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Are we on track towards the long term sustainability targets?

Task Force on Integrated Assessment Modelling
43rd Session, Helsinki, May 6-7, 2014

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How to quantify sustainability targets for air pollution impacts?

Strict interpretation of no-effect levels:

- Human health:
  - WHO review does not support a no-effect threshold
  - Some PM/O3 will always originate from natural sources
  - Thus no space left for anthropogenic emissions
  - GAINS does not model complete elimination of (or negative) anthropogenic emissions

- Ecosystems:
  - Full achievement of critical loads and critical levels
  - Some critical loads are below natural background levels negative anthropogenic (non-CO2) emissions are unrealistic, and not modelled in GAINS

Alternative approaches

- EU Environment Action Program:

  "to achieve levels of air quality that do not give rise to significant negative impacts on, and risks to, human health and environment."

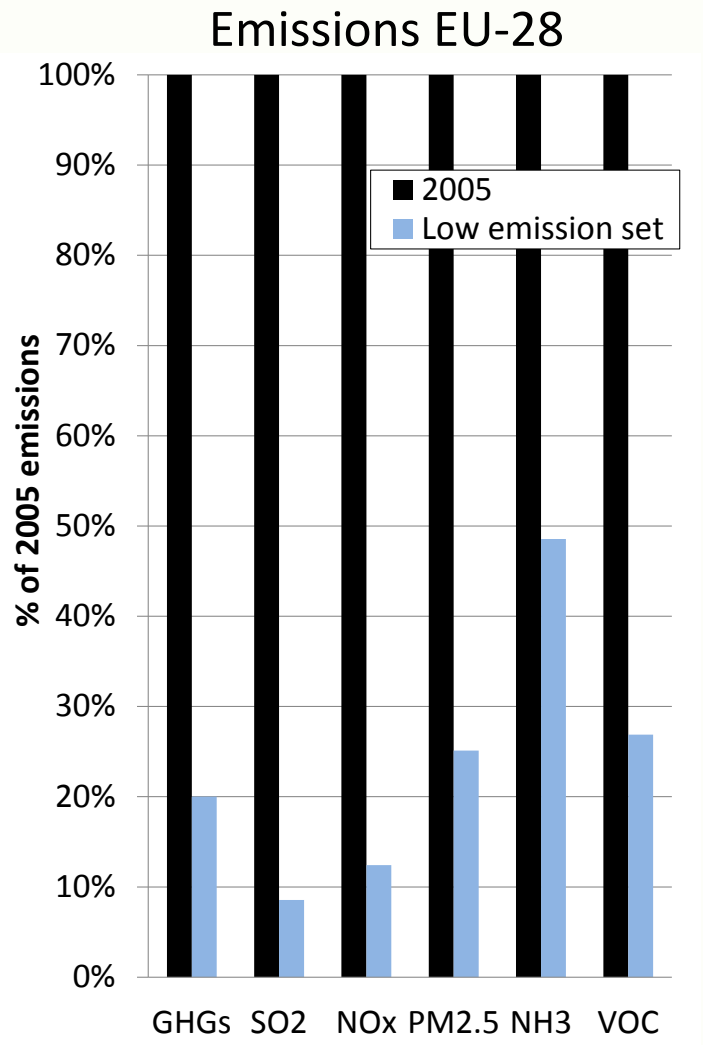
  – *But what is 'significant'?*

- For this work:

