



PBL Netherlands Environmental  
Assessment Agency

# Impact of Emission Metrics on Mitigation Scenarios

Comparing emissions and  
costs through GWPs and  
GTP

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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  $3.7 \text{ W/m}^2$
  - 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

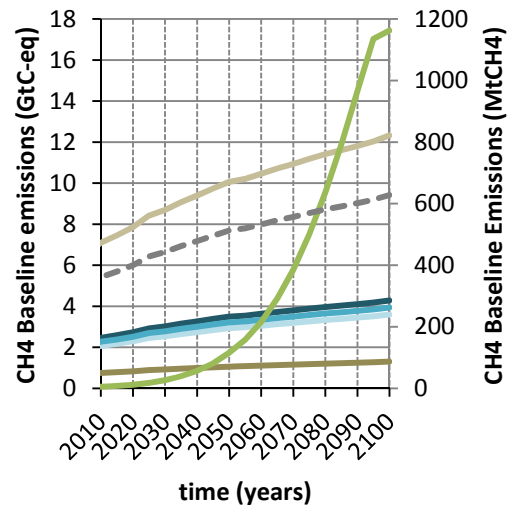


## Emission Metric

- 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

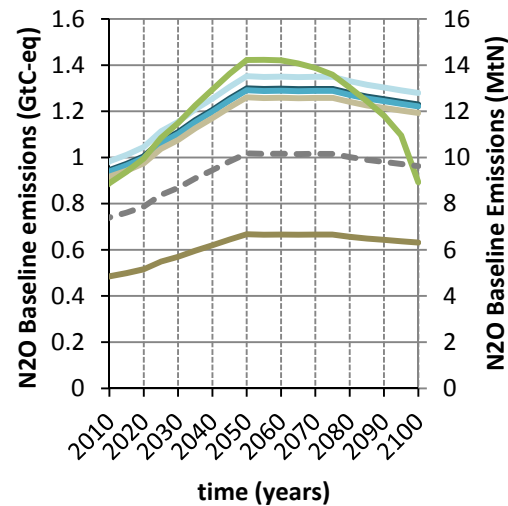


## Baseline Emissions



— CH4 AR4 100yr — CH4 SAR  
— CH4 AR4 500yr — CH4 TAR  
— CH4 AR4 20yr — CH4 GTP  
- - - CH4 (MtCH4)

CH<sub>4</sub>



— N2O AR4 100yr — N2O SAR  
— N2O AR4 500yr — N2O TAR  
— N2O AR4 20yr — N2O GTP  
- - - N2O (MtN)

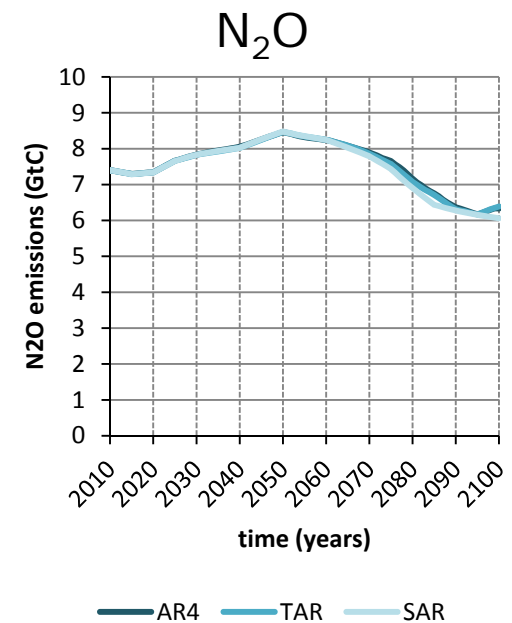
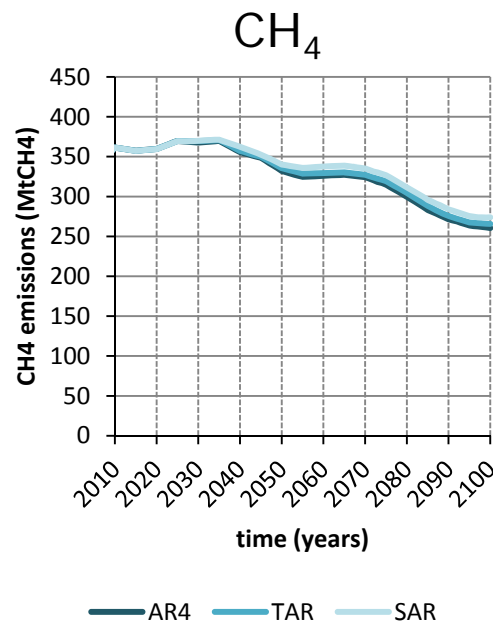
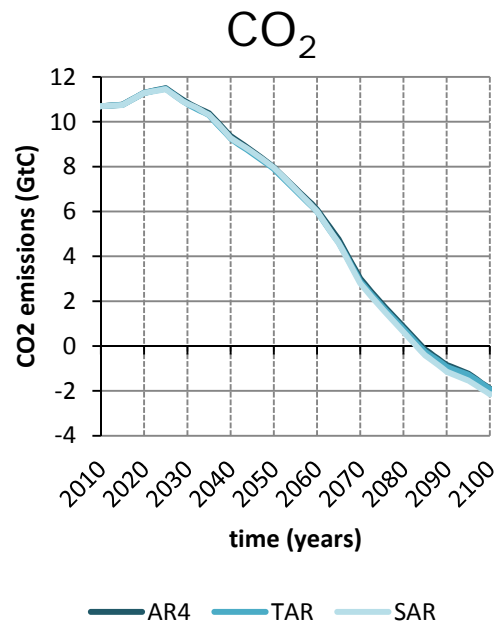
N<sub>2</sub>O

