

NOMMON



Engage 2 KTN - Vertiport site selection

Introduction to the project

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Engage 2

Background

Innovative Air
Mobility (IAM) is
emerging

- Driven by advancements in eVTOL technology, IAM offers new possibilities for passenger and cargo transport within urban areas.

Infrastructure is a key
challenge

- The lack of suitable landing sites (vertiports) is a major obstacle to IAM implementation. Cities need sufficient take-off and landing infrastructure to support eVTOL operations at scale.

Vertiport location is
crucial

- Optimal vertiport placement is essential for an efficient IAM system. This involves considering factors like passenger needs, cargo delivery requirements, and urban planning.

This problem requires a **holistic approach** that integrates all essential **operational and design requirements** of these infrastructures, alongside **advanced data analysis techniques** that make the most of available datasets

- Build a **decision support tool for vertiport site selection**.
- This tool will help identify the most suitable locations for a network of vertiports within a given area, **considering both**:
 - **Passenger transport**
 - **Last-mile delivery services.**

1 - Review of the requirements for vertiport design and location

2 - Development of optimal vertiport location model

3 - Implementation of the vertiport location decision support tool

4 - Demonstration of the optimal vertiport location decision support tool

1 - Review of the requirements for vertiport design and location



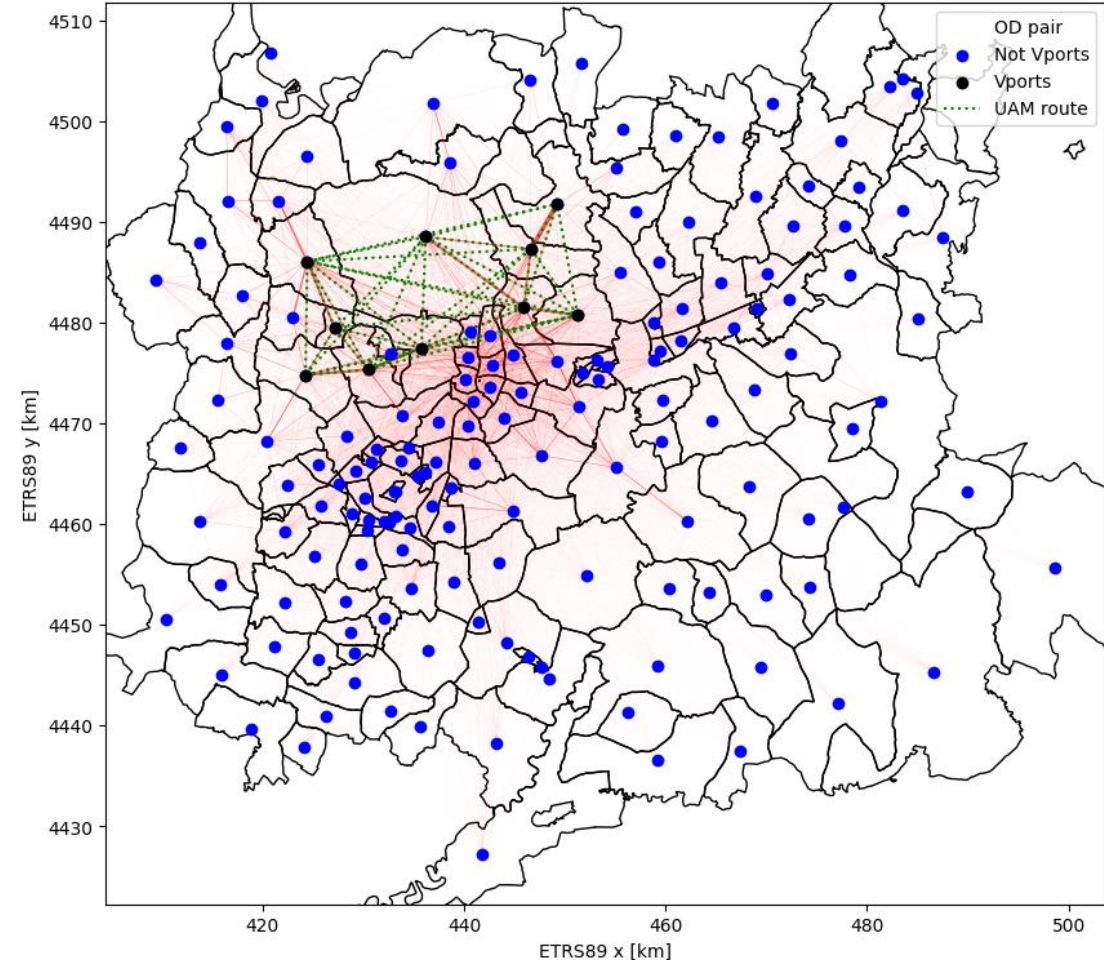
2 - Development of an optimal vertiport location model

