

Developments in CBA and health assessment

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Task Force on Integrated
Assessment Modelling

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Saltsjöbaden 7 parallel working groups

1. Attain Good Air Quality in Airsheds at Risk
 2. **Achieve Policy-relevant Understanding of Air Pollution Effects on Health**
 3. Fulfil Air Convention Objectives
 4. Transform Nitrogen Waste into Nitro-Resources and Flourishing Ecosystems
 5. Integrate Policies and Research on Air Pollution, Climate Change & Biodiversity
 6. Accomplish Significant Air Quality Improvements Through International Cooperation
- Also, first meeting of the Convention's Forum for International Cooperation on Air Pollution (FICAP)
 - Observation – very limited participation from the ECCA countries

Saltsjöbaden health conclusions

- Need for better communication of the harm to health caused by poor air quality
- Need to better communicate pollution control options
- Analysis to support the Convention must be based on up-to-date science
- Increased rigour needed in science publications
- Consider the full range of possibilities for controlling air pollution
- Concern expressed that exposure reduction target could increase inequalities

TFH May 2023: Selected highlights

- High benefit-cost ratios identified in EU air quality policy proposals
- HRAPIE2 and EMAPEC underway
- Health effects of airborne pollen
- WHO interest in links to Sustainable Development Goals (SDG 11.6.2, SDG 7.1.2)
- Netherlands Clean Air Agreement – forecast of 3.5 month improvement in life expectancy 2016-2030
- USEPA Integrated Science Assessment on lead
- Canadian focus on $PM_{2.5}$, SO_2 , NO_2 , O_3 . Now turning to PM_{10} , As, CO, benzene, formaldehyde
- Serbian Air Quality Plan: recent increase in exposure, but significant reduction in emissions in the plan
- Ireland: Desire to meet WHO AQ Guidelines by 2040
- Trace pollutants – evidence for broader range of impacts



HRAPIE2 and EMAPEC

- Umbrella reviews

- HRAPIE2 (WHO lead)

- Health risks of air pollution in Europe
 - Follows 2013 [HRAPIE](#) study
 - Updated mortality functions
 - Due end 2023/early 2024

- [EMAPEC](#) (WHO lead)

- Estimating the Morbidity from Air Pollution and its Economic Costs
 - Updated response functions for morbidity
 - Due end 2023

- Unclear what they will say about:

- Potential double counting for multi-pollutant assessments
 - Balance in the coverage of different pollutants

- Working group on health impact valuation (UK COMEAP lead)

- Defining the link between health impacts and economic costs
 - Improve communication between health experts and economists
 - Due end 2023

Comparison of health impact results (UBA)

- Problem:
 - Mortality estimates for Germany vary from 15k to 63k
 - Why?
- Reasons:
 - Different response functions
 - Relative risk
 - All cause mortality vs cause specific mortality
 - Different population estimates
 - Total population (small effect)
 - Deaths due to specific causes (potentially very big effect)
 - Different exposure estimates
 - Current concentration
 - Counterfactual concentration
 - Concentration in excess of WHO Guideline
- Differences can be large, but:
 - All indicate a substantial impact on mortality
 - Some have limited effects on policy analysis

EC/EEA policy studies

- [Revision of the Ambient Air Quality Directives](#)
 - [3rd Clean Air Outlook](#)
 - [EEA State of the Environment Reporting](#)
 - [External costs of industrial emissions](#)
- Efforts made to ensure a common framework for analysis across all of these studies (partially successful)

Impacts considered in CAO3 (Mortality)

	2 nd Clean Air Outlook	Air Quality Directives	EEA: Annual air quality assessment	3 rd Clean Air Outlook
Mortality				
PM _{2.5} (chronic, adult)	✓	✓	✓	✓
PM _{2.5} (infant)	✓	✓		✓
NO ₂ (chronic)	✓	✓	✓	✓
O ₃ (acute)	✓	✓	✓	✓

Impacts considered in CAO3 (PM_{2.5} morbidity)

