Challenges for the Post-Paris Process

Prof. Dr. Ottmar Edenhofer

39th IAEE International Conference

Energy: Expectations and Uncertainty

22 June 2016

Bergen, Norway

POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

P I K

Leibniz Gemeinschaft

MCC
Mercator Research Institute on Global Commons and Climate Change

Technische Universität Berlin
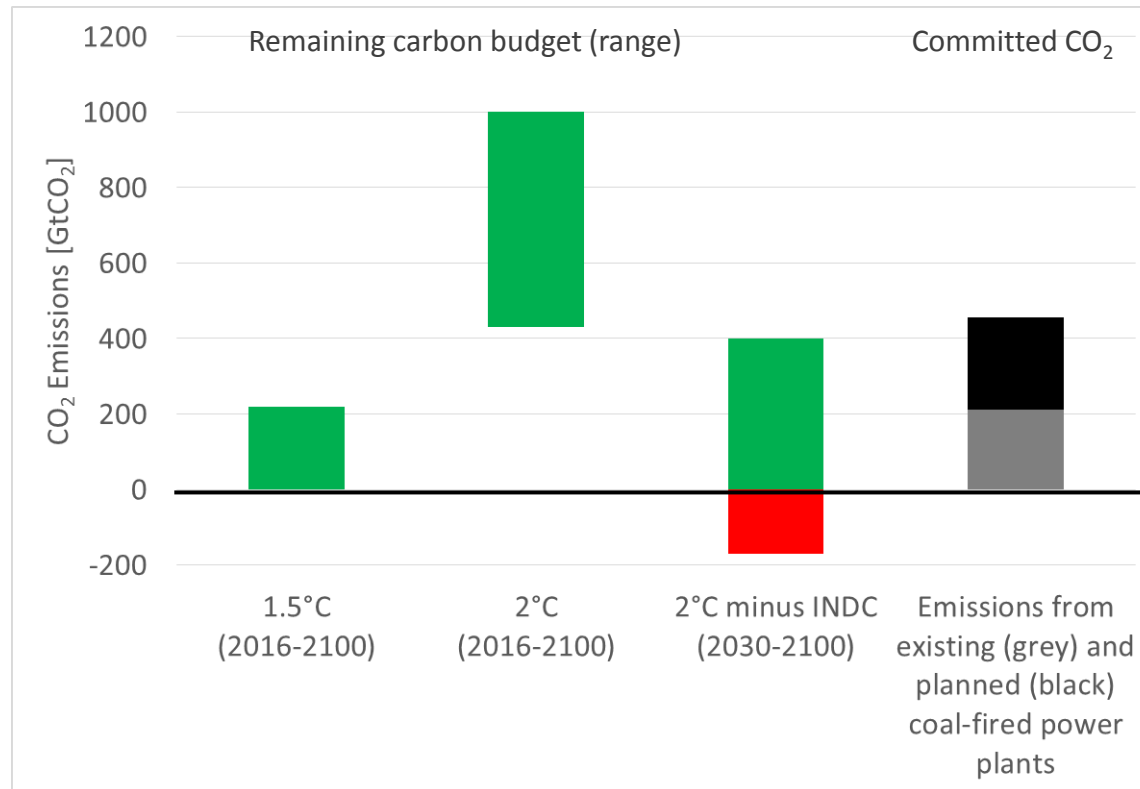
The Paris Agreement: INDCs

