Mobility Solution: MPAT Tool

Piloting in: Amsterdam & Tallinn

Introduction

The MPAT tool (Mobility Policy Auto Tuner) is an engine to optimize the CO2 emission-reduction potential of city mobility policies, beginning with shared micro-mobility. By understanding the geographies where a trip on an electric-powered shared bicycle, scooter, or moped is most likely to create an emissions saving (ie, to replace an internal combustion engine vehicle trip), the tool is able to make recommendations for areas to implement new policies (ex, subsidies on rides, or removals of fleet caps).

The impact of these policies can be monitored with a specific view on CO2 emissions savings. MPAT's innovativeness lies in the way it calculates shared mobility's CO2 savings potential, also anticipating its growth and change. By using AI to forecast where demand for low-carbon micro-mobility trips will grow, it goes beyond currently existing practices for modelling the decarbonization potential of mode shift and can directly inform policy making to realise that potential.

The challenge

Vianova sees that shared mobility provides significant opportunity for more Europeans to use more sustainable, efficient, and human modes of transport. Shared electric scooters, bicycles, mopeds, and even cars can complement existing public transport options, are throughout the continent being employed as compelling alternatives to owning and driving a personal automobile. While the speedy rise of shared mobility services is good news, they are faced with problems that could minimise their effectiveness in the fight against climate change. Cities struggle with improper vehicle storage and containing the harmful effects to non-riders. Furthermore, these services are in most cases owned by private sector companies, often working to maximise profit and minimise costs, at the expense of the policy objectives of cities. The MPAT tool aims to address these challenges by using AI to enable policymakers to better balance the positive and negative impacts of shared mobility.

The solution

Before AI4Cities, Vianova's existing Cityscope platform was used by nearly two dozen major cities across Europe to design, communicate, and monitor policies to shared mobility operators. The platform bridges the communication between operators and the cities who regulate them. The MPAT Tool, built on top of CityScope, expands this communication to include novel, highly targeted policy solutions that help policymakers optimise the "best" aspects of shared mobility.

The tool works by estimating the adopted policy designs' impact on transport-related emissions by calculating the CO2 savings from users' shift to more sustainable shared modes. It uses real-world shared mobility trip data and city-wide travel habits to estimate the modal shift triggered by MPAT-suggested regulations, especially single occupant vehicles. Using those modal shift estimates, trip duration and emissions per mode, the tool calculates the net CO2 savings (in gCO2) by subtracting the direct emissions of new shared mobility trips from the avoided emissions of other modalities. Following this, it compares the savings to city-wide transport emissions (excl. aviation and heavy freight).

Through these technologies, the tool is able to highlight the areas where an increase in the number of available shared vehicles would lead to travellers using more sustainable modes of transportation, thus reducing their carbon emissions. This enables policy makers to work together with shared mobility operators to find the correct policies and incentives to achieve the correct fleet size in the selected areas. Policymakers will also be able to see where they shouldn't offer shared mobility services; shared mobility options can reduce much more CO2 in areas with low public transportation or high car ownership than in walkable areas or in bike-friendly neighbourhoods.

Policymakers can make their decisions by setting the relative weights of priorities such as desired CO2 reduction, reduced impact of parked devices, or increased utilization of vehicles. MPAT then suggests a set of policy interventions to achieve the best results. Once the policymaker has selected the interventions they wish to pursue, the tool automatically informs operators of the change in policy and monitors the change in KPIs while the policy is in effect. This feedback loop also informs future policymaking in both the policymaker's city and in the network of cities using the MPAT tool.

An additional innovative element of the MPAT tool is that it seeks to achieve a paradigm shift in the way shared mobility policies are conceived. Currently most shared mobility tools focus on compliance and adherence to public order; MPAT shifts this focus towards decarbonisation and sustainability. In other words, it aims to move policymaking from regressive regulation towards incentive-based regulation that focuses on the positive outcomes of shared mobility.

In the future ;MPAT may be applied to optimize shared fleets to also cater to a host of other policy objectives, beyond just reducing carbon emissions. To reduce the impact of parked devices, for example, policymakers could set the relative weights of competing policy objectives, based on which MPAT would suggest a set of policy interventions to achieve the best results. The policymaker could then select those she wishes to pursue, and the tool would automatically inform operators of the change in policy, and monitor the change in KPIs while the policy is in effect.

MPAT & AI4Cities

Phase 1 of Ai4Cities enabled Vianova to do a feasibility analysis which gave the project team the confidence that there is a fertile market for the tool. The study concluded that there are over 200 EU cities with both more than 75.000 inhabitants and sufficient volumes of shared mobility. In addition, the relevant data sources are accessible in many of these potential markets, while the cities also have specific authorisation that can help regulate shared mobility towards more sustainable options.

Further stages of the project gave Vianova the opportunity to explore the viability of a range of data sources to project existing CO2 usage due to transportation, and to further extrapolate the effect of the tool on CO2 emission reductions in the future. This enabled the team to refine the characterisation of typical users of shared vehicles, as well as its modal split analysis. This provided Vianova with a better understanding of the CO2 impact of a modal shift, aligning its model closer to local realities.

The PCP process also enabled Vianova to make significant improvements to the user experience of the MPAT tool. Leveraging the resources of the development of the core Vianova product, the project team was able to rely on synergies in UX/UI in order to achieve a better interface for displaying recommendations as "layers" on top of the existing platform. While the team prioritised the core use case of CO2 emission reduction the user interface remains significantly adaptable and scalable to additional use cases that cities may have, such as promoting electric goods delivery or less-CO2 intensive ride hailing services.

Thanks to its collaboration with Amsterdam, Vianova managed to conduct a series of interviews within city government and adjacent public agencies (such as the public transport authority), giving it a better understanding of the needs of its potential users. At the same time, the project team is aware that the Northern European, technologically innovative cities of AI4Cities may have different needs and resources than other potentially relevant markets.

Piloting in Amsterdam, Vianova m built two sets of 30 recommendations for mobility hub locations, using a mix of CO2 savings potential, predicted demand, and app opens which did not lead to trips. The MPAT model proposed locations optimization for different objectives - hubs which maximize potential CO2 savings and hubs which can support better public space management by organising demand. The main challenge in Amsterdam is that its citizens make frequent use of bicycles and public transportation. The city has to be careful to not make these citizens shift to shared mobility options – that could lead to an increase in CO2. Therefore the mobility hubs in Amsterdam are located in outlying car-dependent areas where the city hopes to shift users to shared bikes, mopeds and cars.

Tallinn also has a robust cycling network, but its utility is affected by some significant gaps. Addressing these gaps, The project team built a model of existing usage, then identified those corridors in the city where trips under 5 kilometers were disproportionately taken by car. Using shared mobility data from electric bikes and scooters, the MPAT team was then able to identify 50 gaps in the cycle path network and simulate the effect of 2%, 5%, and 10% growth in usage of the corridors, for both shared devices and private bicycles.

The consortium:

The MPAT Tool has been developed by a consortium of Vianova and Rebel. Vianova uses connected vehicles data to help cities and mobility operators build more efficient and sustainable transport systems for people and goods. Rebel provides transportation advice and support for transportation by road, rail and waterways, high-speed links, high-capacity metro systems, fast trams, ports and airports.

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