

TFIAM-CIAM

Policy brief and recent modelling results

TFIAM & CIAM team

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TFIAM/CIAM Policy brief on potential targets to reduce risks for health and ecosystems

- An informal document updated throughout the GP revision process
- Documenting modelling progress and results in support of the GPR
  - Feasibility of an overarching risk-based goal for the Convention for impacts on health and biodiversity
  - Support to decision makers for negotiating emission reduction commitments and flexibilities
- Draft version 7 made available for HoD
- Key changes compared to the v6
  - Updated Baseline and other improvements in the modelling
  - Focus on key analyses requested by EB (further analyses in annexes and reference to policy brief v6)
- V7 will be completed for EB-46

Available online: https://iiasa.ac.at/policy/applications/task-force-on-integrated-assessment-modelling-tfiam-under-lrtap-convention

TFIAM/CIAM Policy brief – Principal updates in GAINS

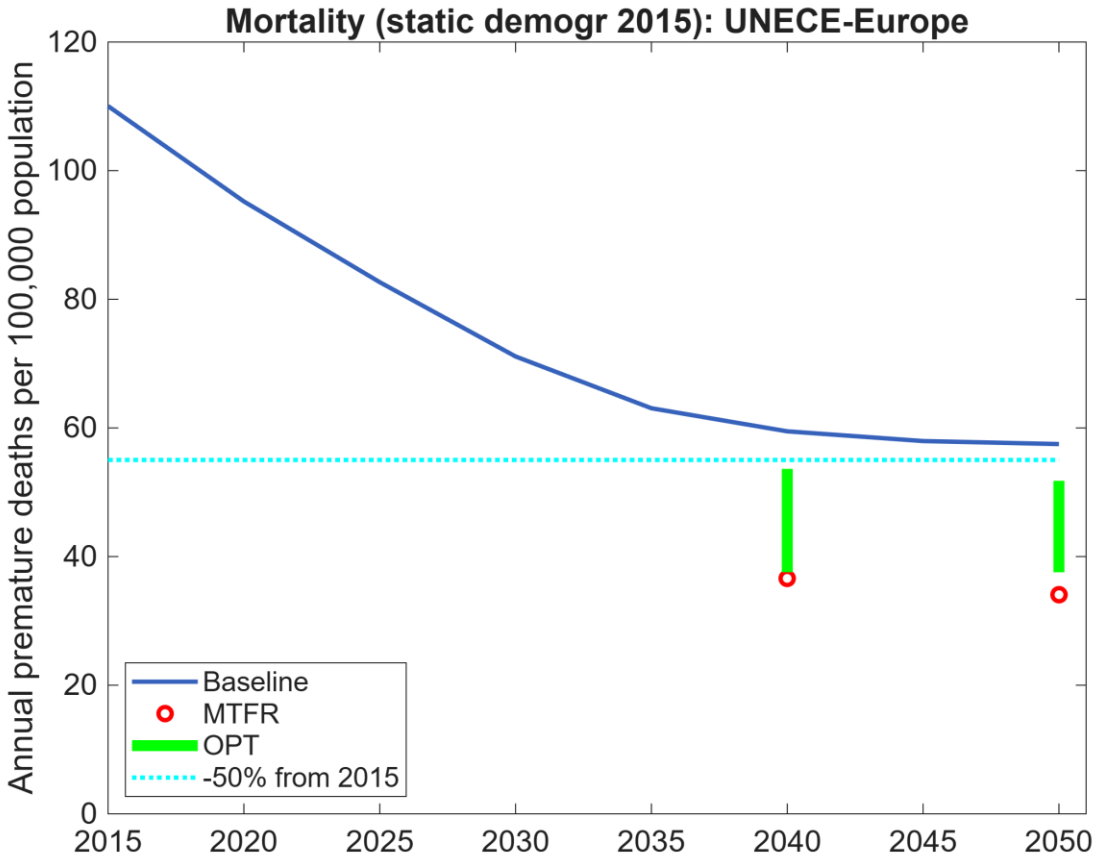
- Updated baseline scenario – v7a
  - including the most recent energy and agricultural projections and national comments, where appropriate
- Updated cost-estimates and modelling for ammonia abatement (collaboration with TFRN)
  - Full accounting of mineral N fertilizer saving due to NH_3 abatement (previously assuming 50%); fertilizer price about 1 €/kg N (lower than price spikes during recent crises),
  - New abatement option in GAINS: manure acidification for treatment of liquid manures
  - Explicit consideration of the size structure in GAINS (country- and animal type-specific),
  - Projections include change of farm-size distribution (previously fixed average farm size),
  - Costs and applicability of measures depend on the size of operation, and these can be better considered now
- Costs for residential solid fuel burning for non-EU were updated and harmonized with the EU costs

