



Hubs and Cargo-Bike Fleets for Expanding Zero-Emission Zones

Problem description

Cities are rolling out zero-emission zones. Inside these zones diesel vans are no longer allowed, so goods have to reach customers another way. A common answer is to set up hubs on the edge of the zone, where deliveries are transferred onto cargo bikes for the last stretch into the centre. As a zone grows, both the hubs and the bikes have to keep up.

Two choices decide how well this works. The first is where to place the hubs, because a hub in the wrong spot means long, slow trips into the zone. The second is which cargo bikes to run from them, since some bikes are built for heavy loads and others for quick, small drops, and the right mix depends on the deliveries. The two choices pull on each other: where the hubs sit changes which bikes make sense, and the bikes you have change where a hub is worth placing. This thesis will explore:

- Where the hubs should go, and which mix of cargo bikes should run from them, to serve a zero-emission zone well.
- How these choices shift as the zone grows, and how much a company should commit to early rather than adjust later.

This thesis will explore these questions using Amsterdam's zone plans, within the PROSPER research programme (TKI Dinalog) at ORBIT Lab, in partnership with Pon Holdings, Tring Tring, Gemeente Amsterdam, and AMS Institute.

Assignment

In this project you focus on:

- Modelling a zero-emission zone and how its deliveries grow and change as it expands.
- Deciding where to place the hubs and which mix of cargo bikes to run from them, treating the two choices together rather than one at a time.
- Showing how the best hub-and-fleet plan shifts as the zone grows, and how far a company should commit ahead, using Amsterdam's zone plans.

Background

The ideal candidate has an interest in optimisation and decision-making under uncertainty, and is comfortable with programming, for example Python. Some exposure to facility location or fleet planning is a plus, along with an interest in logistics and city policy.

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The project can be conducted as a final thesis project for MSc [TIL/TTE]. Preferred start date is as early as possible.