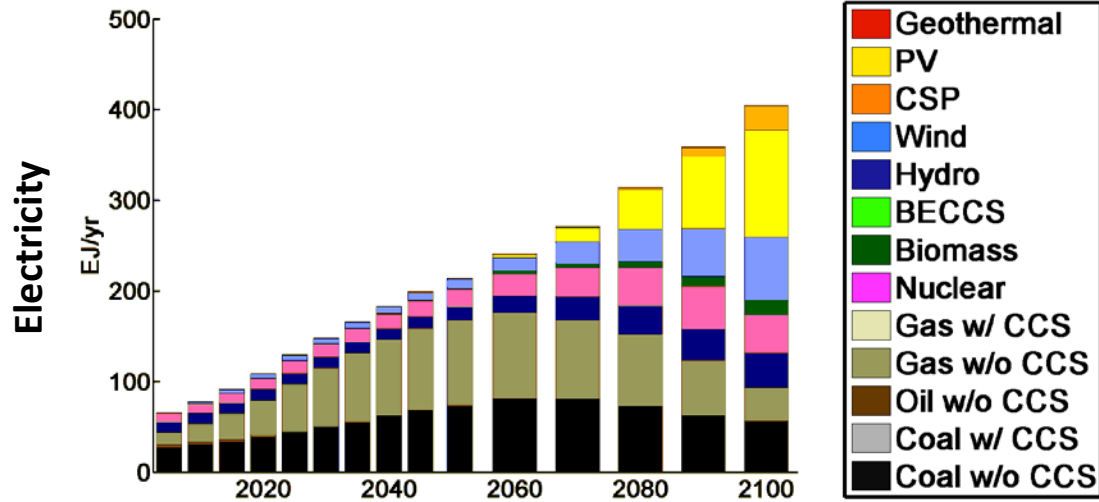
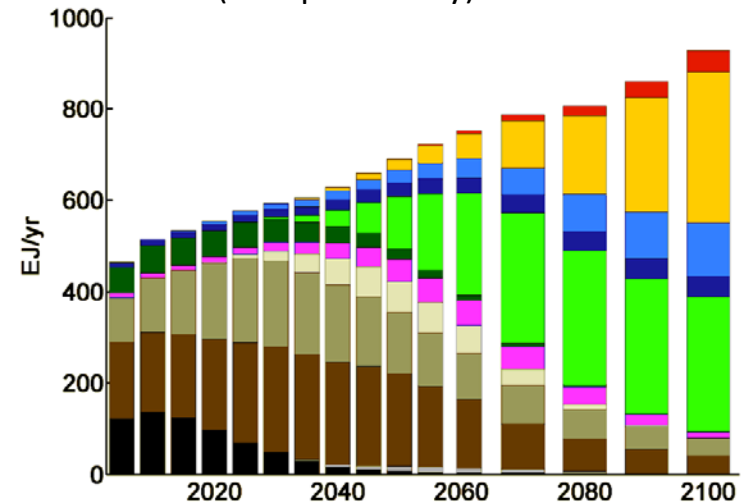
LIMITS Study: Kriegler, Tavoni et al., 2013, Clim Change Econ  
04:1340008

