Emission trading

The Regensburg Formula also allows easy implementation of emission trading between countries. The national emission pathways would be the basis for the allocation of emission rights.

The amount of certificates held by country *i* in year *t*, and the modification of the target amount through emission trading, would result from the following formulae:

$$E_t^i = (1 - C_t) * E_{2019}^i + C_t * TA_{t-1}^i + T_t^i$$

$$TA_{2019}^i = E_{CY}^i$$

$$TA_t^i = TA_{t-1}^i + T_t^i$$

T_t^i = trade volume bought or sold by country i for year t

TA_t^i = target amount of country i in year t

Main advantages of emission trading between countries based on national emission pathways:

- Flexibility: no country would have to agree on unalterable emission limitation.
- Cost efficiency: a global price for CO_2 would be generated, which would ensure that reductions would first be made where it is possible in the most cost-efficient way.
- Review-process: Annual check-ups can examine whether a country has enough certificates.

Paris Agreement:
ratchet up mechanism

Up to the climate conference in Paris reported self-imposed goals of States (INDCs) to the UN climate secretariat are not enough to fall below the 2°C limit. Therefore, a ratchet up mechanism was agreed in Paris, which begins in 2018. In this process, the States should report increasingly ambitions.

The Regensburg Model offers the opportunity of comparing these offers with **concrete reference values**. One might envisage more climate justice in this indirect distribution of the remaining budget, but the model nevertheless allows powerful statements if (I)NDCs in particular of developed countries should not even meet the criterion of converging per capita emissions.

Download tools and further information:

www.save-the-climate.info

Authors:
Professor Manfred Sargl
Andreas Wolfsteiner, Master of Economics
Günter Wittmann, Master of Mathematics

Contact: save-the-climate@online.ms

The Regensburg Model
Distribution of the remaining CO_2 budget on the basis of converging per capita emissions

CO_2 acts in the atmosphere for a long time. Therefore, the IPCC has published a budget which meets the **2°C limit** with a probability of over 66%. This means we have a remaining budget of about **1,000 Gt from 2012 onwards.** We currently emit annually about 40 Gt.

This remaining budget raises the question of how it can be distributed amongst the countries in a **fair** and **economically reasonable** way. This distribution should be the result of climate negotiations. Without binding distribution agreements, responsibility will always be laid on the others. We will also have to deal with the question of finding a fair distribution criterion when calculating reference values and self-imposed targets.

Basic idea behind the Regensburg Model

(1) A **global emission pathway** is determined, which is compatible with the **2°C limit**.

(2) National emission pathways are derived, which gradually implement the idea of a „**one human – one emission right**“.

The Regensburg Model

(1) Determination of a **global pathway**, which complies with a set target budget.

(2) Derivation of national pathways from this global pathway with the following **Regensburg Formula:**

$$E_t^i = (1 - C_t) * E_{2019}^i + C_t * E_{CY}^i$$

where:

$$E_{CY}^i = \frac{E_{CY}}{P_{CY}} * P_{CY}^i$$

$$C_t = \frac{E_{2019} - E_t}{E_{2019} - E_{CY}} = \frac{reduced\ amount}{reduction\ amount}$$

E_t^i: emissions of country *i* in year *t*
C_t: weighting factor in year *t*
CY: convergence year
E_{CY}^i: emissions of country *i* in *CY*
E_{CY}: global emissions in *CY*
P_{CY}: global population in *CY*
P_{CY}^i: population of country *i* in *CY*
E_t: global emissions in year *t*

Converging per capita emissions

The emissions of a country start off with the current emissions in the base year (E_{2019}^i; C_{2019} = 0) and end at the emissions in the convergence year (E_{CY}^i; C_{CY} = 1). As E_{CY}^i results from multiplying this country's population (P_{CY}^i) with the average global per-capita emissions in the convergence year, equal per-capita rights are implemented step-by-step (see fig. 3).

2°C limit

The weighting factor (C_t) is derived from the global pathway in such a way as that the sum of emissions between 2020 and the convergence year across all countries adds up to the budget which forms the basis of the chosen global emission pathway. If this budget is compatible with the **2°C limit**, this also applies to the **national pathways**.

Tools

We have developed an excel tool and a simpler web application (www.climate-calculator.info), where global emission pathways which meet a set CO_2 budget and also show an appropriate trajectory can be determined.

Additionally, a database is provided, so that for virtually any country in the world national emission pathways can be derived with the Regensburg Formula.

The tool provides two ways:

1. Fixed convergence year 2050.
2. Selectable convergence level. The convergence year then results in each selected global path.

We also offer a separate excel tool to determine smooth global paths only.

Exemplary emission pathways

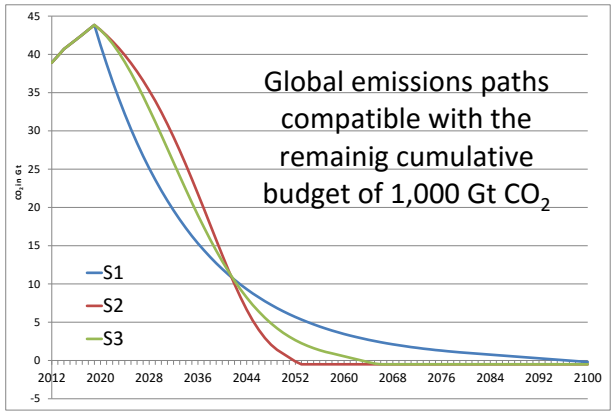

Figure 1

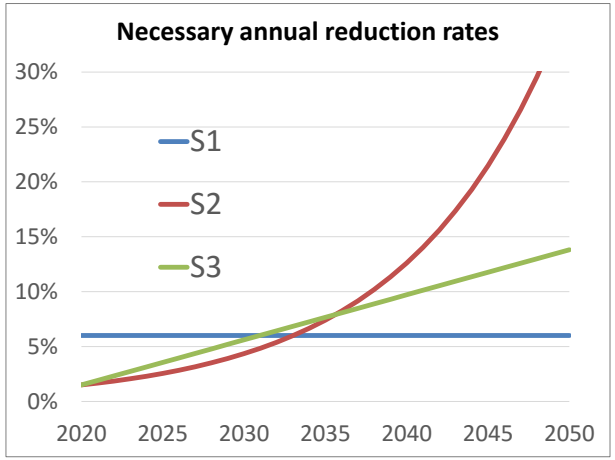

Figure 2

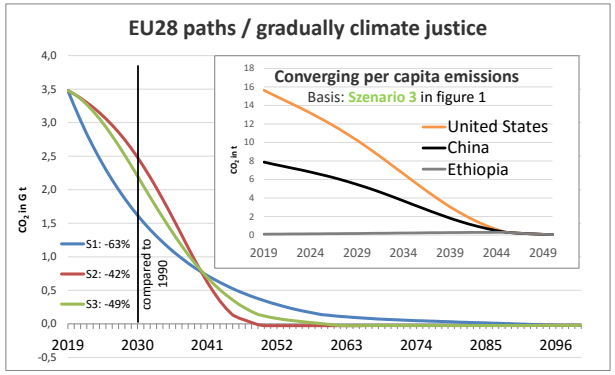

Figure 3