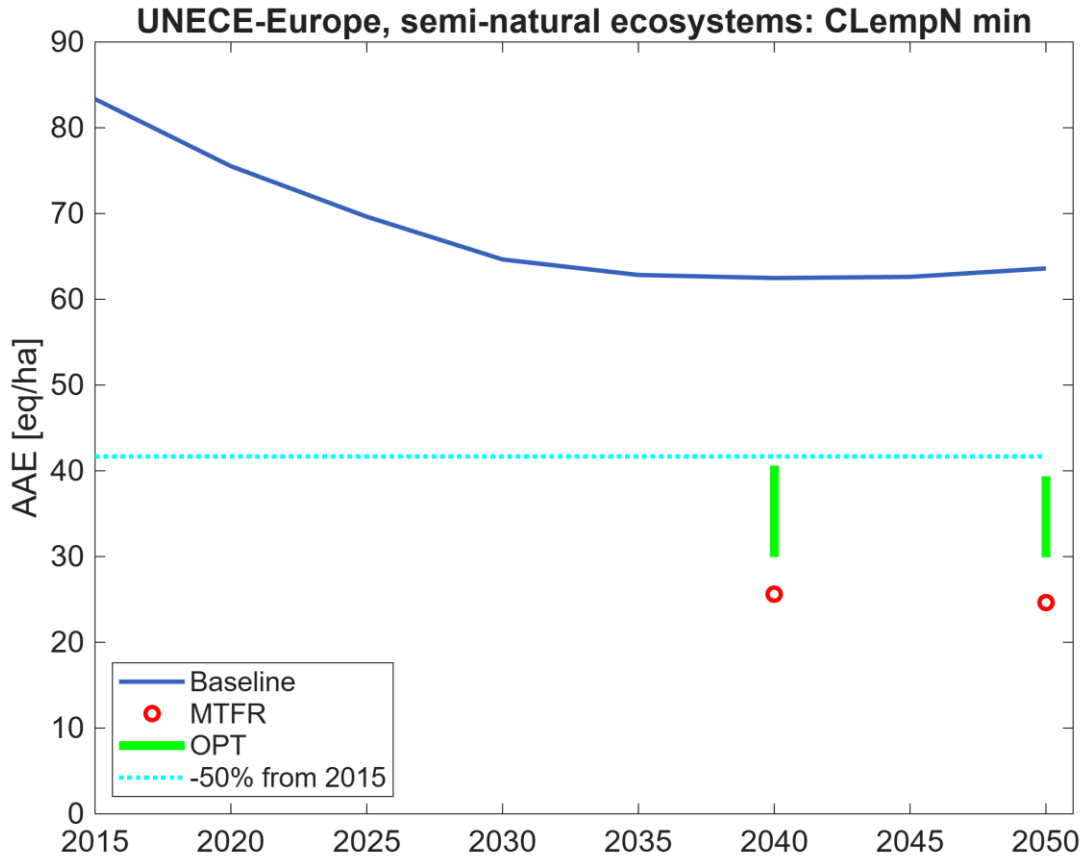
TFIAM/CIAM Policy brief – Key assumptions for the optimized scenarios

- Asses **least-cost solutions** (=optimize) **for 2040, 2050 relative to 2015**
- Optimize reaching targets **cost-effectively across the UNECE** (domain wide optimization, including non-parties Tajikistan, Turkmenistan, Uzbekistan)
- Optimisation jointly for **health and biodiversity**
- **Target** setting with **static population**
- **Target** setting **for variable ambition levels**
  - Range for health ambition (-50% to -65% reduction of premature mortality)
  - Range for biodiversity target (-35% to -50% reduction of AAE above CLempNmin)
- **4 ecosystems excluded from target setting** (out of 50 EUNIS level 3 aggregated ecosystems)

Feasibility assessment – UNECE Europe (v7a)

Green bars shows the outcomes for the whole range of optimization scenarios from 50%/35% to 65%/50%