- Intended Nationally Determined Contributions are inconsistent with the temperature target.
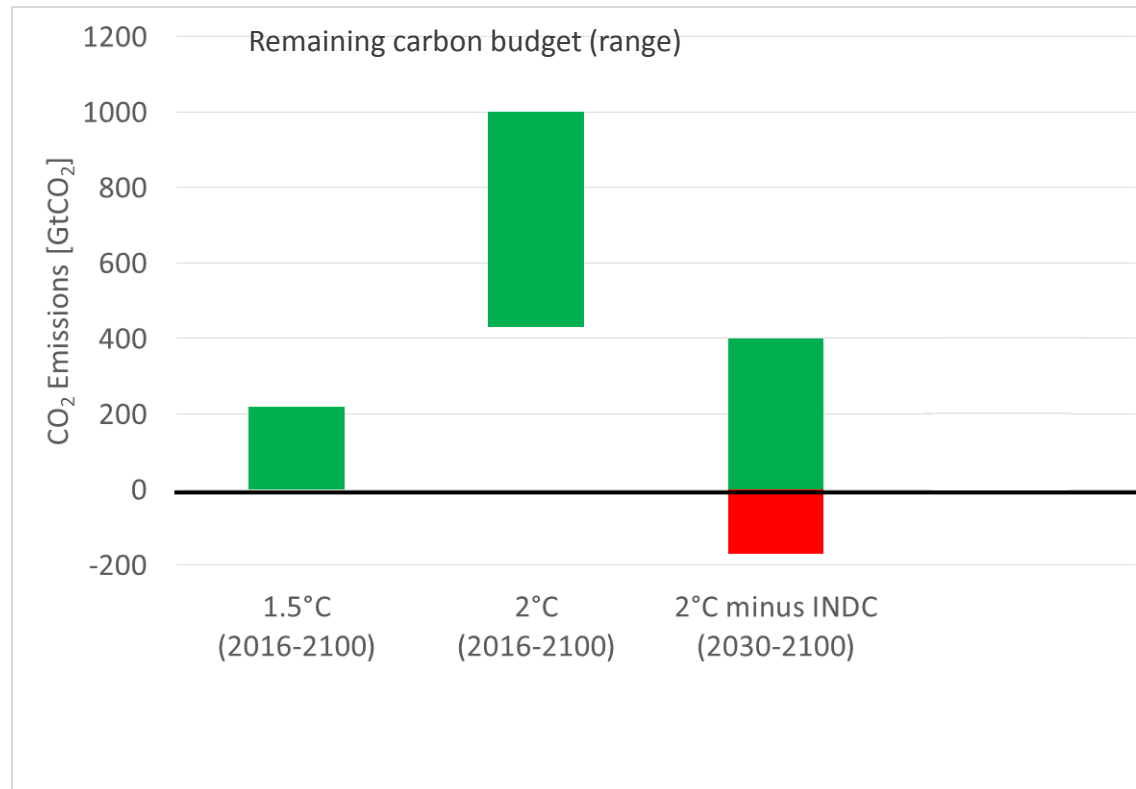
Data sources: Le Quere et al. (2015), Rogelj et al. (2015), Luderer et al. (2015); Fig. adapted from Jan Minx 2016
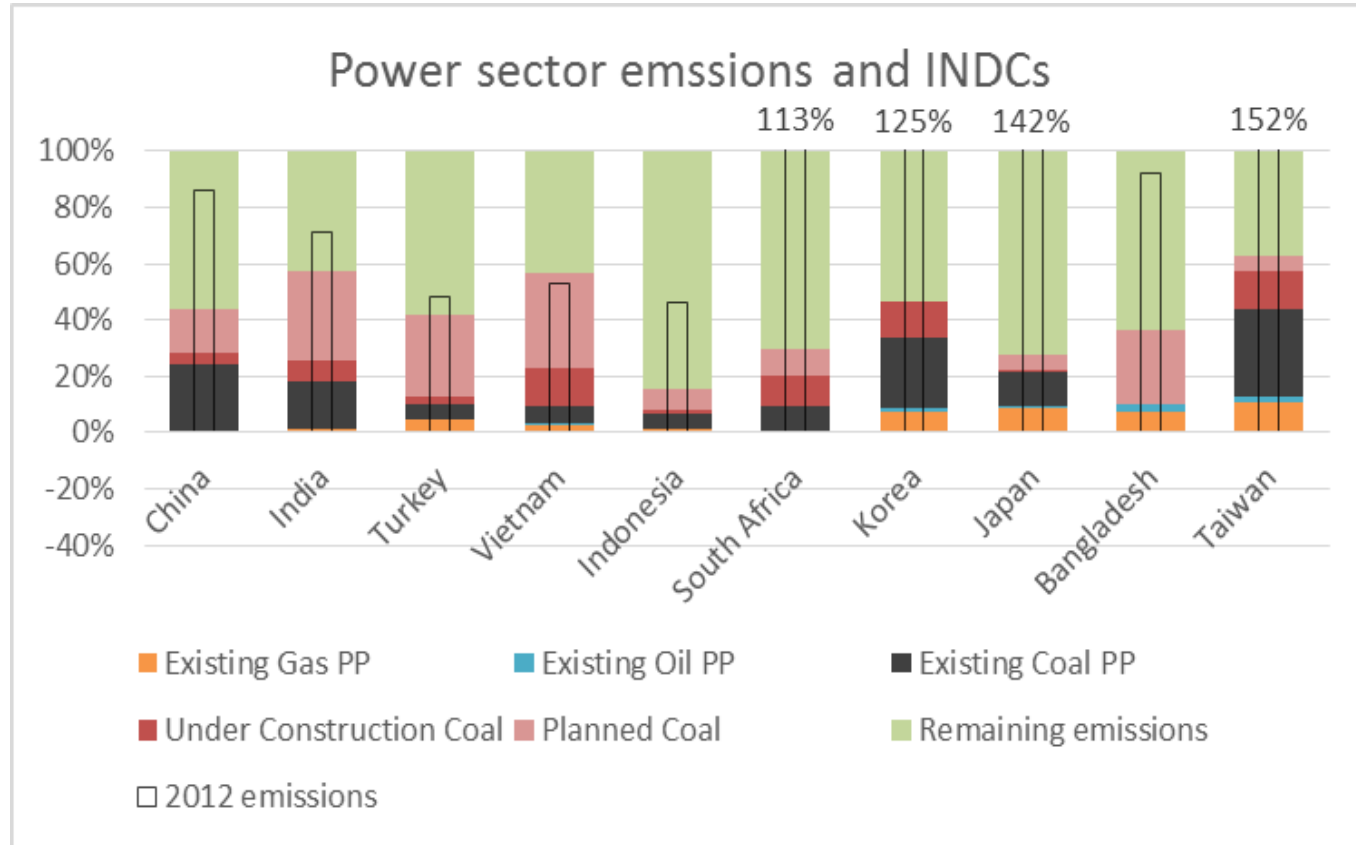
The Paris Agreement: INDCs

