

ACROSS

Towards a quantification of anthropogenic immissions in Luxembourg based on near real time and high frequency measurement campaigns.



Inspiration

Ambient particulate matter (PM) is composed of several organic and inorganic chemical species including trace and major elements. Exposure to high concentrations of these trace elements, particularly heavy metals, can cause serious health issues and ecosystem damages. Many of them are indeed recognised as toxic by national and international air quality monitoring agencies such as the US Environmental Protection Agency. Emissions of heavy metals are controlled by the Amended Protocol on Heavy Metals of the Convention on Long-range Transboundary Air Pollution (LRTAP), requiring emissions of selected metals below the 1990 levels.

The mass and size distribution of ambient PM determine the efficiency of their removal from the atmosphere by dry deposition to terrestrial surfaces, while the intensity and frequency of rainfall events (wash out) largely control the wet deposition of these ambient PM. Their deposition to ecosystems may influence the biogeochemical cycles of trace substances, potentially negatively affecting the functioning of the biosphere.

In a previous project, the screening of the ammonia concentrations in Luxembourg has shown monthly mean NH₃ levels well above the critical loads and recommended WHO critical levels. With average values above the suggested annual guidance value of 3 µg m⁻³ for the protection of vegetation, the 2018-2021 NH₃ concentrations of Luxembourg reach a range comparable to neighbouring countries, especially in agricultural areas.

Innovation

The overarching objective of ACROSS is a screening of specific anthropogenic immissions in Luxembourg at multiple temporal and spatial scales to continue the countywide NH₃ timeseries and to deliver a first dataset on the spatial distribution of ambient heavy metal concentrations bound to particles throughout the country.

LIST researchers will make use of a continuous particulate monitor with X-ray fluorescence in LIST mobile air quality laboratory. It will enable near real time measurements on heavy metal concentrations in the total suspended matter at different locations.

ACROSS will also develop an innovative prototype for a holistic assessment of atmospheric dry and wet deposition in Luxembourg.

Impact

According to the draft of a national soil protection law, and in accordance with the National Emissions reduction Commitments (NEC) Directive (2016/2284/EU), there is a need to determine the atmospheric input of heavy metals, nutrients and persistent organic pollutants to soils. By pursuing Luxembourg's unique NH₃ time series initiated in 2018, ACROSS will define suitable measurement strategies, potential measurement locations and data evaluation protocols. Additionally, it will deliver a first dataset on particulate heavy metal concentrations for Luxembourg.

Based on the identification of potential measurement sites, ACROSS follows the request of the Environmental Agency to develop a prototype set-up for the quantification of wet and dry deposition of atmospheric pollutants in Luxembourg. This key information will contribute to the overall strategy of the MECDD for establishing a national network for soil monitoring and enabling a long-term monitoring of this pollutant, as required by the UNECE and CLRTAP.

Partners

Ministère de l'Environnement, du Climat et de la Biodiversité

Financial Support

Ministère de l'Environnement, du Climat et de la Biodiversité

Contact

5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | LIST.lu

Ivonne TREBS (ivonne.trebs@list.lu)
Céline LETT (celine.lett@list.lu)
© Copyright April 2025 LIST

LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY