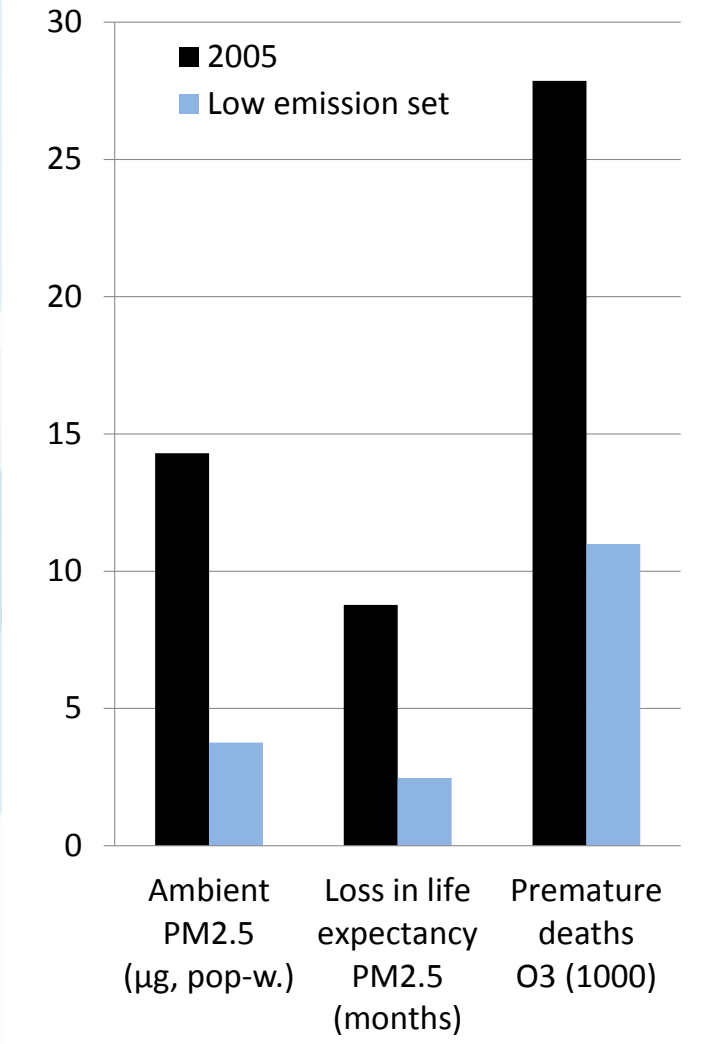
  Would the lowest emission levels that could be modelled in GAINS still lead to robust estimates of harmful impacts to human health and ecosystems?

Assumptions for an illustrative set of low emissions

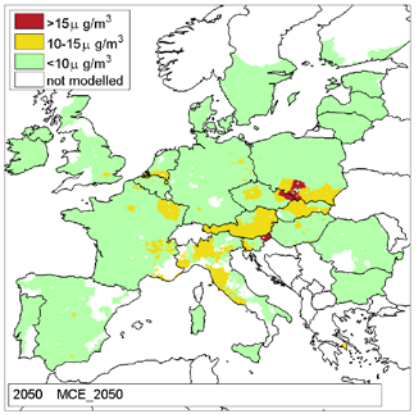
- PRIMES most stringent low carbon scenario (-80% GHGs) in 2050
- Healthy diet
- Full application of the currently available most efficient emission control technologies to the entire capital stock, assuming:
  - complete turnover of existing capital stock,
  - continued concentration process in agriculture towards large farms.
- Still a conservative estimate, because:
  - no additional behavioral changes,
  - no further phase-out of solid fuels for domestic heating,
  - no learning/technological progress.



