

Waterborne vessels as mobile hubs: a design for shared courier micro-delivery resources management for an instant delivery platform

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This study addresses the operation limitations of the current practice in managing shared micro-delivery resources (MDRs) for on-demand meal delivery platforms. The current static hub approach requires long courier non-service riding time for MDR pickups and returns, and the multi-static-hub configuration needs hiring a truck to rebalance the hub inventories, which is pollutant and can cause extra burden to the road traffic. In this research, by making use of the well-developed infrastructures in canal-rich cities and the latest advancements in electric vessel technology, we propose an innovative Mobile-Hub strategy that utilizes electric vessels as mobile hubs (MHs) for MDRs. We formulate the problem as mixed-integer linear programming and name it the Capacitated Mobile Facility Location Problem with Multiple Demands (CMFLP-MDs). The objective of our model is to minimize the total system cost including capital investment and operational cost, while satisfying the demands for MDR pickups and returns of the couriers. Our results show that the Mobile-Hub strategy significantly outperforms the current static central hub approach. The proposed system helps maintain lower and more stable MH inventory levels while providing superior service, which demonstrates the benefits of the Mobile-Hub strategy.

Link to the thesis: <https://repository.tudelft.nl/record/uuid:e256f330-6d6d-4f94-ba06-f150e0c388d8>