Cost of inaction on air pollution – Synthesis of current knowledge

Status of the work & project update

The work is financed by Klima- og Miljødepartementet, Norway

TFIAM 50

21-23 April 2021

Stefan Åström, Katarina Yaramenka (IVL),
Rob Maas (RIVM), TFTEI

National Institute for Public Health and the Environment
Ministry of Health, Welfare and Sport

ivl
Swedish Environmental Research Institute

Aim – to make a synthesis of the current knowledge of air pollution damage to health and environment

Questions to answer

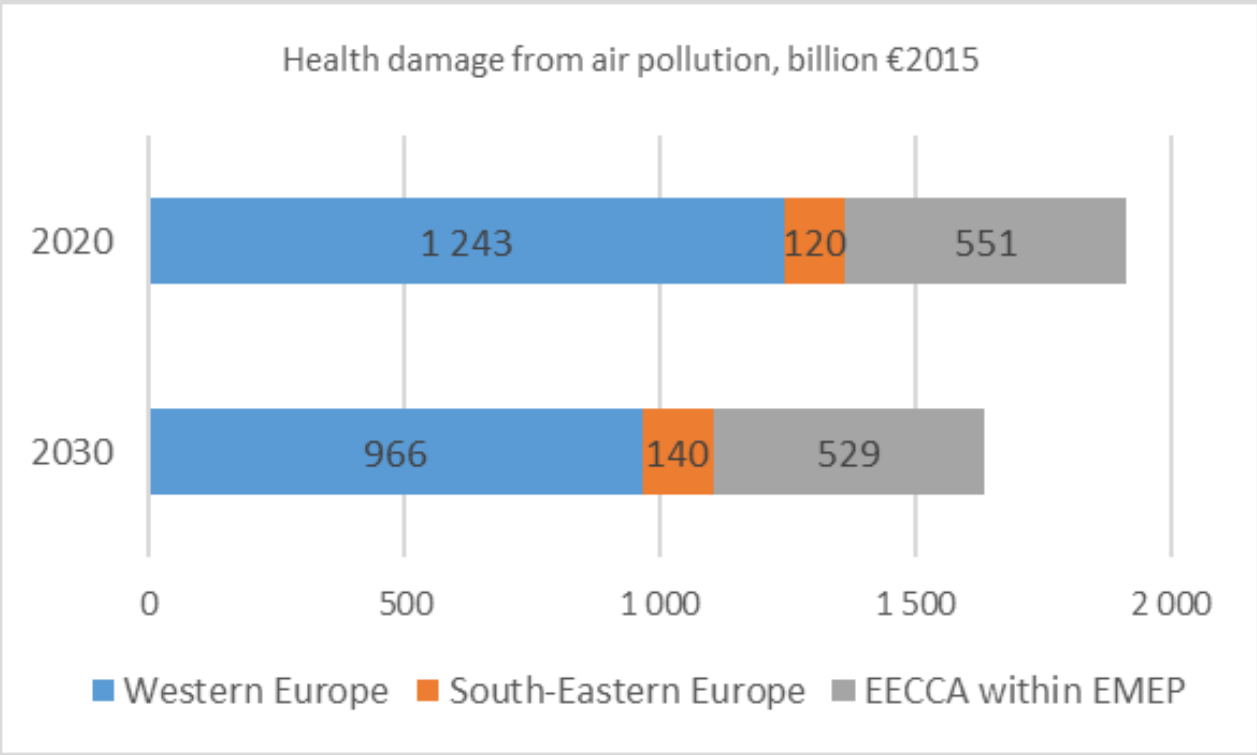
1. How large is the monetized damage from air pollution to human health and ecosystems?
2. How much benefit do we get in the future from expected action?
3. How large costs could be avoided in the future?
4. Are the costs of inaction larger than emission control costs?