Health impact indicators of the illustrative low emission set



PM2.5 in AQ management zones

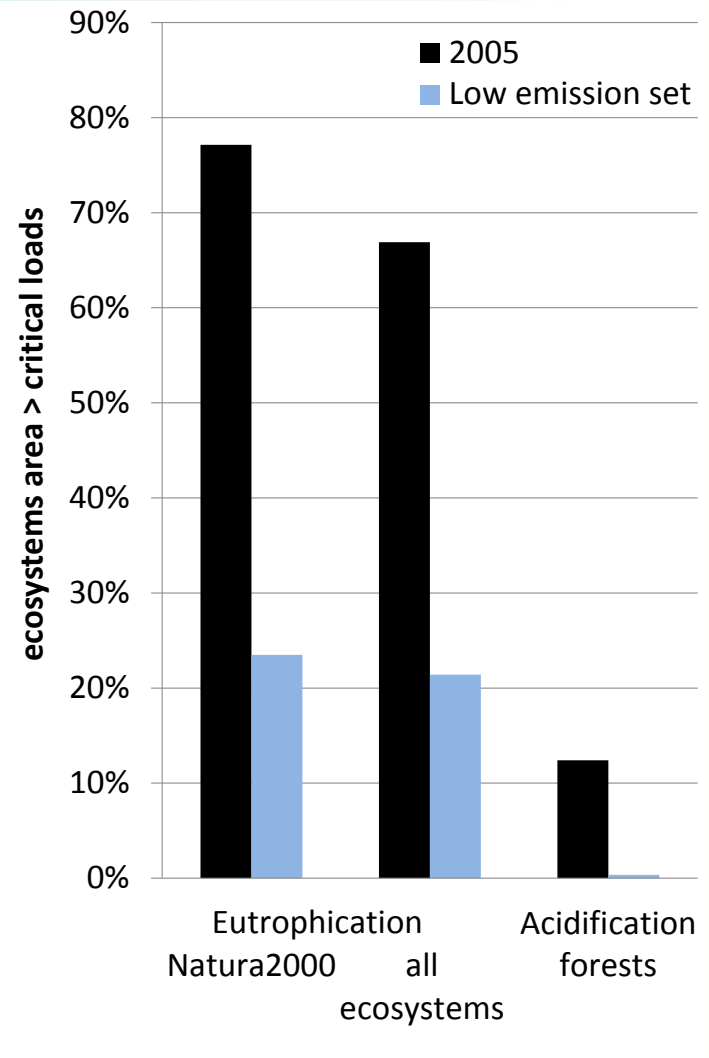


Caveats:

- Computed with GAINS S-R relations, outside the validated emission range
- PM exposure below evidence from Pope et al. study
- No change in background O_3 assumed

Although some health damage is computed, robustness of estimates is questionable

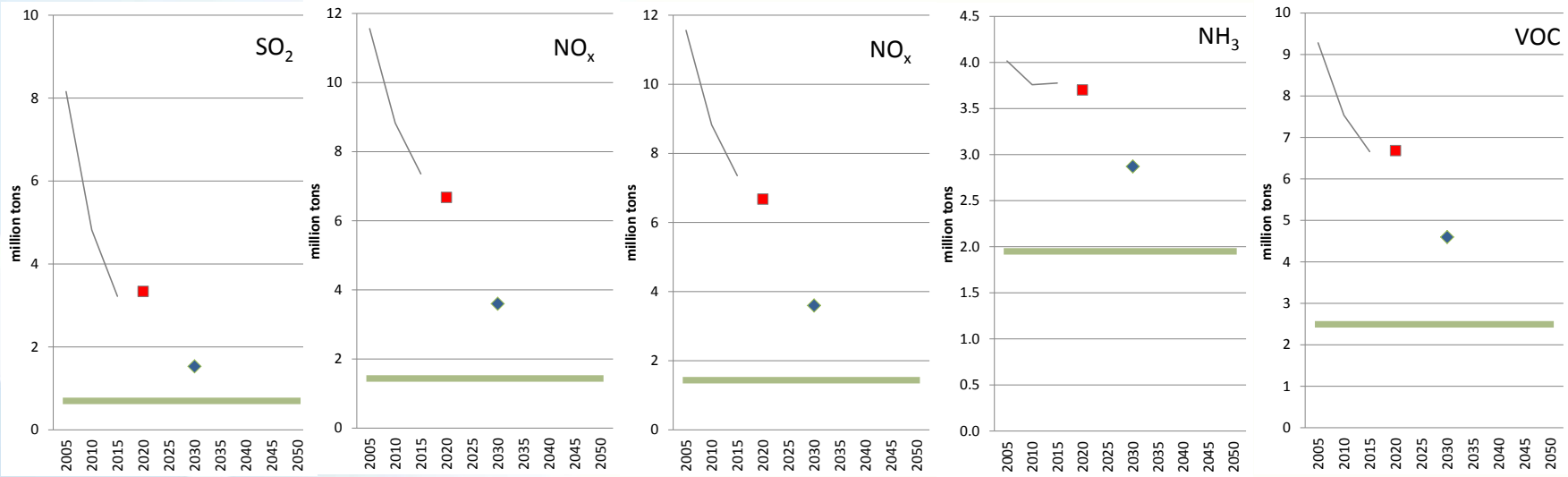
Vegetation impact indicators of the illustrative low emission set



Caveats:

- Computed with GAINS S-R relations, outside the validated emission range
- N-deposition computed with 28km resolution, additional potential from local measures not quantified

