

Feasibility testing of low-cost sensors to represent spatio-temporal variability of ambient ground-level NO₂ and O₃ concentrations (SECURE Pilot Project)

Ambient air pollution and urban air quality in particular present an ongoing challenge for citizens, local authorities and researchers. We will build on recent developments in electrochemical sensors to develop a coherent approach to quantify the accuracy and uncertainty of air quality measurements and identify covariate factors affecting low-cost sensors, using the measurement of ground-level nitrogen dioxide (NO₂) and ozone (O₃) as an example. Applying laboratory and field-based evaluation and validation methods, we will develop robust approaches to advise and guide crowd-sourcing efforts for air pollution data to test novel statistical modelling approaches for fusing low-cost sensor data with reference monitoring data to best estimate the spatiotemporal patterns in pollution fields.

Key research questions:

- Can we develop a coherent approach to quantifying the accuracy and uncertainty of air quality measurements using low cost sensors and identify any covariate factors affecting low-cost electrochemical sensors, using the measurement of ground-level nitrogen dioxide (NO₂) and ozone (O₃) as an example?
- How can laboratory and field-based evaluation and validation methods be documented and robust approaches be developed to advise and guide crowd-sourcing efforts for air pollution data? (Field deployments will be conducted at the [EMEP Supersite at Auchencorth Moss, Bush Estate](#) and the UK AURN site at [Edinburgh St. Leonards](#)).
- How can we develop novel statistical modelling approaches for fusing low-cost sensor data with reference monitoring data to best estimate the spatiotemporal patterns in pollution fields?

Expected outcomes:

- Demonstration of a cross-disciplinary approach to support the use of performance assessment and validation/quality control methods for low-cost environmental sensors, and particularly to assist their use alongside reference monitoring networks
- A protocol developed from existing and new information on the performance and quality of electrochemical sensors, published on the web and publicised to relevant citizen science groups
- A peer-reviewed paper to provide a citeable, open access information source as a reference for the wider scientific discussion and a starting point for the development of a larger-scale funding application