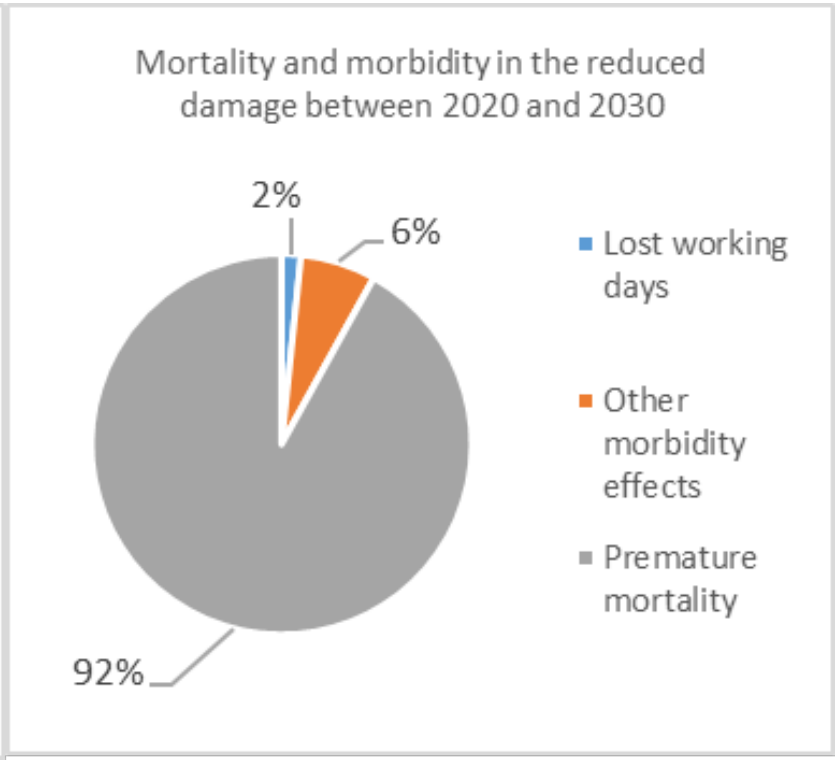
Methodological aspects

- Consider both market and non-market (welfare) damage
- Synthesis of available literature
- Additional analysis of 2nd Clean Air Outlook scenarios (GAINS-ARP)
- Health damage - as in 2nd Clean Air Outlook (table 3.15)
- No purchase power parity (PPP) adjustments for VSL
- All cost estimates in Euro 2015
- Summary of current knowledge – by region

1. Western Europe – EU, Switzerland, Norway, Luxembourg, Iceland, UK
2. EECCA countries within the EMEP domain
3. EECCA countries - Caucasus and Central Asia
4. South-Eastern Europe + Turkey – non-EU Balkan countries + Turkey
5. North America – US, Canada

Health damage from air pollution – EMEP domain





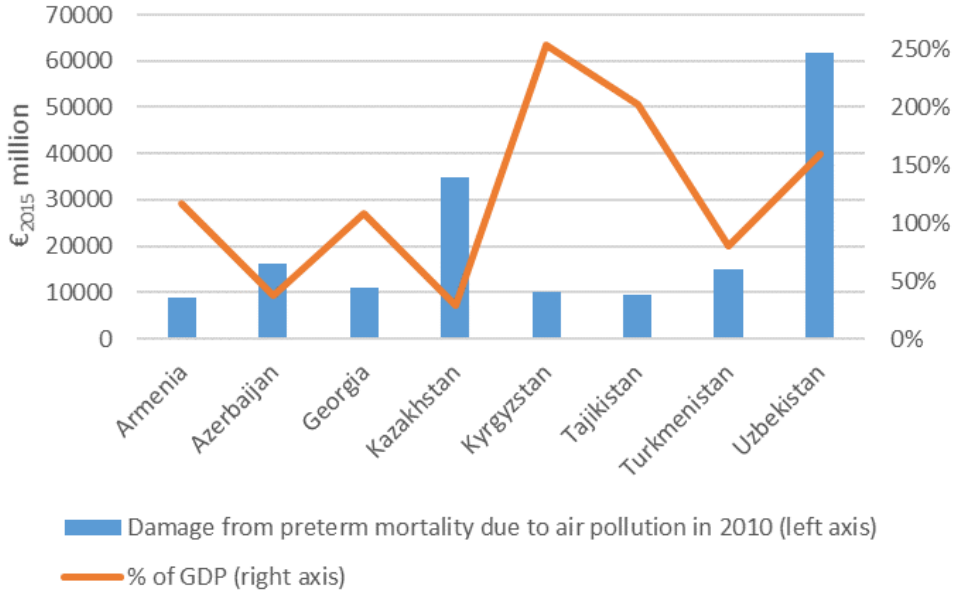
2nd Clean Air Outlook baseline scenario

Current labour productivity costs (as lost working days) – 0.6-1.1%

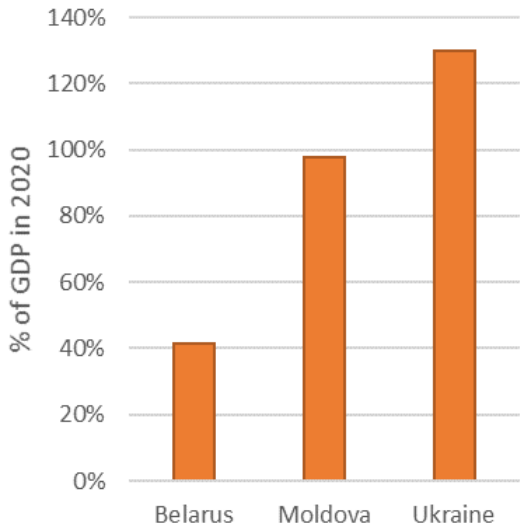
Swedish Environmental Research Institute