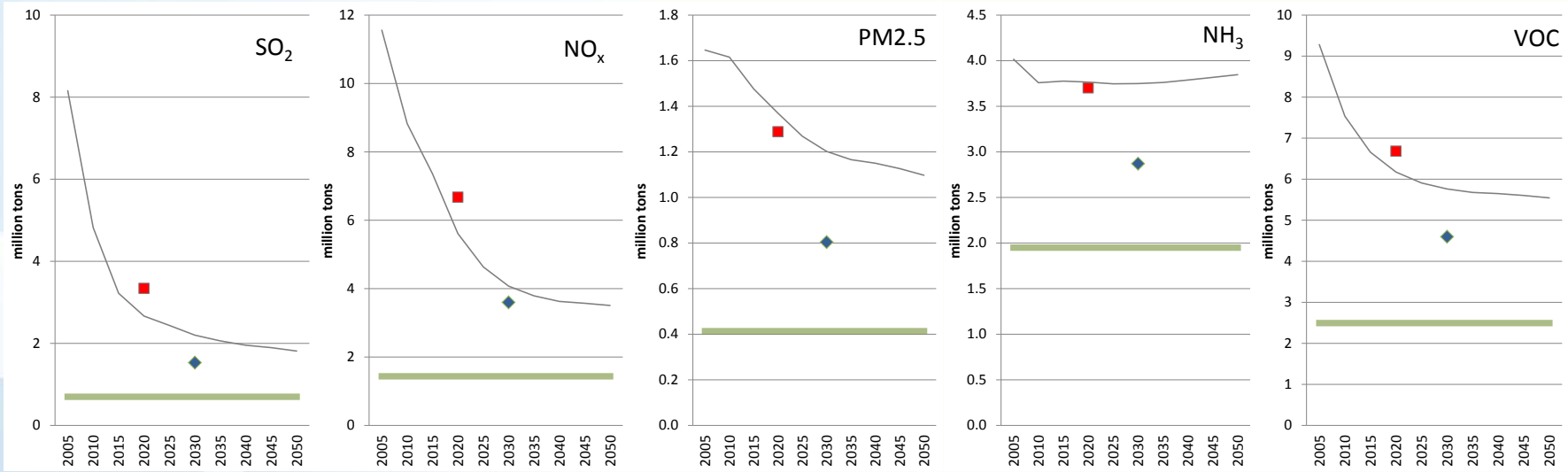
Are we on track?



- A simplistic linear extrapolation of past trends, Gothenburg Protocol and proposed NEC ceilings would suggest achievement of the 'low emission set' by ~2030/2040, except for NH3

Baseline with current legislation
Gothenburg ceilings
Proposed NEC ceilings
Illustrative low emission set

Are we on track?
2: Without further policies (Baseline CLE)



- However, without additional policies, the dynamics of the 'Current Legislation' Baseline suggest a clear flattening out of emission reductions over time, and would miss the 'targets' for all pollutants by more than a factor of two, even in 2050