- 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
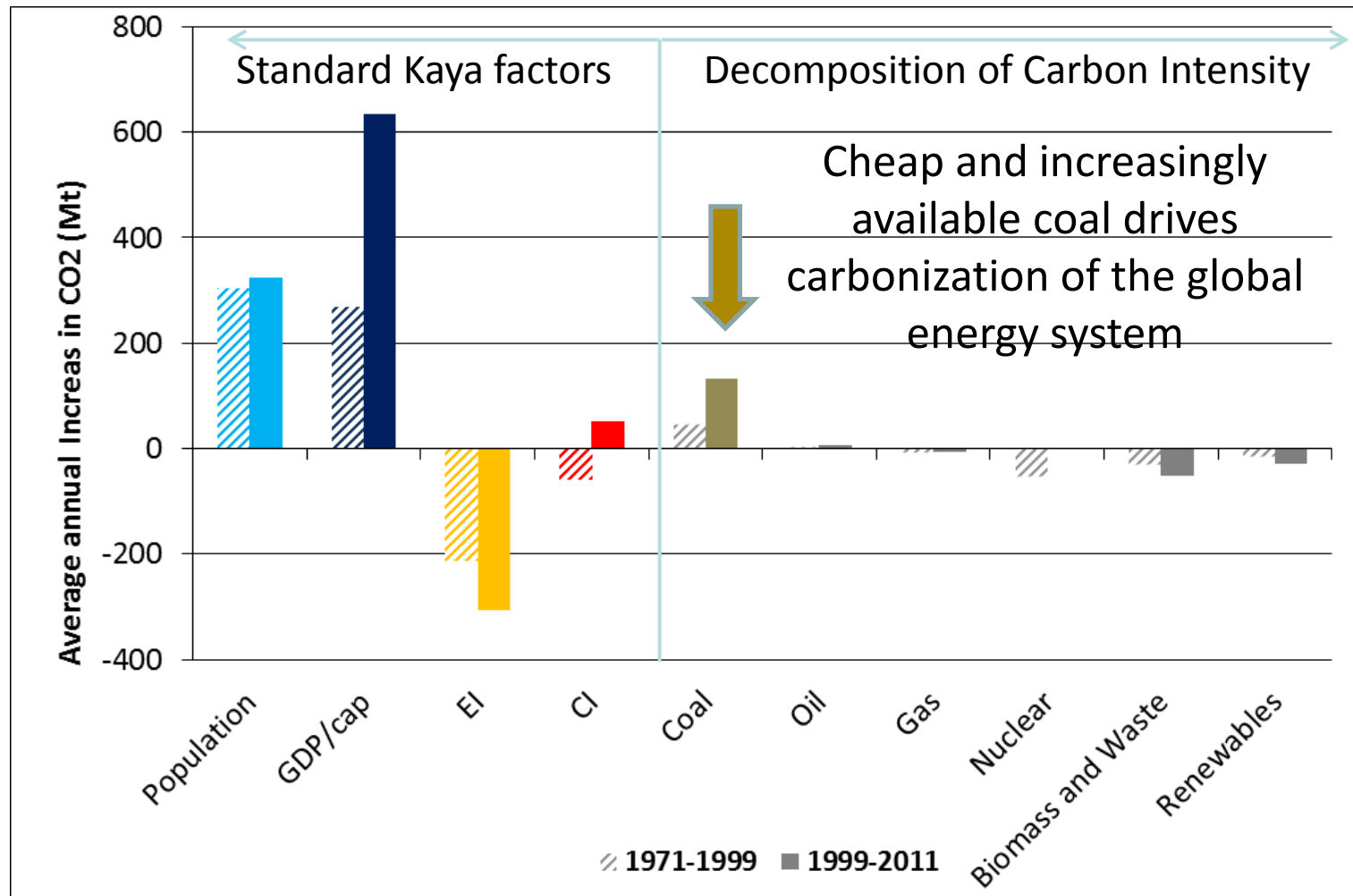
The INDCs are inconsistent

Countries with highest ongoing and planned coal investment
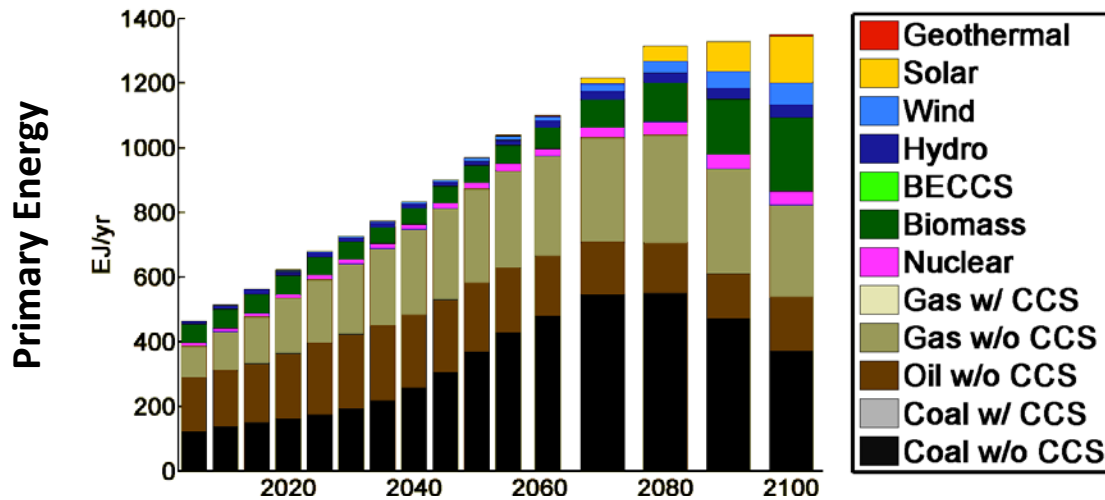
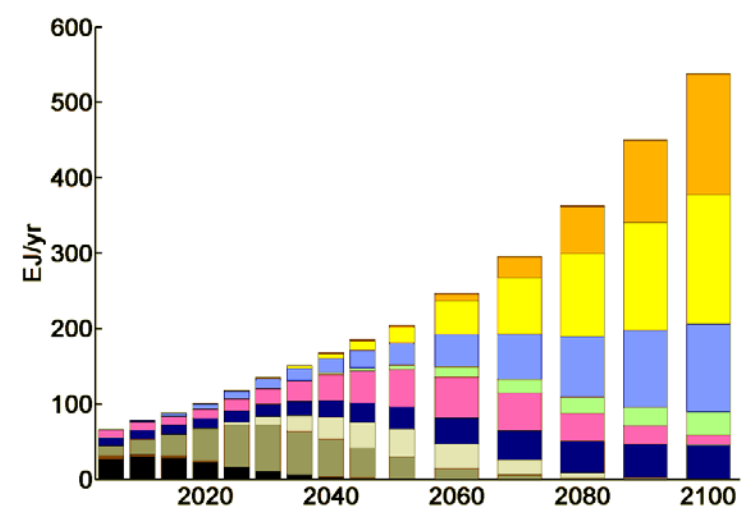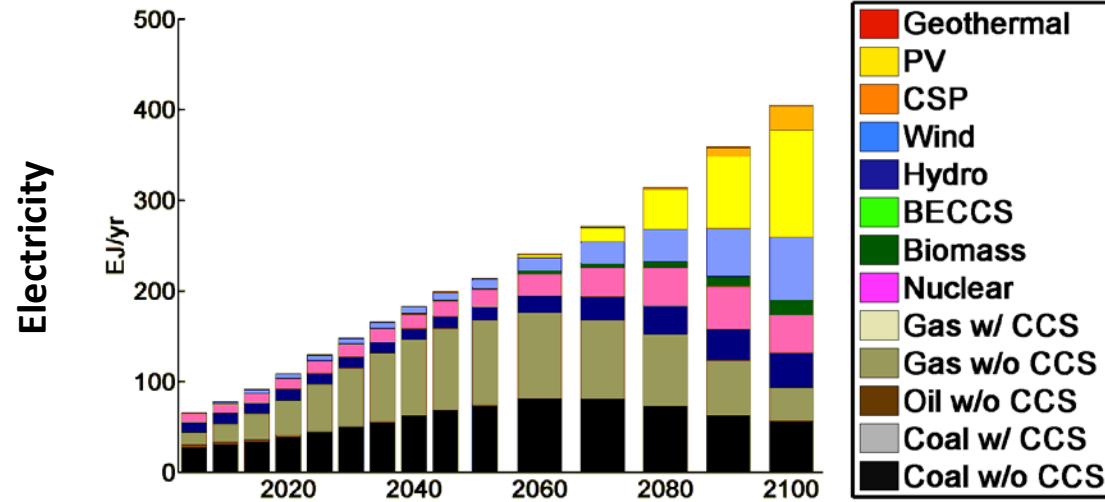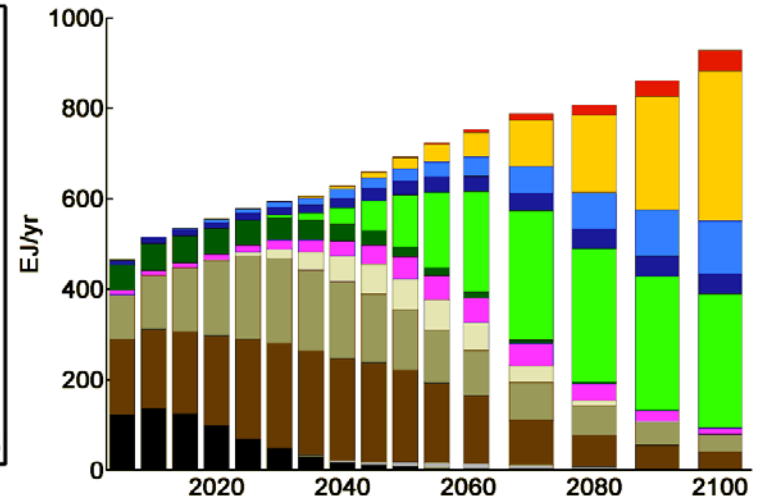# A renaissance of coal drives the global carbonization.

