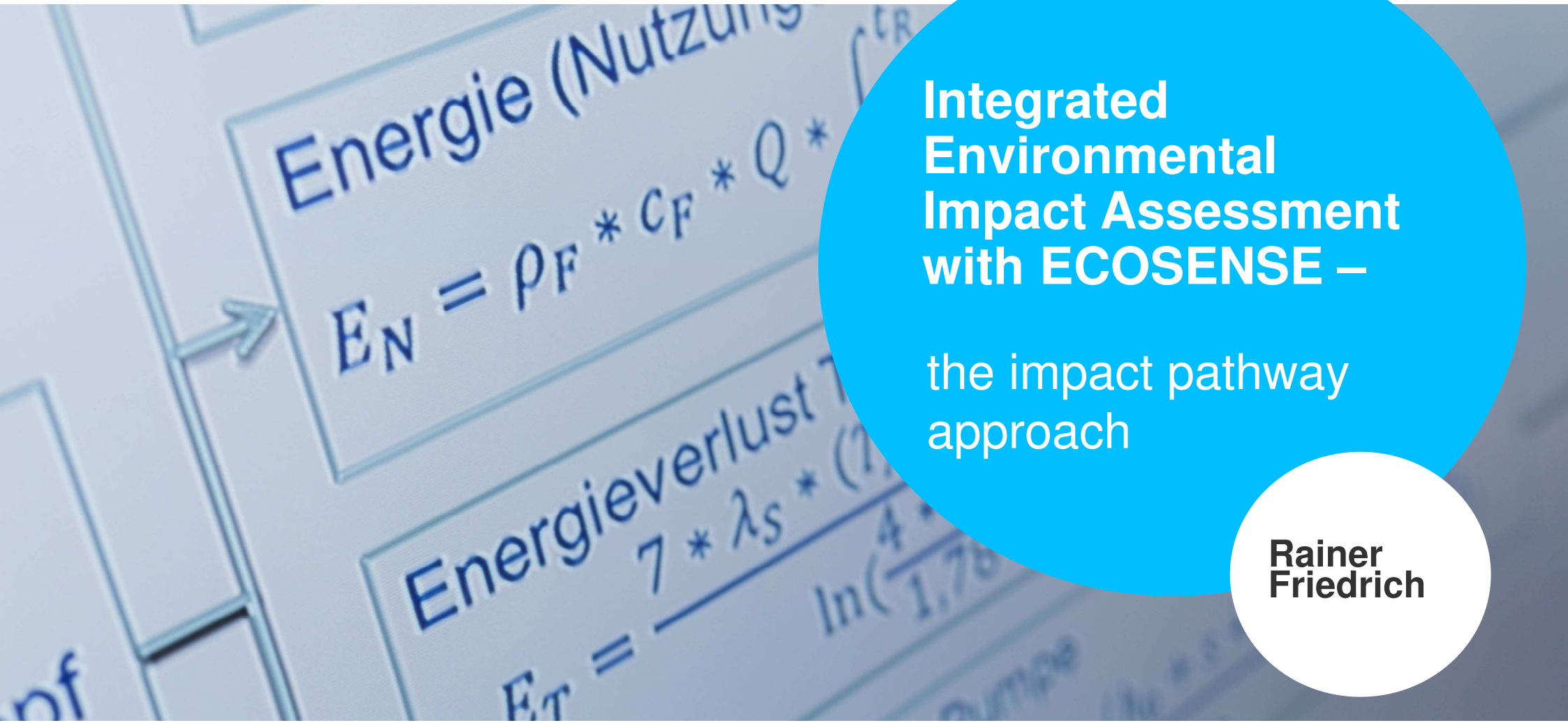
Universität Stuttgart
IER Institut für Energiewirtschaft und Rationelle Energieanwendung