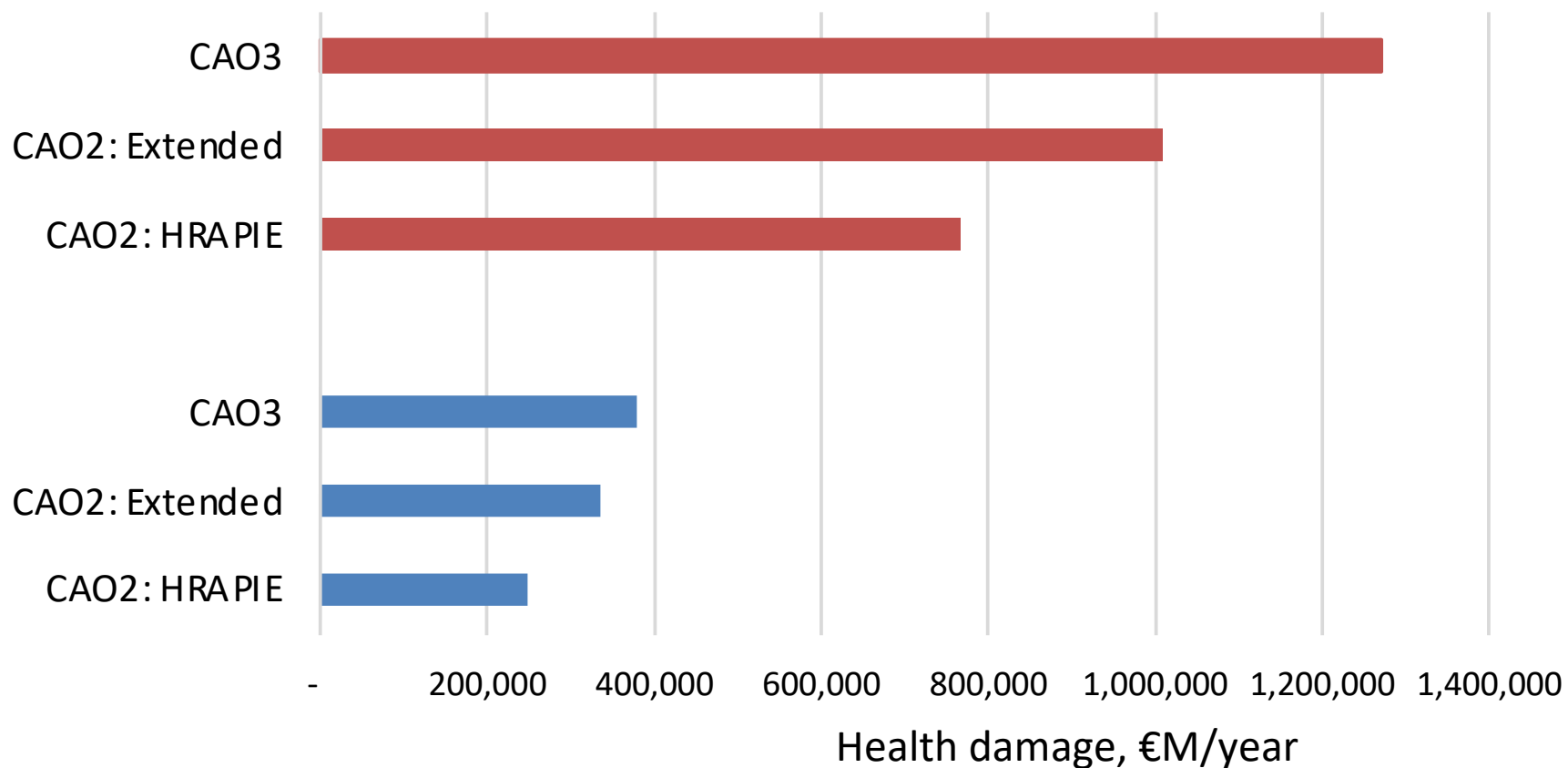
	2 nd Clean Air Outlook	Air Quality Directives	EEA: Annual air quality assessment	3 rd Clean Air Outlook
PM_{2.5} morbidity				
Bronchitis in Children (age 6 -12)	✓	✓		✓
Chronic Bronchitis in adults	✓	✓		✓
Cardiovascular hospital admissions	✓	✓	✓	✓
Respiratory hospital admissions	✓	✓	✓	✓
Restricted activity days	✓	✓		✓
Asthma symptom days in children (age 5-19 years)	✓			
Lost working days	✓	✓	✓	✓
Stroke (CVA)	(✓)	✓	✓	✓
Lung cancer		✓	✓	✓
New incidence of asthma in children (age < 16 years)		✓	✓	✓
Diabetes Mellitus Type2		✓		✓
Non-fatal myocardial infarction	(✓)	✓		✓
Chronic Obstructive Pulmonary Disease (COPD)		(✓)	✓	(✓)
Acute coronary heart disease		(✓)	✓	(✓)

Impacts considered in CAO3 (NO₂, O₃ morbidity)