- Expression of CH<sub>4</sub> emissions (here illustrated for baseline) depends strongly on metric)



# Outcome mitigation scenarios (Emissions)

SAR, TAR and AR4 100-year GWP

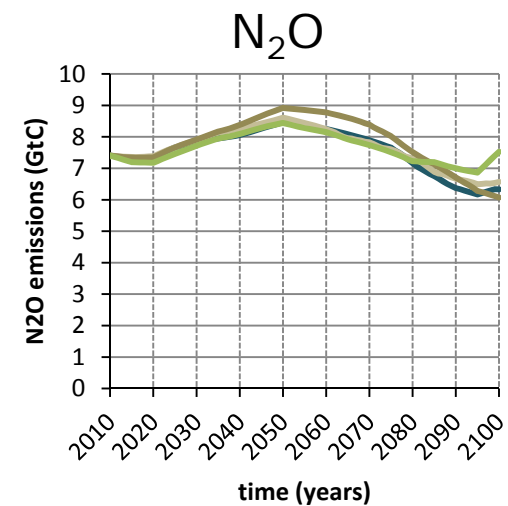
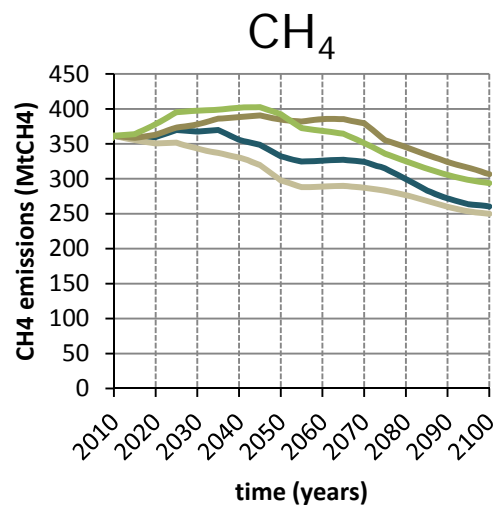
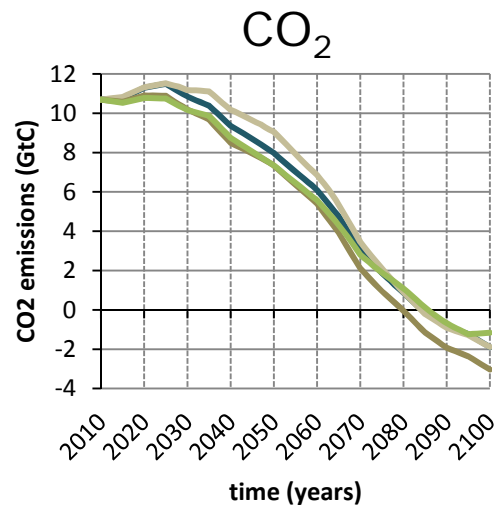


Hardly any influence on timing of emissions from choice between SAR, TAR and AR4 GWPs