Integrated Environmental Impact Assessment with ECOSENSE –

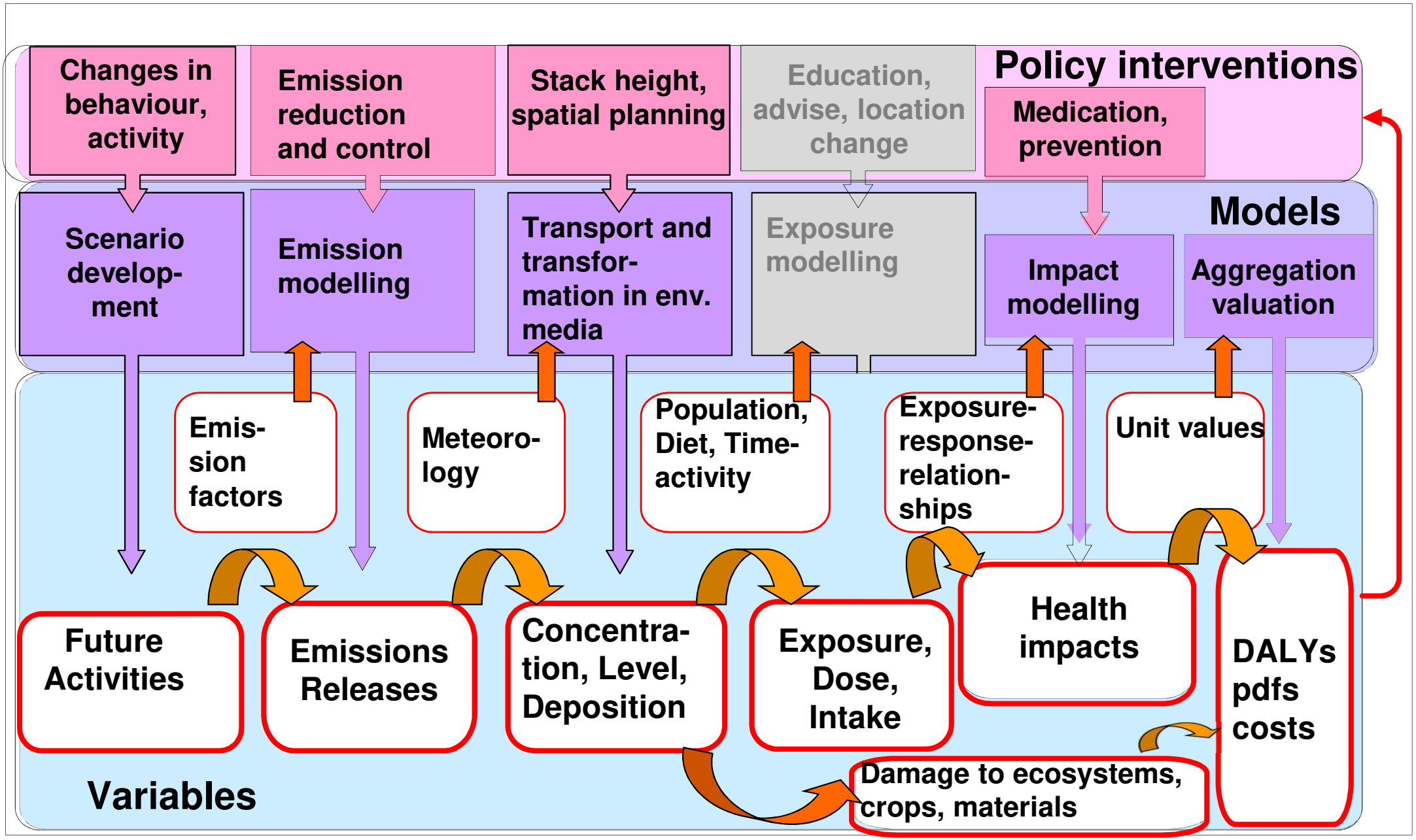
the impact pathway approach

Rainer Friedrich

Objective of methodology (impact pathway approach) and tool (ECOSENSE)