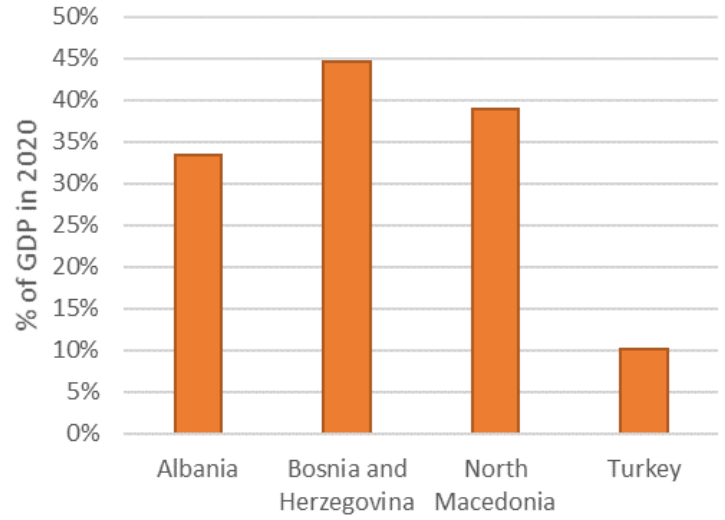
Health damage from air pollution – European UNECE