Steckel, Edenhofer and Jakob, in press

Global energy system transformation pathways

Baseline

Climate Policy
2°C (50% likelihood)

The climate problem at a glance

Atmosphere
800 Gt CO_2

Fossil resources
15,000 Gt CO_2
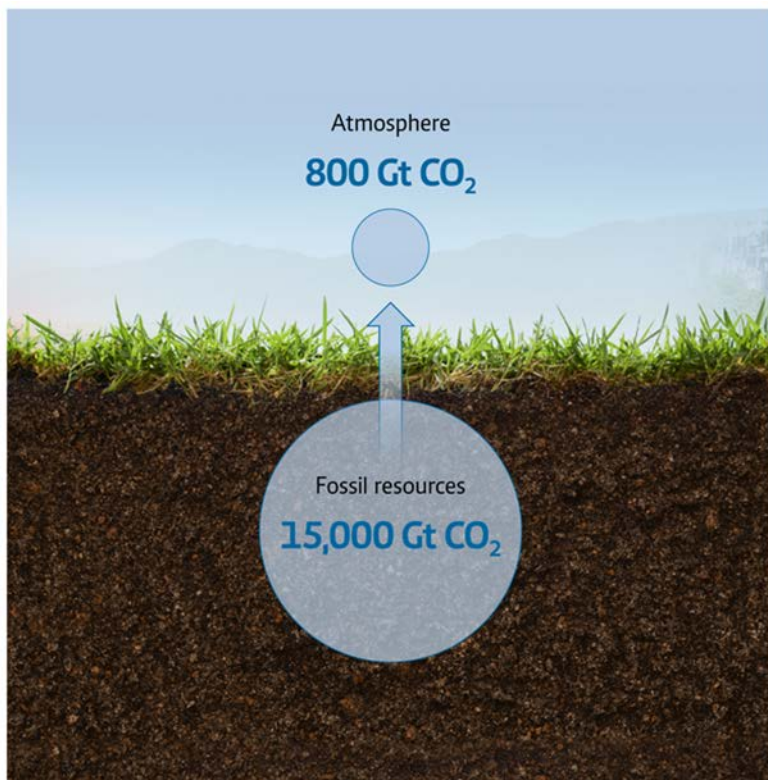
Resources and reserves to remain underground until 2100 (median values compared to BAU, AR5 Database)		
Until 2100	**With CCS [%]**	**No CCS [%]**
Coal	70	89
Oil	35	63
Gas	32	64