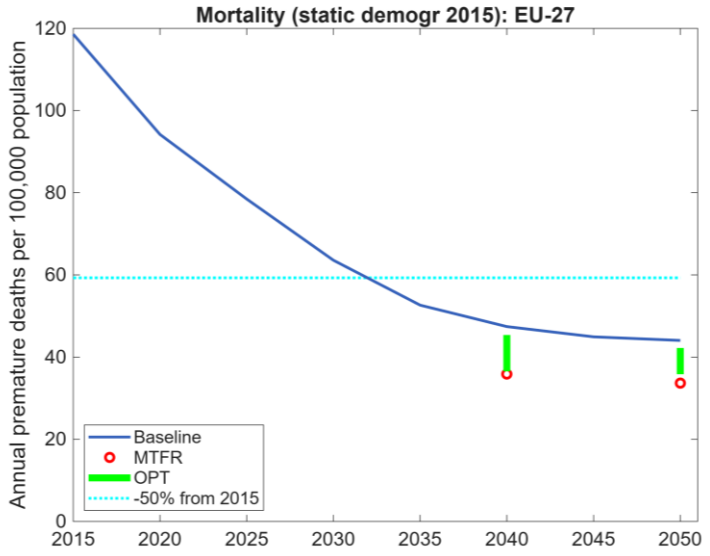


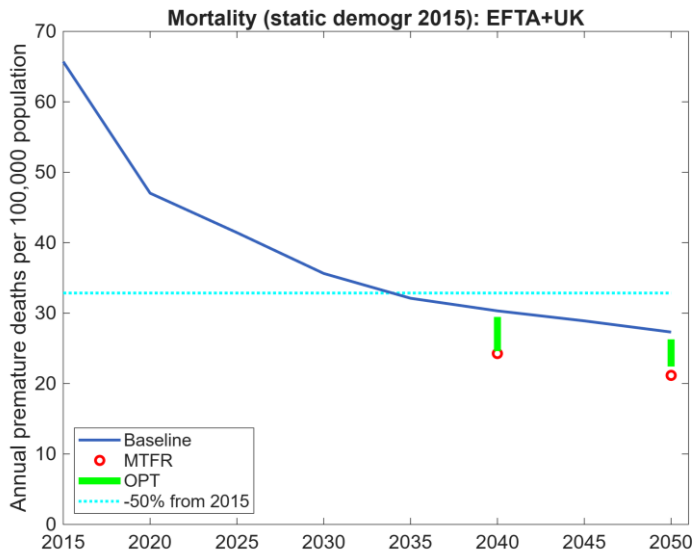
Source: GAINS model (CIAM/IIASA)

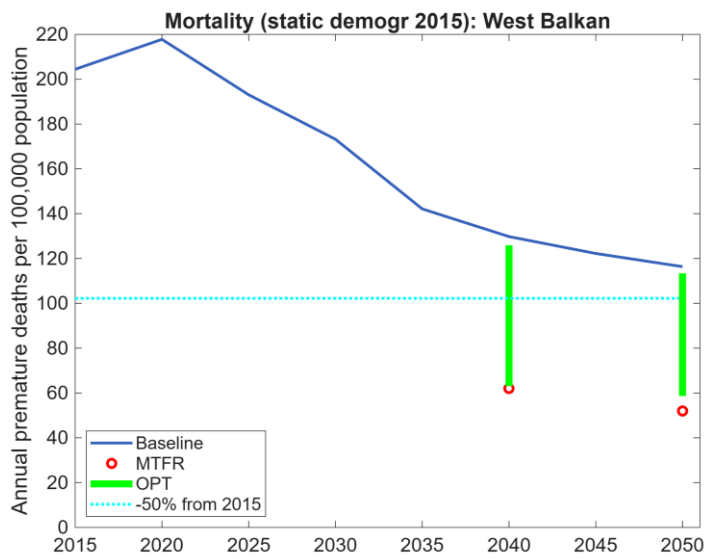
Mortality rates attributable to $PM_{2.5}$

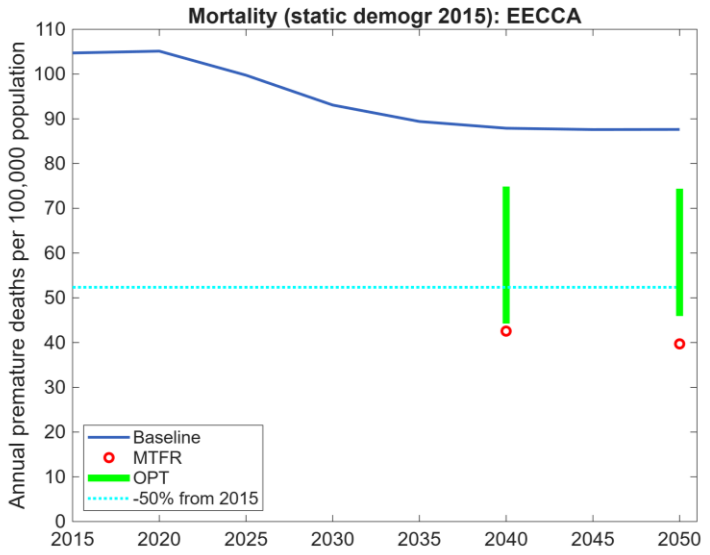
Source: GAINS model (CIAM/IIASA)

