



External Cost Values to be Applied in the EE IO Framework of EXIOPOL

Wolf Müller, Philipp Preiss, Rainer Friedrich

Institute of Energy Economics and the Rational Use of Energy (IER),
University of Stuttgart
15 September 2011, Berne

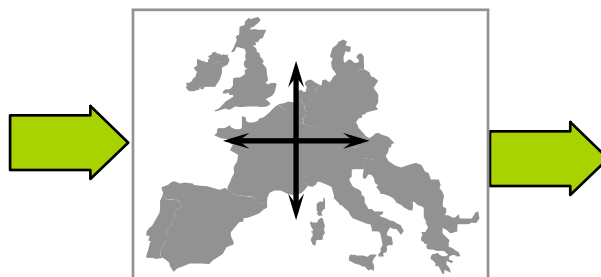


Impact Pathway Approach (www.ExternE.info, EcoSense, NEEDS-Project)

Pollutant/Noise Emission

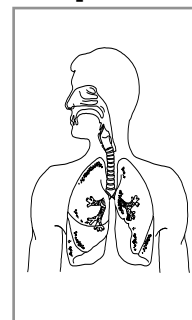


Transport and Chemical Transformation; Noise Propagation



Calculation is made twice: with and without project!

Differences of Physical Impacts



Monetary Valuation





In EXIOPOL: Classification of Sectors According to Spatial Characteristics

- In EU-Project EXIOPOL spatial characteristics have been identified for 130 sectors by
 - i. defining the share of total emissions released at different stack heights
 - ii. defining the share of emissions released in urban and rural areas for each of the stack heights

industry type name	transport / traffic			low stack < 20m			medium stack 20<x<100m			high stack >100m
	thereof:			thereof:			thereof:			
	share	urban	rural	share	urban	rural	share	urban	rural	share
Manufacture of cement, lime and plaster				20%	80%	20%	20%	80%	20%	60%
Production of electricity by coal										100%
Other land transport	100%	33%	67%							
Research and development				100%	90%	10%				