P I K

MCC
Mercator Research Institute on
Global Commons and Climate Change

Technische
Universität
Berlin

The public goods game and conditional cooperators

Data from Andreoni 1988 JPE
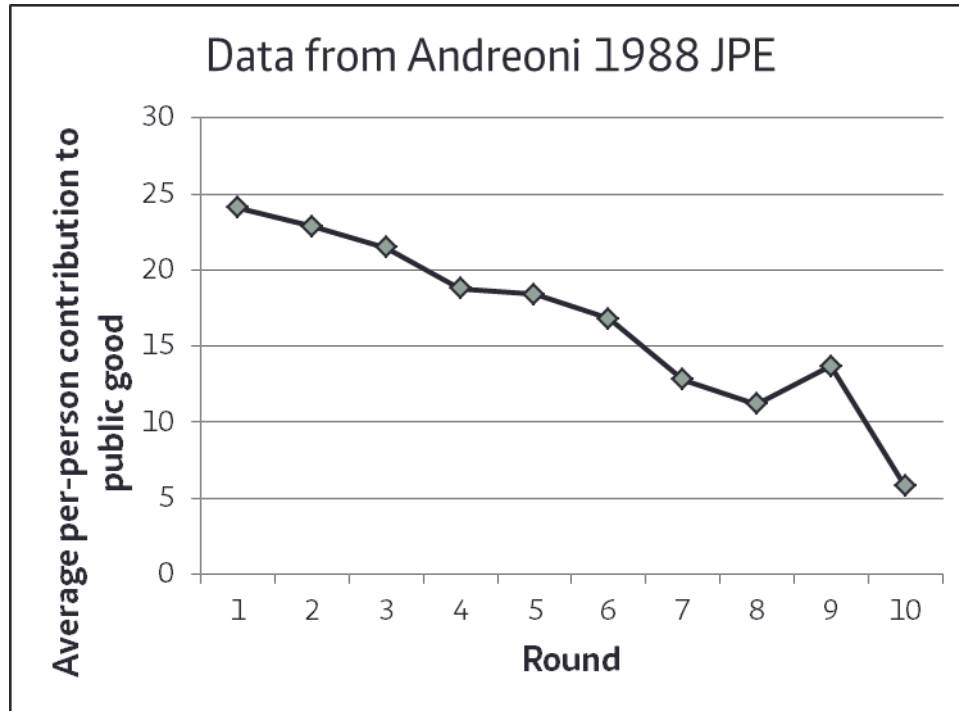
- Large group of people are willing to cooperate when others also cooperate – „I cooperate when you cooperate"
- People start out by giving something
- Contribution drops, when free-riding is observed
- How to sustain conditional cooperation for climate change mitigation?

Minimum Carbon Price and Transfers
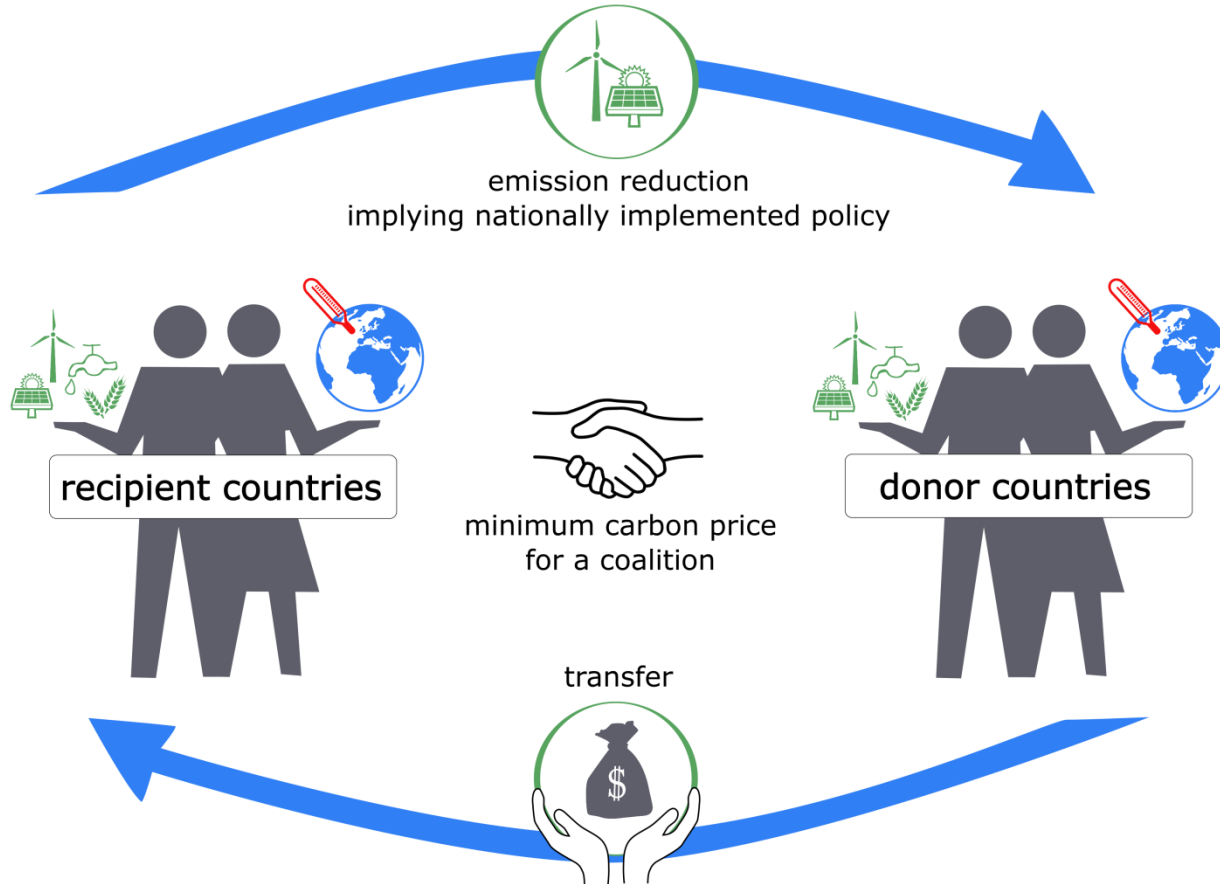
emission reduction
implying nationally implemented policy

recipient countries

minimum carbon price
for a coalition

donor countries

transfer

The public goods game with strategic transfers

- Implementation of strategic transfer through a compensation fund:

$$\mathcal{T}_i = T \quad \cdot \; size_i \cdot \underbrace{\left(\frac{C_i}{size_i} - \frac{1}{\sum size_j} \sum C_j \right)}$$