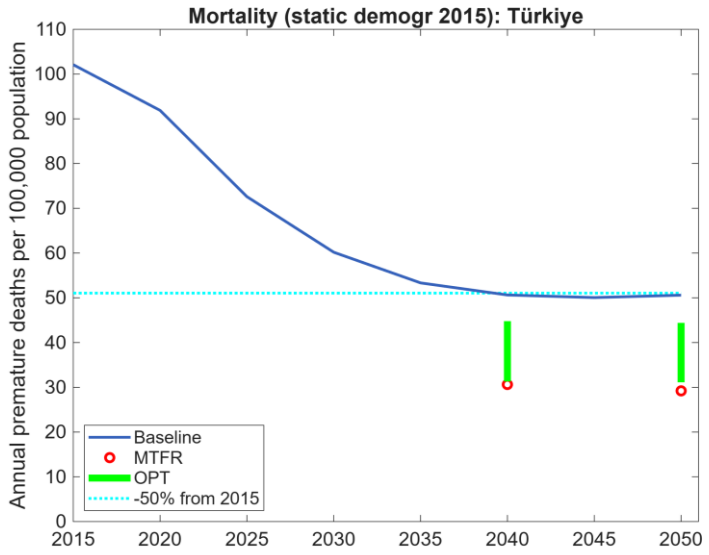
Green bars shows the outcomes for the whole range of optimization scenarios from 50%/35% to 65%/50%

