Simone Schucht, Mike Holland | April 20th 2020 | TFIAM 49

Cost of industrial air pollution in Europe

Updating the damage cost calculation and externalities assessment

INERIS
maîtriser le risque pour un développement durable

EMRC

Aether

NILU

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European Topic Centre on Air Pollution, Transport, Noise and Industrial Pollution

Context

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EEA updates its air pollution cost assessment

- Previous EEA reports assessing the costs of air pollution from EU industrial facilities
  - EEA (2011), Revealing the costs of air pollution from industrial facilities in Europe, EEA Technical Report 15/2011
  - EEA (2014), Costs of air pollution from European industrial facilities 2008–2012, an updated assessment, EEA Technical Report 20/2014
- The assessments involved two stages
  - Calculation of damage costs per tonne of pollutant emitted and per country
  - Assessment of externalities of industrial facilities using E-PRTR emission data
- Pollutant groups covered:
  - Main air pollutants, heavy metals, prominent organic pollutants, CO_2
- EEA invited its European Topic Centre on Air pollution, Transport, Noise, and Industrial pollution (ETC/ATNI) to
  - Review the methods for the damage cost assessment in 2019
  - Update the assessment in 2020 for the period 2012-2017

} Task 1.2.2.2 “External costs of industrial air pollution” of ETC/ATNI work programme

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Scope of the previous report

- Main air pollutants: NH_3, NOx, SO_2, NMVOCs, $PM_{2.5}$, PM_{10}
  - Dispersion & exposure relying on EMEP Source-Receptor-Matrices (SRMs)
  - Sectoral adjustment factors from Eurodelta-II
  - Health effects from $PM_{2.5}$, O_3 – as in TSAP / CLRTAP work, HRAPIE
  - Corrosion of buildings
  - Ozone effects on crops & forests (AOT40)
  - Valuation as in TSAP / CLRTAP work
- Metals & organic pollutants: As, Cd, Cr, Pb, Hg, Ni; 1,3-butadiene, benzene, dioxins & furans, formaldehyde, PAHs
  - Dispersion & exposure relying on Uniform World methodology, environmental accumulation, transport in food & water, uptake via ingestion & inhalation
  - Valuation as in RiskPoll model, Spadaro & Rabl 2008
- Greenhouse gases: CO_2
  - Valuation via ETS price forecast directly applied to E-PRTR emissions
- Unit damage costs per pollutant multiplied by E-PRTR emissions (2008-2012)

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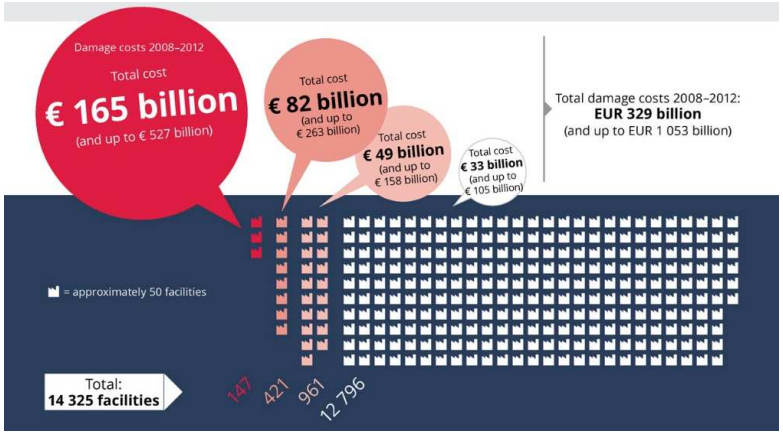
The results have been widely used

- EEA communications on externalities



Source: EEA Technical Report No 20/2014

- Member State authorities & EC have used the unit damage costs for
  - Cost-benefit assessments, incl. decision making for IED derogation dossiers
  - Monetizing the cost of sectoral or regional air pollution
  - Setting levels of environmental taxes
  - …..