Assessment of existing methodologies and algorithms



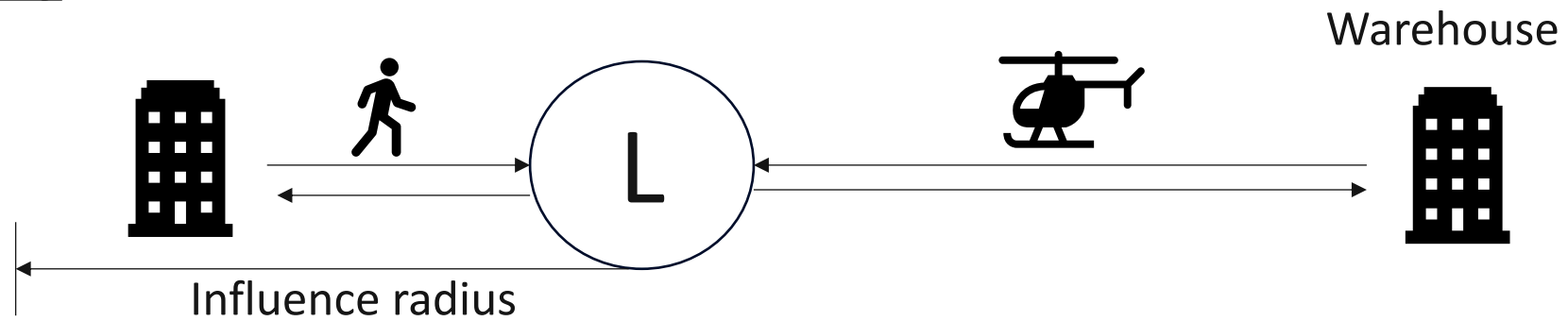
Development of the optimal location model:

- Architecture
- Data sources
- Optimisation problem
- Optimisation techniques

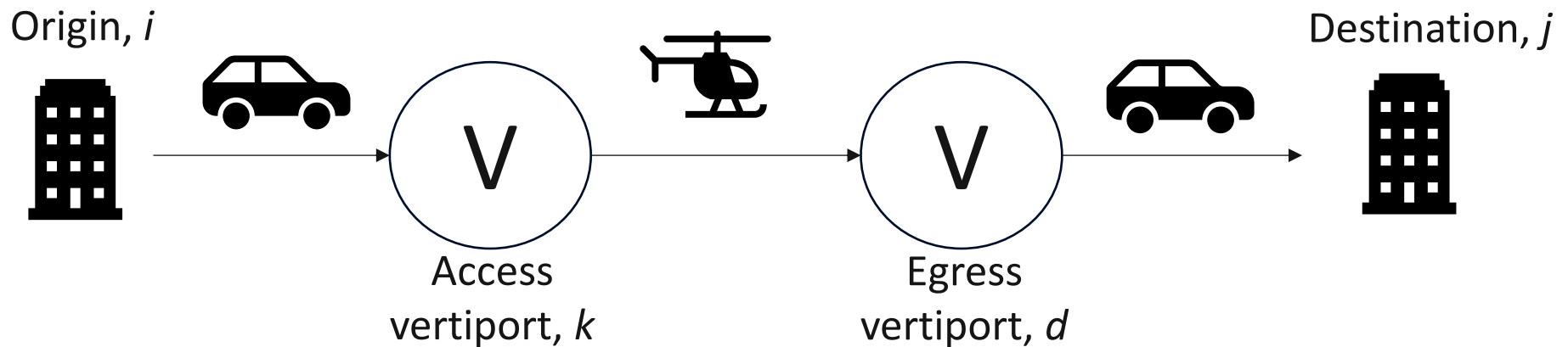


2 - Development of an optimal vertiport location model

Last mile delivery



Passenger transport



2 - Development of optimal vertiport location model

Last mile delivery – Capacitated Facility Location Problem

Income:

- Potential demand [customers] - 16-64 y.o. employed population [1]
- Market penetration [drone deliveries/ (customers)] -Sensitivity analysis needed
- Delivery commission [currency / drone deliveries]

Costs:

- Establishment costs: floor purchase and locker installation costs.
- Operational costs: electricity cost (increases based on the distance between the locker and the warehouse).

