Mobility Solution: Avenue

Piloting in: Stavanger and Tallinn

Introduction

AVENUE has developed an AI-powered decision support tool that allows cities to measure and monitor the reduction of the carbon footprint derived from different shared mobility regulatory frameworks and policy strategies. The initiative seeks to respond to the pressing need of city leaders and policymakers of a data-driven solution that can help them take measurable and up-to-date decisions related to the implementation of smart mobility systems from a climate change mitigation perspective.

The AVENUE project exploits the information provided by two existing solutions for collecting and leveraging geolocated big data: Nommon's Mobility Analytics solution, which processes the registers from mobile network data and other geolocated sources to provide actionable insights about people's activity and mobility patterns, and Populus' Mobility Manager, which enables cities to gather and analyse the data that mobility operators share with authorities to manage the enforcement of regulatory measures.

The challenge

Nommon and Populus have developed AVENUE in the context of cities' increased use of shared mobility solutions. Cities see that these solutions can provide them with a more sustainable, resilient and safe mobility system, but the danger is that these solutions can cannibalise public transport, induce new motorised trips and compete for public space with vulnerable population groups. Most of the regulations in the field are being developed through trial and error, and most of the discussion still focuses on balancing cities and operators' goals regarding profitability and the quality of the public space. There is huge potential to develop better policies and regulations that specifically aim at reducing GHG emissions by encouraging modal shift from private cars to more sustainable modes. In light of these challenges, Nommon and Populus have developed Avenue, an AI-based decision support tool for designing and monitoring shared mobility regulatory frameworks specifically oriented towards the reduction of GHG emissions

The solution

By combining the data collected by Nommon's Mobility Analytics solution and Populus' Mobility Manager with other data sources (e.g. weather or demographics data) available by cities Avenues develops demand prediction models demand prediction models that estimate the number of trips captured by shared mobility services, and substitution mode models that unveil which mode would be used if shared mobility services were not in place. The outcome of these models can help policymakers to evaluate the carbon footprint effects of different possible measures by combining it with an estimation of the emission factors of each urban transport mode, made through a GHG emission model based on a Life Cycle Assessment (LCA) framework. This framework takes into account the emissions caused by the production of the vehicles and the infrastructure, the production of the energy required to use the vehicles, the vehicle's carbon-efficiency, and the recycling of the transport assets. The estimates of the GHG emission impacts of each alternative policy measure are exploited by a policy optimisation engine that provides recommendations on the strategies that can be adopted by cities to align shared mobility operations with GHG emission targets.

AI is key for AVENUE. The solution relies on the use of AI techniques to leverage the potential of a variety of large-scale, heterogeneous data sources to assess the impact of shared mobility. The combination of AI techniques with new big data sources helps identify hidden patterns and trends, contributing to fill the current gap in the understanding of the drivers for the adoption and use of

shared mobility services. The solution is built upon two machine learning models: a regression model that predicts the demand for shared mobility services for each origin-destination pair, and a classification model that infers the substitution mode that would be used if the shared mobility service were not available. The combination of these models allows AVENUE not only to predict future demand of shared mobility services under certain policies, but also to predict modal shift effects, which in turns enables the estimation of the impact of shared mobility services on the carbon footprint of the city.

Through its use of AI, AVENUE can impact cities in areas beyond just CO2 reduction. The models embedded in the solution can address other environmental challenges, such as air and noise pollution and energy consumption. Moreover, as the tool provides data about the use of shared of different population groups, policymakers can have a better understanding of the impact their policies have on social (in)equality. Finally, the tool can also contribute to the economic sustainability of urban mobility systems and facilitate multilevel, participatory governance processes.

The project team has identified two key clients for the use of AVENUE. Firstly, local and metropolitan transport authorities that are in charge of developing mobility strategies and plans, regulating how mobility services are implemented through licenses or tendering processes, or monitoring and enforcing the compliance of shared mobility operators with the regulations in place. They can use the insights provided by the tool to formulate evidence-based policies and adjust regulation to meet policy objectives. Secondly, shared mobility operators, could use the platform to support both their strategic decisions regarding service expansions and their operations, ensuring vehicle availability for satisfying the expected demand

Avenue & AI4Cities

AVENUE's participation in AI4Cities enabled the project team gather direct feedback from the end-users, which they incorporated into the first prototype. The cities' involvement has also been extremely valuable for further defining the solution development roadmap, covering more functionalities and relevant aspects considered by cities to become carbon neutral: NOx and PM emissions, mobility hubs location, no-parking zones, etc. Furthermore, the project was for AVENUE been an enabling platform to learn about the Buyers Group's experience with novel mobility data sources and to collect key data available from cities. The adaptability of the tool to the data landscape in each city has proven to be a crucial element for shortening the solution's time-to-market.

Based on feedback from the cities, the project team developed the following use cases for the use of AVENUE:

- Deployment of new shared mobility operators in the city. AVENUE's travel demand models are able to estimate the adoption and usage rates of new shared mobility services and their impact on the existing modes. A city where there is no current shared mobility service can use a calibrated model from another city with similar characteristics to evaluate the impact of a new shared mobility operator on GHG emissions. City authorities can use the tool to simulate alternative licensing scenarios (e.g., by varying the size of the operating area) and decide which deployment conditions are more beneficial for the city in terms of emission
- Once a shared mobility service starts to operate, it is important to monitor how its contribution to emissions changes over time depending on the modal shifts it creates. City authorities can use the tool to monitor the demand for a shared mobility service to evaluate its alignment with the city goals. This provides cities with evidences of the impact of shared mobility on urban sustainability, supporting the improvement and fine-tuning of regulations and policies.

For instance, priority parking space can be allocated in those areas where shared mobility delivers higher GHG savings over time.

- Assessment of service expansions. Operators often consider the expansion of their services to nearby areas. City authorities can use the tool to understand the impact of expanding the current area of operation. AVENUE can simulate alternative scenarios, providing interesting information about where the expansion is more beneficial. Cities can leverage the results of the simulations conducted with the tool for negotiating the conditions of the expansions and reaching agreements that take into account the effects on emissions.
- Service optimisation during special events. The tool can predict the demand for a date when a special event is scheduled to happen, considering the total number of trips it will attract. City authorities can use the tool to evaluate the GHG emissions generated by such trips depending on the percentage of these trips captured by shared mobility. Cities can collaborate with shared mobility operators to nudge travel behaviour towards less carbon intensive options by ensuring vehicle availability or designing tailored pricing mechanisms and incentives.

The consortium

AVENUE has been developed by a consortium of Nommon and Populus. Nommon is a technology company that develops and provides decision support solutions based on big data and artificial intelligence. Nommon is specialised in the analysis of mobility data for the planning and management of transport and traffic systems. The company is a pioneer in Europe in the study of mobility through anonymised records from mobile phone network.

Populus helps cities and private mobility providers deliver safe, efficient, and equitable streets. The Populus platform is the only comprehensive digital solution that empowers cities to manage their streets and curbs—with access to mobility data from shared bike, scooter, moped and carsharing operators, and delivery services.

- Nommon (https://www.nommon.es/)
- Populus (https://www.populus.ai/)

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