Markus Amann *et al.*
International Institute for Applied Systems Analysis (IIASA)

Optimized policy scenarios for EU-28

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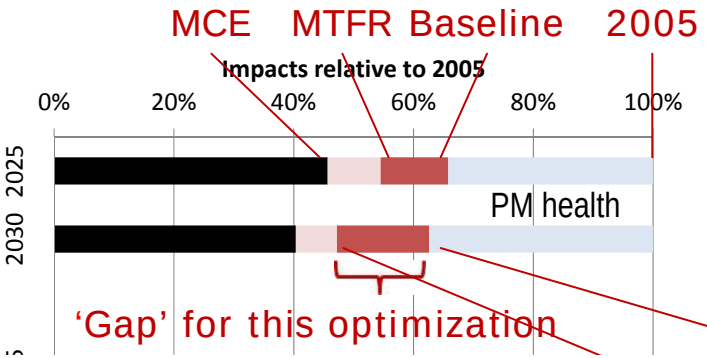
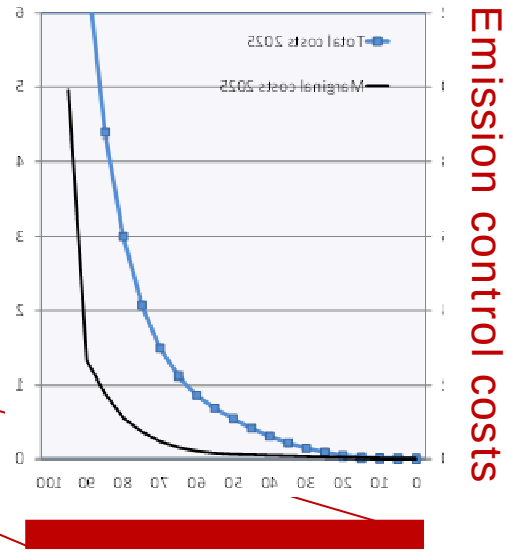
Contents

1. Exploring rationale interim ambition levels for 2025/2030
   - The feasible range for further health and ecosystems improvements
   - Health benefits vs. emission control costs
   - ‘Low-hanging fruits’ for ozone, eutrophication and acidification
   - Targets under alternative baseline projections
   - Regret investments?

2. Cost-effective options for implementation
   - Emissions/costs
   - Sensitivity cases for ships and agriculture
   - Co-benefits Hg, PN, BC

The available scope for further measures beyond current legislation (the ‘gap’)





The ‘gap’ between CLE and MTFR

The GAINS optimization identifies the cost-effective sets of measures to achieve different ‘gap closures’ between CLE and MTFR

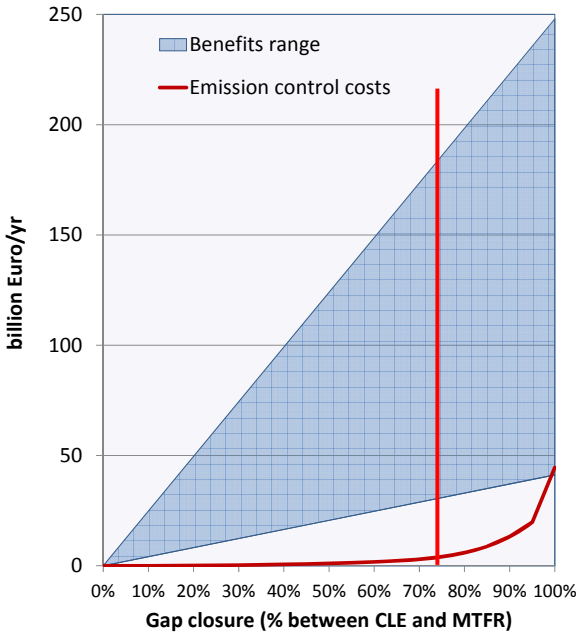
- Residual emissions
- Scope from Maximum Control Efforts
- MTFR measures
- Improvement from baseline