2 - Development of optimal vertiport location model

Passengers – Capacitated Hub Location Problem

Income:

- Potential demand [passengers] – MNO data OD matrix filtered for taxi trips[2,3,4]
- Market penetration for trip ij through vertiports k and d [-]
 - Travel time and variability (car vs IAM), accounting for restricted areas.
 - Average income at OD districts and residence districts (when available).
- Delivery commission [currency / drone deliveries]
- Fraction of meteorologically safe days

Costs:

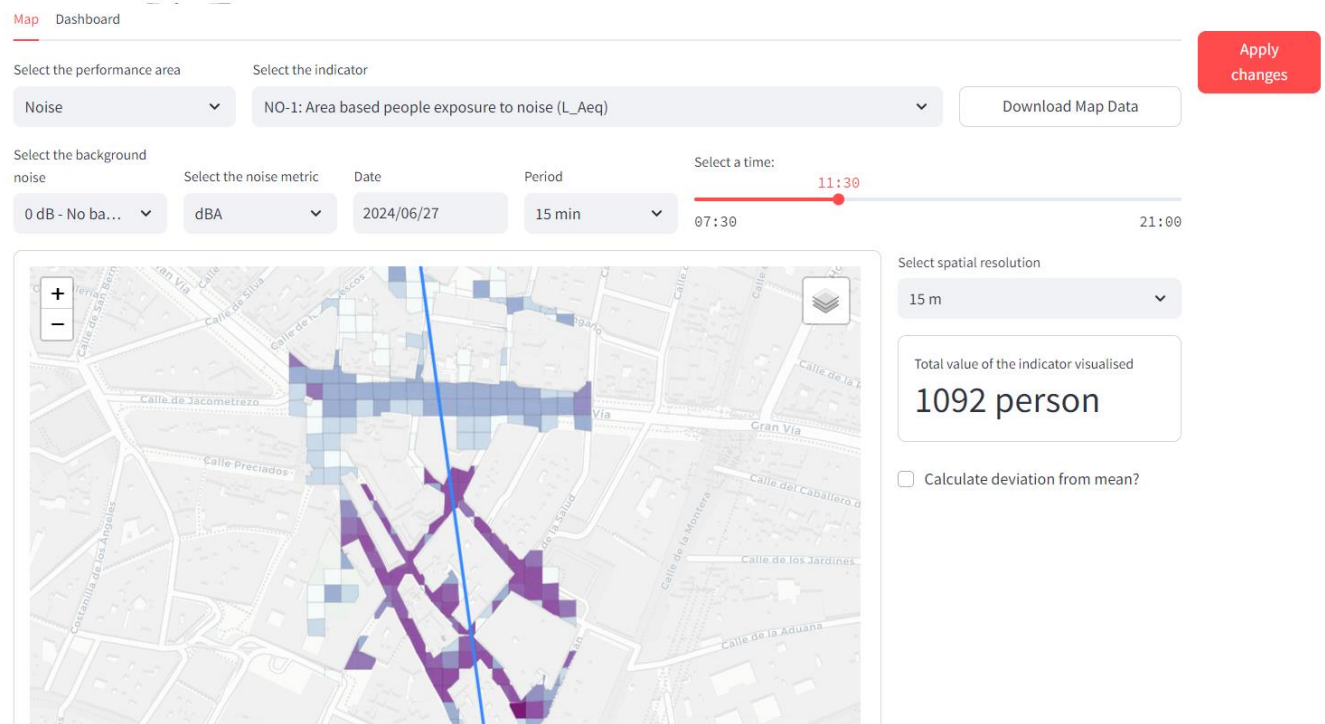
- Establishment costs: power grid connection, infrastructure and floor purchase costs.
- Operational costs: personnel salaries and electricity costs.