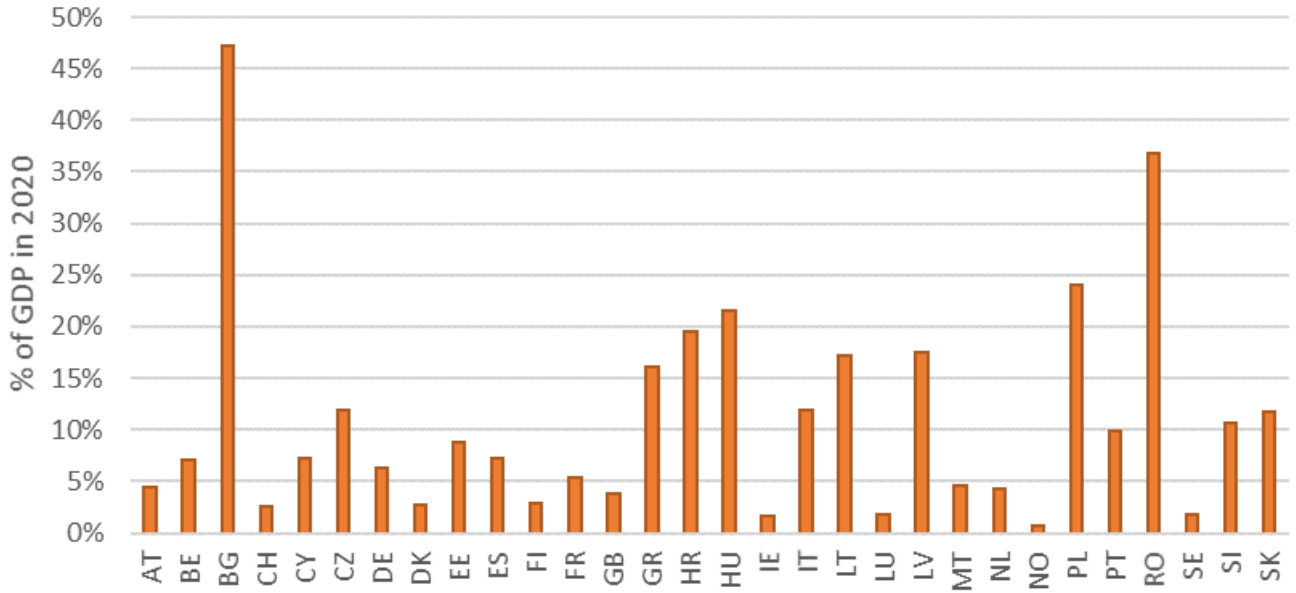
2010, based on WHO 2015



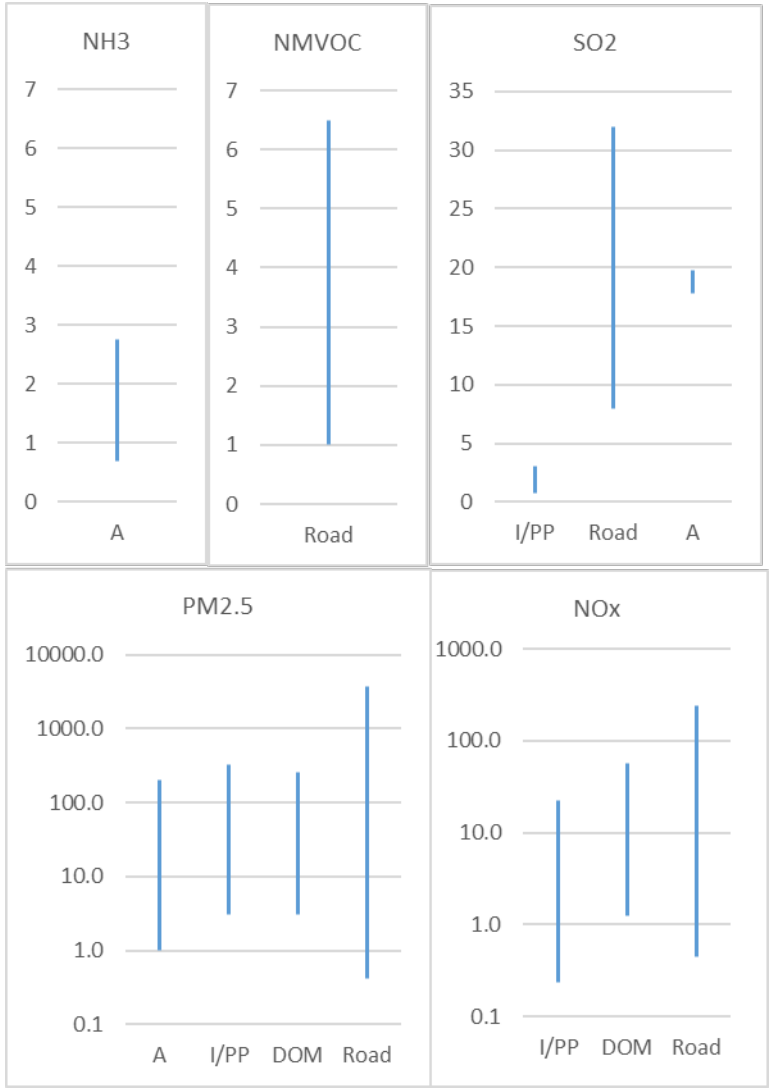
2020, based on 2nd Clean Air Outlook baseline



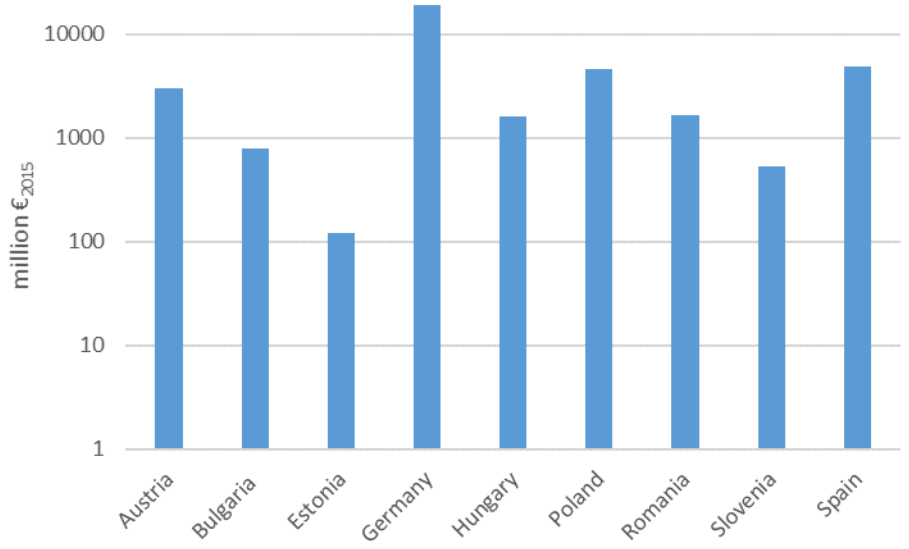




Damage from air pollution – sectors and pollutants (Western Europe)