# The global energy system

**Baseline**

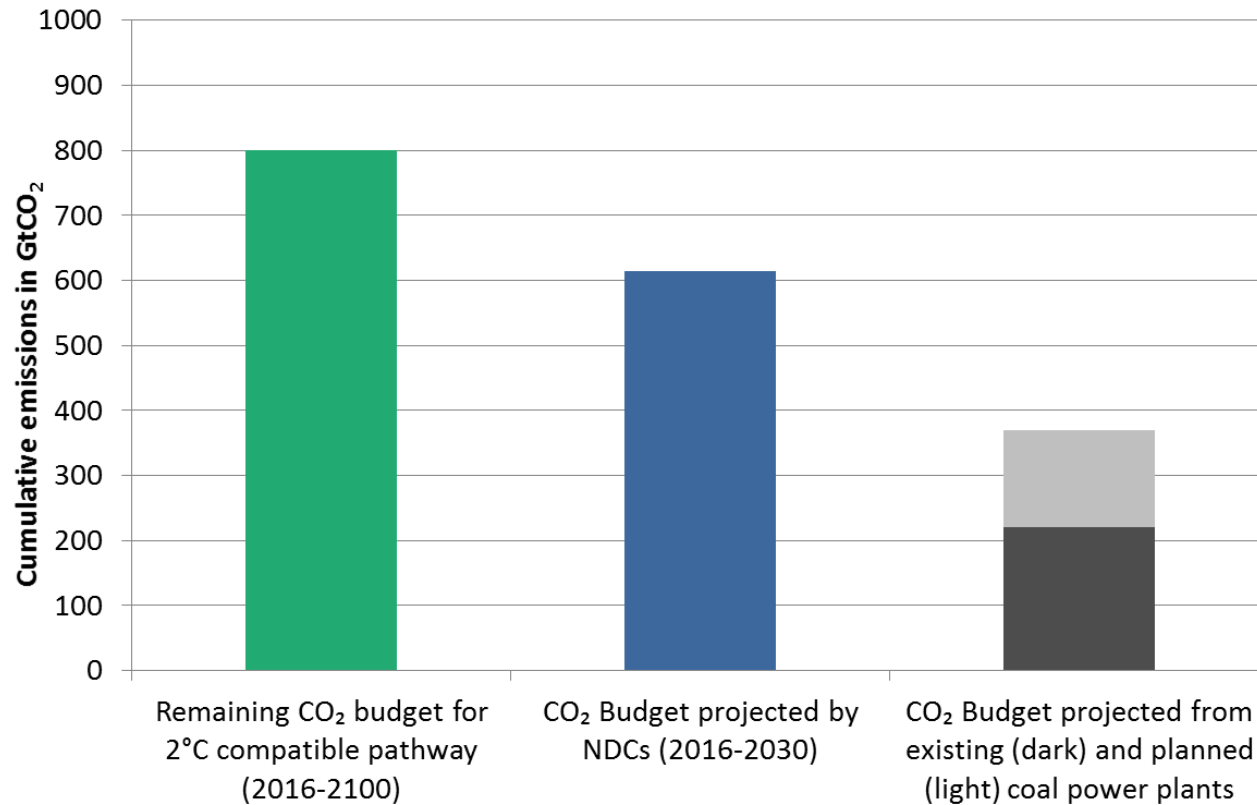


**Climate policy**  
2°C (50% probability)



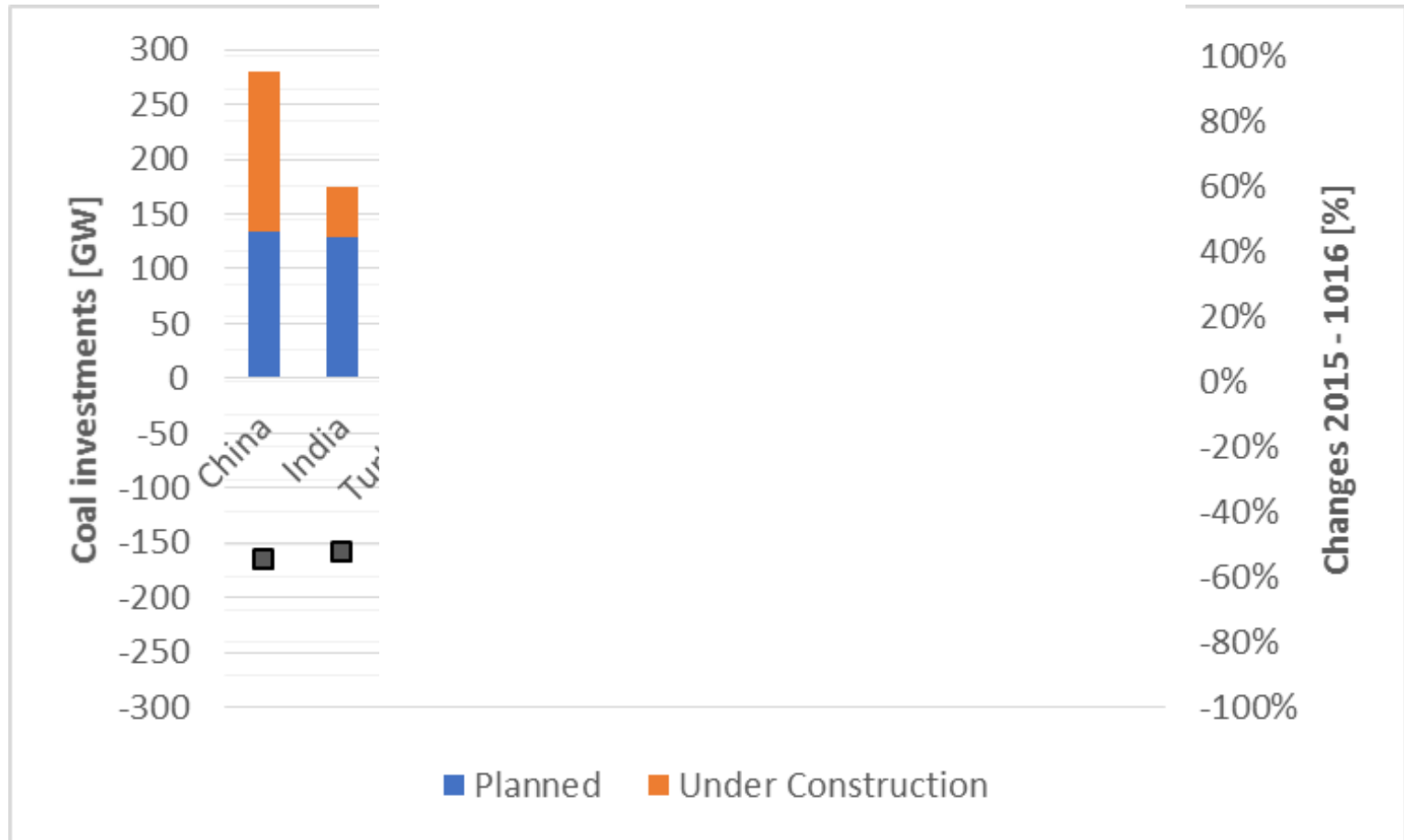
# The 2°C budget does not leave any leeway

