Impact of Emission Metrics on Mitigation Scenarios

Comparing emissions and costs through GWPs and GTP

November 12 | IAMC meeting, Utrecht
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Introduction

- **Motivation: UNFCCC decision**
  - Use AR4 GWPs for 2nd commitment period (2012 – 2017/2020)
  - Assess impact of metric choice on KP commitment period

- **Scenario Set-up**
  - Solve scenarios from 1 baseline for 3.7 W/m²
  - Allow for flexibility in timing and choice of GHG
  - Six different metrics explored
    - GWP: SAR, TAR, and AR4 100-year GWPs
    - GWP: AR4 20 year, AR4 500 year
    - GTP
Emission Metric

- Both GWP and GTP are based on a GHG pulse emission

- GWP versus GTP
  - **GWP**
    > Integrated contribution to radiative forcing
    > Integrated over a fixed time period (e.g. 100 years)
    > Independent of time
  - **GTP**
    > Contribution to temperature in a certain year
    > Integration over variable time period
    > Time-dependent
Baseline Emissions

- Expression of CH$_4$ emissions (here illustrated for baseline) depends strongly on metric
Outcome mitigation scenarios (Emissions)

SAR, TAR and AR4 100-year GWP

Hardly any influence on timing of emissions from choice between SAR, TAR and AR4 GWPs
Outcome mitigation scenarios (Emissions)

AR4, 20-100,500 year and GTP

CH$_4$ emissions (and to some degree CO$_2$) emissions clearly influenced between more extreme differences in metric.
Outcome mitigation scenarios (Emissions)

Discounted abatement costs

Costs depend to some degree on the metric (especially AR4 – 500 year expensive)
Conclusions

- Using different GWP values has small impact on global costs
  - exception: 500 year GWP
- The profile of global non-CO₂ reductions not very sensitive to the changes in 100-year GWP values in SAR, TAR and AR4
- Choice of metric can impact the profile of methane reductions
  - for large changes in metric values
- Impact of different metric values on temperature is small
- Regional impact of different metric values might diverge from global results
Carbon price
Temperature

![Graph showing temperature over time with different emissions metrics]

- AR4
- TAR
- SAR

![Graph showing temperature over time with different time spans]

- AR4 20yr
- AR4 500yr
- GTP