The real work is just beginning – the issues international climate policy is facing „post-Paris“ to make the Paris Agreement a success

Prof. Dr. Ottmar Edenhofer

Public Lecture
University of Melbourne
17 June 2016, Melbourne
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

![Graph showing climate projections and associated risks. The graph illustrates temperature changes projected for 2100 relative to 1850-1900 and the level of additional risk due to climate change. The risk levels range from undetectable to very high.](image-url)
Growth vs. temperature

The diagram illustrates the relationship between annual average temperature and growth in GDP/cap (per year). The graph shows data for China, Brazil, and Germany, with 2010 and 2100 marked on the x-axis. The growth in GDP/cap is negatively correlated with temperature, peaking at around 20°C. The website provided for further information is http://web.stanford.edu/~mburke/climate/map.php.
Global non-linear effect of temperature on economic production

Marshall Burke\textsuperscript{1,2,\#}, Solomon M. Hsiang\textsuperscript{3,4,\#} & Edward Miguel\textsuperscript{4,5}

Source: Nature, doi:10.1038/nature15725
Risks from climate change depend on cumulative CO₂ emissions...

Based on SYR Figure SPM.10
...which in turn depend on annual GHG emissions over the next decades.
The great transformation

CO₂ emissions from fossil fuels

Luderer et al. (2012)
Global energy system transformation pathways

Baseline

Climate Policy
2°C (50% likelihood)

Primary Energy

Electricity

Primary Energy

Electricity
All regions see radical transformation of their energy system
All regions see radical transformation of their power system.
Sectoral Emissions

Based on IPCC AR5 WGIII Figure TS.17
Each Sector has to contribute – The power sector most

450 ppm CO$_2$ eq with Carbon Dioxide Capture and Storage

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

<table>
<thead>
<tr>
<th></th>
<th>Until 2100</th>
<th>With CCS [%]</th>
<th>No CCS [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>70</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>35</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td>32</td>
<td>64</td>
<td></td>
</tr>
</tbody>
</table>

Source: Bauer et al. (2014); Jakob, Hilaire (2015)
The Paris Agreement: INDCs

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

Remaining carbon budget (range)

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.

Remaining carbon budget (range) | Committed CO₂

| 1.5°C (2016-2100) | 2°C (2016-2100) | 2°C minus INDC (2030-2100) | Emissions from existing (grey) and planned (black) coal-fired power plants |

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

Power sector emissions and INDCs

Countries with highest ongoing and planned coal investment
Minimum Carbon Price and Transfers

- recipient countries
- donor countries
- emission reduction
  implying nationally implemented policy
- minimum carbon price for a coalition
- transfer
Renaissance of Coal
Social Costs vs subsidies

“one ton of CO₂ receives, on average, more than 150 US$ in subsidies”

Source: Science, 18 September 2015, Vol 349, Issue 6254, 1286ff
Developing countries face fundamental infrastructure challenges

Water

Electricity

Transportation

Telecommunication
Reasonable policy and financing instruments are needed

- User charges
- Land rent taxation
- Private finance
- CO₂ prices
- Reduction of subsidies
- Public debt
Carbon pricing revenues with redistribution are sufficient to finance universal access to infrastructure...

Except for roads where Africa’s & Latin America’s cost still partially exceed revenues.
ETS lack dynamical cost efficiency

- Falling CO₂ 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 lack dynamical 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!