The ambition level for PM health impacts: Comparing benefits and costs

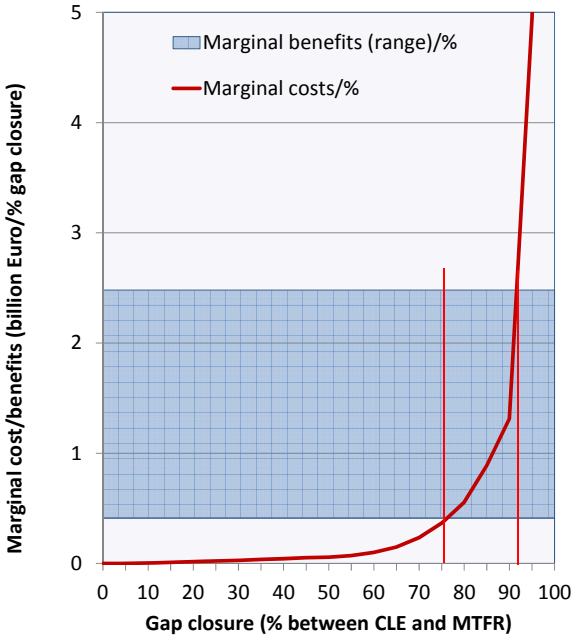
For MTFR measures:

- Estimates of PM health impacts range from 41-250 bn € in 2025.
- Costs increase to 45 bn €/yr.

Total costs and health benefits



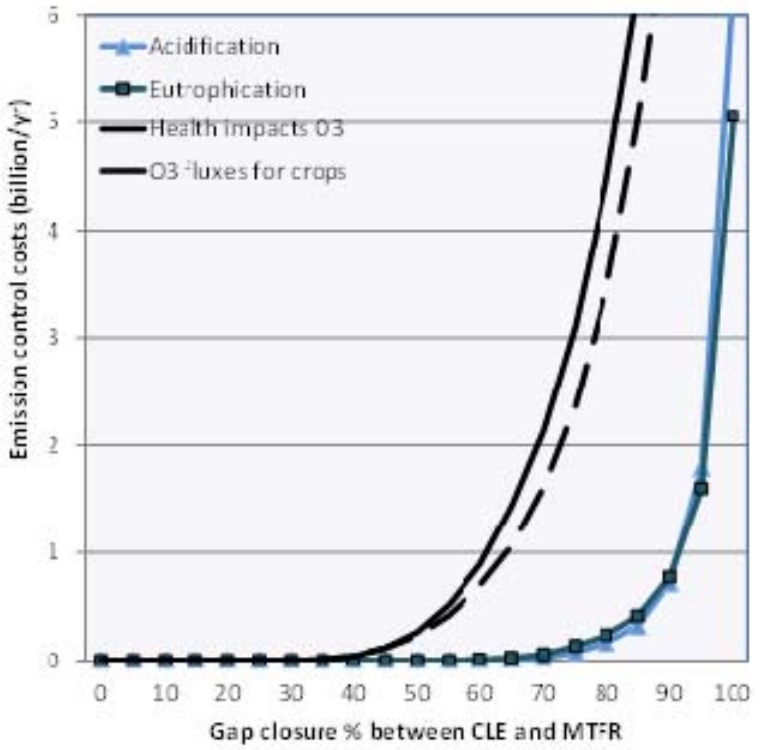
Marginal costs and health benefits



- Marginal costs equal marginal benefits at a 76.2% gap closure.
- A 75% gap closure for YOLLs is taken as a starting point for further analyses.