- NGOs have used the unit damage costs for
  - Assessing the impact of coal fired generation
  - Evaluating applications for derogation under the IED
  - …

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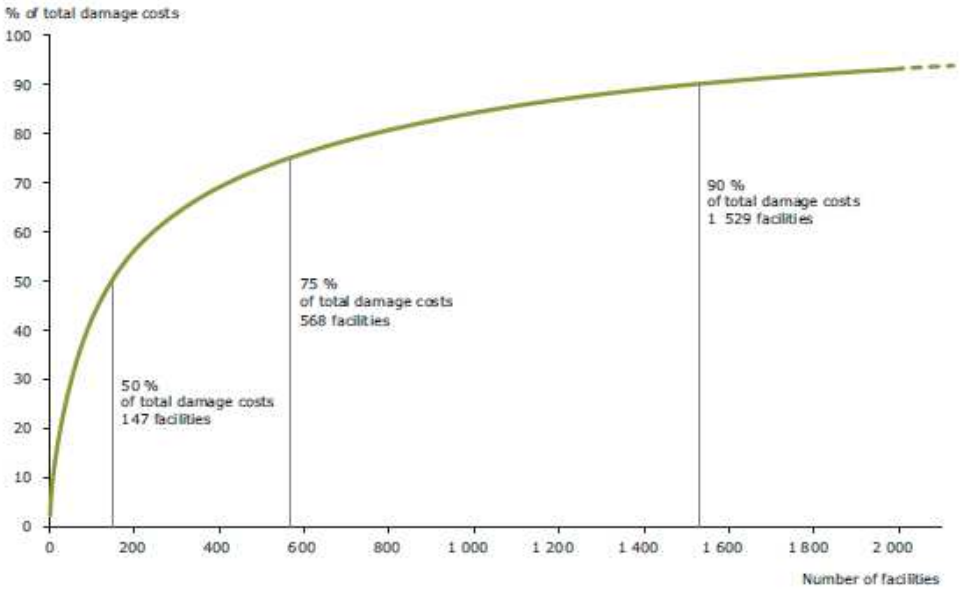
Further examples of output

- Cumulative damage: 50% of damage from a small number of plant

Figure 3.9 Cumulative distribution of the estimated damage costs associated with emissions of selected pollutants from E-PRTR facilities, 2008–2012

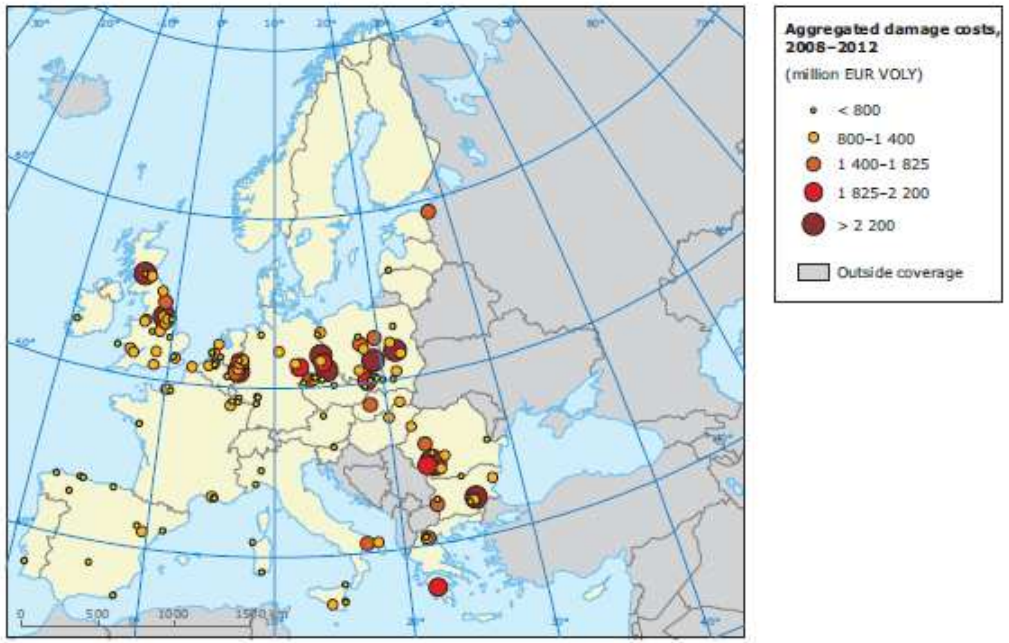


Note: The distribution is based on the lower VOLY approach for the main air pollutants and a CO_2 price of EUR_{2005} 9.5 per tonne.