Compensation between countries based
differences in per-size ($size = \text{gdp}, \text{pop}$)
mitigation costs C_i

The public goods game with strategic transfers

- Implementation of strategic transfer through a compensation fund:

$$\mathcal{T}_i = \underbrace{T \cdot size_i} \cdot \left(\frac{C_i}{size_i} - \frac{1}{\sum size_j} \sum C_j \right)$$

Magnitude of
compensation

The public goods game with strategic transfers

- Implementation of strategic transfer through a compensation fund:

$$\mathcal{T}_i = T \quad \cdot \; size_i \cdot \left(\frac{C_i}{size_i} - \frac{1}{\sum size_j} \sum C_j \right)$$

- Strategic transfers enhance cooperation:

  1. Increased incentive to reduce as countries anticipate that they only have to pay a fraction of their increase in mitigation costs

  2. Countries either contribute through reducing emissions or through compensatory payments

Developing countries face fundamental infrastructure challenges

Water

Electricity

Transportation

Telecommunication

P I K

MCC
Mercator Research Institute on
Global Commons and Climate Change

Technische
Universität
Berlin

Reasonable policy and financing instruments are needed

User charges

Land rent taxation

Private finance
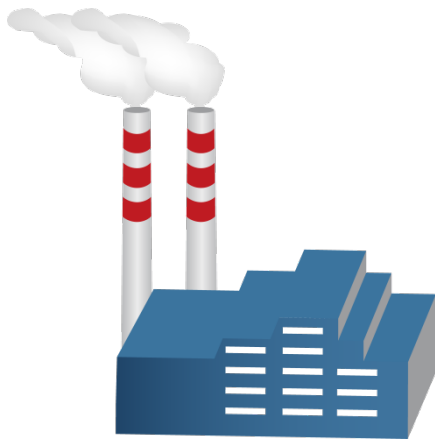
CO_2 prices
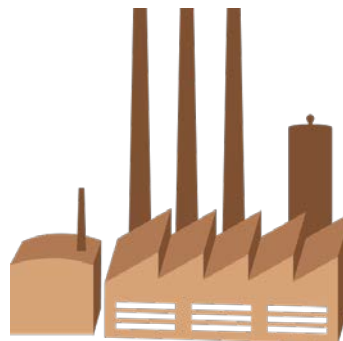
Reduction of subsidies