	2 nd Clean Air Outlook	Air Quality Directives	EEA: Annual air quality assessment	3 rd Clean Air Outlook
NO₂ morbidity				
Bronchitis in children aged 5 to 14	✓			✓
New incidence of asthma			✓	✓
Stroke			✓	✓
Diabetes			✓	✓
Respiratory hospital admissions	✓		✓	✓
O₃ morbidity				
Cardiovascular hospital admissions	✓		✓	✓
Respiratory hospital admissions	✓		✓	✓
Minor restricted activity days	✓			✓

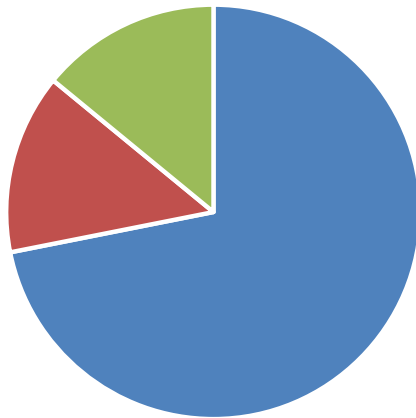
Effect of method changes on the numbers

Increased health damage (red=VSL, blue=VOLY)



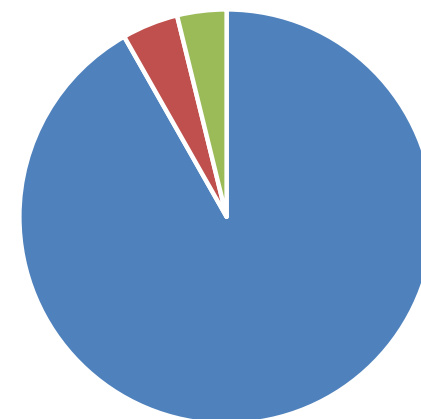
Effect of adding more morbidity effects

Health with VOLY valuation of mortality



■ Mortality ■ HRAPIE morbidity ■ Extended morbidity

Health with VSL valuation of mortality



■ Mortality ■ HRAPIE morbidity ■ Extended morbidity

Sensitivities investigated in CAO3

- Mortality valuation: factor 3 variation VSL:VOLY
- Tiering of impacts:
 - Tier 1: Mortality
 - Tier 2: HRAPIE (2013) morbidity
 - Tier 3: New (extended) morbidity
- Potential double counting of NO₂
- Assume that WHO Guidelines = thresholds for effect

Sensitivities investigated in CAO3

Table 25. Benefit-cost ratios for each scenario relative to the CAO3 Baseline at the EU27 level. 'n/a' shows cases where pollution control costs are below baseline.

	B:C ratios from reduced PM _{2.5} , NO ₂ and O ₃ damage		B:C ratios; omitting NO ₂ reductions	
	2030	2050	2030	2050
Health damage <u>in excess of WHO Guidelines</u> + materials + ecosystems				
<i>Mortality = VOLY</i>				
Baseline + Optimized for 10µg/m ³	9.8	5.0	8.9	4.8
<i>Mortality = VSL</i>				
Baseline + Optimized for 10µg/m ³	35	24	32	23
Health damage over full exposure range + materials + ecosystems				
<i>Mortality = VOLY</i>				
Baseline + Optimized for 10µg/m ³	12	3.1	10	1.9
<i>Mortality = VSL</i>				
Baseline + Optimized for 10µg/m ³	39	45	33	35

