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

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UQEI Energy Express Seminar
The University of Queensland
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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

![Diagram showing climate projections and associated risks]

- **Global mean temperature change**
  - 2100 °C
  - Temperature change from 1850–1900
  - Temperature change from 1986–2005

- **Levels of additional risk due to climate change**
  - Undetectable
  - Moderate
  - High
  - Very high

Slide by H. J. Schellnhuber
Growth vs. temperature

China

Brazil

Germany

LETTER

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}

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.
The great transformation

CO₂ emissions from fossil fuels

Luderer et al. (2012)

Emissions w/o climate protection

mitigation contributions from different technologies

2°C-consistent emissions

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

Baseline

Climate Policy
2°C (50% likelihood)
All regions see radical transformation of their energy system
All regions see radical transformation of their power system

Baseline

Climate Policy

2°C (50% likelihood)

Electricity

EU

USA

China

- Geothermal
- PV
- CSP
- Wind
- Hydro
- BECCS
- Nuclear
- Oil w/o CCS
- Coal w/o CCS
- Gas w/o CCS
- Coal w/ CCS
- Gas w/ CCS
The climate problem at a glance

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

<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.

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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The INDCs are inconsistent

Countries with highest ongoing and planned coal investment

Power sector emissions and INDCs

- Existing Gas PP
- Existing Oil PP
- Existing Coal PP
- Under Construction Coal
- Planned Coal
- Remaining emissions
- 2012 emissions

Edenhofer et al. submitted (Science)
Minimum Carbon Price and Transfers

emission reduction
implying nationally implemented policy

recipient countries
minimum carbon price for a coalition
donor countries

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

![Maps showing carbon pricing revenues for different infrastructure sectors](image-url)
ETS lack dynamical cost efficiency

- 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 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 CO₂ in 2020

EUA Nearest Contract and Futures

Cost-efficient CO₂ 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!