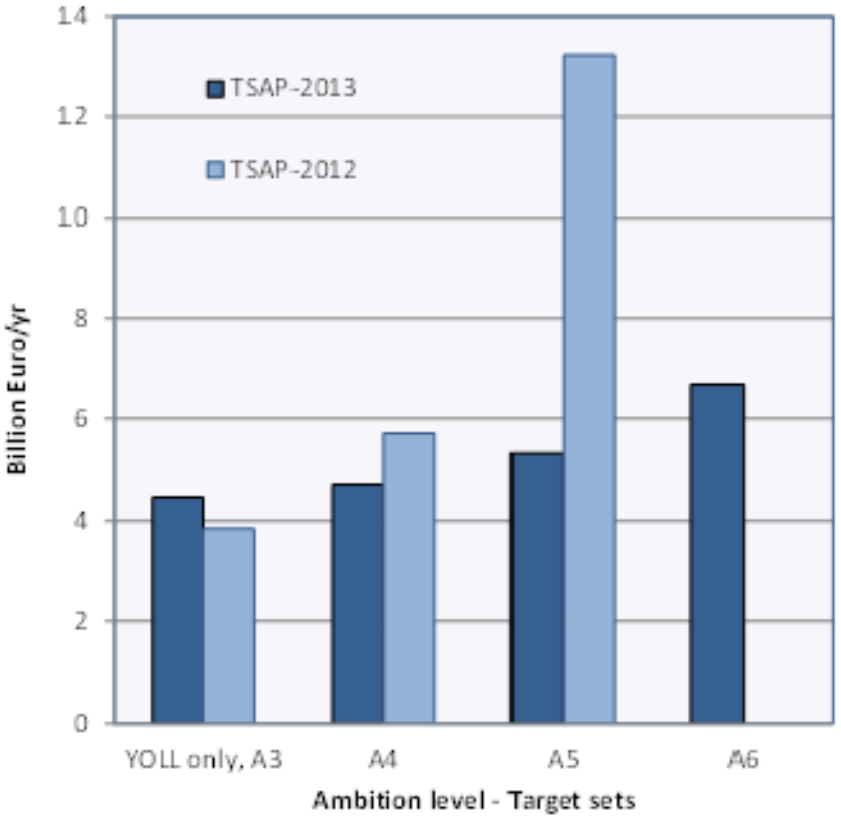
Considering non-PM related impacts

- Non-PM related benefits (for ecosystems, crops, etc.) are difficult to monetize
- A sole focus on the YOLL target might miss low-hanging fruits for these other impacts
- Pragmatic approach for further analyses:
  - Three combinations of additional targets for ozone, eutrophication and acidification
  - at 5%/20%/50% higher costs



Target	YOLL	Ozone	Eutrophication	Acidification
A4	75%	50%	50%	55%
A5	75%	60%	55%	65%
A6	75%	70%	60%	75%

Emission control costs under different baseline projections



- YOLL only targets (A3):
  - 4.5 bn € for TSAP-2013
  - 3.9 bn € for TSAP-2012 (less PM2.5)
- A4, A5:
  - 4.7-5.4 bn € for TSAP-2013
  - 5.7-13.2 bn € for TSAP-2012
- A6:
  - 6.7 bn € for TSAP-2013
  - Not achievable for TSAP-2012 (mainly due to problems in Cyprus, Greece, Malta, etc.)

Analysis of potential regret investments

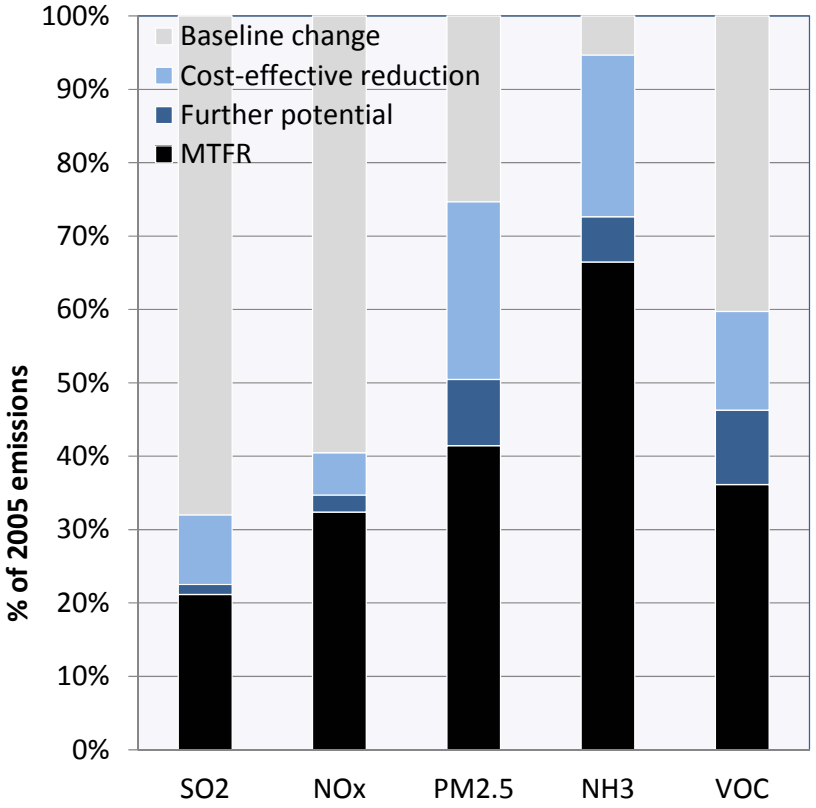
- Emission ceilings optimized for 2025 could imply ‘regret’ investments into long-lived infrastructure that would retire soon thereafter according to the energy scenario.