Public debt

P I K

MCC
Mercator Research Institute on
Global Commons and Climate Change
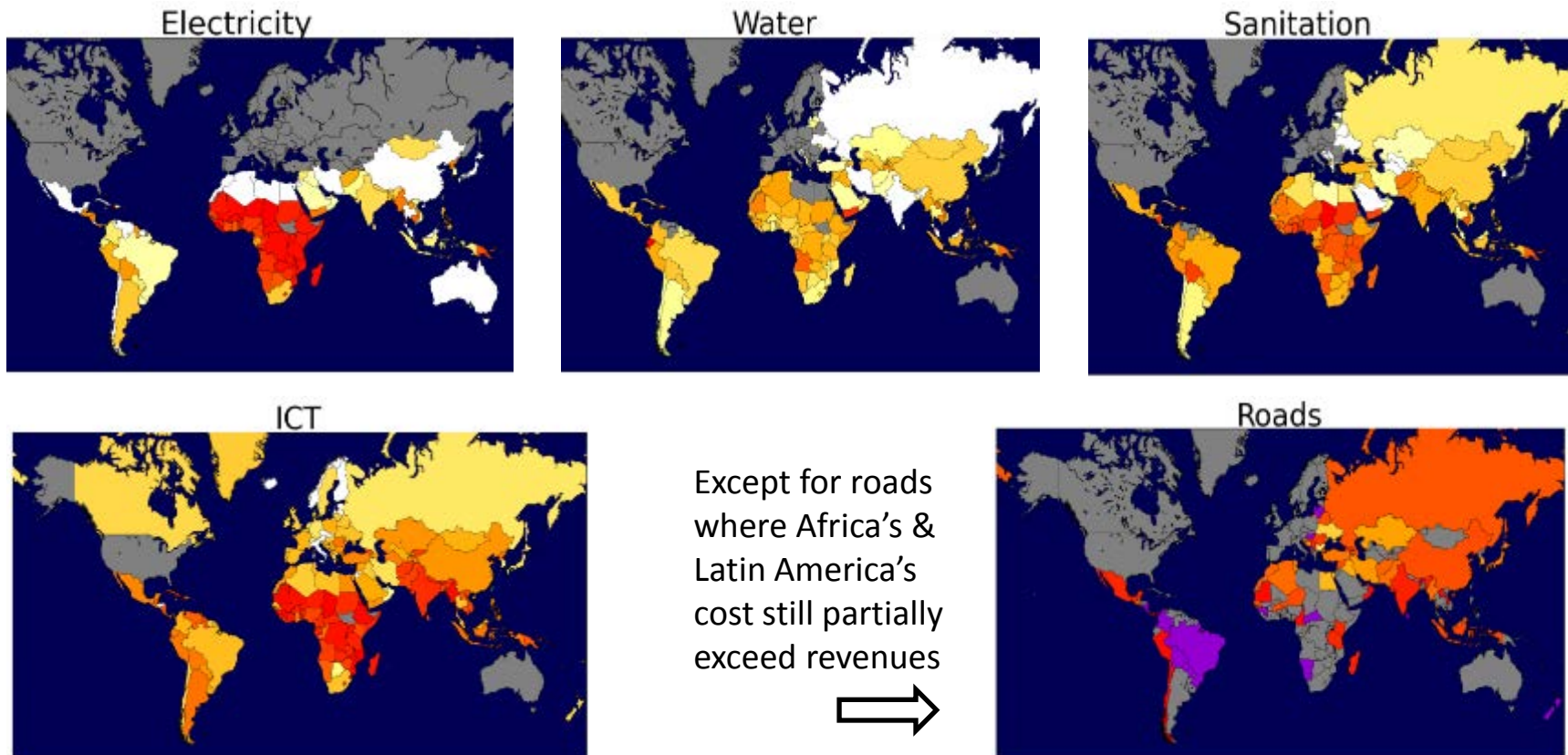
Technische
Universität
Berlin
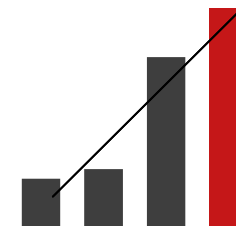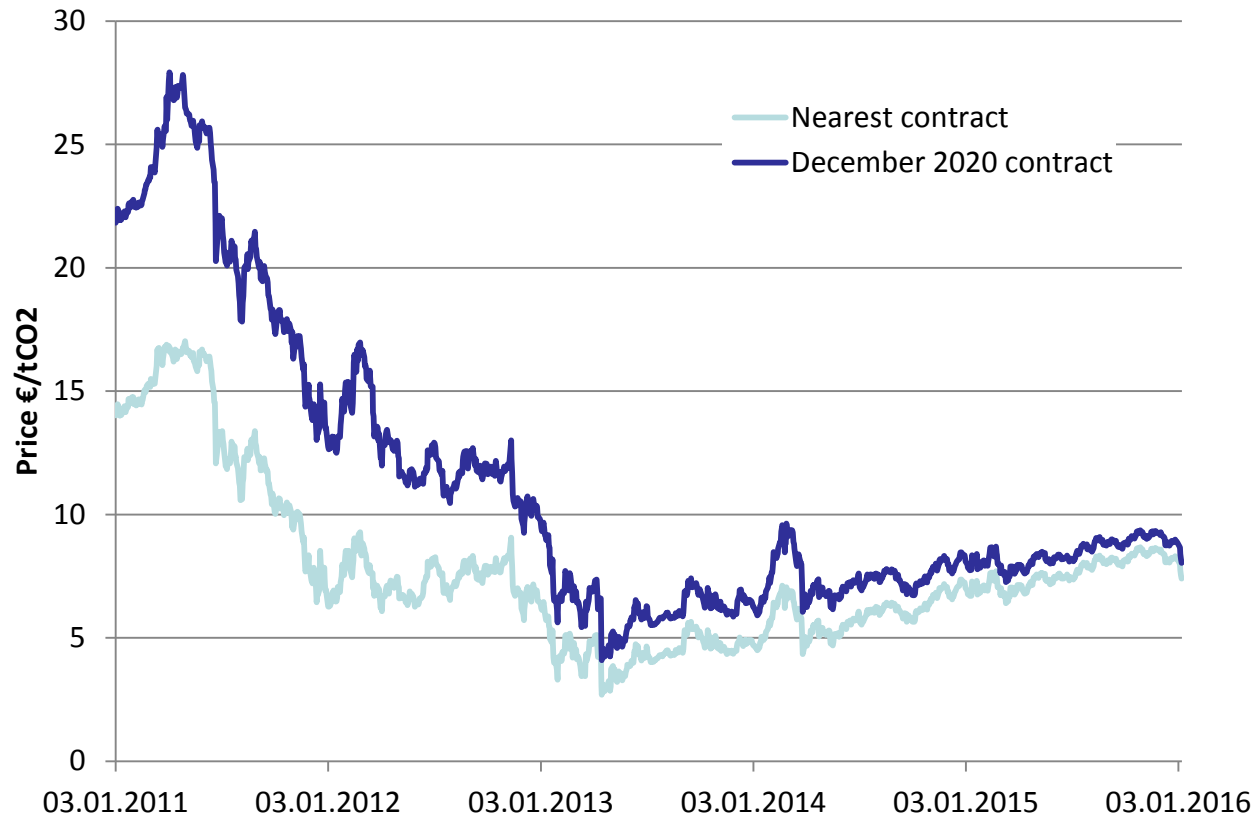
Carbon pricing revenues with redistribution are sufficient to finance universal access to infrastructure…

Electricity   Water   Sanitation

ICT

Except for roads where Africa's & Latin America's cost still partially exceed revenues ⟹

Roads

0.001   0.002   0.005   0.01   0.02   0.05   0.1   0.2   0.5   1

[x of Carbon Tax Revenues]

PIK

MCC
Mercator Research Institute on
Global Commons and Climate Change

Technische
Universität
Berlin

ETS lack dynamical cost efficiency

Legend:
- Nearest contract
- December 2020 contract

Y-axis: Price €/tCO2 (0 to 30)
X-axis: 03.01.2011, 03.01.2012, 03.01.2013, 03.01.2014, 03.01.2015, 03.01.2016