Sensitivities investigated in CAO3

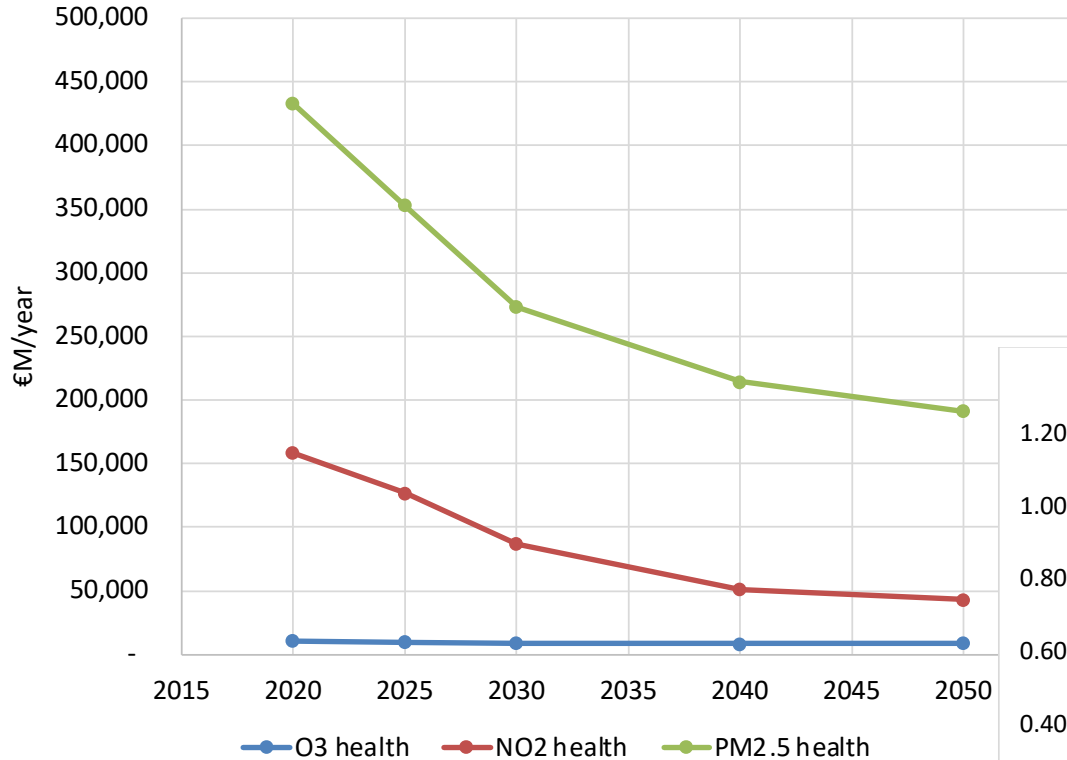
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	2030	2050	2030	2050
Health damage <u>in excess of WHO Guidelines</u> + materials + ecosystems				
<i>Mortality = VOLY</i>				
<u>FlexDiet</u> + MTFR	2.1	0.9	1.9	0.8
<i>Mortality = VSL</i>				
<u>FlexDiet</u> + MTFR	7.4	3.6	6.7	3.4
Health damage over full exposure range + materials + ecosystems				
<i>Mortality = VOLY</i>				
<u>FlexDiet</u> + MTFR	2.7	2.0	2.2	1.6
<i>Mortality = VSL</i>				
<u>FlexDiet</u> + MTFR	8.9	8.0	7.4	6.3

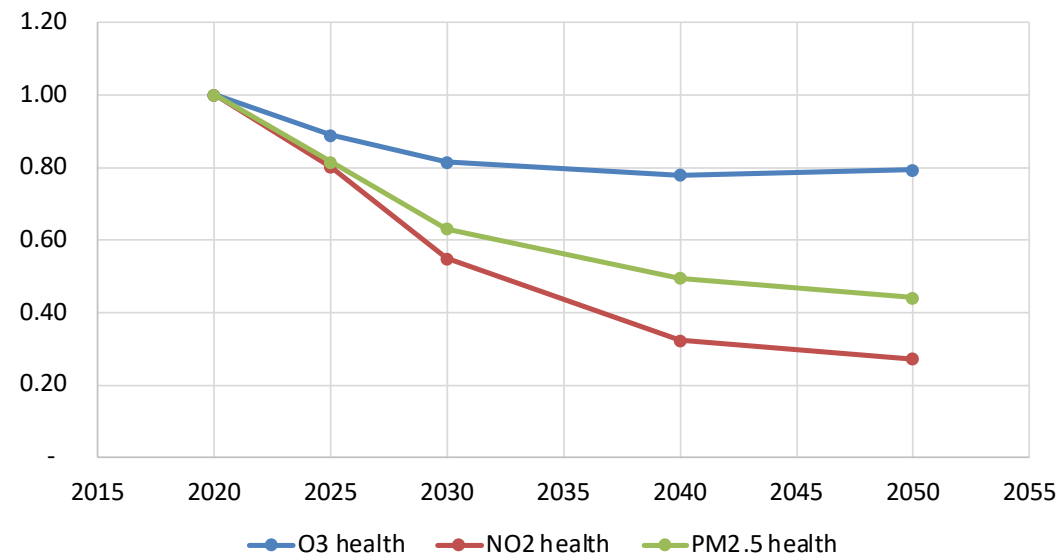
Sensitivities investigated in CAO3

- Potential double counting for NO₂

Value of health impacts by pollutant



Fall in health impacts over time



Key messages

- A lot of progress is being made on health
- Investigations show that uncertainties have limited impact on the outcome of CBA
- Systematic bias towards $PM_{2.5}$ in underlying research
- No empirical basis for moving from assumption of treating all $PM_{2.5}$ the same
- Watch out for HRAPIE2 and EMAPEC reports from WHO (end of year)