3 - Implementation of the vertiport location decision support tool

Software development

Visualisation design

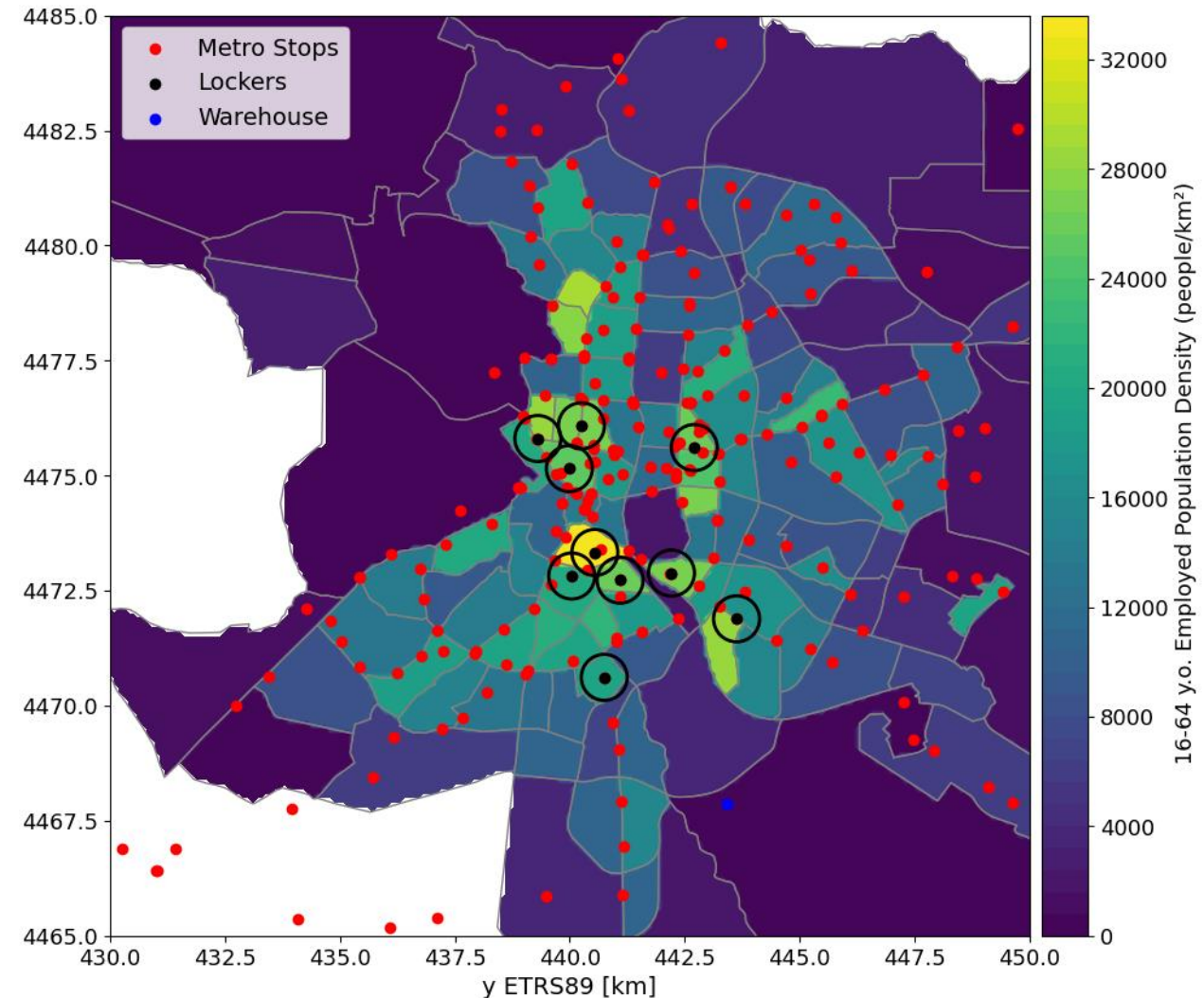
Integration



3 - Implementation of the vertiport location decision support tool

