

Transitioning to a low emissions future: Implications for global energy systems

Douglas Copland Lecture

Melbourne, March 27, 2012

Prof. Dr. Ottmar Edenhofer









- 1. Has global warming stopped?
- 2. Scope of the challenge
- 3. Energy transformations in a first best world
- 4. An assessment of current climate policy
- 5. Four ideas for tomorrow's climate policy
- 6. Conclusions

Has global warming stopped?



•Looking at last 10 years, global warming seems to have slowed down or even stopped

- •Has the IPCC made a major mistake?
- •Is global warming real?

The influence of cutting the data!



• Multiple reasons for stable temperatures last decade:

- "Slow down" last decades within natural variation
- 1997/98 exceptionally warm due to El Niño
- Cooling effect of increasing air pollution, particularly sulphur
 - Temperatures likely to increase once clean air policies are commissioned also in newly industrializing countries

 Looking at longer trends makes obvious that global warming has not stopped at all

Long term trends show clear evidence



- Temporal slow downs of global warming have occurred already in the past
- Recent independent examination of IPCC results (Berkeley Earth Surface Temperature Project) has confirmed results

Average temperature anomaly per year



Last decade was the warmest since the beginning of industrialization !

- 1. Has global warming stopped?
- 2. Scope of the challenge
- 3. Energy transformations in a first best world
- 4. An assessment of current climate policy
- 5. Four ideas for tomorrow's climate policy
- 6. Conclusions



Depending on different socio-economic assumptions, global surface warming can rise from 1°C to 4°C compared to 2000 levels.

Reasons to concern: Tipping elements



sing processes of the children system show a strong rea

already to small climate changes

Schellnhuber, 1996; Lenton et al., 2008



GHG emissions resulting from the provision of energy services contribute significantly to the increase in atmospheric GHG concentrations.



We are not on track !



Economic growth – particularly in newly industrializing countries – drives global emissions !

Fossil Fuels are not scarce!



The BAU Scenarios Could Exceed the Level of Greenhouse Gas Concentration of 600ppm (~4°C Temperature Increase) !

The Atmosphere as a Global Common



- 1. Has global warming stopped?
- 2. Scope of the challenge
- 3. Energy transformations in a first best world
- 4. An assessment of current climate policy
- 5. Four ideas for tomorrow's climate policy
- 6. Conclusions

The Great Transformation – Mitigation Shares:



Costs of mitigation



Costs hinge critically on:

- The stabilization target
- The biomass potential
- The availability of technologies, RE and CCS in particular

- 1. Scope of the challenge
- 2. Energy transformations in a first best world
- 3. An assessment of current climate policy
- 4. Four ideas for tomorrow's climate policy
- 5. Conclusions

Copenhagen: Climate policy with "collection box"

Pledged reduction targets for 2020:

- Japan: 25% wrt 1990
- EU: 20-30% wrt 1990
- USA: 17% wrt 2005
- Canada: 17% wrt 2005



Implementation of the minimal Copenhagen targets means that emissions in 2020 will be 10-20% higher than today



Copenhagen implications for 2050: high probability for exceeding 2°C warming target, 50% chance for exceeding 3°C

Rogelj et al. 2010, Nature

The Durban Outcome

1. Ad Hoc Working Group on the Durban Platform for Enhanced Action (AWG-DPEA)

- "develop a Protocol, another legal instrument or an agreed outcome with legal force under the UNFCCC applicable to all Parties"
- negotiation until 2015 / COP 21
- implementation from 2020 onwards
- 2. Kyoto 2nd commitment period
 - agreement on length (2017 or 2020?) and ambition (targets for signatories) postponed \rightarrow COP 18 in Qatar
- 3. "Operationalization" of Cancun Agreements
 - Establishment of Green Climate Fund

- Dilemma: Incentives in the climate game
 - "Everybody cooperates on climate change" is globally optimal

- Dilemma: Incentives in the climate game
 - "Everybody cooperates on climate change" is globally optimal



- Every single country is better off if only the others mitigate



- Dilemma: Incentives in the climate game
 - "Everybody cooperates on climate change" is globally optimal
 - Every single country is better off if only the others mitigate
 - "No climate protection" is the globally least desirable state

- Dilemma: Incentives in the climate game
 - "Everybody cooperates on climate change" is globally optimal
 - Every single country is better off if only the others mitigate



- "No climate protection" is the globally least desirable state



• What determines countries' incentives?

Overview

- 1. Has global warming stopped?
- 2. Scope of the challenge
- 3. Energy transformations in a first best world
- 4. An assessment of current climate policy
- 5. Four ideas for tomorrow's climate policy
- 6. Conclusions

More issues: "Issue-Linking"

Idea: Find mechanism to make cost-benefit ratio of climate mitigation (from individual country perspective) more attractive

- Link climate cooperation with R&D cooperation
- Create and link emission trading markets
- Trade sanctions against climate free-riders
- No-regret policies

Reducing the coalition size

Cumulative emissions of countries in the Major Economies Forum on Energy and Climate (MEF). [Year 2008. Only CO₂, without LULUCF emissions]



- Reducing the complexity of negotiation process
- ... but at the price of cost-effectiveness

Carbon Capture and ...

...storage (CCS)



Still, costs are higher than fossil alternatives, but ...



... some technologies are competitive today!



The role of technologies



Renewable energy technologies have witnessed tremendous price decreases !



http://srren.ipcc-wg3.de/report



Linking of regional cap-and trade initiatives



Justification for trade sanctions?



34

No regret policies – Reducing fossil fuel subsidies

Global subsidies for fossil energies: 409 Billion \$ in 2010, a rise of 35% compared to 2009.



No regret policies – Reducing fossil fuel subsidies

- Current subsidies for fossil energies correspond to a negative carbon price of 9US\$ per ton CO₂ on average ! [Source: own calculation]
- Without further reforms, subsidies for fossil fuels will reach 660 Billion Dollar in 2020: 0.7% of global GDP
- Phase-out of subsidies until 2020:
 - Energy demand lowered by 4.1%
 - ➢ Oil demand reduced by 3.7 Millionen Barrel/day
 - > Reduction of CO_2 -emissions by 1.7 Gt
 - Many countries are planning or already implementing reforms:

Most important reason: Pressure on national budgets

IEA World Energy Outlook 2011

Overview

- 1. Has global warming stopped?
- 2. Scope of the challenge
- 3. Energy transformations in a first best world
- 4. An assessment of current climate policy
- 5. Four ideas for tomorrow's climate policy
- 6. Conclusions

Concluding remarks

- Climate change problem will not be solved by resources becoming scarce
- Climate policy can be seen as an insurance against catastrophic risks
- Reaching a 2°C target is still possible at relatively low costs, but
- ... game-theoretical analysis proves the dilemma of international negotiations
- Issue linking and technology policy could break the negotiation stall

Thank you for your attention!

Ottmar.Edenhofer@pik-potsdam.de