

Implementation and Analysis of an Urban CO2 Network in Heidelberg/Mannheim

MSc Thesis

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Project Overview:

Cities are responsible for approximately two-thirds of global CO2 emissions. However, they also have the potential to lead in developing innovative climate mitigation strategies. A key challenge in reducing emissions is accurately measuring and attributing them at the urban level. As part of the Paris Climate Accord, cities are encouraged to implement independent monitoring systems to track progress in emission reductions. Heidelberg and Mannheim are at the forefront of this movement towards climate neutrality.

In this MSc thesis project, you will contribute to the development of an urban CO2 monitoring network, deploying 18 sensors across Heidelberg-Mannheim to measure CO2 and other pollutants. The master student will explore optimal sensor placement, optimize the sensor data by post-processing and finally analyse the data to determine emission patterns and track emission reductions. This project aims at developing a new urban monitoring capacity, providing real-time concentration and independent information to citizens and decision-makers (Vardag and Butz, 2025).

Skills and Requirements:

- Programming skills in Python
- Knowledge of environmental physics and atmospheric dynamics
- Interest in stakeholder engagement and collaboration

References:

- Turner, A. J., et al. (2020). Observed impacts of COVID-19 on urban CO2 emissions. *Geophysical Research Letters*, 47(22), e2020GL090037.
- Vardag, S.N., and Butz, A. (2025). *In die Atmosphäre und wieder zurück. Von Daten zum Handeln, Ruperto Carola Forschungsmagazin*. [Link to article](#)