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)

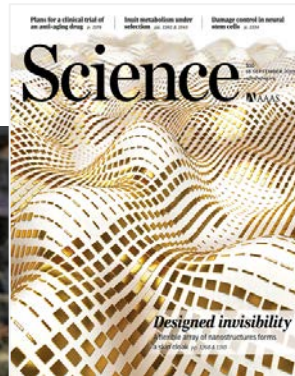
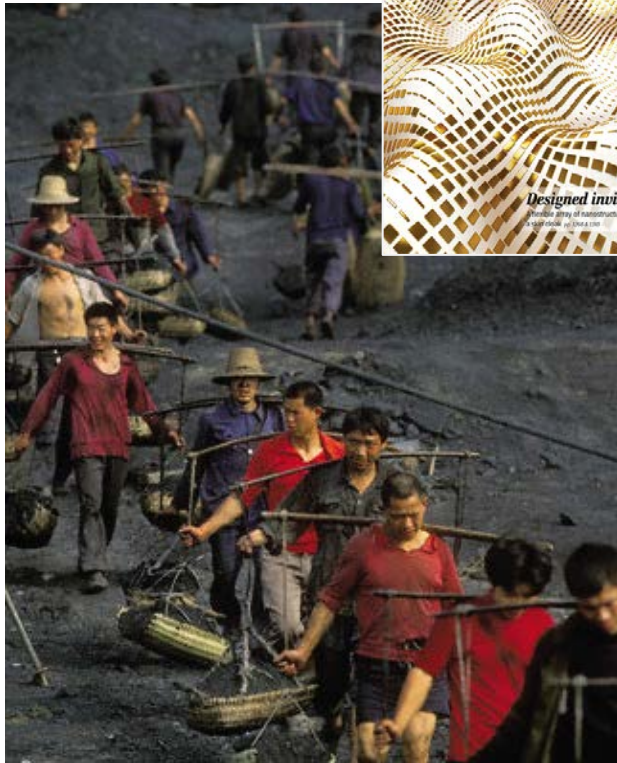
# The coal pipeline in 2016



