

Draft programme of the case study on heavy metal pollution assessment

WP1. Emission data preparation for modelling and analysis

Objective: Prepare maximum detailed heavy metal emission data set for a country for modelling

Description: For the complex analysis of factors affecting quality of pollution assessment it is planned to involve as detailed emission inventories as possible. In particular, for modelling at finer spatial scales, emission with higher resolution is needed (e.g., 10 x 10 km). Besides, importance of other parameters of emissions (temporal variability, emission height etc.) will be evaluated. The requirements to the emission data are given below.

Basic requirements to the information on emissions:

- National emission totals
- Gridded emission data with 50 x 50 km resolution
- Gridded emission data with finer resolution (e.g., 10 x 10 km)

Additional requirements:

- Temporally resolved gridded emission data (e.g., daily means, monthly means)
- Gridded emission data by source categories
- Gridded emission data distributed along vertical levels
- Large point sources (LPS) data (emission magnitude, geographical coordinates, stack height, temperature and velocity of exhausted gases)
- Speciation of Hg emissions (if a country is interested in the case study for Hg)
- Size distribution of particles-carriers of heavy metals

The compiled national emission data will be analyzed by comparison with expert estimates. Potentially unaccounted emission source categories will be searched. Uncertainties of emission data will be evaluated. Year, for which emission data will be related, will be agreed with representatives of a country.

Deliverables:

- Emission data for modelling including emission totals, source categories data, gridded data with fine spatial resolution.
- Characterization of the emission data quality, including their completeness and uncertainties.

WP2. Collection and analysis of monitoring data for pollution assessment

Objective: Collect and evaluate the existing information on heavy metal measurements at national scale.

Description: National scale information on measurements will be collected and analysed. It is highly important to have so-called co-located measurements (measurements of concentrations both in air and in precipitation). It is important to compile all available measurement information, including EMEP data, data of national networks, campaigns etc. The requirements to the measurement data are given below.

Basic requirements to the information on measurements:

- Concentrations in air and in precipitation at EMEP stations with maximum possible temporal resolution
- Characteristics of EMEP stations (geographical peculiarities, information on nearby emission sources, measurement methods etc...)

Additional requirements:

- Concentrations in air and in precipitation measured at national networks with maximum possible temporal resolution
- Characteristics of stations from national networks (geographical peculiarities, information on nearby emission sources, measurement methods etc...)
- Observed meteorological parameters from monitoring stations (EMEP and national-scale ones) or from nearby meteorological stations
- Additional measurement information such as data on concentrations in mosses or throughfall measurements
- If possible, measurement field campaigns will be organized, and monitoring of other parameters (e.g., dry deposition) could be initiated

Deliverables: Set of measured parameters for the comparison with modelling results with detailed characteristic of measurement stations

WP3. Preparation of input geophysical and meteorological data for modelling and modification of the model

Objective: Collect necessary input data for modelling with required spatial resolution

Description: Geophysical and meteorological data for modelling over the EMEP domain with 50-km resolution are already available. However, for modelling over smaller scale region (i.e., a country) additional set of input data with higher spatial resolution is needed. These input data will be prepared by MSC-E in cooperation with national experts of the participating country. The model should also be adjusted by MSC-E to modified input data and spatial resolution.

Basic list of the input data (prepared by MSC-E) with high spatial resolution (e.g., 10x10 km)

- Meteorological data calculated using MM5 or WRF meteorological driver
- Geophysical data (e.g., land cover, concentrations of heavy metals in soils)
- Wind re-suspension flux
- Boundary concentrations of heavy metals in air (simulated by MSCE-HM model)

Additional list of data (provided by national experts)

- Soil concentrations of heavy metals
- Land-cover information
- Re-suspension of dust particles
- Critical load data in a country

Deliverables:

- Meteorological data with finer spatial resolution.
- Geophysical data (land cover types, concentrations of heavy metals in soils) with finer spatial resolution
- Wind re-suspension of heavy metals with finer spatial resolution
- Boundary concentrations of heavy metals in air for national-scale domain (including contributions of main external sources)

WP4. Atmospheric modelling

Objective: Produce detailed modelling information on pollution levels over a country for further analysis

Description: Modelling of atmospheric heavy metal pollution levels in a country using input data prepared in **WP1** and **WP3** will be carried out. The most detailed information will be prepared for grid cells where measurement stations are located. Intercomparison of modelling results of MSCE-HM model and national models is also appreciated.

Basic set of calculations will include:

- Modelling of pollution levels over a country with current (50 x 50 km) and finer spatial resolution (10 x 10 km)
- Source-receptor modelling for a country. The administrative regions and grid cells with monitoring stations will be considered as receptors. Neighbouring countries and administrative regions of a country will be considered as sources.
- Contribution from the global sources estimated by GLEMOS model (for Hg)

Additional calculations (depending on the availability of input emission data) for evaluation of:

- Contributions of different source categories of a country to pollution levels
- Modelling with different temporal resolution of emissions
- Modelling with detailed vertical distribution of emissions
- Calculations of pollution levels from individual LPS
- Calculations of national models

Deliverables:

- Maps of pollution levels over a territory of a country with fine spatial resolution (e.g., 10 x 10 km)
- Contributions of country's regions and external sources to pollution levels at the selected grid cells where monitoring stations are located

WP5. Complex analysis of modelling results

Objective: Perform comprehensive analysis of modelling results obtained in WP4, identify reasons of the discrepancies between modelled and measured values and work out recommendations.

Description: Modelling results obtained in **WP4** will be compared with measurements. Discrepancies between modelling results and monitoring data will be analysed. The analysis will depend on the availability of initial information (emission details, amount of monitoring stations etc...) and will include the steps listed below.

- Comparison with measurements and with national models
- Analysis of discrepancies using back trajectories for selected grid cells and source-receptor results
- Analysis of monitoring data
- Investigation of the effect of different model parameterizations on calculation results. In particular, attention could be paid to vertical mixing; dry deposition and wet scavenging (for example, rain vs. snow).
- Evaluation of influence of different emission parameters (spatial resolution, temporal variability etc...) on model simulations

Deliverables:

- Results of the analysis
- Recommendations to improve quality of pollution assessment based on model parameterizations, emission inventories, and measurement data

WP6. Improved model assessment of pollution levels in a country

Objectives: Produce state-of-the-art assessment of pollution in a country

Description: On the base of recommendations of **WP5** pollution assessment will be improved. The steps to be undertaken are presented below.

- Revision the model parameterizations, if necessary
- Selection of most appropriate monitoring data (both EMEP and other), from viewpoint of representativeness of stations and quality of measurements
- Updating emission data set
- Additional model calculations to produce improved assessment

Deliverables:

- Calculated concentrations and deposition with high (e.g., 10x10 km) spatial resolution
- Contributions of administrative regions and neighbouring countries to pollution levels
- Contributions of global sources to country's pollution levels (for Hg)
- Contributions of source categories to pollution levels
- Contributions of large point sources to pollution levels
- Critical loads exceedances maps
- Simulations based on national future emission scenarios