CASES

COST ASSESSMENT FOR
SUSTAINABLE ENERGY SYSTEMS

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External costs database: description of data

ACCESS TO THE ONLINE TOOL ECOSENSE-WEB

FOR THE CALCULATION OF EXTERNAL COSTS

EcoSenseWeb is an integrated computer system developed for the assessment of environmental impacts and resulting external costs from electricity generation systems and other industrial activities. Based on the Impact Pathway Approach (IPA) developed in the ExternE-Project on External Costs of Energy funded by the European Commission, EcoSenseWeb provides relevant data and models required for an integrated impact assessment related to pollutants.
Modules for the assessment of emissions to air, and pathways via soil and water are also included. The emissions considered include classical airborne pollutants, heavy metals, greenhouse gases and radionuclides. The different impact categories considered include human health, crops yield loss, damage to building materials, loss of biodiversity and climate change.
One of the major objectives of the EcoSenseWeb development was to produce a user-friendly system that is capable of performing a highly standardised impact assessment procedure with a minimum of data required as input from the user. Only the technical data of the facility to be analysed has to be added by the user. All other data are provided by the system, thus the user loses no time with the tedious compilation of data. However, it is obvious that the approach of providing all important data and models to the user limits the flexibility of the system. Although the various modules of the system have a potential for high flexibility, the current EcoSenseWeb version is limited to a set of standard applications that can be very easily carried out. The EcoSenseWeb and the calculation of external costs follows, as far as possible, the so called Impact Pathway Approach (IPA).
The link to the online tool EcoSenseWeb is
http://EcoSenseWeb.ier.uni-stuttgart.de/ .
After registration one will find the most relevant information on the homepage (i.e. background reports and User Manual, etc) in the section “News”.

RECOMMENDATION

HOW TO USE THE DIFFERENT EURO PER TON VALUES IN THE EXCEL FILE

The Excel file ("ExternalCosts_per_unit_emission_080821") consists of different spreadsheets.

Table 0.1 Description of spreadsheets in Euro per ton Excel file

Name of the sheet	Description
History	Here the overview of updates compared to the previous version are listed and explained
Assumption	Here the year of assessment has to be specified
Unkno_Height of Release_20xx_xx	Values for emission of unknown height of release, discounted to the year of emission
Unkno_Height of Release_20xx_00	Values for emission of unknown height of release, discounted to the year 2000
Low_Height of Release_20xx_xx	Values for emission of low height (<100m) of release, discounted to the year of emission
Low_Height of Release_20xx_00	Values for emission of low height (<100m) of release, discounted to the year 2000
High_Height of Release_20xx_xx	Values for emission of high height (>100m) of release, discounted to the year of emission
High_Height of Release_20xx_00	Values for emission of high height (>100m) of release, discounted to the year 2000
Radionuclides_20xx_xx	Values for emission of radionuclide release, discounted to the year of emission
Radionuclides_20xx_00	Values for emission of radionuclide release, discounted to the year 2000
Margi._Costs_of_GHG	Lower, central and upper values recommended – also discounted to the year of emission or alternatively to the year 2000
Unknown Height of Release Low Height of Release High Height of Release Radionuclides	The last four sheets are not to be modified by the user and are merely input files for the computations performed in the excel file, for the year of the assessment specified in the spreadsheet: "Assumption"

Year of Assessment

The year of assessment, i.e. the year the emissions occur has to be specified in the spreadsheet named "Assumption". Euro per ton and Euro per Bq values can then be retrieved either discounted to the year 2000 or to the year of emission. For some policy questions it will be necessary to get the first (e.g., comparison of different measures at different times) for other questions (e.g. taxes) the second values.

Height of release

If the average height of release for a certain process or for emission per functional unit from different processes is not known, the values which are based on total emissions from all sectors, in the spreadsheets named: "Unkno_Height of

Release_20xx_xx" or "Unkno_Height of Release_20xx_00" can be used as a best estimate.
However, if the height of emission is approximately known, the values in the spreadsheets "Low_Height of Release_20xx_.." should be taken for emission with a height of release below 100 meters, and the values in the spreadsheets "High_Height of Release_20xx_.." should be taken for emission with a height of release above 100 meters.

PPMcoarse and PPM2.5

In the past emission of primary particulates were expressed as TSP (total suspended solid). Later the indicator, called PM10 (particulate matter with an aerodynamic diameter smaller than 10 µm) was used. In order to distinguish between primary and secondary particulate matter the abbreviation for primary particulate matter is PPM10.
Within NEEDS, PPM10 has to be further distinguished into PPMco (primary particulate matter "coarse" with an aerodynamic diameter smaller than 10 µm but larger than 2.5 µm) and PPM2.5 (particulate matter with an aerodynamic diameter smaller than 2.5 µm).
There is not a value "Euro per ton PPM10" available. The external costs of PPM10 strongly depend on the share of PPM2.5 within PPM10 as it is illustrated in ***Figure 0.1***.

