Master Thesis Topic

Environmental impacts assessment approach with R: a case study on public transportation-related emissions for the greater Munich area

Background

Urban Air Mobility (UAM) is a recent concept aiming to reduce travel time and **environmental footprint** to and from important destinations in and around the metropolitan area of Munich.

In the project "AMI AirShuttle", the Chair of Transportations Systems Engineering (TSE) and its partners are analyzing and evaluating the necessary requirements and solutions for the integration of electric vertical take-off and landing aircraft (eVTOL) into the infrastructure of commercial airports, focusing on the airport of Munich. The partners are aiming for a seamless travel chain, catering to user requirements and public acceptance with considering the social and **ecological aspects**.

The goal of this master thesis would be to use the existing R package/library to evaluate **the environmental impacts** of the base case scenario of Munich (before introducing UAM). The student will mainly focus on **the assessment of air pollution, and noise emissions/immissions situation for the metropolitan area of Munich**.

Methodology

There is already an R library which could be called to calculate the public transport-related air pollution emissions. The prospective student is expected to:

- Explore the R library and get familiar with using it
- Define input parameters for the simulation
- (Extract the required input from the Munich Model provided by the chair)
- Calculate the emissions emitted by public transportation vehicles and/or immissions perceived by the citizens
- Use R to analyze the obtained simulation results

During data analysis, the master's student can investigate several research questions and apply innovative methodologies. In particular, this master thesis within the framework of the research project "AMI-AirShuttle" aims to explore **new approaches in calculating the emissions not only for road traffic, but also for rail traffic**.

Results

This master thesis will result in **a holistic temporal-spatial analysis**, together with the results of the road traffic-related emissions from MATSim simulation (provided by the chair), which could be the baseline (i.e., before implementing the UAM services) for the assessment of the environmental impacts for the metropolitan area of Munich.

Key skills

1. Fluency in English, and good communication skills in German will be highly appreciated
2. Willingness to work independently for 6 months
3. Previous experience with **programming language R** or similar.

Relevant work

João Pedro Bazzo VieiraRafael H. M. PereiraPedro Ribeiro Andrade. (2022). Estimating public transport emissions from General Transit Feed Specification data. *Preprint.*

For more information about the research project "AMI-AirShuttle", please check:
https://www.mos.ed.tum.de/en/vvs/research/projects/ami-airshuttle/

Starting date

As soon as possible

How to apply:

Interested applicants should contact Hao Wu (wu.hao@tum.de) by sending an email including your **resume** and **your starting date**.