## Outcome mitigation scenarios (Emissions)

AR4, 20-100,500 year and GTP



— AR4 — AR4 20yr  
— AR4 500yr — GTP

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— AR4 500yr — GTP

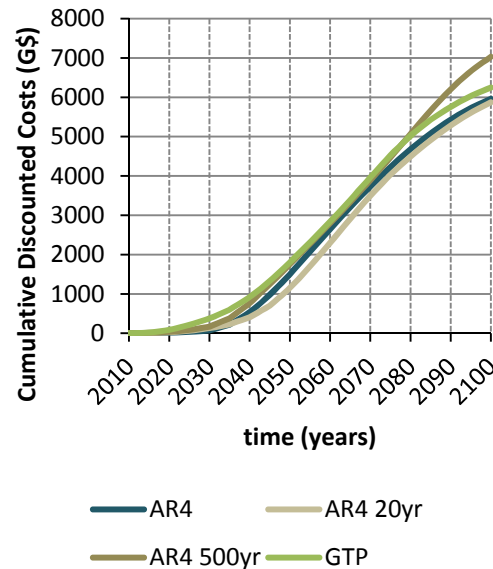
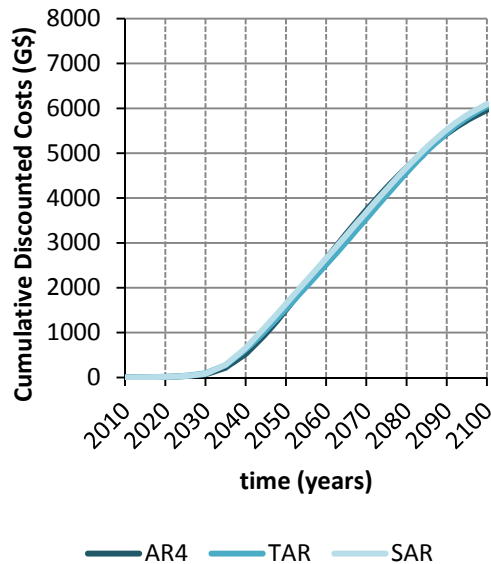
— AR4 — AR4 20yr  
— AR4 500yr — GTP

CH<sub>4</sub> emissions (and to some degree CO<sub>2</sub>) 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)



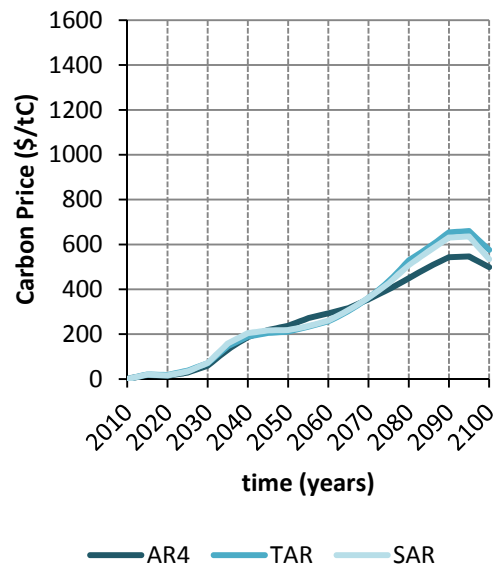
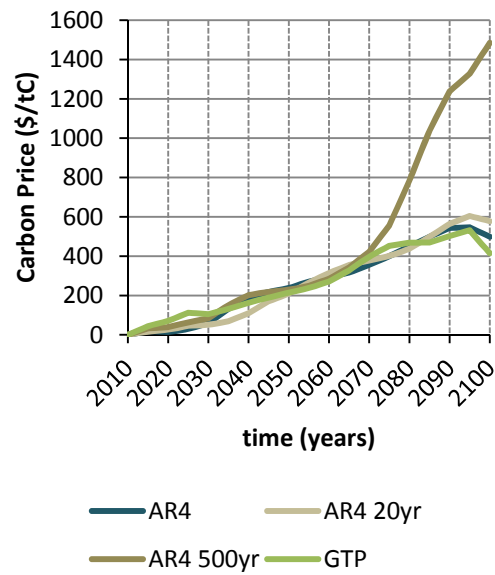
## Conclusions

- Using different GWP values has small impact on global costs
  - exception: 500 year GWP
- The profile of global non-CO<sub>2</sub> 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