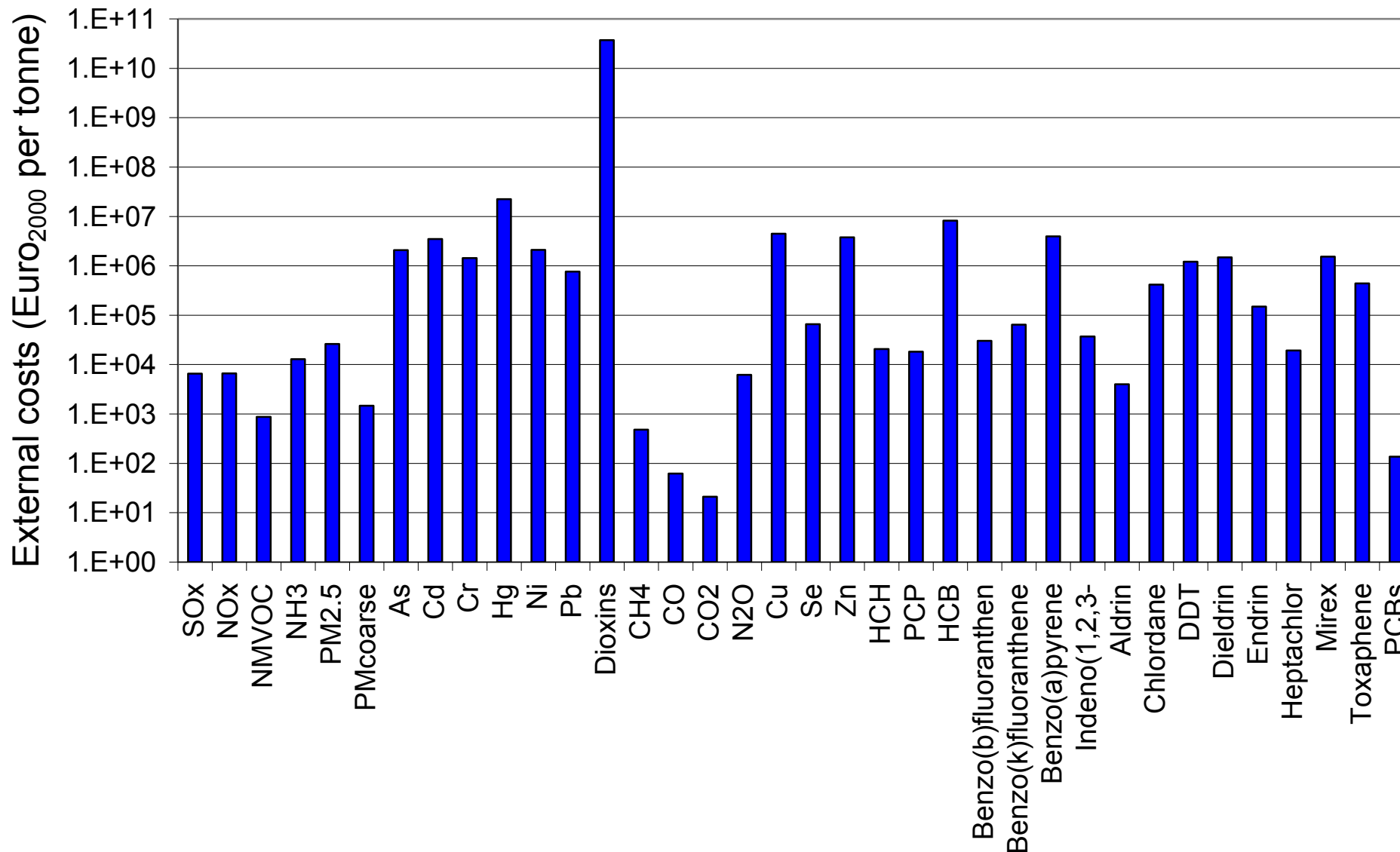
Estimation Damage Cost Values for

- **41 airborne pollutants, including**
 - i. Classical air pollutants (SO_2 , NO_x , NMVOC, NH_3 , CO, $\text{PM}_{2.5}$, $\text{PM}_{\text{coarse}}$),
 - ii. heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn),
 - iii. greenhouse gases (CH_4 , CO_2 and N_2O) and
 - iv. Dioxins, POPs, Pesticides, HCH, PCP, PAH, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyren, Paraffin's
- **43 Countries**
 - i. EU-27 Member States,
 - ii. 4 European countries: Norway, Switzerland, Russia, Turkey
 - iii. 12 non-EU countries: Australia, Brazil, Canada, China, India, Indonesia, Japan, Mexico, South Africa, South Korea, Taiwan and USA
- **130 Sectors**

covering all parts of economic activities in the countries



Monetary values for medium stack height in EU-27





Thank you very much for your attention!

Links

- EXIOPOL project
<http://www.feem-project.net/exiopol/>
- NEEDS project
<http://www.needs-project.org/>

ExternE project series

<http://www.externe.info/>

Contact:

wolf.mueller@ier.uni-stuttgart.de



NEEDS recommend: WTP for Reduction of Health Risks

Health end-points	Euro2000 per case / per YOLL
Core Endpoints	
Increased mortality risk (infants)	3,000,000
New cases of chronic bronchitis	200,000
Increased mortality risk - YOLLacute	60,000
Life expectancy reduction - YOLLchronic	40,000
Respiratory hospital admissions	2,000
Cardiac hospital admissions	2,000
Work loss days (WLD)	295
netto Restricted activity days (netRADs)	130
Minor restricted activity days (MRAD)	38
Lower respiratory symptoms	38
LRS excluding cough	38
Cough days	38
Medication use / bronchodilator use	1

<http://www.needs-project.org/>



Estimation of monetary damage factors

EcoSenseWeb model

- i. The model is based on the Impact Pathway Approach
- ii. Integrated computer system developed within the ExternE project series with last updates in the EU-project NEEDS
- iii. Assessment of the impacts on human health, crops yield loss, damage to building materials, loss of biodiversity and climate change caused by emissions to air
- iv. Chemical transport modelling based on source receptor matrices (SRM) from MET.NO
- v. <http://ecosenseweb.ier.uni-stuttgart.de>





Deriving Damage Cost Values per Unit Emission

- **Application of EcoSenseWeb model**

- Estimations include classical airborne pollutants such as NO_x , SO_2 , NH_3 , NMVOC and primary particles ($\text{PM}_{2.5}$ and PM_{10})
- Country-specific external cost values for EU-27 Member States plus NO, TR, RU, CH in Euro/Tonne which differ between:
 - levels of stack height
 - emissions in urban or rural areas for each country (for primary PM)

- **For other pollutants: Application of LCIA data from IMPACT2002+**

- No differentiation between levels of stack heights or geographical location
- For the monetary valuation the following values have been derived in NEEDS

Impact	Ecosystem Quality	Human Health
Euros	0.47 € ₂₀₀₀ / PDF	40,000 € ₂₀₀₀ / DALY



Example: Monetised damages of Primary PM2.5 emissions from cement production in Germany

- Total emissions of PM2.5 in 2000: 2,613.54 t (EEA data)

shares	low stack < 20m			medium stack 20<x<100m			high stack >100m
	total share	urban	rural	total share	urban	rural	total share
Manufacture of cement	20%	80%	20%	20%	80%	20%	60%

Emissions of PM2.5 (in t)	low stack < 20m			medium stack 20<x<100m			high stack >100m
	total	urban	rural	total	urban	rural	total
Manufacture of cement	522.71	418.17	104.54	522.71	418.17	104.54	1,568.12

€ ₂₀₀₀ /tonne	low stack (3-20m)		medium stack (20-100m)		high stack (<100m)
	rural	urban	rural	urban	
Germany					
PM2.5	41,964.00	91,481.52	41,964.00	43,222.92	21,899.00

- Total external costs: 99,443,683 €₂₀₀₀



Damage Cost Values Outside Europe: PPP weighting

- For non-EU countries: same fate & effect factor but adjustment via national purchasing power parities (PPP in 2000)