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

# Renaissance of Coal

## Social Costs vs subsidies



### ENERGY

## 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.

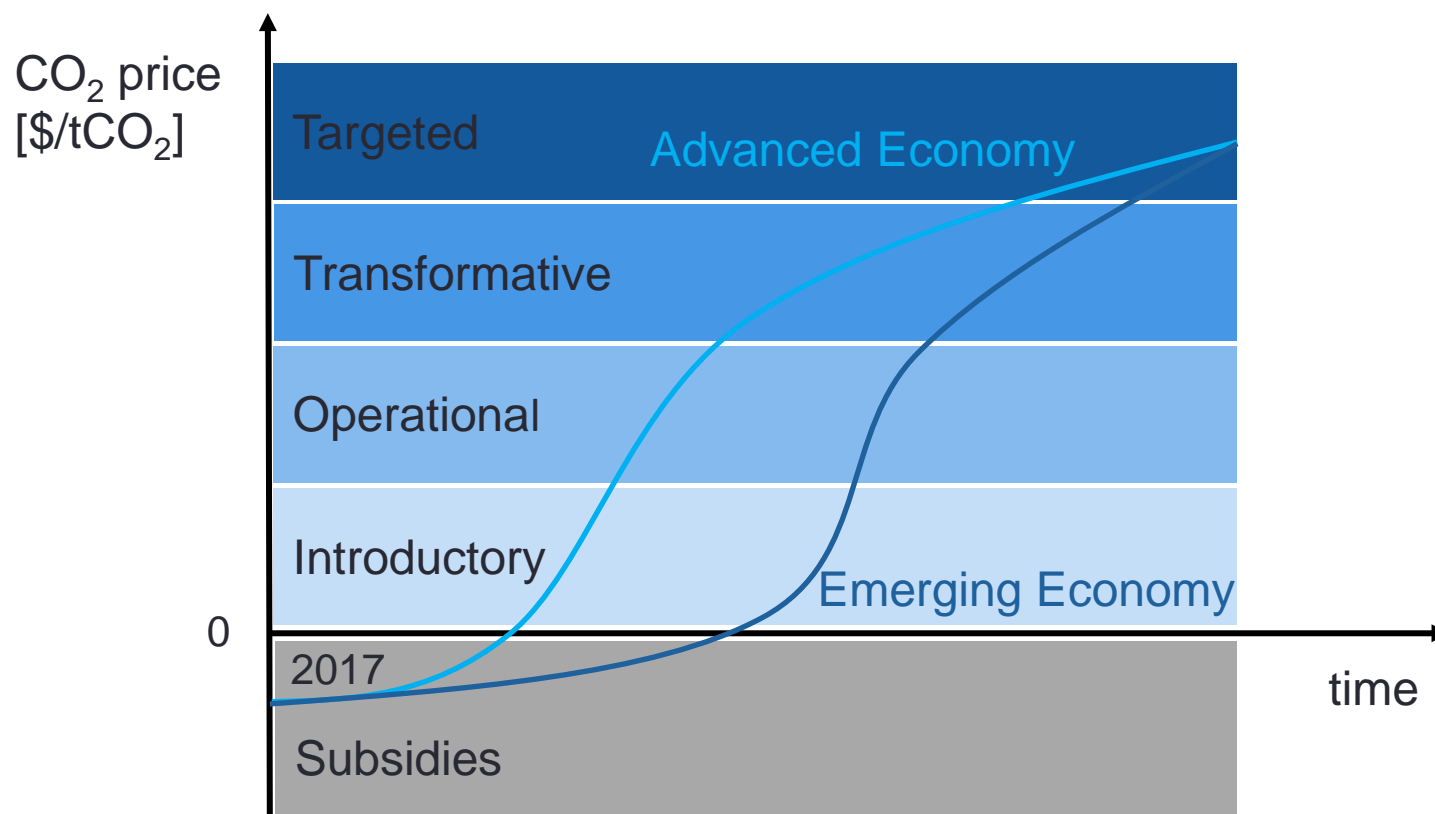
As a result of technological progress and economies of scale, the costs of generating

“one ton of CO<sub>2</sub> receives, on average,  
more than **150 US\$** in subsidies”

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

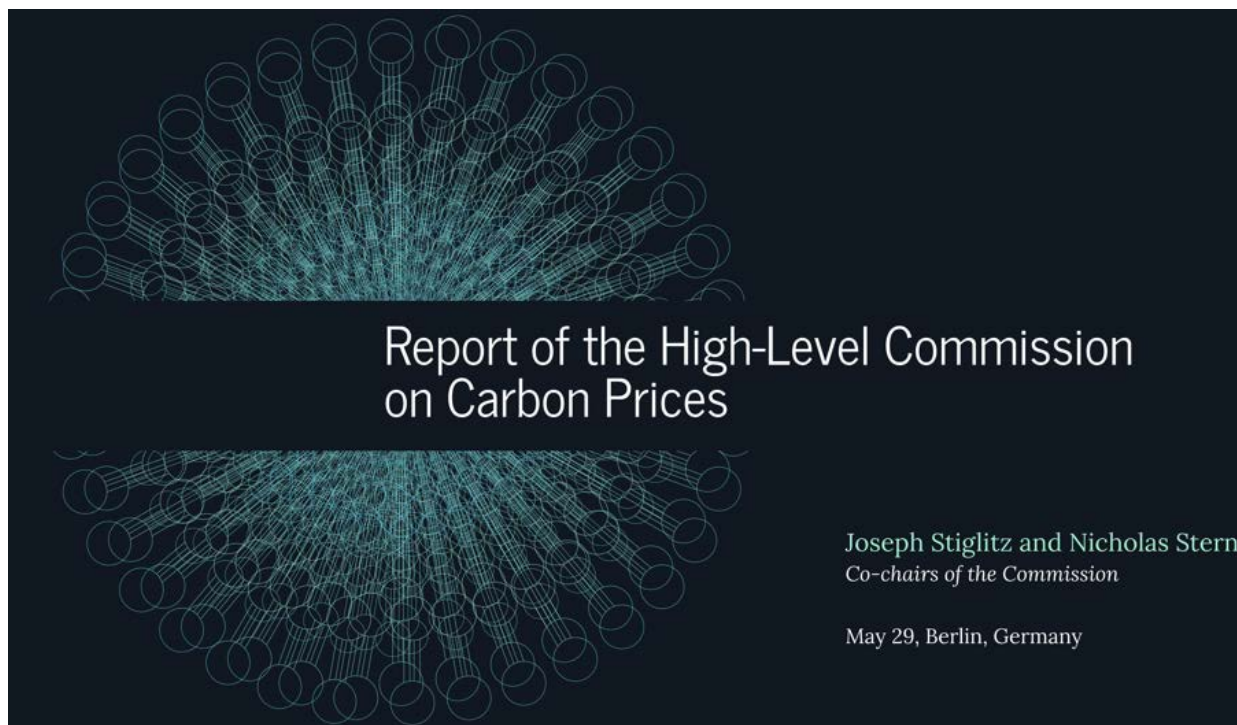
# About negative and positive CO<sub>2</sub>-pricing

Carbon pricing (with taxes or emission trading systems) is essential because of the oversupply of fossil fuels.