- The need for the additional emission controls required by A5 in 2025 has been checked against the vintage structure implied by the energy scenario for 2030

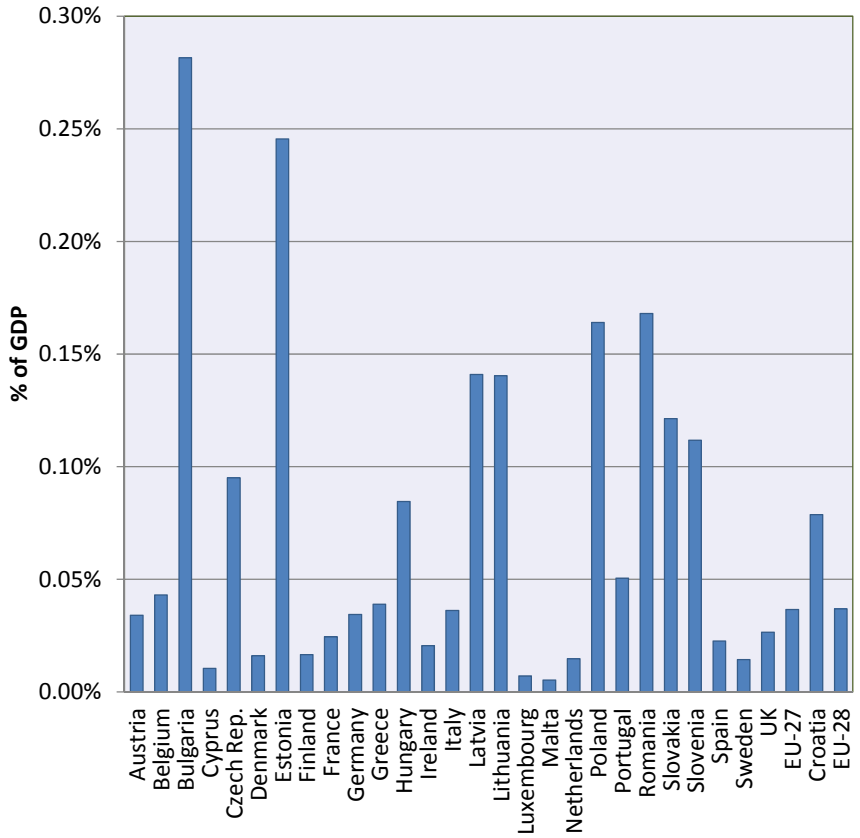
- For the A5 scenario, potential (marginal) regret investments have been identified, related to
  - 1.2% of SO_2, 0.5% of NO_x, 2.5% of PM2.5 reductions of the A5 scenario;
  - 0.6% of A5 costs; 50% of costs occur in the UK where almost all coal fired power stations would retire between 2025 and 2030 according to PRIMES-2012
- These estimates are very sensitive towards assumptions on the (rapid) speed of capital turnover in TSAP-2013

Emissions and costs of the A5 scenario

Emission reductions



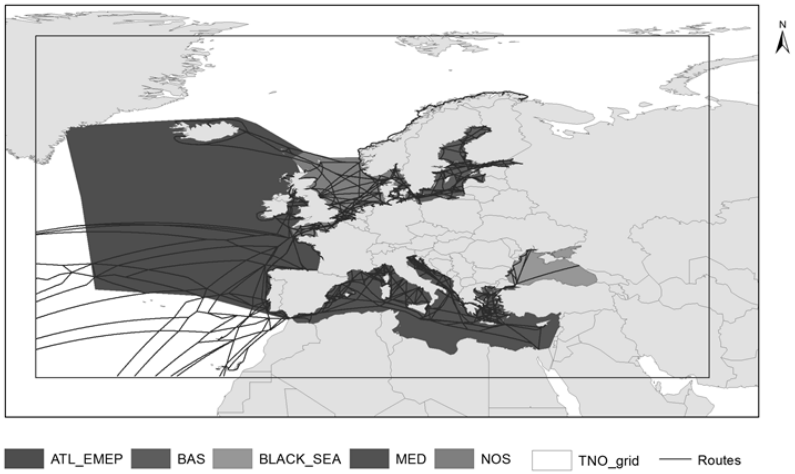
Costs (on top of CLE)