- **Falling CO_2 price**

- **No increase expected before 2020**

- **Market Stability Reserve will be implemented, but effect might be limited**

P I K

MCC
Mercator Research Institute on
Global Commons and Climate Change

Technische
Universität
Berlin

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)
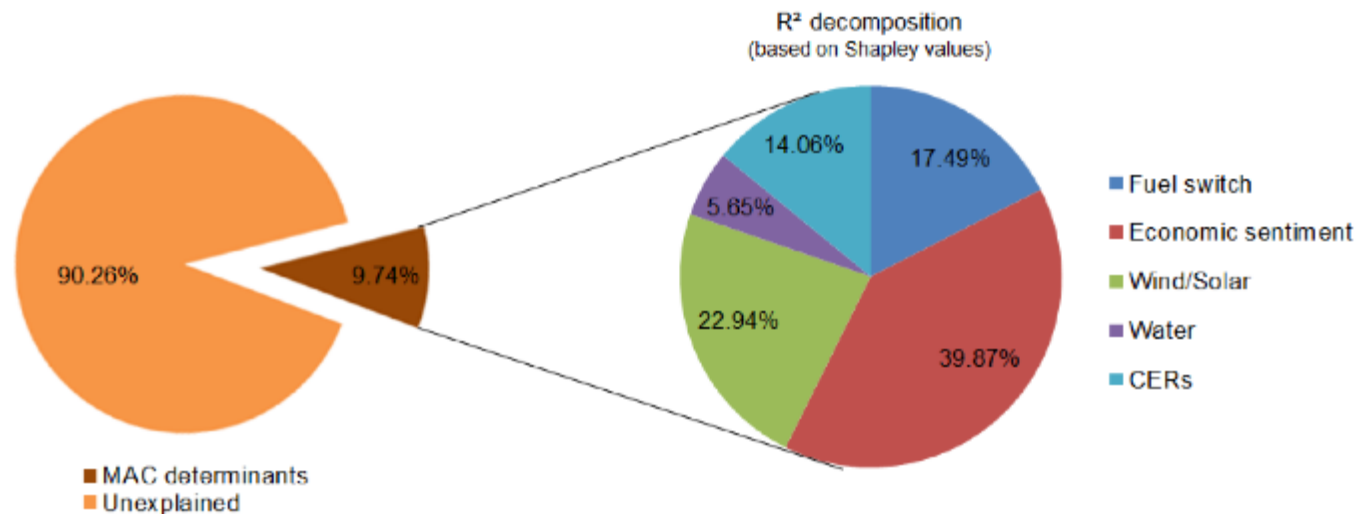
EU ETS betting shop for political decisions
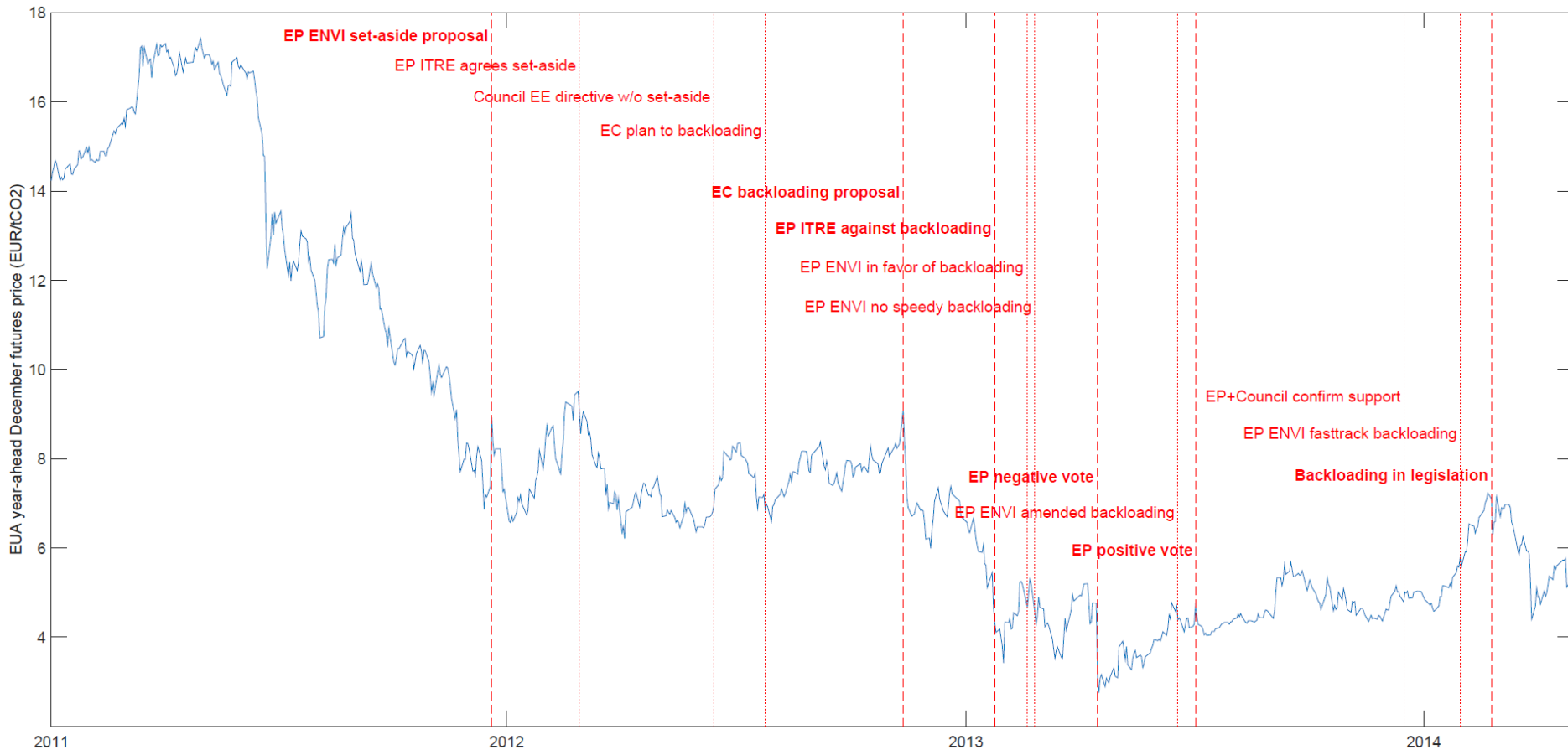
Koch et al. (2016)

Introduction of a price corridor

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