# Report of the High-Level Commission on Carbon Prices



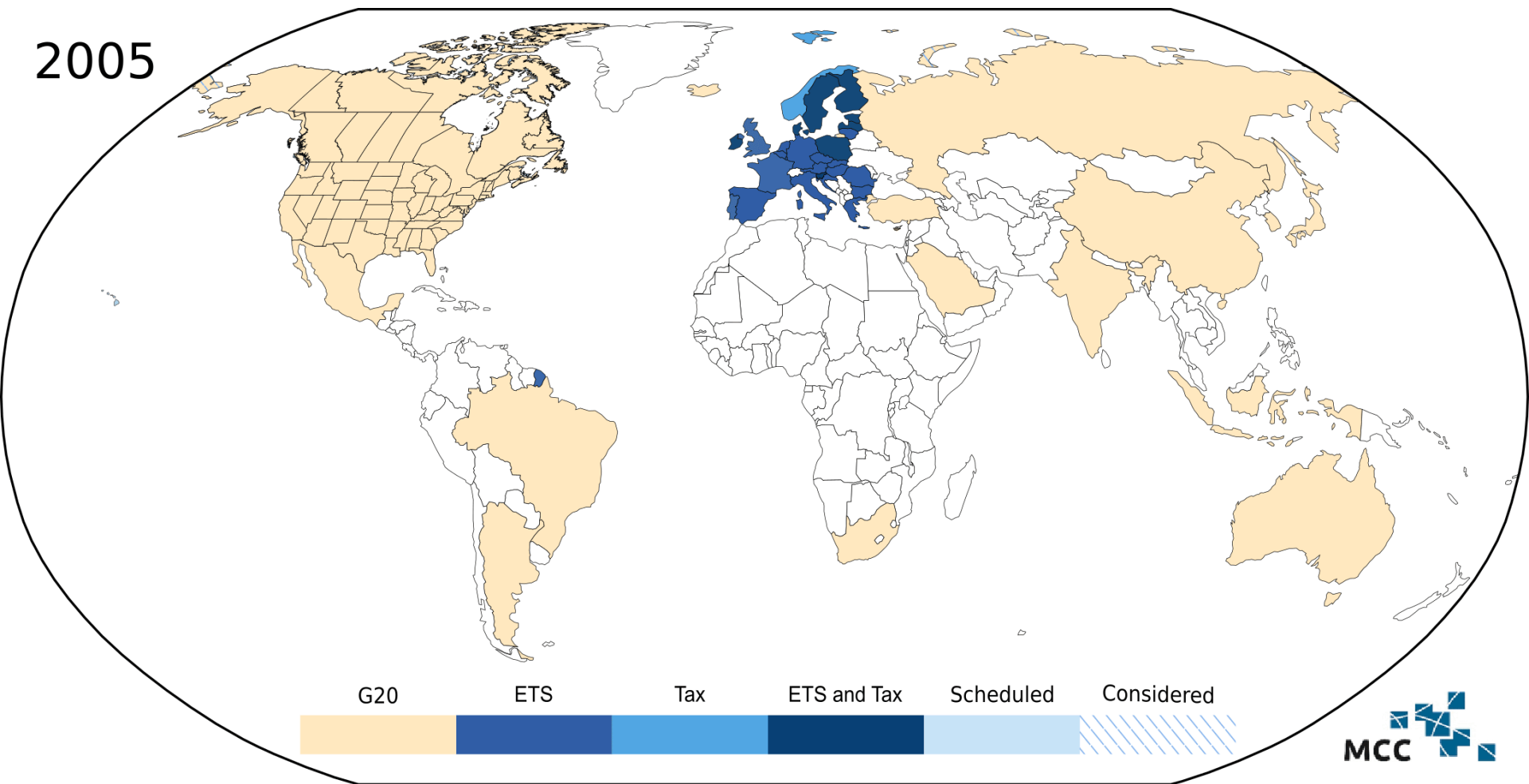


# Results obtained by Stiglitz-Stern-Commission

- Based on the analysis of three approaches:  
technical roadmaps, national roadmaps, global models
- Necessary carbon price for implementing the Paris Agreement:  
40-80 \$/t CO<sub>2</sub> until 2020 and 50-100 \$/t CO<sub>2</sub> until 2030
- This assumes that carbon pricing will be complemented by activities and policies such as efficiency standards, R&D, urban development, healthy climate for investments, etc.
- Stress on the relevance of the income side. Put to use in order to reduce other taxes, invest in clean infrastructure, etc.