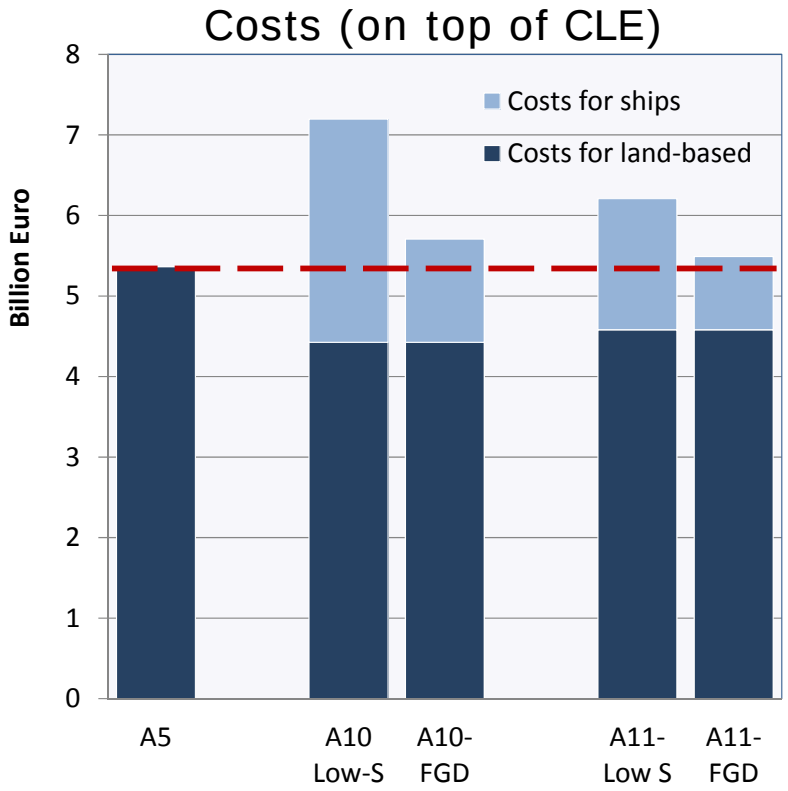
Sensitivity case: further controls for ships

The TSAP-2013 Baseline assumes the MARPOL agreement (see VITO report)

- Two sensitivity cases:
  - A10: SECAs and NECAs in all 200nm zones (VITO Scenario #2) SO_2 -50%, NO_x -24%
  - A11: as above, but no SECA in Mediterranean (VITO #4)



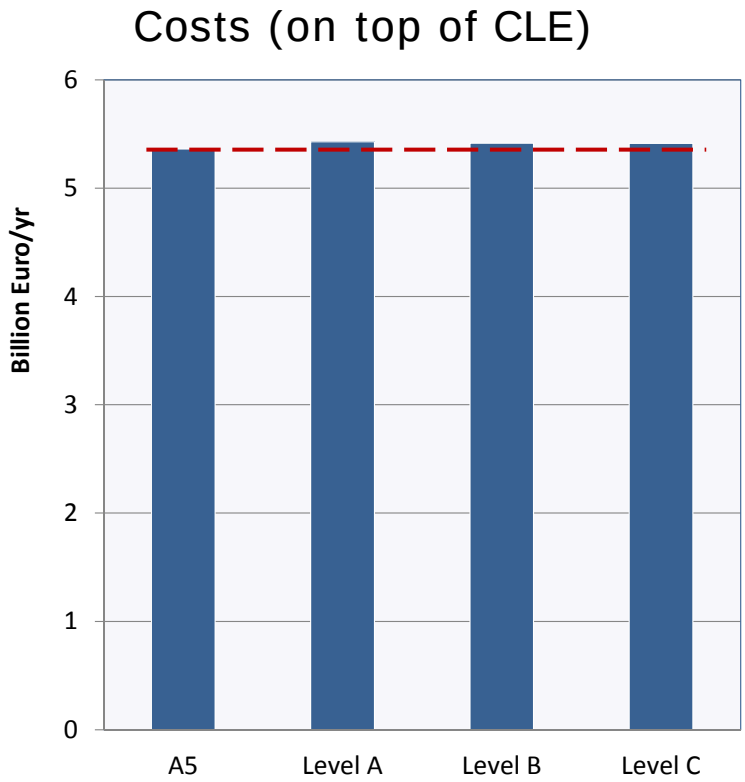
- For A5 targets: A11 with scrubbing has slightly higher costs, although the chosen package is unlikely to be cost-optimal