- Estimation of health and other impacts caused by environmental stressors (toxic pollutants and precursors, greenhouse gases, noise, radiation) released to environmental media (air, indoor air, soil, water)
- Monetary assessment of impacts for use in cost-benefit analyses

Methodology: the Impact Pathway Approach

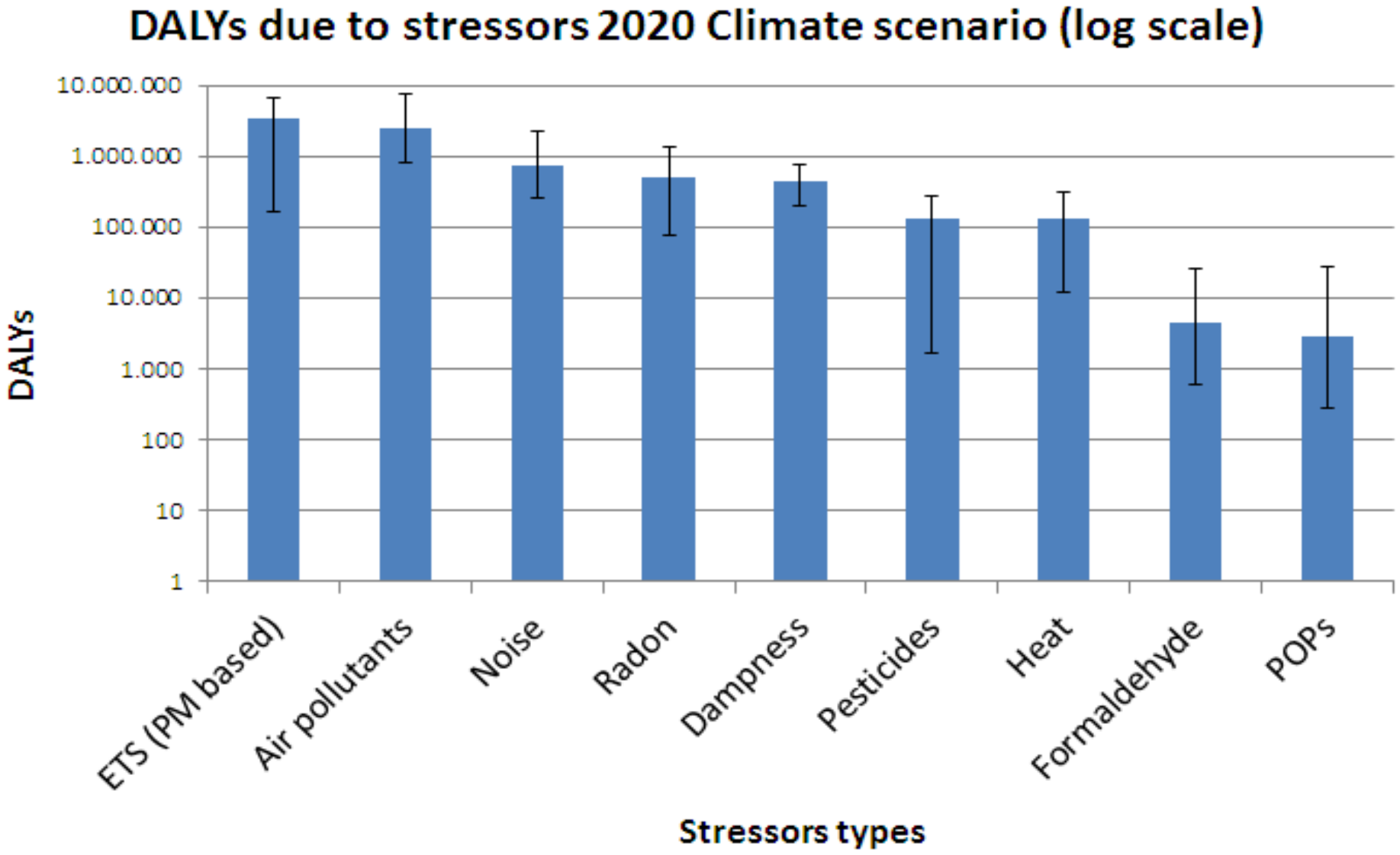


Includes: assessment of uncertainties (Monte Carlo Simulation) $2\rho_g$ = ca 1,8 – 2,9; use of WHO set of recommended concentration-response functions for PM2.5, PM10, O3 and NO2