# Carbon Pricing in G20 Countries

2005



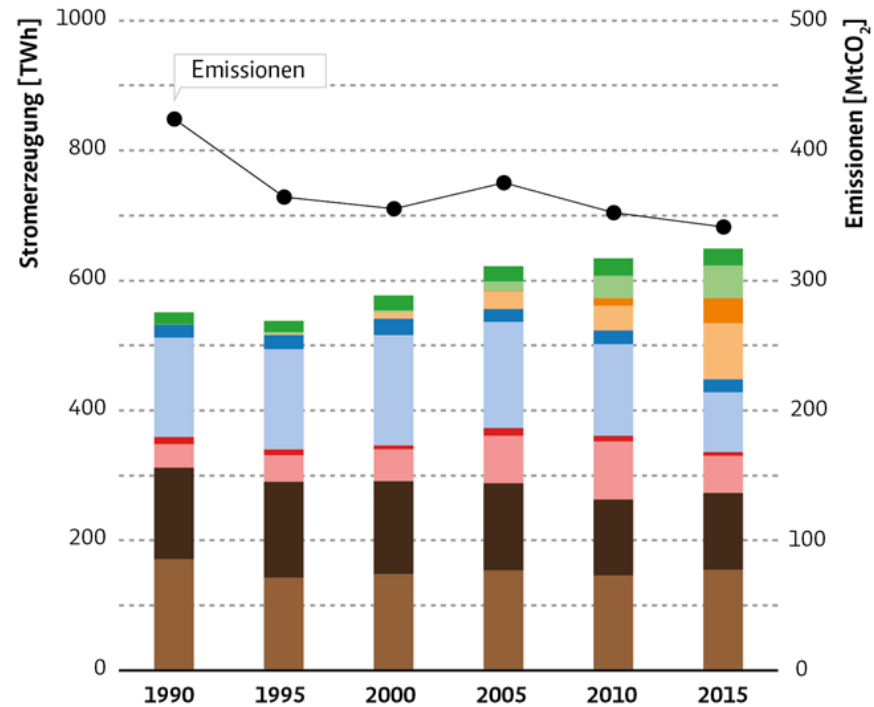
# ETS lacks dynamic cost efficiency



- Falling CO<sub>2</sub> price
- No increase expected before 2020
- Market Stability Reserve will be implemented, but effect might be limited