Sensitivity case: EU-wide measures for agriculture

Three packages defined in Gothenburg Draft Annex IX:

- Low nitrogen feed
- Housing adaptation
- Covered storage of manure
- Low-emission application of manure
- Low emission application of urea

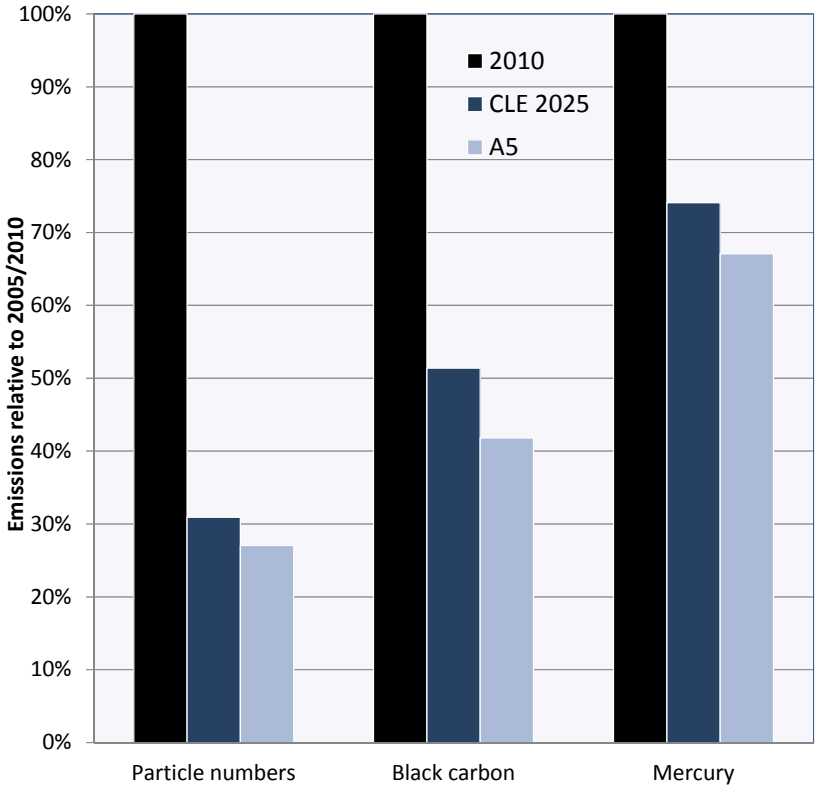


•If applied EU-wide for A5 targets, costs would increase by <1%, no impacts on other sectors

•These packages are part of cost-effective A5 portfolios in almost all countries

Co-benefits on emissions of other substances

- As a side-effect, the measures of the A5 scenario also reduce other emissions of interest:
  - Particle numbers: -73%
  - Black carbon: -58%
  - Mercury: -33%



Conclusions

- In a most conservative approach, marginal PM2.5 health benefits in 2025 exceed marginal abatement costs up to a 75% gap closure (CLE-MTFR), i.e., a 50% reduction in YOLLs compared to 2005.
- At 20% additional costs, ozone impacts and eutrophication can be reduced by one third relative to 2005.
- For the TSAP-2013 Baseline, related emission ceilings would imply costs 0.04% of GDP (5.4 bn €/yr) in 2025, with only a very small chance for regret investments into long-lived equipment that would become obsolete in 2030.
- These target would be achievable also under the TSAP-2012 Baseline; robust feasibility of NECs could be secured at some extra costs.
- Emission reductions at ships and EU-wide measures for agriculture could offer practical and cost-effective means for achieving the A5 targets.