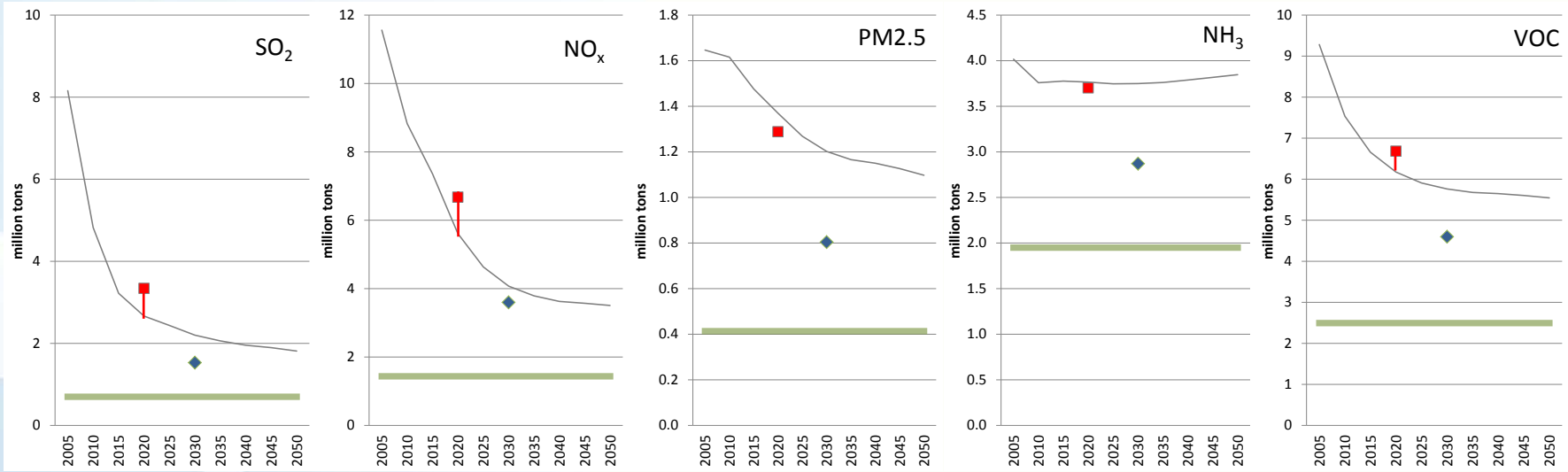
Baseline with current legislation

Gothenburg ceilings

Proposed NEC ceilings

Illustrative low emission set

Are we on track?
3: The Gothenburg targets



- The Gothenburg targets (which are less ambitious than the CLE Baseline) will weaken the incentives for the implementation of current legislation (except for PM2.5), and thereby delay the achievement of the long-term objectives even more.

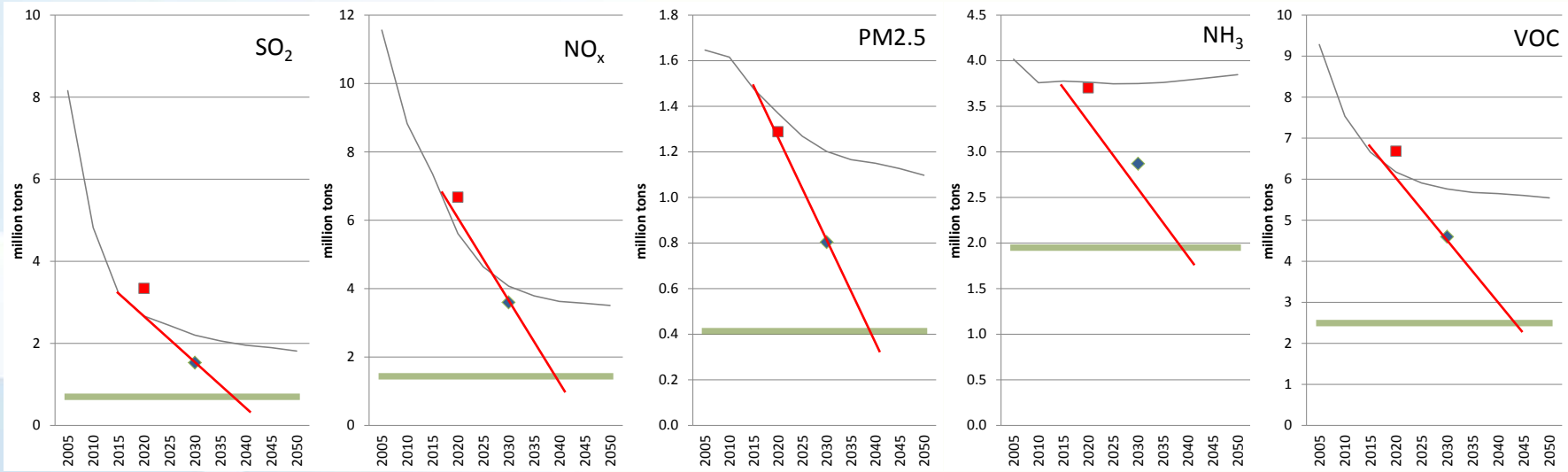
Baseline with current legislation

Gothenburg ceilings

Proposed NEC ceilings

Illustrative low emission set

Are we on track?
4: The NEC targets for 2030



- The proposed NEC targets will move significantly closer towards the illustrative low emission set.
  However, ambitious further action after 2030 will be necessary to achieve the low emission sets.

Baseline with current legislation
Gothenburg ceilings
Proposed NEC ceilings
Illustrative low emission set

Conclusions

- An illustrative low emission set has been developed.
- Assuming such low emissions in the whole EMEP domain (including Sea regions), computed health and vegetation damage would remain within the likely uncertainty range of the estimates. However, the cost-effectiveness of these emission reductions has not been examined.
- The 'Current Legislation' Baseline will miss for all pollutants the low emission set by ~ a factor of two, even in 2050
- The Gothenburg emission ceilings for 2020 could decrease the incentives for implementing already decided legislation, and thereby delay the achievement of the long-term objectives.
- The NEC ceilings proposed for 2030 would move substantially closer to the low emission set. However, further action after 2030 will be necessary to achieve the long-term objectives.