Last mile delivery - Outputs

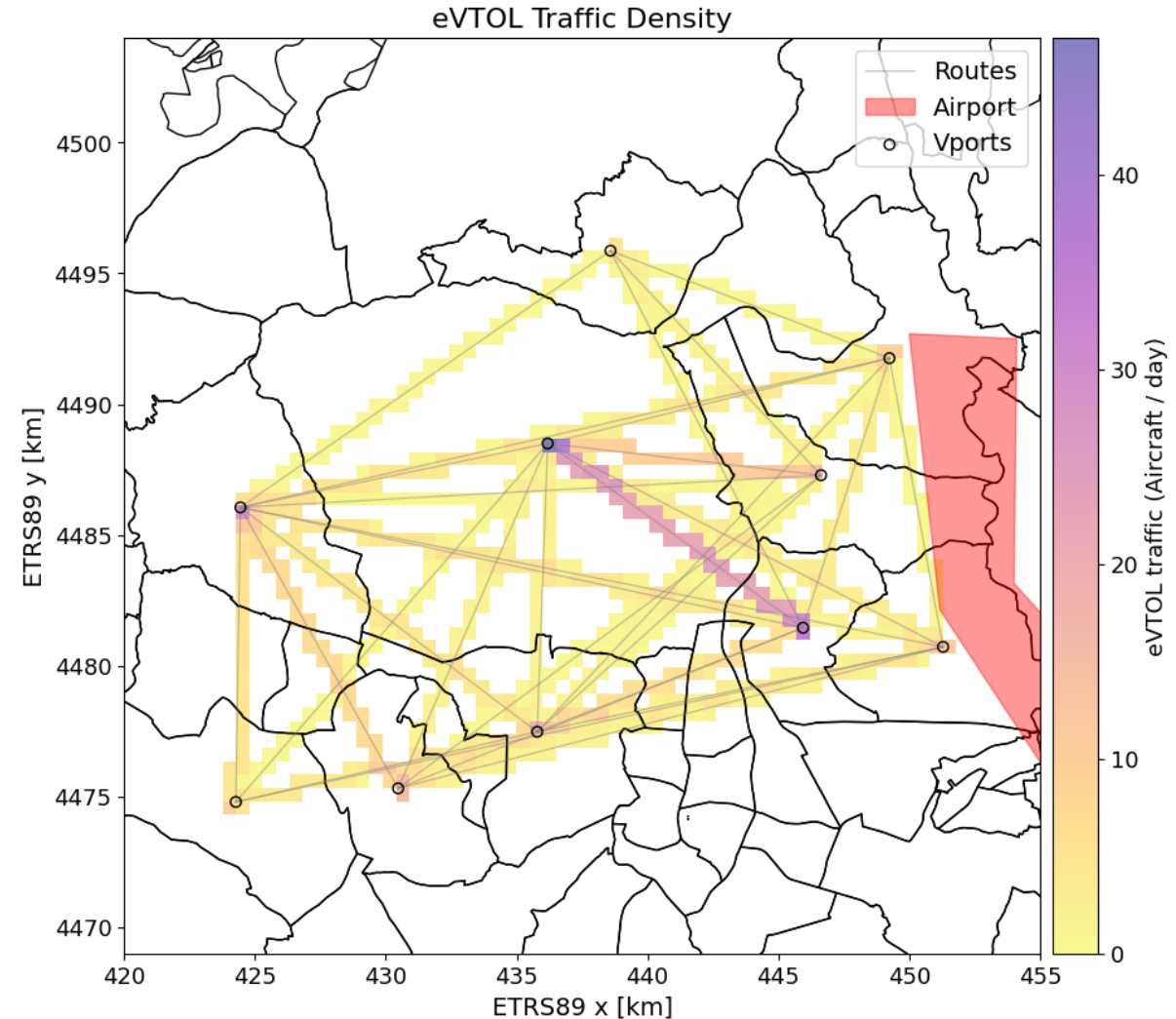
- Cost , income and number of users breakdown by:
 - Source
 - Locker
- Plots for interpretability (example on the right).
- Plots with complementary results.