Range of unit damage costs per pollutant and sector, thousand Euro 2015 per ton pollutant

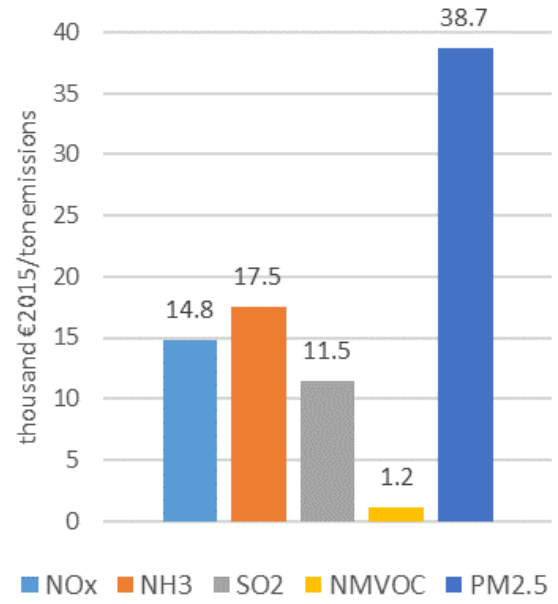


Damage from transport in European countries in 2016

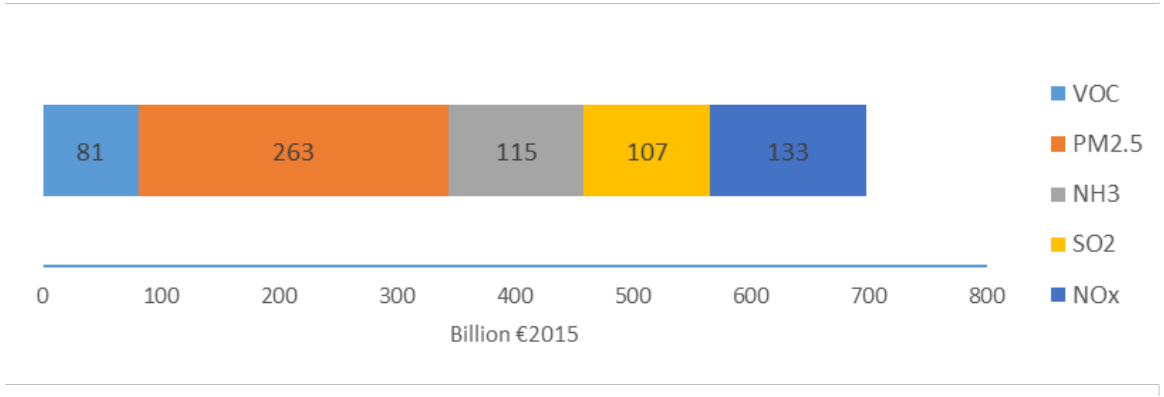
(CE Delft 2018 diesel)

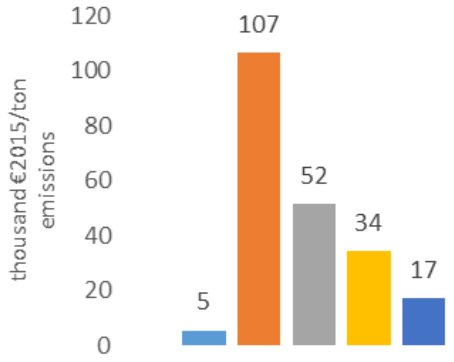
Unit damage costs in Europe

(CE Delft 2018 Environmental Prices)



Damage from air pollution – North America (examples for the US)