# Why emissions in Germany remain the same

## Stromerzeugung und daraus resultierende CO<sub>2</sub>-Emissionen in Deutschland

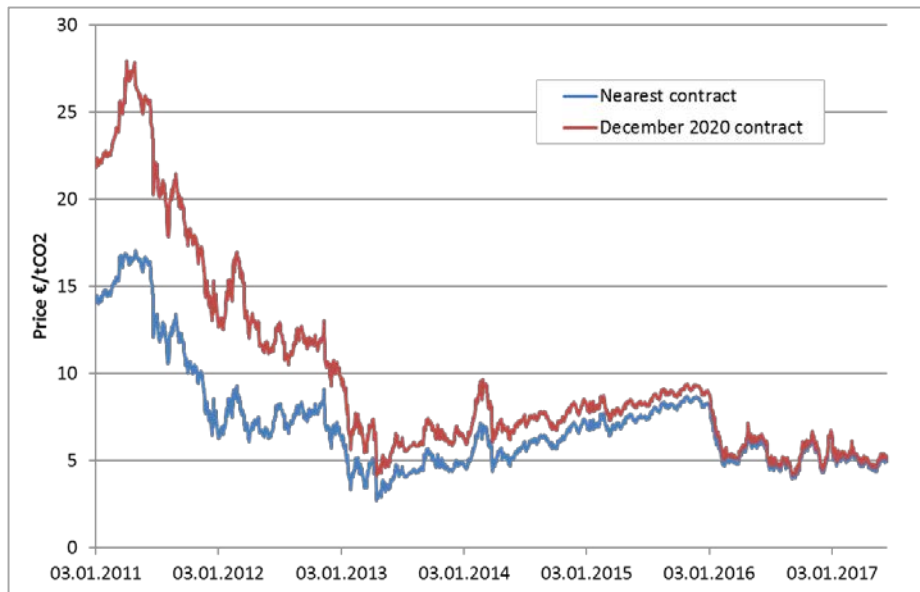


© 2017 MCC

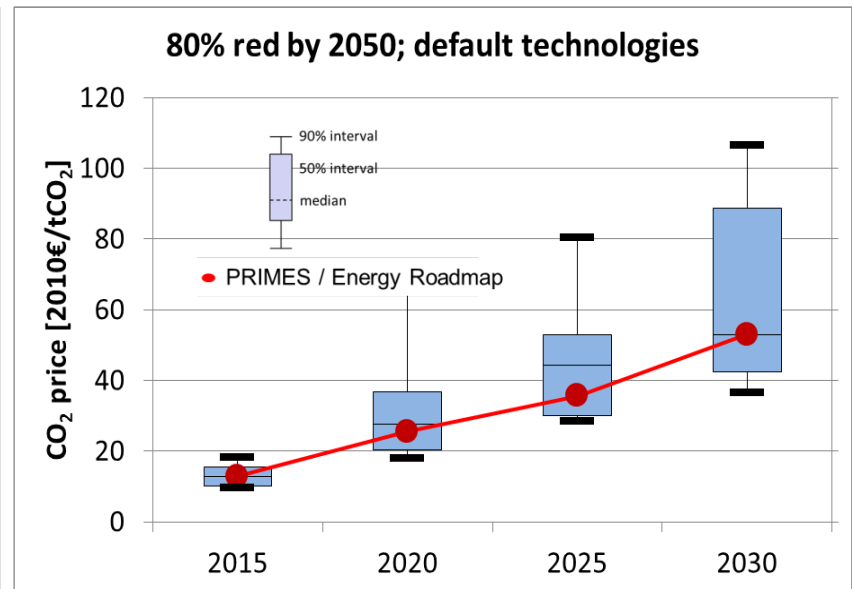
# ETS lacks dynamic cost efficiency

- 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<sub>2</sub> in 2020

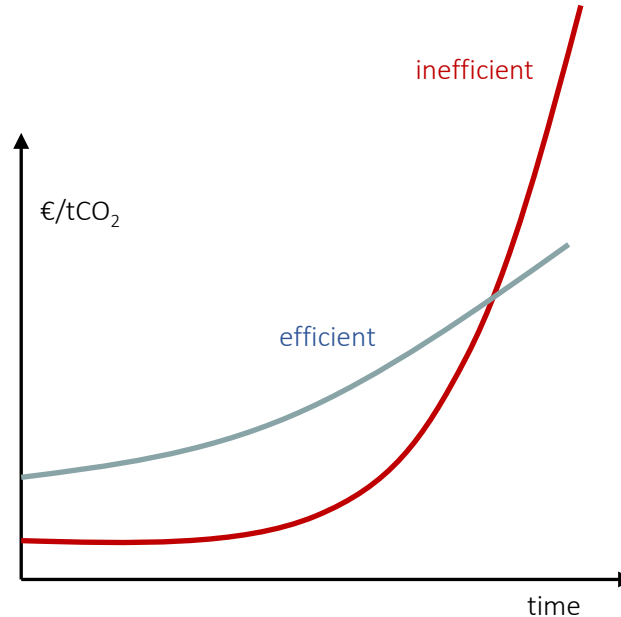
## EUA Nearest Contract and Futures



## Cost-efficient CO<sub>2</sub> price from models



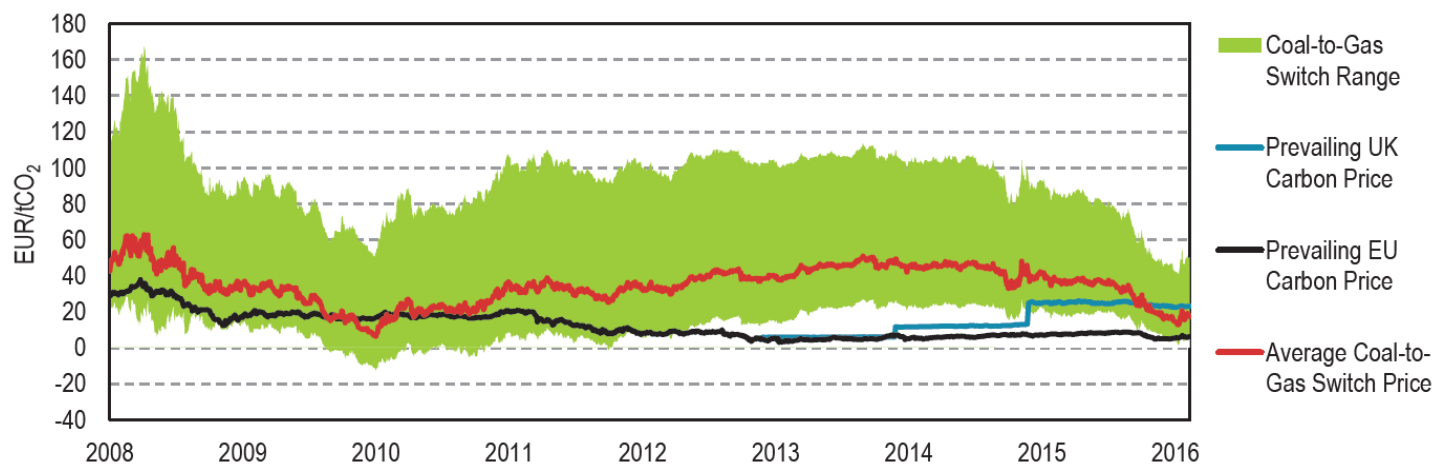
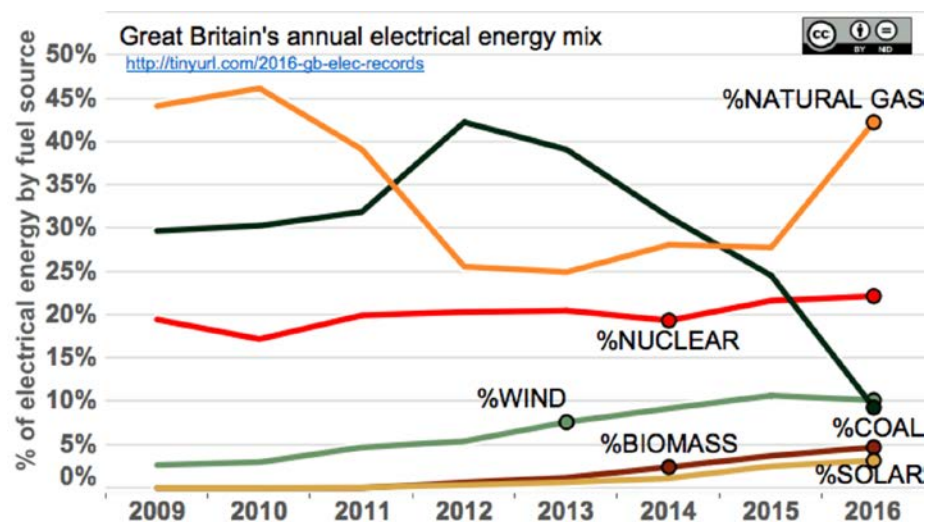
# Reasons for concern



- Persistently low EUA price might lead to „hockey stick“ price curve
- Escalating price will induce future downward adjustment of the cap
- Concern over self-fulfilling prophecy

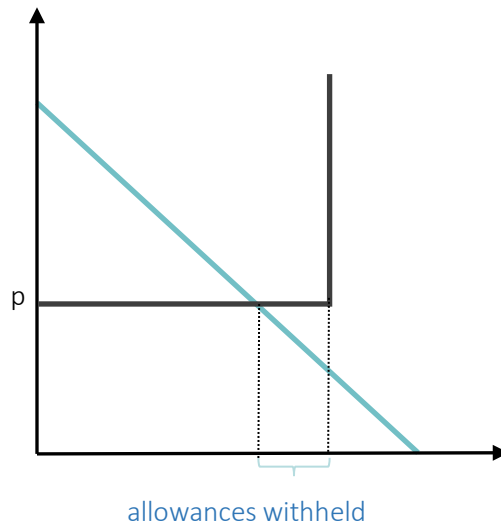
(Salant 2016, Koch et al. 2016, Acworth et al. 2017, Fuss et al. 2017)