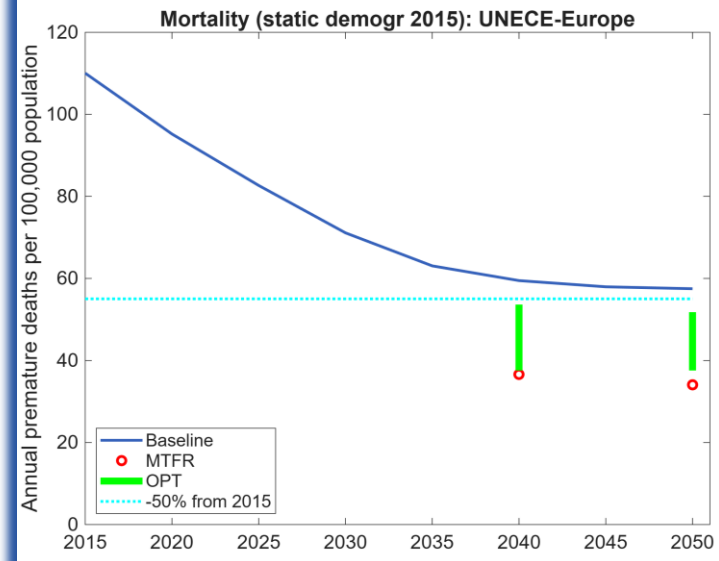




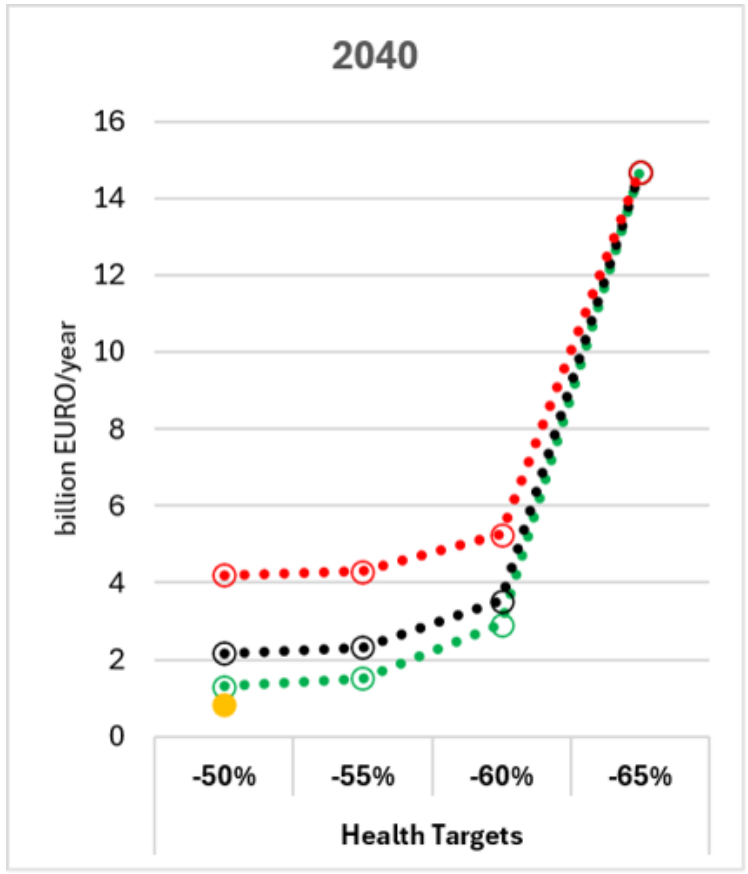


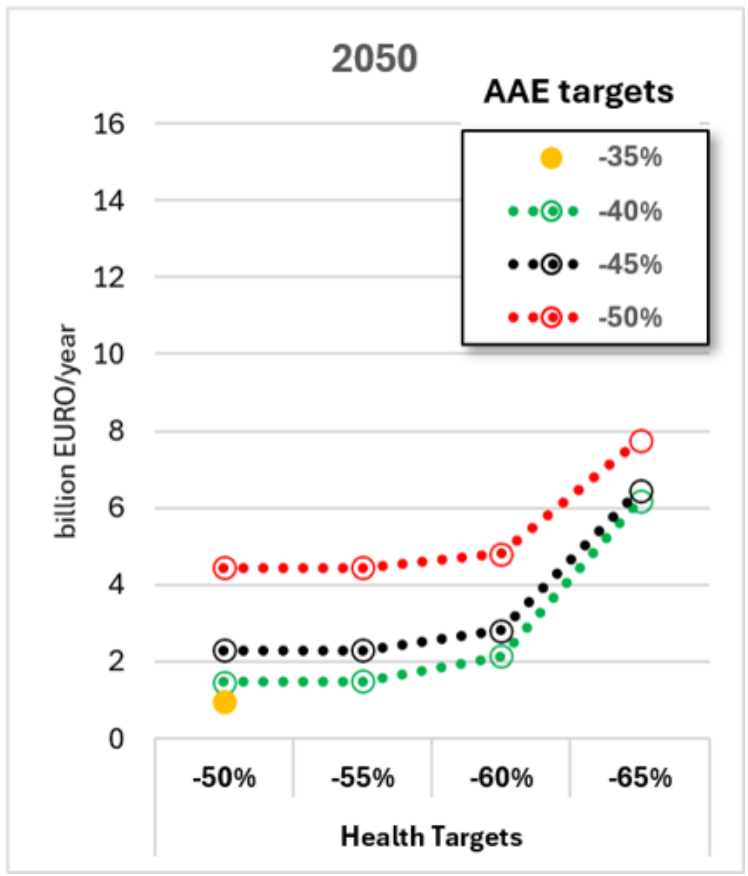






Overview of costs for the optimized scenarios (*v7a*)