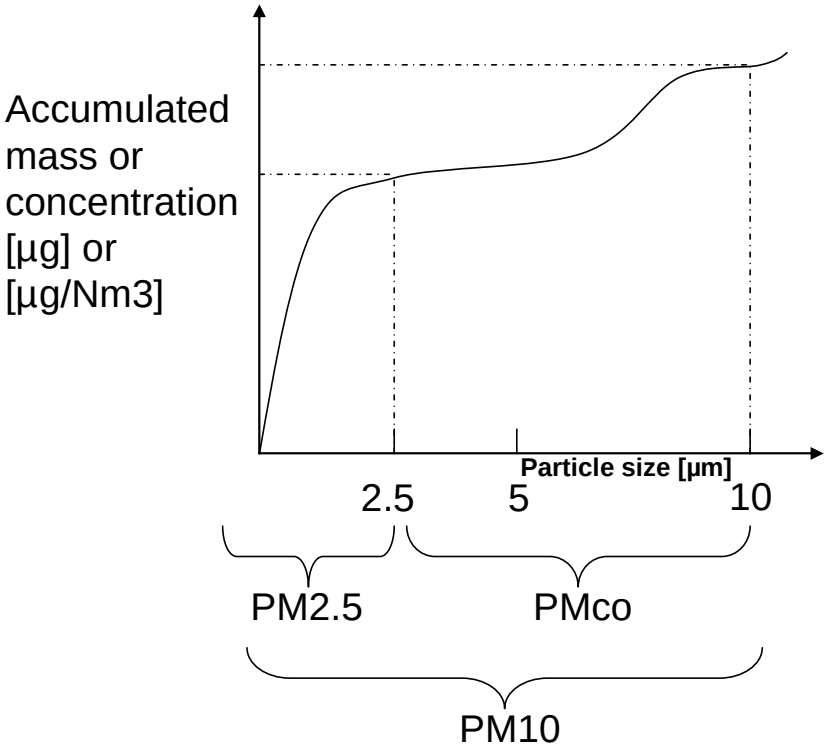

Figure 0.1 Example of distribution of PPM2.5 and PPMco within PPM10

For some flue gases, such as those from traffic, the share of PPM2.5 can be up to nearly 100% whereas for emissions of an embarkation of coal the share of PPM2.5 can be as low as ca. 5%. A general recommendation is therefore not possible.

Examples for shares of PPM2.5 on PPM10 can be found at following sources:

- Pregger, Thomas, Dissertation, „Ermittlung und Analyse der Emissionen und Potenziale zur Minderung primärer anthropogener Feinstäube in Deutschland", 2006,
- http://deposit.ddb.de/cgi-bin/dokserv?idn=980280427&dok_var=d1&dok_ext=pdf&filename=980280427.pdf
- Klimont, Z.; Cofala, J.; Bertok, I.; Amann, M.; Heyes, C.; Gyarfas, F.: Modelling Particulate Matter Emissions in Europe. International Institute for Applied Systems Analysis (IIASA), Interim Report IR-02-076, Laxenburg (A) 2002.
- International Institute for Applied Systems Analysis (IIASA): Updated CAFE baseline scenarios. Laxenburg 2004 (http://www.iiasa.ac.at/web-apps/tap/RainsWeb/).

- AEAT: Passant, N.R.; Peirce, M.; Rudd, H.J.; Scott, D.W.; Marlowe, I.; Watterson, J.D.: UK Particulate Heavy Metal Emissions from Industrial Processes. Report AEAT-6270 Issue 2, Feb. 2002.

Different impact categories for classical pollutants: HH regional, crops, materials, biodiversity and HH North Hemispheric model [Euro per ton]

The external costs of the different impact categories are listed. Moreover, the "Total cost" i.e. the sum of HH regional, crops, materials, biodiversity and HH North Hemispheric model [Euro per ton] is provided. Although the results of the North Hemispheric model have a higher degree of uncertainty and the monetary valuation is based on Western European monetary values, they are included in the total external costs.

Different services – functional unit – External cost per kWh

For example, with regard to electricity generation from renewable technologies like WEC (wind energy converters) the largest share of the emissions occurs during the building of the plants and not during operation. Therefore, most of the external costs also take place before any kWh is produced. The life time electricity output of the plant is then produced in the subsequent years. This can be taken into account if one wants to calculate external costs per kWh including discounting. Moreover, backup-technologies and corresponding emissions may be taken into account in order to compare external costs per kWh from different technologies.