Assessment of heavy metal pollution within EMEP

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Main activities on heavy metals in 2020

- **Operational activities:**
  - Emissions - collection, gap-filling, gridding (CEIP)
  - Monitoring - data collection and analysis (CCC)
  - Model assessment of pollution levels (MSC-E)

- **Co-operation and research activities (MSC-E):**
  - Co-operation with national experts (case studies - Germany)
  - Scientific co-operation on mercury pollution (countries, AMAP)
  - Co-operation with the effect community (WGE)

Status report 2020  
Technical and data reports
Case studies for the EMEP countries (2010-2020)

Objective:
Assessment of HM and POP pollution on a country scale involving national experts and variety of national data

Countries involved:
Czech Republic, Croatia, Netherlands, Belarus, UK, Poland, Spain, France, Germany

Main outcomes:
- Refined information on pollution levels
- Analysis of national emissions
- Improvement of modelling approaches
Co-operation with national experts

Country-scale assessment of HM pollution in Germany

Main features of the study:

- Model assessment of Pb, Cd and Hg levels in Germany in 2014-2016
- Multi-scale modelling approach (global, regional, local)
- Thorough evaluation of modelling results vs. observations (EMEP and national)

The project was jointly funded by EMEP and the country (UBA, Germany)
Co-operation with national experts

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In collaboration with:
G. Schütze, S. Feigenspan and K. Uhse (UBA)

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**Lessons learned for the EMEP assessment**

- Use of **national monitoring data** largely expands the scope of the analysis but requires additional metadata (location, methodology etc.)
- Modelling results are sensitive to **detailed emissions data** (spatial distribution, height, chemical speciation etc.)
- Fine resolution modelling ($0.1° \times 0.1°$) simulates regional/national background but still does not reproduce effects of local pollution
- The **multi-scale modelling** allows distinguishing different pollution scales for targeting national, regional and global policies

![Monitoring sites](image.png)

- EMEP data
- national data
Interlink of different scales (Germany)

Contribution of **global/regional/national** sources to HM pollution

Co-operation with national experts

Air concentration at site DE001

Air concentration at site DEBW029
Co-operation with national experts

Interlink of different scales (Germany)

Contribution of global/regional/national sources to HM pollution

Monitoring sites

Pb wet deposition at site DE002

Hg wet deposition at site DE002

Graph showing Pb and Hg wet deposition with different scales and data sources.
Objective:

- Analysis and evaluation of new Hg oxidation/reduction mechanisms in the atmosphere

Current activities:

- Collaborative study by international research group (EMEP/MSC-E, Spain, France, USA, Canada, UK, Germany)
- MSC-E contributes with model evaluation of the new mechanisms

The new results were submitted for publication in PNAS
Mercury pollution of the Arctic

Contribution to the AMAP Mercury Assessment 2021

Information included:

- Multi-model assessment of Hg deposition to the Arctic in 2010 and 2015
- Mercury deposition to the Arctic rivers watersheds
- Sources apportionment of Hg deposition to various sub-regions of the Arctic
Attribution of long-term pollution changes
(in co-operation with TF HTAP)

Objective:
• Analysis of the key factors effecting long-term Hg and POP pollution changes
  (direct and secondary emissions, climate and LU change, etc.)

Tentative program:
• Analysis of available global Hg and POP emission inventories and measurements
• Multi-model assessment of long-term trends (1990-2019) in EMEP and other regions
• Sensitivity simulations to identify effect of various factors

TF HTAP workshop (virtual) with participation of modelling groups, AMAP, Minamata and Stockholm Conventions (December 2020)
Co-operation with ICPs (WGE)

Current:

- Joint analysis of heavy metal measurements in moss in co-operation with ICP-Vegetation (TF meeting, Riga, January 2020)

Potential:

- Analysis of heavy metal trends in co-operation with ICP-Integrated Monitoring and ICP-Forests
- Information exchange with ICP-Waters on Hg deposition to water bodies
- Co-operation with CCE on assessment of exceedances of heavy metal critical loads

Co-operation with effect community
Main future activities

- Attribution of long-term changes of Hg pollution (co-operation with TF HTAP, AMAP, Minamata Convention)
- Scientific co-operation with national experts on research of Hg atmospheric chemistry
- Country-scale pollution assessment (case studies)
  - Generalizing and application of gained experience to EMEP operational modelling
  - Initiation of a new study
- Co-operation with the effect community (WGE, ICPs)