Source: EEA Technical Report No 20/2014

- Geographic distribution of damage

Map 3.1 Location of the 147 E-PRTR facilities that contributed 50 % of the total damage costs estimated for 2008–2012

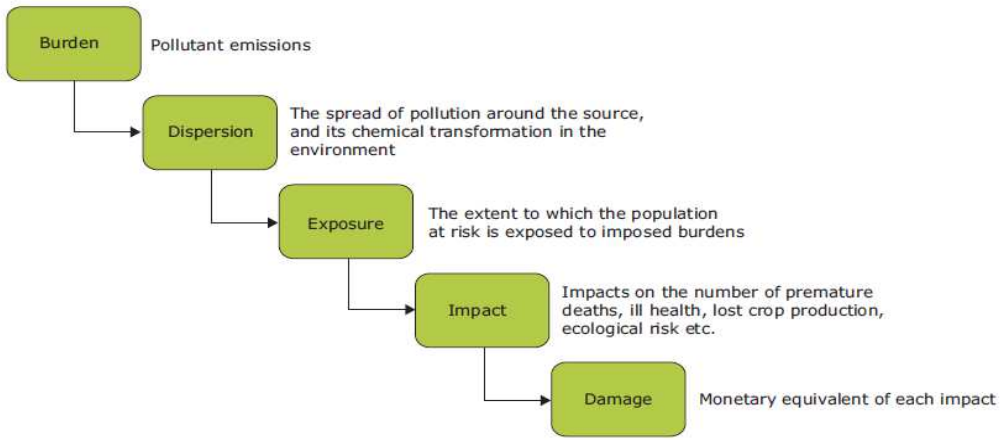


Note: The lower VOLY approach for the main air pollutants and a CO_2 price of EUR_{2005} 9.5 per tonne are applied. Of these facilities, 94 of the 147 facilities are categorised in E-PRTR as being power generating facilities.

Methods for damage cost assessment reviewed in 2019

- Objectives
  - Review past work in the light of current knowledge covering all steps of the impact pathway
  - Considering current best practice in EC projects; Commission, WHO & national guidance; publications of national health institutes or committees…
  - Suggesting areas where new scientific findings could be considered or parameter values be adapted
  - Trying to ensure consistency across EC services
  - Including feedback obtained from experts through a written consultation

The impact pathway approach as it relates to pollutant emissions



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Recommendations from the 2019 work – changes compared to the previous report

We thank the EEA task managers and the numerous experts consulted for their feedback on the first version of the 2019 working paper.
The final recommendations are our own responsibility.

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Main air pollutants (NH_3, NOx, SO_2, NMVOCs, $PM_{2.5}$)

- Per tonne damage costs covering
  - Impact of emission per tonne of pollutant from a particular country, wherever the impacts occur
  - Damage occurring only in the country
- Dispersion & exposure modelling
  - Use of latest EMEP SRMs
  - Assessment of possibility to derive sectoral adjustment factors via the Sherpa model (ongoing)
  - Intention to use Sherpa for higher resolution modelling of NO_2
- Health impacts
  - Include impacts from NO_2 (functions without cut-off point)
  - Conduct sensitivity assessment for additional impacts (cardio vascular disease, stroke), possibly for non-linear $PM_{2.5}$ mortality response functions, for updated productivity impact
  - Mortality valuation: OECD 2012 for VSL, consistent VOLY

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Main air pollutants (NH_3, NOx, SO_2, NMVOCs, $PM_{2.5}$)

- Materials
  - Account also for impacts of soiling from particulate matter and possibly impacts of ozone
  - Use updated response functions (e.g. paints) if available
  - Update unit cost data for repair & replacement in line with inflation
- Crops & forests
  - Use POD indicator if SRMs available (unlikely)
  - Assess for all major crops and tree species
- Ecosystems impacts
  - Include ecosystems impacts
  - Start with deposition of NH_3 and NO_2 for exceedances of critical loads in Natura 2000 areas
  - Valuation based on Christie et al., 2012
  - ECLAIRE approach

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Metals (As, Cd, Cr, Pb, Hg, Ni)

- Health impacts
  - Include further impacts, esp. mortality from mercury and lead
  - Use updated unit cost data
  - Adapt assessment from Nedellec/Rabl studies (population alive instead of birth cohort …)

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Greenhouse gases

- Scope of gases
  - Include also methane and nitrous oxide
- Update of valuation
  - DG Move Transport cost handbook MAC value - central value € 100 up to 2030 ($€_{2016}$) – for consistency reasons?
- Carbon neutrality of biomass combustion?
  - Apply a sensitivity calculation to account for biomass use not necessarily being carbon neutral
  - Arbitrary middle option between assuming 0 and 100% carbon emissions

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Ongoing work

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Work for the 2020 update of the cost assessment

- Compilation of data and functions to calculate damage costs per tonne of pollutant
- Compilation of E-PRTR data and outlier removal
- Ongoing exchange with EEA & DGs (esp. for valuation of mortality and CO_2 effects)
- Time schedule
  - Updated set of damage costs & first results for externalities from industrial facilities by mid-August
  - Final report in December 2020

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Thank you for your attention!

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+ Joseph Spadaro (Basque Centre for Climate Change) in 2020

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