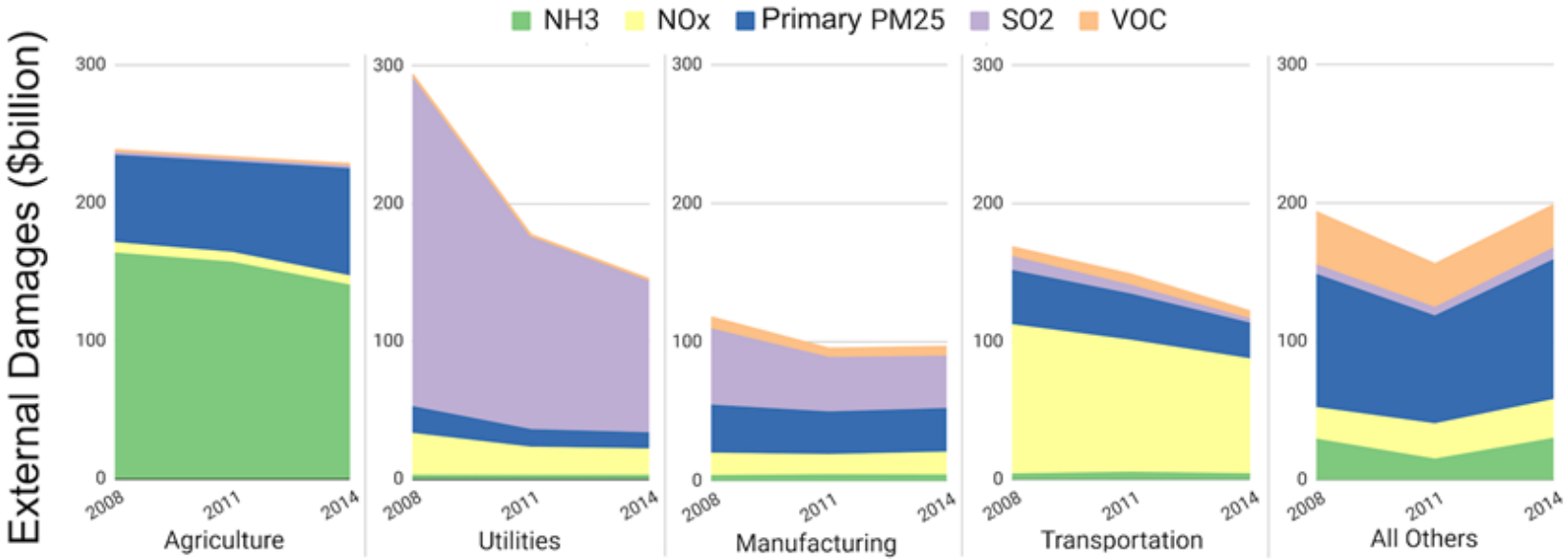




Total damage in 2011 and unit damage per pollutant (Goodkind 2018, Tschofen 2019)

Tschofen 2019

~75% of the total damage from air pollution in the US is caused by activities in four sectors responsible for less than 20% of GDP – agriculture, energy sector (utilities), manufacturing industries and transport.



Damage by sectors, USD 2018

Benefits of action – damage reduced with existing policies

Baseline damage reduction by country, 2030 related to 2020 (based on 2nd Clean Air Outlook)

Co-benefits with climate policies:

Considering Climate and Energy Framework adopted by EC in 2014 as new baseline results in the following changes in 2030, compared to the previous baseline:

-up to 10 % reduction in emissions

-5% reduction in damage

-4% reduction in air pollution control costs

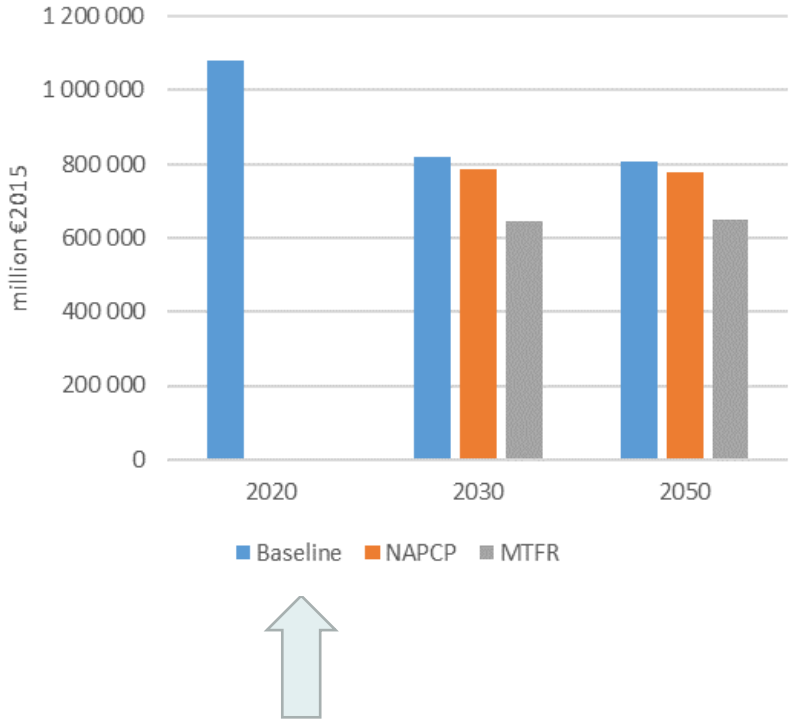
(IIASA 2014)