Applications of the method:

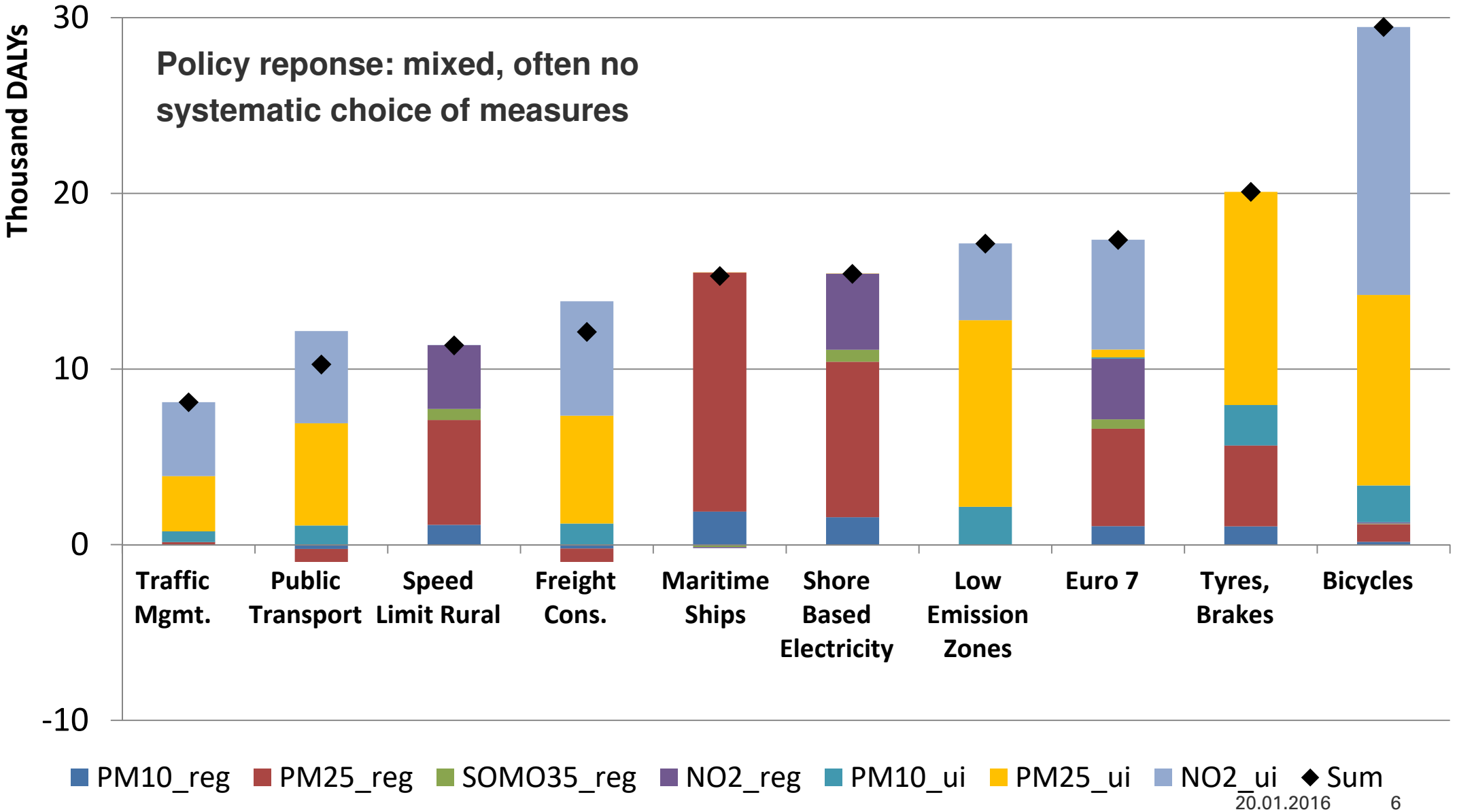
- **DG ENVIRONMENT: support for design and justification esp. for all directives related to air pollution control**
- **DG MOBILITY AND TRANSPORT and national authorities: appraisal of large transport infrastructure projects**
- UN/ECE multi-pollutant multi-effect protocols
- **Umweltbundesamt (Environmental Federal Agency Germany): recommendation for use of the methodology for project appraisals**
- **Industry: ecological benefits of product compared to competitor‘s products, usefulness of political guidelines**
- **Numerous national and local applications (mainly engineering offices applying the tool for various clients)**