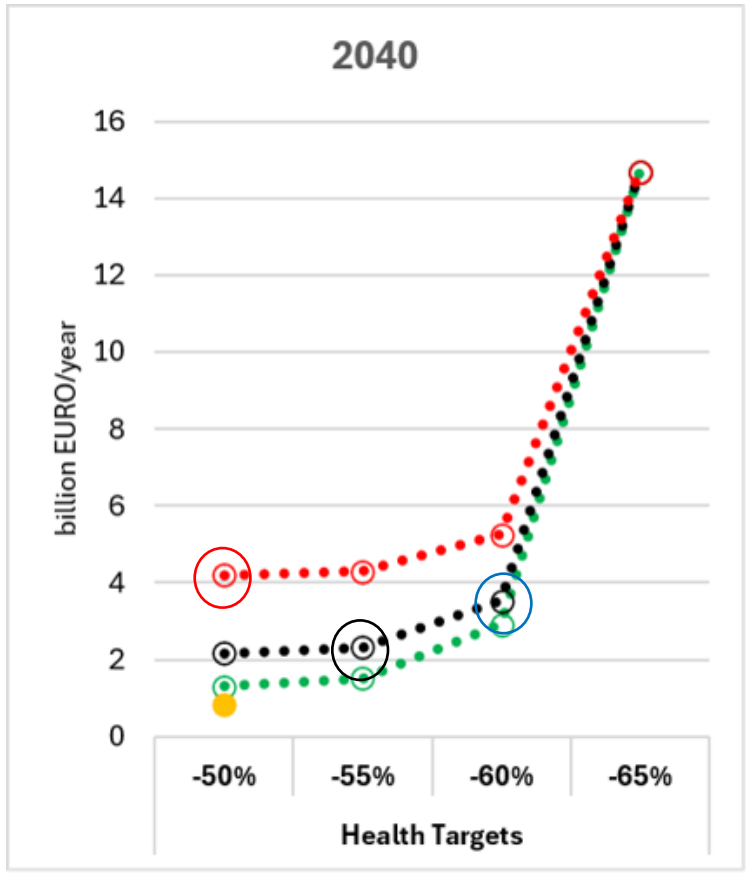


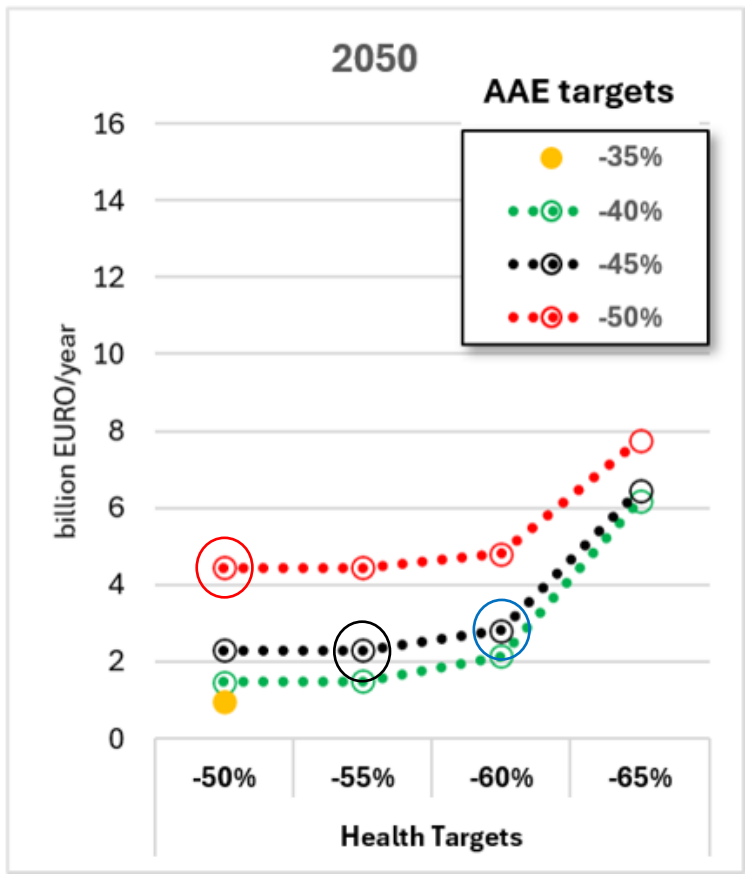
- Updated scenarios indicate lower costs than v6b for comparable ambition levels*
- Strong growth of costs for the highest ambition levels for both health and biodiversity – *nearing MTFR levels in many regions*
- Lowering ambition level for risk of biodiversity loss from 50% to 45% would halve the total costs, except when highest ambitions for health targets are pursued
- Increasing health ambition from 50% to 55% leads to only marginally higher costs for each analysed biodiversity targets

* *for example:* for 50%/50% from € 5.4bln -> € 4.2bln; for 55%/45% from € 3bln to € 2.3bln

Source: GAINS model (CIAM/IIASA)