# UK experience: Effects of Carbon Price Support Mechanism

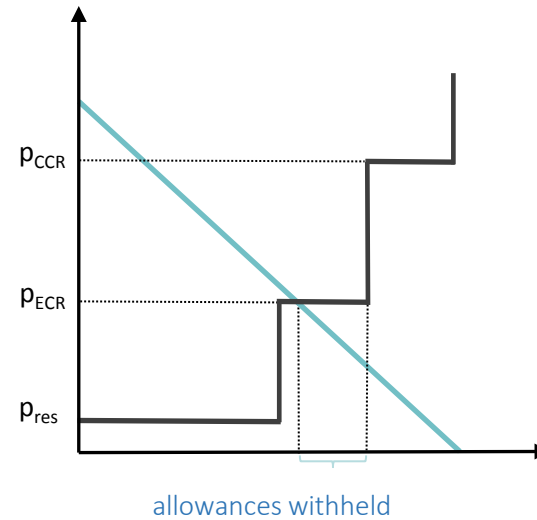


# Price floor implementation options

Auction reserve price California



Emission Containment Reserve (RGGI)





# Conclusions

- Unabated climate change will cause high economic costs; the cost of mitigating climate change will be substantially smaller.
- Ambitious climate protection is only possible if an effective carbon pricing is introduced (necessary condition). Transfer payments are a necessary condition for the participation of developed and developing countries in climate protection.
- The EU ETS needs a minimum price: a) to stabilize the expectations of the investors, b) to leave some leeway for EU member states to design their own climate policies.
- In Germany the energy transition can only be successful if a climate protection plan is implemented; an economy-wide policy instrument is needed