Example of Use 1: ranking of environmental stressors (Impacts caused by pressures during one year in Europe) - a result of the EU project HEIMTSA.



Policy response: EU limit values for PM2.5, EURO 6c and RDE tests, Environmental Noise Directive, update of noise limit values for vehicles

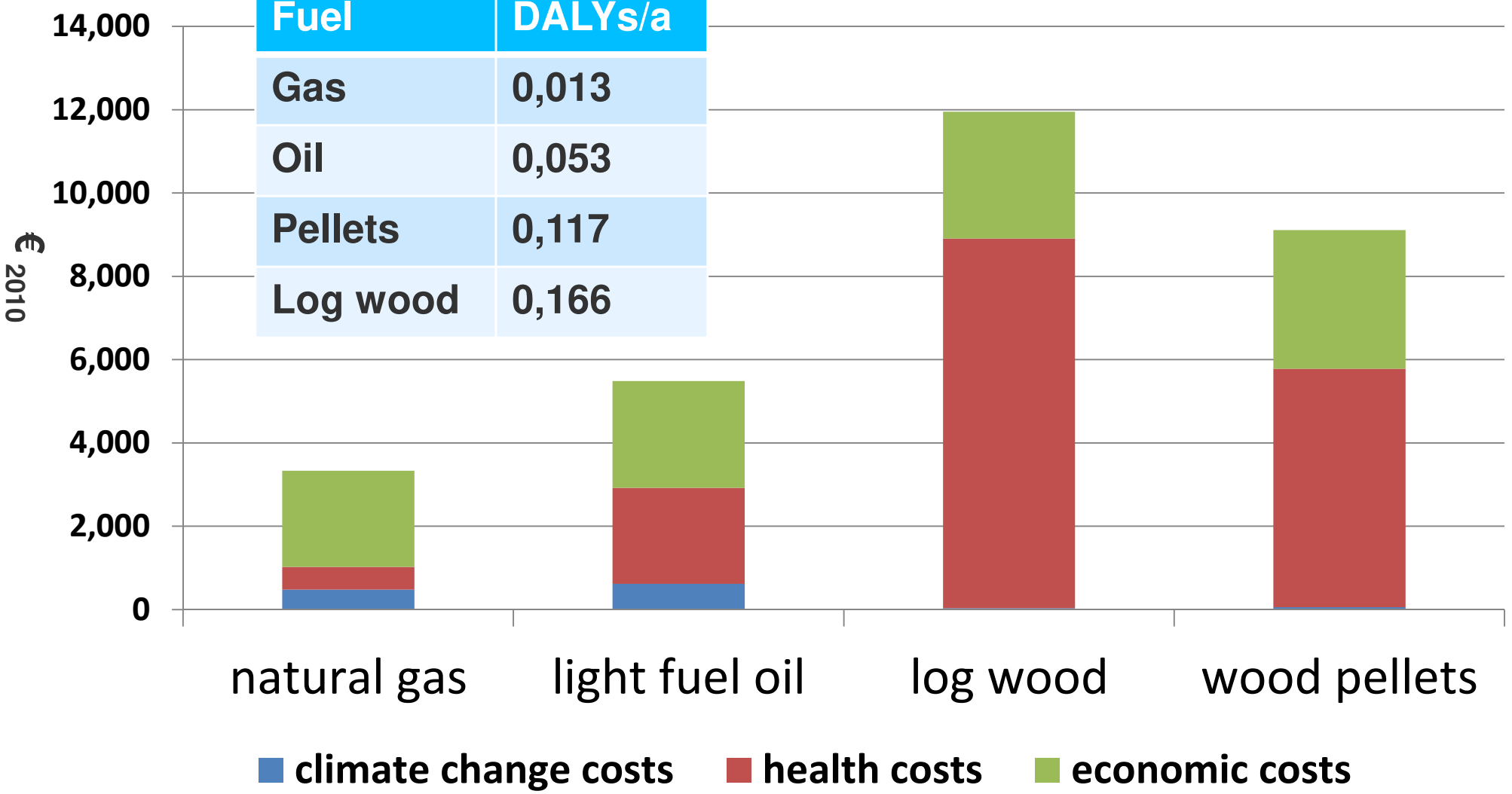
Example of Use 2: avoided health effects caused by implementing air pollution control policies in the transport sector in the EU in 1000 DALYs per year, result of the EU project TRANSPHORM (www.transphorm.eu)