Suggestion for core scenarios

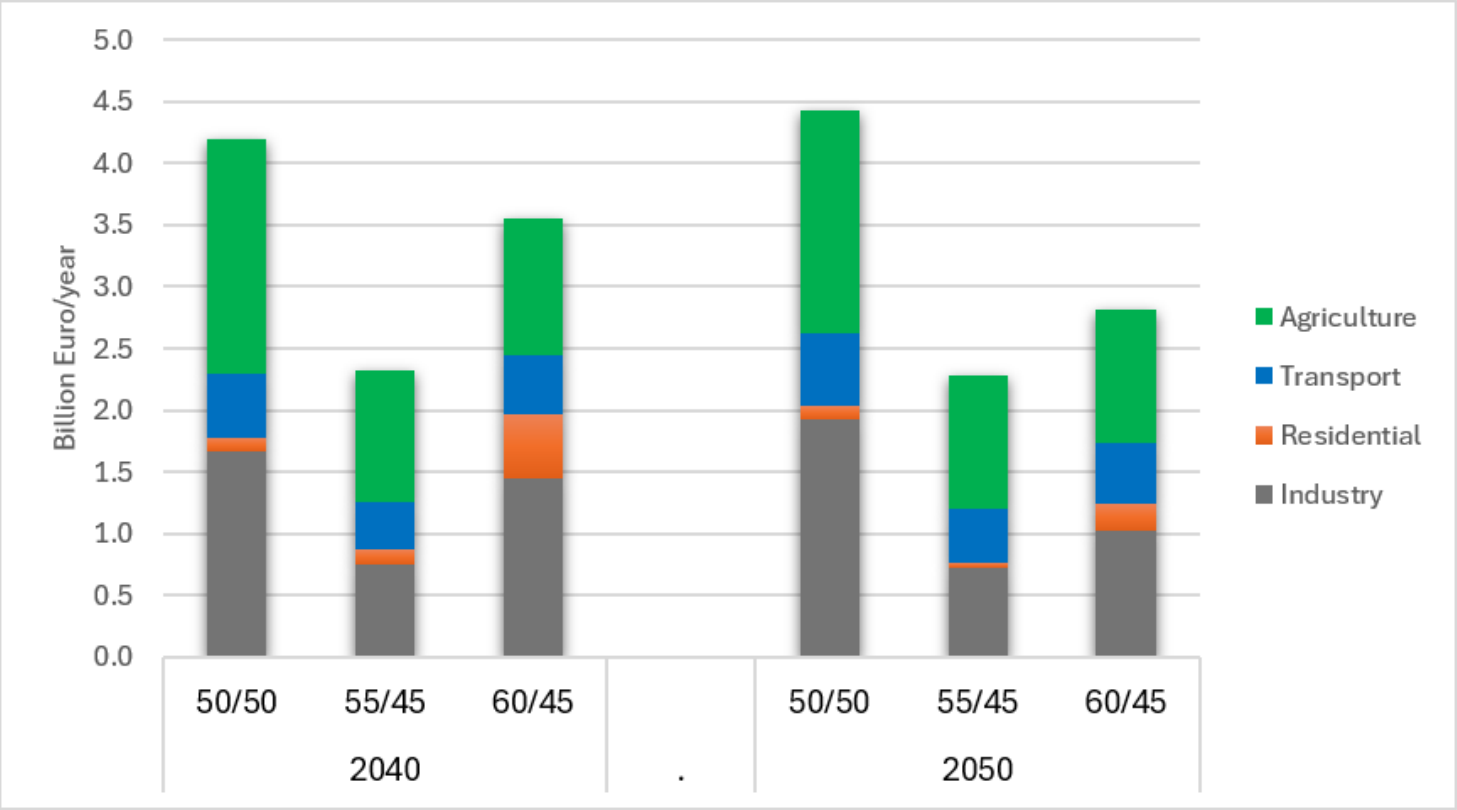




- Criteria for selection
  - exclude scenarios that would lead to a sharp increase in abatement costs at the UNECE level
  - prevent additional costs from being more than 0.3% of GDP at the country level for Convention parties, with majority well below 0.1% of GDP
- Core ambition scenarios
  - 50% health/50% biodiversity risk reduction (reference case)
  - 55% health/45% biodiversity risk reduction (mid ambition)
  - 60% health/45% biodiversity risk reduction (high ambition)

Source: GAINS model (CIAM/IIASA)

Distribution of costs across key sectors for core scenarios



- Costs of **reducing NH_3 (agriculture) and NOx (industry, transport) emissions dominate total costs** up to mid-ambition for health
- **Reducing biodiversity ambition from 50% to 45%**, while increasing health ambitions, nearly **halves total costs**
- Strong increase in costs when the high ambition level for health is included. Many sectors are important, including PM reduction from residential combustion and industry
- Little difference in costs for 2040 and 2050 for scenarios where health ambition is <60%
- *Note that optimization for 2050 does not consider results for 2040*

Source: GAINS model (CIAM/IIASA)

Cost-benefit analysis to support the negotiation of the Gothenburg Protocol revision