In the expected damage reduction between 2020 and 2030, 21% is estimated to result from climate policies (analysis based on 1st Clean Air Outlook scenarios)

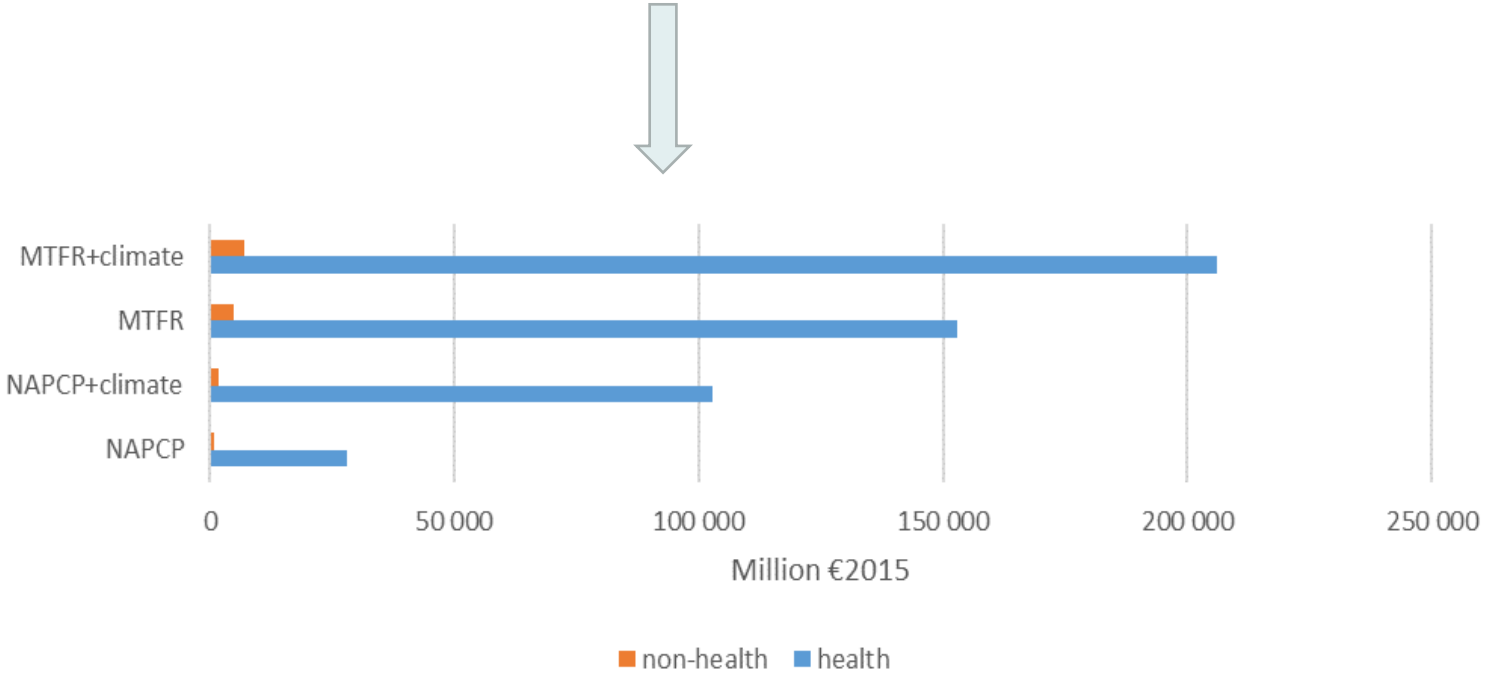
Swedish Environmental Research Institute

Benefits of action – additional policy action in EU-27

2nd Clean Air Outlook



Co-benefits from additional climate actions in 2050



Avoided damage (health+non-health) in 2030-2050 compared to baseline:

