Policy Brief 4

Enhancing Global Mercury Emission Scenarios for Effective Environmental Management

The Multi-Compartment Hg Modeling and Analysis Project (MCHgMAP), part of the MSCA ITN GMOS-Train initiative, provides a comprehensive assessment of global mercury (Hg) emissions, focusing on their environmental impacts. The project emphasizes the need for robust emission inventories, enhanced modeling techniques, and improved policy scenarios to support the Minamata Convention on Mercury's effectiveness evaluation. This policy brief summarizes the key findings and provides actionable recommendations for policy makers.

Key Findings

1. Global mercury emission scenarios:

The GMOS-Train project highlights the need to refine emission inventories, particularly concerning small-scale gold mining and the global phase-out of coal power generation, to better assess future Hg concentrations and deposition patterns. Several emission inventories, such as AMAP/GMA and EDGAR, reveal significant spatial and temporal variation in Hg emissions. These discrepancies must be addressed to improve the accuracy of global Hg modeling.

2. Modeling mercury deposition:

The project utilizes advanced modeling approaches, including GEOS-Chem and other state-of-the-art 3D atmospheric and marine models, to simulate Hg dispersion and deposition. The models show how emission inventories influence atmospheric concentrations and deposition, with significant regional variation. Uncertainty in emission inventories and the need for more refined data on mercury speciation are crucial areas for improvement to achieve more accurate predictions.

3. Policy implications:

Effective policies must account for the complexities of Hg emissions and their long-term environmental impacts. The integration of emission control technologies, improved data on artisanal gold mining, and regional differences in coal use are critical to crafting meaningful policy interventions. Enhanced global collaboration, through initiatives like MCHgMAP, can help harmonize emission inventories and improve policy design for the Minamata Convention.

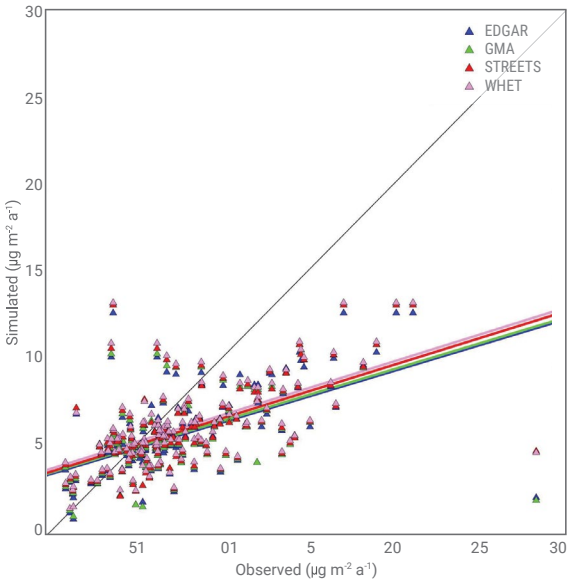

Figure 1: Scatter plot of simulated vs. observed annual wet deposition for different model simulations and lines that depict linear approximations. The observations that are higher than 10 µg m−2 y−1 are underestimated by all simulations. Good agreement between modelled and measured wet deposition is achieved when the annual wet deposition is close to 6 µg m−2 y−1.

Policy recommendations

1. **Strengthen global cooperation on data sharing:**
   Encourage further collaboration between international bodies to harmonize emission inventories and share best practices for emission control.
2. **Invest in improved emission inventories:**
   Focus on refining datasets for specific emission sectors, particularly artisanal gold mining and the phase-out of coal-fired power plants in developing regions.
3. **Focus on regional impact assessments:**
   Tailor policies to address the specific mercury emission profiles of different regions, considering the varying intensity of emissions from industrial, artisanal, and power generation sources.
4. **Enhance modeling capabilities:**
   Support the development of more sophisticated models to reduce uncertainty in mercury projections, with an emphasis on incorporating the role of secondary emissions and the interactions between different environmental media (air, ocean, land).

Conclusion

The GMOS-Train project provides critical insights into the global mercury cycle, emphasizing the importance of precise emission inventories and advanced modeling for assessing the impacts of policy measures under the Minamata Convention. By addressing the uncertainties in current emission inventories and improving the integration of modeling results, policymakers can enhance the effectiveness of global mercury management strategies.

References

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This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497