Metrics and stabilization of the climate – GCP, GTP and CETP

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Stabilizing below 2°C cost-effectively

GWP was not designed to facilitate the basket approach in a cost effective stabilization regime.
Global Cost Potential (GCP)

Comparison GCP and GTP for CH$_4$

Results from runs with the MiMiC model (Azar, Johansson & Persson)


\[
GTP(t) = \frac{\Delta T_X(t)}{\Delta T_{CO_2}(t)}
\]
Cost-Effective Temperature Potential (CETP)

An approximation of GCP.

Includes:
- physical information,
- an estimate of stabilisation year,
- discount rate.

The time integrated discounted temperature pulse beyond the year the stabilization target is met.

\[
CETP(t) = \frac{\int_{t}^{\infty} \Delta T_{X}(\tau) e^{-r(\tau)} d\tau}{\int_{t}^{\infty} \Delta T_{CO_{2}}(\tau) e^{-r(\tau)} d\tau}
\]

\[e^{-r\tau} = \text{Discount factor}\]

\[r\text{-discount rate}\]

\[\tau\text{-time}\]

Comparison of CETP, GCP & GTP for CH₄

Discount rate 4 %, using a simple IAM

Global Energy Transition (GET) model

Energy balance model (Upwelling Diffusion)

Greenhouse gas cycles, aerosols

Radiative forcing

Energy system

C-cycle feedback

Supply
- biomass
- hydro
- wind
- solar
- nat. gas
- oil
- coal
- nuclear

Energy conversion system

Transportation system and technologies

Demand
- transportation
- industry
- electricity
- heat

MAC-curves

CO₂ storage

CO₂, CH₄, N₂O, aerosols, etc.

Non-energy emission baselines
Comparison of CETP, GCP & GTP for CH₄
Discount rate 5 %, using a complex IAM (GET) – preliminary results
Conclusion

• The GWP was not constructed to facilitate the implementation of cost-effective climate stabilization regime…
• … although it has enabled the implementation of the basket approach.
• Using cost effective trade-off ratios (Global Cost Potential - GCP) instead of the GWP could enhance the cost-effectiveness of a stabilization regime…
• … but one would then depend on complex optimizing IAMs.
• However, the CETP approximate the GCP well under a range of assumptions and models structures.
THANK YOU!

Questions, comments?