

Implicit weighting of the population in the allocation of a global CO2 budget

The starting point is the allocation of a global CO2 budget with a weighted distribution key.

The weighted distribution key takes into account the share of the global population and the share of global emissions of the selected country in a base year (BY):

$$B^i = \left(C * \frac{P_{BY}^i}{P_{BY}} + (1 - C) * \frac{E_{BY}^i}{E_{BY}} \right) * B$$

where

B or B^i global CO2 budget or national CO2 budget of the country i

E_{BY} or E_{BY}^i global emissions or emissions of country i in a base year

P_{BY} or P_{BY}^i global population or population of country i in a base year

C weighting of the population

This distribution key can thus map the two most important factors:

- current reality
- climate justice

For further possible criteria, see the corresponding excursus in (Sargl, et al., 2023a).

Given a national budget, the implicit weighting of the population can be calculated:

$$C = \frac{B^i - B * \frac{E_{BY}^i}{E_{BY}}}{B * \left(\frac{P_{BY}^i}{P_{BY}} - \frac{E_{BY}^i}{E_{BY}} \right)} = \text{IWP}$$

The national budget can be derived

- from an NDC,
- national climate change legislation (cf. Wolfsteiner, 2023) or
- a resource sharing model (Sargl, et al., 2023c) such as the Regensburg Model (Sargl, et al., 2023b).

If the national budget is derived from national targets, the IWP can be used to evaluate them (Wolfsteiner & Wittmann, 2023).

In the Regensburg Model, a global path is distributed among countries with converging per capita emissions. There, IWP is an important indicator for the resulting national budgets. Depending on the selected global emission path and the selected convergence level, the IWP in the Regensburg Model is the same for all countries (Wittmann & Wolfsteiner, 2023).

The IWP in the Regensburg Model can be used in our Extended Smooth Pathway Model (ESPM) to derive a plausible national emission path with different scenario types based on a national budget calculated with the above formula for B^i and with the IWP. Here is an overview of tools and papers on the ESPM: <http://climate-calculator.info>.

References

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