
REWARD: Revolutionary Waste Management with App-Based Request and Delivery

1. Idea owner:

Shadi Sharif Azadeh, TU Delft

2. Submitted to:

Relevant to policy pillars and living lab themes (please indicate, see call text)

- Policy pillar: 2
- Living lab theme: A/B

3. Project team:

The research team from TU Delft includes Shadi Sharif Azadeh, Serge Hoogendoorn and Gonçalo Homem de Almeida Correia. We plan to hire a postdoc for 20 months years (January 2025-October 2026) with the supervision of the mentioned TU Delft team.

4. Idea:

Smart cities need smart ways for managing their limited available space to collect and transport waste. Amsterdam is a unique city in that sense. While this populous city struggles with spatial shortage, it has an extensive access to in-land waterway coupled with a very well-connected bike network that pave the path for designing and operationalizing eco-friendly multi-modal waste collection systems. The objective of this research is to increase the efficiency of an on-demand (platform-based) multi-modal waste collection system. The objective is threefold: a) demand prediction (for proactive fleet management), b) introducing synchronized multi-modal transport through hubs (real-time matching and dispatching), c) designing incentivization mechanisms for households and businesses. The innovation of this research lies in managing a multi-modal waste collection system in (semi-)real-time relying on demand predictions and in presence of sources of uncertainty (related to e-fleet). In this research, the “more valuable” waste will be given priority in the real-time matching, dispatching, and routing and as a result, capacity of the multi-modal fleet will be managed more efficiently. Inspired from mobility credit concept, incentivization schemes will be designed to steer demand towards more sustainable waste disposal behaviour.

5. Collaboration:

This proposal is defined aligned with three out of 5 pilots of metaCCAZE HE project (where our team at TUD and AMS are leading the Amsterdam living lab). These three pilots are related to a) Logistics optimization through multimodal logistics hubs and mini e-vehicles b) operations of electric and autonomous ships (Zoevcity) and c) designing mobility credits for a multi-modal service. The already existing synergy between this proposal and the seven partners for the Amsterdam living lab in metaCCAZE project make it possible to amplify the impact through engaging these stakeholders. From scientific perspective, the topic covers different aspects of the metaCCAZE project that make it possible to expand our collaborations beyond the transport planning and management and extend the bridge towards social sciences and behavioural economics.

6. Scientific and societal relevance:

a) The proposed research in this proposal is aligned with our departmental goals which are to develop sustainable solutions to address the complex challenges facing transport and mobility in modern societies in the best possible way by researching beyond-state-of-the-art methods and technologies. The topic is also perfectly aligned with the expertise and research goals of the SUM and hEAT lab led by Dr. Sharif Azadeh and Dr. Correia as well as enormous expertise of Professor Hoogendoorn in transport management. b) The traditional urban waste collection is mainly done by collecting the waste from all the bins regardless of the status of bins (full or not) considering fixed predetermined routes and schedules and transporting it to the disposal station. However, in this proposal, we aim at focusing on a smart and multi-modal network for waste collection.

We leverage on the available data and plan to capitalize on already existing and engaged partners at metaCCAZE project whose Amsterdam LL is led by AMS to make forward looking decisions and to create a more efficient, sustainable and resilient collection of wastes in Amsterdam.

7. Activities & deliverables:

The tasks of this project and their associated deliverables are enlisted as follows aligned with the above-mentioned goals and related to the living labs.

Tasks	Connection to LLs	Jan/25-	Jul/25-	Jan/26-	Jul/26-
		Jun/25	Dec/25	Jun/26	Oct/26
T1. Demand prediction for proactive fleet management	B				
T2. Synchronized multi-modal transport through hubs	A/B				
T3. Designing incentivization mechanisms for households and business	A/B				

There will be in total four deliverables: **D1.** and **D2:** For Task 1 and 2 we will provide “functional prototype algorithms” that are transferable to be used for other cities. **D3:** For Task 3, the deliverable includes a technical report to be used for involved stakeholders. **D4:** The last deliverable is scientific publication that embeds Task 1 and Task 2.

8. Budget:

We will hire a postdoc for 20 months (Transport & Planning department at TUD) who will work closely with our PhD student and postdoctoral researcher working on the metaCCAZE project related to the topic of this proposal. Dr. Correia and I will dedicate five percent of our own time to this research as an in-kind contribution during the period of this project. Professor Hoogendoorn is part of the team and will part of our team in conceptualization and tailoring the relevance to other on-going projects with Amsterdam within themes A and B.

Item/Activity	Position (WR, WU, TUD)	Hourly rate	Hours	Budget (personnel costs)
One post-doc for 20 months	TUD	55	2.866,67	157,707.0
Totaal ex BTW				157,707.0
BTW				157,707.0

Item/Activity	Material costs	Equipment	Third party	Budget (other costs)
Traveling				4,000.0
Computer				2,000.0
Totaal ex BTW				6,000.0
BTW				6,000.0