

The Role of Uncertainty in CO₂ Emissions Inventories

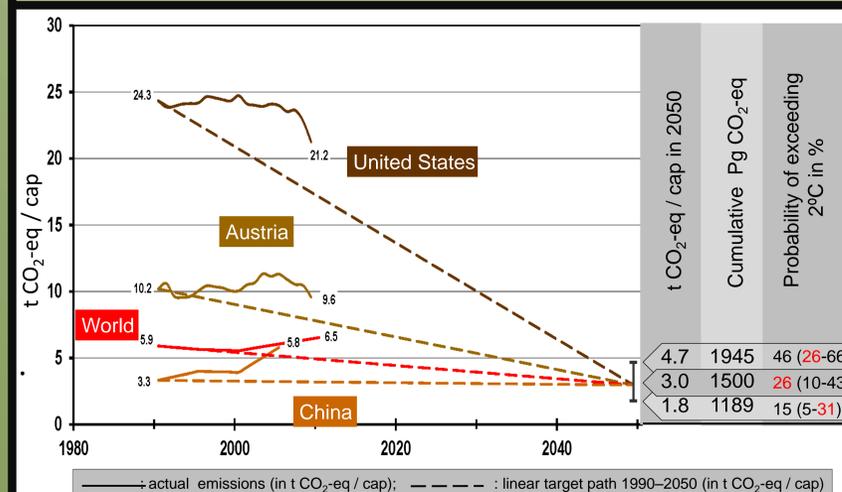
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Setting Targets

Cumulative emissions targets need to be set at the global level but implemented at the national level. There is an uncertain risk in setting climate targets.

Targets and Trajectories



For illustration, setting a target for global convergence to a universal per capita value of greenhouse gas emissions, and limiting cumulative emissions sufficiently to hold the increase in global temperature to 2° C as of 2050. The central projection here is that limiting global emissions to 1500 Pg of CO₂ equivalent between 2000 to 2050 will require limiting per-capita emissions globally to 3 tons of CO₂.

Based on Meinshausen et al., 2009, Nature 458:1158-1162. Data and details are in Jonas et al., 2012, under review.

Projecting Forward

Setting these targets involves a risk that the 2°C target will actually be exceeded. The 3 tons per-capita target bears a risk of 10 - 43% (mean = 26%) that the temperature target will be exceeded.

In turn, one finds 1189 and 1945 Pg of CO₂ equivalent emissions (1.8 and 4.7 tons of CO₂ equivalent per capita) by 2050 for emission targets with levels of risk tolerance encompassing a range between 26-31%.

Projecting forward, we find that uncertainty in current emissions inventories and uncertainty in emissions scenarios lead to uncertainty in emissions outcomes.

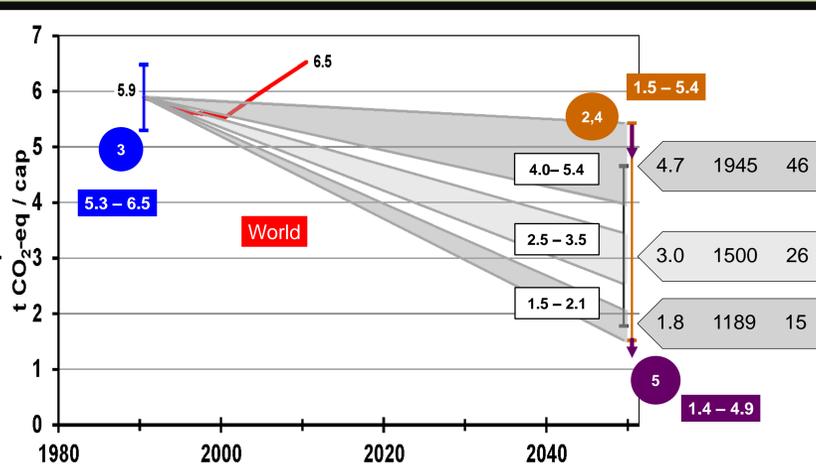
Evaluating Risk

Uncertainties arise for a variety of reasons, are spread over space and time, and vary from a few percent to orders of magnitude.

1. The uncertainty in setting a climate target.
2. The uncertainty in translating to an emissions target.
3. The uncertainty in current emissions.
4. The uncertainty in the emissions path.
5. The uncertainty in meeting targets.

We need a clear and consistent framework for dealing with uncertainty

Grasping Uncertainties

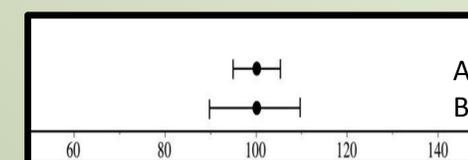


Valuing Commitments

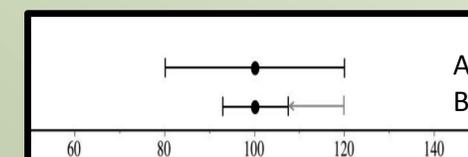
Emissions and offsets need to be valued accurately and fairly to inform all accounting activities and transactions.

- The cost of emissions must ultimately be paid.
- Transactions include taxes, trades, future commitments.
- Emissions come from multiple sources.
- Emissions are distributed in time.
- There is a cost associated with uncertainty.
- There is a risk associated with uncertainty.

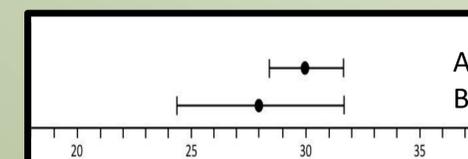
We propose adding a risk charge on uncertainty.



If A represents emissions and B represents offsets, are they equivalent?



If A shows emissions at time zero and B at time t, have emissions been reduced?



If A and B are emissions from two companies, should they pay the same emissions tax?

A risk charge quantifies and values uncertainty to ensure objective decisions and comparisons.

We have greater certainty for what has happened in the past than for what will happen in the future. Uncertainty on the impact and value of emissions can be very large. Given all of the elements of uncertainty, we are challenged to set global targets for limiting the environmental impact of emissions, to distribute those targets among the many Parties responsible for emissions, to evaluate the trajectories toward targets, to understand the risk involved in not meeting targets, to motivate the collective efforts and burden sharing or trading, and to verify that targets have been achieved.