3 - Implementation of the vertiport location decision support tool

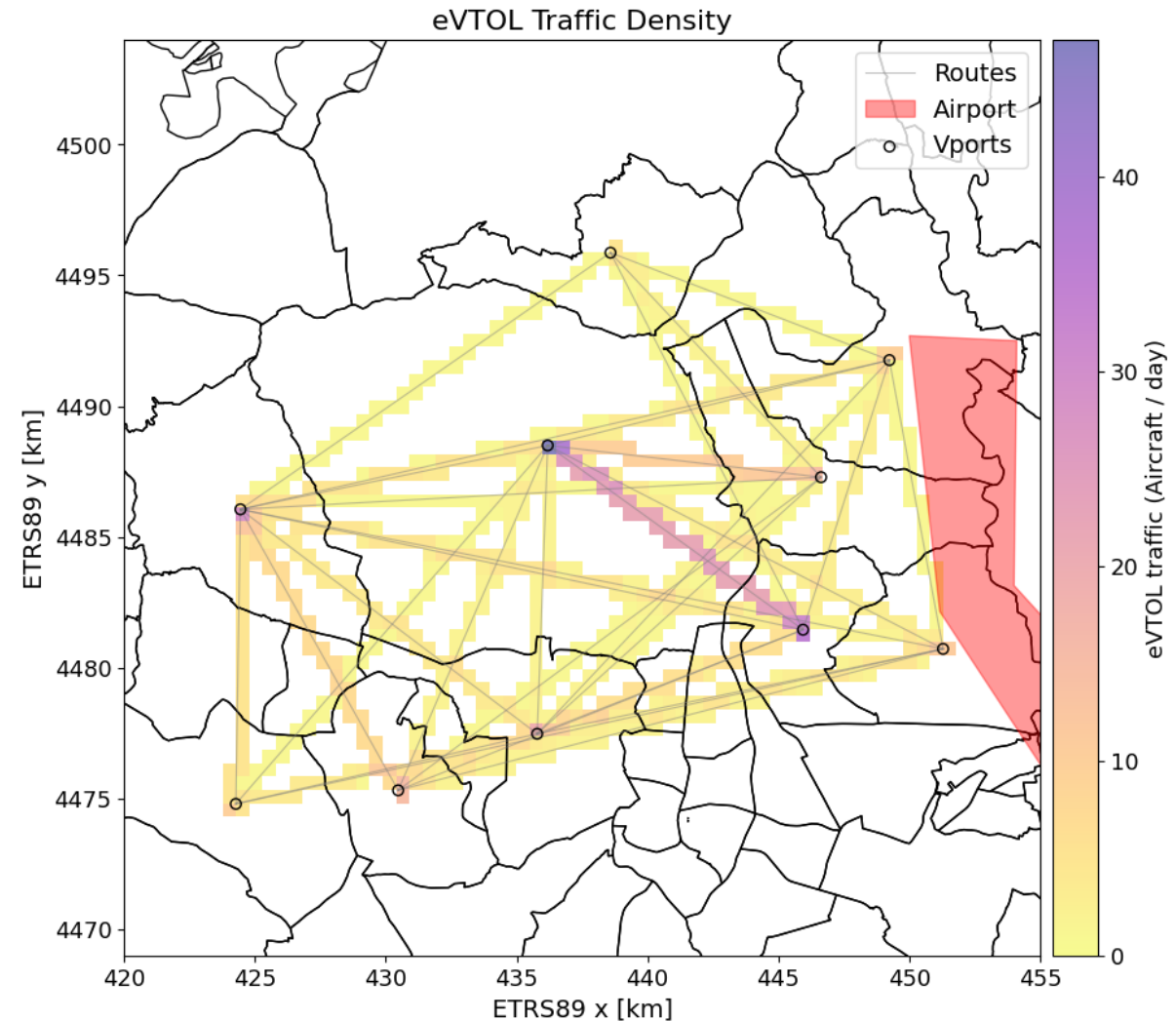
Passengers – Outputs

- Cost , income and number of users breakdown by:
 - Source
 - Vertiport
- Plots for interpretability.
- Plots with complementary results (example on the right).



Future steps for vertiport site selection

- Airspace management:
 - Free route airspace vs gridded airspace
 - Restricted airspace – interaction with traditional air traffic.
- Exact site selection – requires further studies:
 - Finding obstacle free volumes
 - Noise minimisation around vertiports
 - Wind and gusts.
- Improved demand estimation:
 - Large publicly available polls on the intention to use AM



- This Project aims to build a decision support tool for vertiport site selection based on a holistic approach.
- Based on the stakeholder consultation the following aspects, which are often overlooked, are being considered:
 - Meteorological constraints
 - Access to electricity
 - Flight restrictions.
- In the following months we will be working on finalising the tool and demonstrating its capabilities in at least one case study.

- [1] Iannaccone, G., Marcucci, E., & Gatta, V. (2021). What young e-consumers want? Forecasting parcel lockers choice in Rome. *Logistics*, 5(3), 57.
- [2] Jin, Z., Ng, K. K., & Zhang, C. (2024). Robust optimisation for vertiport location problem considering travel mode choice behaviour in urban air mobility systems. *Journal of the Air Transport Research Society*, 2, 100006.
- [3] Rath, S., & Chow, J. Y. (2022). Air taxi skyport location problem with single-allocation choice-constrained elastic demand for airport access. *Journal of Air Transport Management*, 105, 102294.
- [4] UBER Elevate (2016). Fast-Forwarding to a Future of On-Demand Urban Air Transportation.

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Thank you!



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