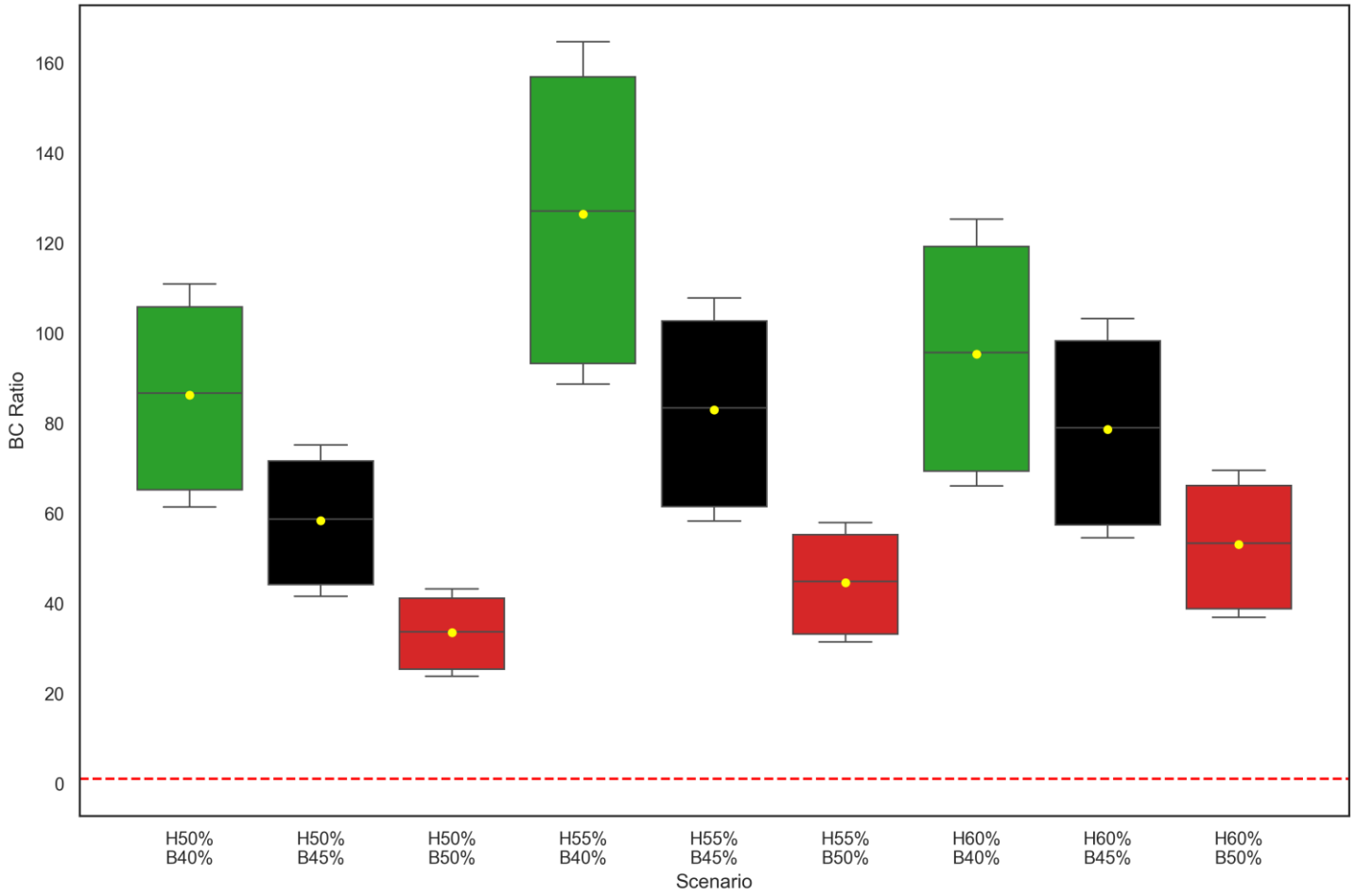
Benefits assessed

- Avoided health effects (mortality and morbidity) associated with $PM_{2.5}$
- Climate effects associated with air pollutants
- Avoided damage to biodiversity (forests and semi-natural ecosystems) associated with nitrogen
- Avoided damage to crops (wheat & potato) associated with O_3
- Avoided soiling from $PM_{2.5}$

Health effects dominate the benefits in the (current) assessment

The CBA shows that benefits exceed the costs of all optimised scenarios

Benefit-cost ratios of all optimised scenarios in 2040



Red dot = Mean
Black line = Median
Box = 25th-75th percentile
Whiskers = 5th-95th percentile
Red dashed line = B/C = 1

- Uncertainty range over value and parameter variability
- Benefits relative to the baseline scenario in 2040
- H55%/B40% shows highest benefits relative to additional costs
- For any given ambition level for health, increasing the ambition for biodiversity decreases the BC-ratio

Summary of the TFIAM/CIAM analysis

- A 50% reduction target for health and biodiversity is feasible (for health higher ambition is feasible); for 4 ecosystems 50% reduction of AAE cannot be achieved
- Joint optimization considering any biodiversity target and varying ambition levels for health requires focus on reactive nitrogen reduction, which dominates costs except for cases with high ambition for health
- Lowering ambition level for risk of biodiversity loss from 50% to 45% would halve the total costs, except when highest ambitions for health targets are pursued
- Increasing health ambition from 50% to 55% leads to only marginally higher costs for each analysed biodiversity target
- There are differences in distribution of economic burden between countries, with a systematic difference between the EU, EFTA, UK and other countries, where the latter bear higher relative increase in mitigation costs, relative to the Baseline scenario. Nevertheless, for none of the parties the estimated additional costs exceed 0.3% of GDP
- For health the largest improvements and mitigation potential are in Balkan and EECCA
- Benefits largely exceed costs for all scenarios tested

Scenario results (v7a) and new policy brief (v7) are available

- The policy brief (v7) and MS Excel files on the TFIAM and CIAM webpages
  - https://iiasa.ac.at/policy/applications/centre-for-integrated-assessment-modelling-ciam
  - https://iiasa.ac.at/policy/applications/task-force-on-integrated-assessment-modelling-tfiam-under-lrtap-convention

- The GAINS explorer
  - https://gains.iiasa.ac.at/gains/GPV/index.login

Thank you!

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For presentations & conclusions from TFIAM and EPCAC meetings and documents:

Task Force on Integrated Assessment Modelling (TFIAM) under the LRTAP Convention | IIASA

For data and documents from CIAM:

Centre for Integrated Assessment Modelling (CIAM) | IIASA

CIAM/TFIAM team

