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## ABSTRACT

## DISPERSION MODELLING AS A TOOL FOR ASSESSMENT AND MANAGEMENT OF ODOUR EMISSIONS FROM A WASTEWATER TREATMENT PLANT

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The risk of unpleasant odour emissions from wastewater treatment plants (WWTPs) is of great concern to nearby communities and residential areas. Moreover, some compounds, like $H_2S$, can be a risk to workers' health.

In this work, air quality measurements of $H_2S$ emissions from a WWTP located inside a touristic town were conducted during 220 days. Summer was the most unfavourable period since there were more residents, more occupied dwellings, higher wastewater production, and higher temperature that favours the anaerobic processes in the sewer (responsible of the odour compounds that are released at the WWTP inlet).

Using a gas detector Dräger Polytron 7000 (one measurement was recorded each minute), the inlet of the WWTP was identified as the main $H_2S$ emission source, exceeding occasionally values of 20 ppm (being the 95th percentile = 16.04 ppm). On-site measurements were made at different points within the WWTP following a 10 m grid, but no significant $H_2S$ concentrations were recorded at any other point.

Data analysis of the essential variables involved, such as wind speed, wind direction and the $H_2S$ concentrations revealed via contrasting annual, monthly and daily patterns, that the probability of the closest residential areas to be affected by was highest from June to August in the late afternoon (from 19:00).

On-site olfactometry was also conducted by two expert panellists within the WWTP as well as on its surroundings to evaluate the odour impact.

To identify possible risk areas for workers and to determine under which conditions $H_2S$ concentrations above the perception threshold of 0.00047 ppm can occur in the

surroundings, mathematical modelling using AERMOD, a conservative Gaussian dispersion model was applied.

The modelling results confirmed that the concentrations remain significantly below values hazardous to health at all places of interest, both for the WWTP staff and the local residents. The recommended 15-minute average exposure limit for $H_2S$ is 10 ppm, whereas the maxima from the model output around 2.5 m next to the emission source remained significantly below 1 ppm.

Comparing with the wind patterns with the on-site olfactometry measurements and model outputs, it could be confirmed that the wind direction was the deciding factor in the question whether or not an odour can be noticed at a specific place.

Odour emissions from a WWTP integrated into an urban environment can led to complains in the neighbourhood. Dispersion modelling is a useful tool for assessment and management of odour emissions.

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