Critical discussion of dispersion modelling for odorous substances to determine the annoyance by environmental odour

Günther Schauberger, WG Environmental Health, Department for Biomedical Sciences, University of Veterinary Medicine, Vienna, Austria, qunther.schauberger@vetmeduni.ac.at

Martin Piringer, Geosphere Austria, Vienna, Austria, martin1956@gmx.at

Beside noise, environmental odour is the most relevant airborne pollutant for citizens causing annoyance and in some cases complaints. The emission of odour and the dilution in the atmosphere is handled identically to other airborne pollutants. For odour, dispersion models are used to determine a time series of hourly mean values of ambient odour concentrations. These time series are evaluated by odour impact criteria (OIC) to decide if annoyance can be expected. This model approach is applied predominantly for planning and zoning approval of non-existing plants and in the case of complaints, if they are reasonable.

Environmental odour can only be measured to a limited extent. This means that this limitation often makes empirical validation of the individual model steps impossible. Nonetheless, sensitivity assessments are an important step in model evaluation.

For the process step starting from the emission up to the assessment if annoyance can be expected at a certain site, ten questions will be discussed, which cover the pitfalls and shortcomings of this model approach: (1) Emission: mixture of odorous substances and chemical stability, (2) Emission: temporal variability of the emission rate, (3) Dispersion model: validation of dispersion models in the light of odour, (4) Meteorological data: which data are needed, (5) Meteorological data: impact of the interannual variability on the separation distance, (6) Emission: impact of climate change, (7) Assessment of the perception related exposure, (8) Empirical evidence by field measurements, (9) Impact assessment by dose-response function, (10) Odour impact criteria: reliability of annoyance assessment.

These ten questions have diverse impacts on the resulting assessment of annoyance. Most of the problems are caused by the fact that on the one side, odour is treated as a chemical substance using the dispersion model, like many other airborne pollutants, and on the other side, it is treated as a perception of humans, which is related to the intensity of odour and the hedonic tone. This affords a special treatment of the outcome of dispersion models, which is not yet agreed on an international level. While not all can be satisfactorily addressed, this overview provides key milestones for future research activities in environmental odour.