



# Monetization of environmental externalities

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**Discussion panel**  
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# Overview

- **Definition** of “External Costs” [www.ExternE.Info](http://www.ExternE.Info)
- The **Impact-Pathway-Approach**
- **Results:** External costs per unit of air pollutant emission
- **Application:** External & internal costs per kWh-electricity
- **Conclusions**

# Definition „External Costs”

Source: [www.ExternE.Info](http://www.ExternE.Info)

- Externalities arise, when the social or economic activities of a participant in the economy have negative or positive impacts on another participant and these impacts are not fully accounted for or compensated by the first participant.
- Actually, external costs are the share of damage costs which is not internalised.
- Externalities cause market failures.  
The free market's allocation of resources will be non-optimal from society's point of view.
- External costs are externalities, that are transformed into monetary values. This allows a comparison between external and internal costs.

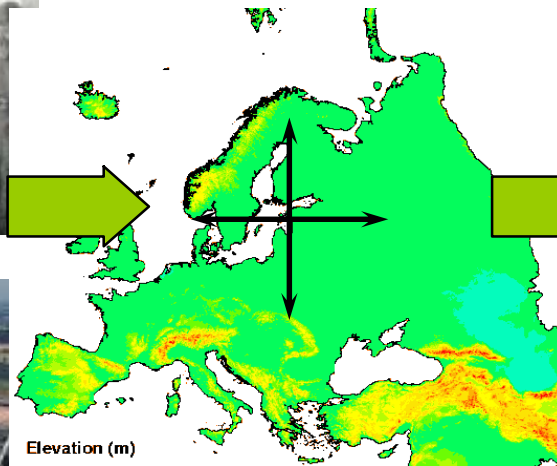
# Impact Pathway Approach

## Differences of Physical Impacts

Emissions

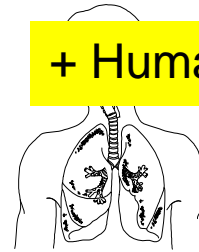


Transport and chemical Transformation



**Calculation is made twice: with and without project!**

+ Human health



+ Building materials



+ Crops



+ Ecosystem

+ Climate Change



Monetary Evaluation

# What is considered

- **The release of the air pollutants (particulate matter, NO<sub>x</sub>, NMVOC, SO<sub>2</sub> and NH<sub>3</sub> and some others) and their impact on human health, crops, materials and ecosystems.**
- **Climate change: evaluation took into account damage costs\* and compares with avoidance cost approach.**

\*Source: FUND model, co-developed by David Anthoff and Richard Tol

# Monetary valuation of human health is based on willingness to pay. Source: NEEDS (2007)

<b>End point</b>	<b>unit</b>	<b>Monetary value per case or per YOLL [Euro<sub>2000</sub>]</b>
New cases of chronic bronchitis	cases	200,000
Increased mortality risk	YOLL	60,000
Life expectancy reduction – YOLLchronic	YOLL	40,000
Respiratory hospital admission	cases	2,000
Cardiac hospital admission	cases	2,000
Work loss days (WLD)	days	295
Restricted activity days (netRADs)	days	130
Lower respiratory symptoms	days	38
Cough days	days	38
Medication use / bronchodilator use	cases	1

# Greenhouse Gases

## evaluation per tonne CO<sub>2</sub>-eq

Source: NEEDS (2007)

“Best Estimate”: Low, central and high value

43 €<sub>2010</sub>/t CO<sub>2</sub>-eq

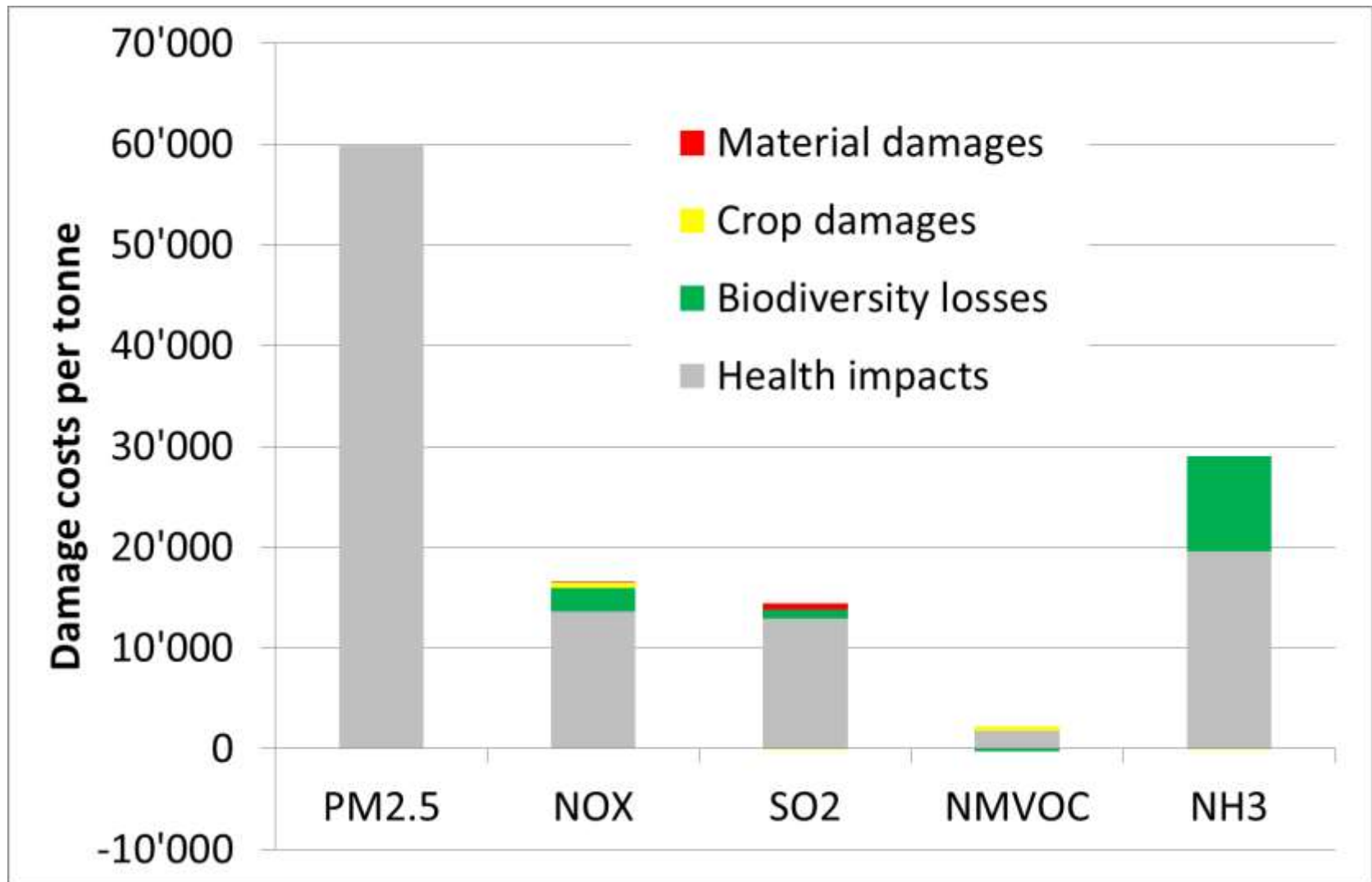
89 €<sub>2010</sub>/t CO<sub>2</sub>-eq

135 €<sub>2010</sub>/t CO<sub>2</sub>-eq

**HOWEVER:** values range from **below 0 Euro up to 450 €**  
**per Tonne of CO<sub>2</sub>-eq** for current emissions

**Depending on the settings of**  
equity weighting and discounting!

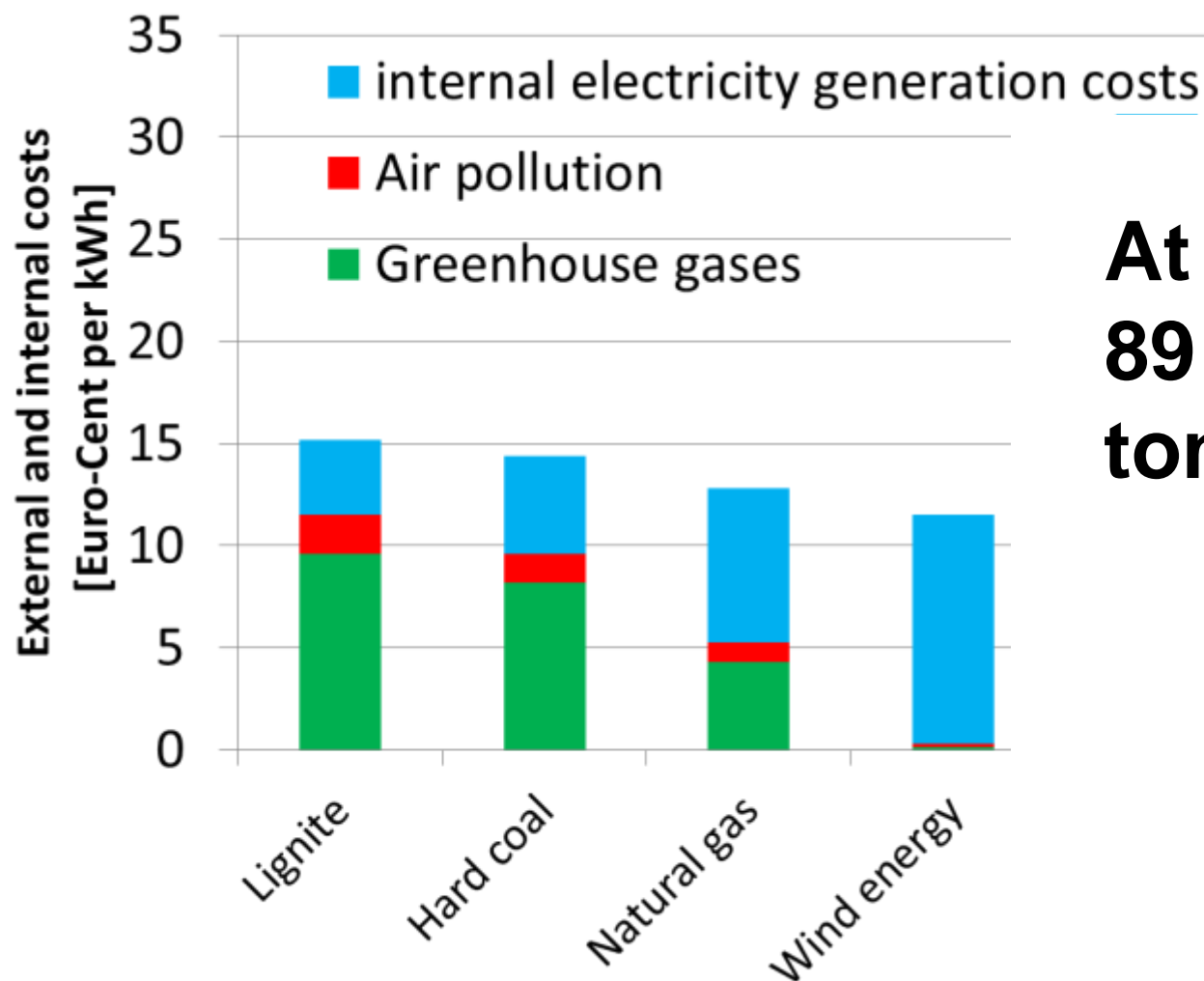
# Damage costs [Euro<sub>2010</sub> per tonne of air pollutant] for average height of release





# Example of application: average external and internal costs per kWh electricity

(Source: NEEDS for Germany, new technologies 2015)



**At a value of  
89 €<sub>2010</sub> per  
tonne of CO<sub>2</sub>-eq**

# The ExternE-series and other projects

- since early 90's focus on "energy externalities"
- research project "US-EC Fuel Cycle"
- 1995 ExternE-project study series →  
    "Impact Pathway Approach" → EcoSense
- Large scale EC projects: NewExt, Methodex, ExternE-Pol, MAXIMA, Cases, **NEEDS (2007)**, EXIOPOL, HEIMTSA, INTARES, etc...  
→ **total budget: several million Euro**
- **German Federal Environmental Agency (UBA):**  
**2007:** "Economic Valuation of Environmental Damage - Methodological Convention for Estimates of Environmental Externalities"  
**2013\*:** update \* <http://www.umweltbundesamt.de/publikationen/economic-valuation-of-environmental-damage-0>  
**2018/19:** 2<sup>nd</sup> update

# Some conclusions

- One comprehensive, consistent, robust, transparent, generally applicable and easy to understand & state-of-the-art-approach is not available
- It is difficult to compare results of different studies (in different years) because of missing conventions and on-going scientific progress
- In order to communicate or compare results from different sources documentation of assumptions and input needs to be open
- Need for harmonisation and common guidance  
e.g. ISO 14007 and 14008 (is ongoing)
- With monetisation of externalities the monetary values are shown explicitly. Without monetisation the impacts of a decisions are implicitly monetised by the difference of the internal costs.
- Monetisation offers an additional indicator but must not be the only basis for decision-making.

