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

The tool is based on the distribution of a global CO2 budget using 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*):

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

where

$E_{BY}\ or\ E^i_{BY}$	global emissions or emissions of country *i* in the base year
$P_{BY}\ or\ P^i_{BY}$	global population or population of country *i* in the base year
B	global CO2 budget
B^i	national CO2 budget of the country *i*
C	weighting of the population

Implicit Weighting Population (IWP)

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

$$\mathrm{C} = \frac{B^i - B * \frac{E^i_{BY}}{E_{BY}}}{B * (\frac{P^i_{BY}}{P_{BY}} - \frac{E^i_{BY}}{E_{BY}})} = IWP$$

The national budget can be derived from an NDC, for example. The IWP can thus be used to **evaluate NDCs**. The base year is 2019 and the budget period is 2020 - 2100 when calculating the implicit weighting.

Explicit Weighting Population

This tool can also be used to **calculate** the **national budget** for **any country in the world** by explicitly specifying the population weighting (see also our web app). The national budgets from 2020 on are given with a distribution of the global budget from 2016 or from 2020. With our web app http://espm.climate-calculator.info or a corresponding Excel tool, plausible emission paths can be derived from these national budgets.

Database used

With the EDGAR database, the EU provides the emissions of all countries in the world due to the use of fossil fuels and cement production. For the EU, data from the European Environment Agency (EEA) can also be accessed, which also provides total CO2 emissions including land-use changes. The IWP or the national budgets refer to the respective data basis used.

References

Sargl, M., Wiegand, D., Wittmann, G. & Wolfsteiner, A., 2022. *Berechnung Paris-kompatibler Emissionspfade mit dem ESPM am Beispiel Deutschlands und der EU.* [Online]
Available at: https://doi.org/10.5281/zenodo.5678717

Sargl, M., Wiegand, D., Wittmann, G. & Wolfsteiner, A., 2022. *Calculation of Paris-compatible emission targets for the six largest emitters with the ESPM.* [Online]
Available at: https://doi.org/10.5281/zenodo.4764408

Sargl, M., Wiegand, D., Wittmann, G. & Wolfsteiner, A., 2022. *Distribution of a Global CO2 Budget - A Comparison of Resource Sharing Models.* [Online]
Available at: https://doi.org/10.5281/zenodo.4603032