NAPCP – 4%

MTFR – 25-26%

Swedish Environmental Research Institute

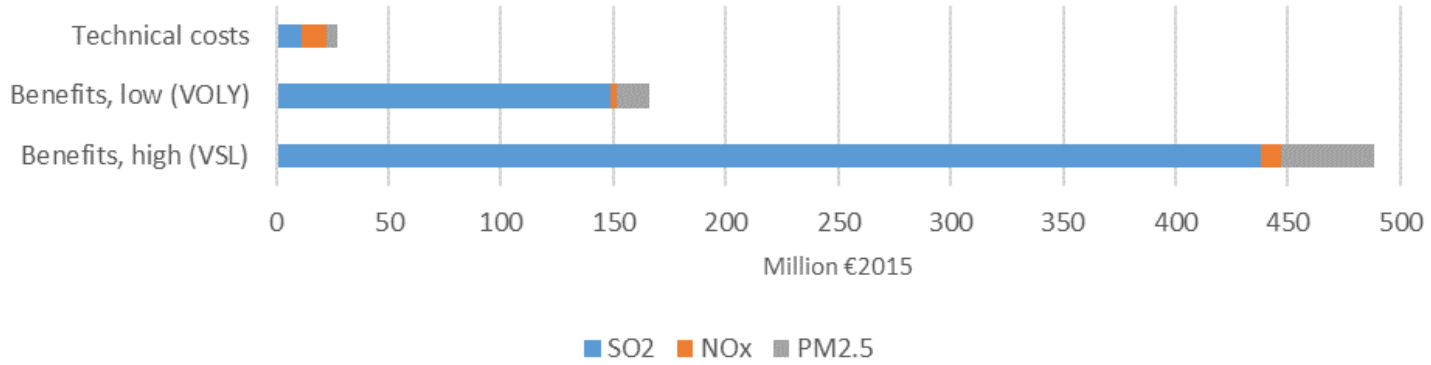
Cost of inaction vs Cost of action – Example of the facility-level CBA

Source: EGTEI 2011

- Apatity coal plant in Russia
- SCR, ESP and wet FGD abatement

Marginal damage costs as in EEA 2021

Pollutant	Emissions in 2008/2010, kt	Removal efficiency of equipment, %	Removed emissions, kt	Technical costs, million €2015	Avoided damage, million €2015	
					Low VOLY	High VSL
TSP	6.23	99.9%	6.18	5.3	-	-
PM2.5*	0.37	96%	0.36		14	42
NOx	2.4	75.4%	1.8	10.5	2.9	8.3
SO2	12.6	95.4%	12.0	11.6	149	438
Total	-	-	-	27.4	166	488



B/C ratio is 6-18

Swedish Environmental Research Institute

Key message 1:

In more than half of the UNECE countries (35 of 56) the current monetary damage to health and ecosystems due to ambient air pollution corresponds to more than 5% of GDP. In 28 countries, the damage is more than 10% of GDP. In 19 countries, the damage is more than 20% of GDP.

The largest part of the damage estimates consists of reduced life expectancy, followed by morbidity costs (hospital admittance, sickness leave, medicines costs) and damage to ecosystems. The monetized damage is – as a percentage of GDP - in the eastern part of the UNECE region significantly higher than in the western part. Labor productivity losses due to air pollution make up ~5-6% of the total damage costs.

Key message 2:

Benefits of action: due to existing policies the monetary damage up to 2030 (in the European UNECE region) is expected to be reduced by ~15%

The implementation of national emission reduction obligations and current emission limit values for vehicles, installations, NRMM and products will reduce damage. The current energy transition plans will contribute ~21% to the expected benefits of policy action in the next decade. The expected damage reduction will (as a percentage of GDP) be higher in the eastern part of the UNECE-region.

Key message 3:

Costs of inaction: up to 21% of the monetary damage in the EU-27 in 2030 could be avoided by additional policy actions

Applying technically feasible measures (not entailing excessive costs) could reduce the annual monetary damage by 4% (compared to the baseline) in 2030-2050. All measures despite the costs (MTFR) – 20-21%. If MTFR is combined with climate measures – relative damage reduction in 2050 might reach 26%. Especially in the eastern part of the UNECE-region there is a large potential to reduce the costs of inaction. About 0.8% of the welfare costs of inaction consist of labor productivity losses.

Key message 4:

The abatement costs (the costs of taking action) are significantly lower than the costs of inaction

Benefits tend to be higher than costs. Abatement costs of available additional actions in EU-27 on the relatively low level of ambition are more than 20 times lower than the avoided damage.

Key message 4:

The ‘damage cost approach’ is a useful tool to assess the external costs new infrastructure or installations, but requires further development

To support decisions on new projects or permits, several countries apply damage costs per unit of emission, to quickly scan the potential additional damage to health and ecosystems from those activities and to decide if additional air pollution measures are required and proportional. Often these assessment tool only look at local or national damage, while transboundary damage is omitted. A comprehensive assessment would require including all external effects.

Thank you!

katarina.yaramenka@ivl.se

Swedish Environmental Research Institute