Example of Use 3: Assessment of Replacing an Oil and Gas Firing by a Wood Firing in a Single Family House in Stuttgart (77€/t CO2)

http://www.zfes.uni-stuttgart.de/deutsch/projekte/p_0030.html

Fuel	DALYs/a
Gas	0,013
Oil	0,053
Pellets	0,117
Log wood	0,166



Policy response: weak as biomass burning is an important measure for reducing CO2 emissions, however: recommendation to not use ‚comfort fire places' during days with high concentration of fine particles in Stuttgart http://www.zfes.uni-stuttgart.de/deutsch/projekte/p_0030.html

Limitations and new development

- **Currently: Estimation of Health Impacts based on Urban Background Concentration; no differentiation of population in a city possible.**

-> new: External Exposure (and Intake) Modelling using time-activity data and concentration in microenvironments including indoor environment, resulting in lifetime exposures

Allows assessment of health risks for different socioeconomic population groups

- **Currently: no impact assessment for exposure to combination of stressors, direct link from exposure/intake to impact**

-> new: internal exposure modelling: see contribution by Denis Sariagiannis

Example of Use 4: Assessment of the Impacts of Installing Tight Energy Saving Windows

Assumption: 20 % of Buildings in the EU are renovated and get tighter new windows

	Δ Mean exposure [µg/m³]	Δ DALYs
Sum of Impacts	+ 0.12	+ 23,200
Avoided health impacts caused by less energy consumption	- 0.24	- 43,300
Impacts caused by lower air exchange rate (PM2.5, PM10, NO2, mould, radon)	+ 0.36	+ 66,500

Conclusion: for new buidlings mechanical ventilation with heat recovery mandatory, for renovated old buildings mechnical ventilation if possible

Policy response: nothing tangible

A. Gens et al.: Health impacts due to personal exposure to fine particles caused by insulation of residential buildings in Europe, Atmospheric Environment 84 (2014) 213-221

Summary

Methodology – the impact pathway approach – and tools – ECOSENSE - available to estimate the health impacts and costs of environmental pollution.

Methodology is widely used to support decision making in certain fields, e.g. for assessing environmental policies and transport projects.

more information:

www.externe.info

www.integrated-assessment.eu