

Evaluation of Low- Cost Gaseous (CO, NH₃ and NO₂) Air pollutant Monitor (DAirQ) Performance: Case study of Laboratory and Field Deployment of DAirQ Across Dar es Salaam City

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Abstract

Air pollution affects the quality of life and public health, especially in Urban cities. The carbon monoxide (CO), nitrogen dioxide (NO₂) and ammonia (NH₃) air pollutants have potential to cause respiratory illnesses or cardiovascular diseases. Low cost sensors for measurements of air pollutants concentrations is a promising options for understanding air quality problems in low- and middle-income countries (LMICs) where respiratory related diseases is high and there are few measurement instruments. The study focuses on Gaseous air pollutant monitor (DAirQ) unit assembled at Dar es Salaam Institute of Technology (DIT) to measure carbon monoxide (CO), ammonia (NH₃) and nitrogen dioxide (NO₂) air pollutants in urban areas. Measured datasets of NH₃, CO and NO₂ in laboratory and field sites in Dar es Salaam city between October 2021 and January 2022 were used for calibration and performance evaluation of DAirQ units. Adopting the calibration model equations extracted from sensor manufacture curves, datasets recorded in laboratory through colocation of devices were used in calibration process, while datasets recorded during field deployment of sensors across Dar es Salaam city were used in performance evaluation and development of model equation for the city. The results for calibration procedures studied showed significant resemblance of data recorded by sensors in terms of ranges and magnitude variations to be sufficient for indicative measurements in cities. The dataset from site specific recording across the city showed variations of pollutants among the sites and with time of the day as expected. For individual field observations, some high picks of pollutions above WHO recommended values were observed across the city, especially at rush hours and at night time for sensors located in busy roads and industrial areas, respectively. Over all, the observed indicative measure of air pollutants across the city were sufficient for public awareness and policy making purposes.

Early Career Scientist

NO, I am not an early career scientist.

IGAC Activities

MAP-AQ: Monitoring, Analysis and Prediction of Air Quality

IGAC Regional Working Groups

ANGA: African Group on Atmospheric Sciences