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Urban Europe Policy Brief

The potential of shared mobility services: policy recommendations for urban planners and operators

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Introduction

Car sharing, bike and moped sharing, and the usage of electric vehicles have become increasingly popular among urban citizens. Thus, providing vast opportunities to meet today's challenges in terms of environmental objectives, sustainability and living quality. Our society needs to manage a transformation process that shall ultimately lead to fewer emissions and less energy consumption while increasing the quality of public space available.

On a worldwide level the number of operating companies has increased in recent years. Then again, some operators have withdrawn from the market mainly due to economic or organizational reasons. This policy brief provides recommendations for both – operators and city administration in order to improve future urban mobility systems. Car sharing is part of the so called 'sharing economy' which means the sharing of goods and services, i.e. renting instead of owning them.

By studying and solving the optimization problems arising in the system's design and operation this policy brief provides fundamental recommendations for efficient and economically viable (electric) car sharing systems in order to improve urban mobility systems. This is done both from a city and operator perspective.

Our recommendations aim at reducing additional traffic by optimizing the operators' maintenance- or management efforts, to provide the best possible opportunities for citizens as customers and therefore regulate the market. In terms of urban policies based on the reserach carried out in the e4-share project we derive recommendations of how to best establish a framework for sharing operators and the integration of shared services in the urban mobility system.

Key Message

• Car sharing is a means of improving urban traffic and to enhance the quality of life of urban citizens – especially when included in urban MaaS (Mobility as a Service) platforms in order to unfold its full effect.

• Clear regulations for car sharing providers help cities to maximize their benefits, including meeting environmental sustainability targets by deploying shared electric cars.

• Involving users in routine maintenance is a great way of reducing fleet management effort.

• Common problems in planning and operating a car sharing system can be solved mathematically.

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Establish clear regulations for service providers

As a city administration it's in your hands to set the framework correct for shared mobility services to act as a complementary means of transport, and to be perfectly integrated in the urban mobility system. Playing an active role in designing the space for shared mobility solutions will make sure that you're able to maximize their benefits for your city. If done correctly shared mobility services are the perfect counterpart to the existing public transport systems.

Shared cars, both stationary and free-floating, can constitute the missing link where and when public transport offers become scarce, e.g. in the less populated urban fringe or at low-demand times. Shared bikes can encourage active travel for citizens who do not have a bike of their own or for tourists or other non-locals.

However, this potential can only be sourced when the framework conditions are set appropriately: cities should aim to have a say when it comes to defining the operational area of a free-floating car sharing service in order to make sure it can fulfil its specific role in favor of the city and its people. Balancing interests, city administrations need to negotiate parking regulations and land use with the operators of stationary car sharing services. Also, it's up to administrative decision makers to define the rules for stationary or free-floating bike sharing services, e.g. in terms of parking or responsibilities for removal of damaged bikes. In order to seamlessly integrate these new sharing offers into the existing mobility system they should be included in any digital MaaS (Mobility as a Service) platforms covering the urban area.

Greening urban transport: be a frontrunner-city

Replacing traditional vehicles with e-cars is an important element in reducing transport-related emissions and pollution. This is particularly imperative where air quality and peoples' health are at risk. Using electric cars in shared fleets can substantially increase their applicability since the higher up-front investment costs can be better justified by the relatively higher utilization rates of shared cars.

However, car sharing systems based on electric cars impose specific hard-to-solve challenges to providers and city administrations. Among others, one particularly important aspect is the effective placement of re-charging stations, which needs to be planned beforehand, based on traffic and usage forecasts. As a substantial share of the urban charging infrastructure will be installed in public or semi-public spaces, close collaboration and coordination between city and industry stakeholders is required to make sure that interests are well balanced.

Recommendations to city administrations

• Consider shared mobility services in urban planning and mobility strategies as a valuable asset for urban mobility acting as a supplement to public transport.

• Car sharing can help to reduce the land consumption of the mobility system thus (re-)gaining public space for better purposes than car parking. Cities should use their position as a planning authority to assert strong influence when regulating shared mobility services in their territory.

• MaaS (Mobility as a Service) digital platforms are a great way to seamlessly integrate any new sharing offers into the existing urban transport system.

• Establish the required legal framework and standardization to promote the interoperability of different providers in the transport ecosystem in terms of information, planning and payment.

• Continuously collecting data on the use of shared services (surveys, etc.) can help monitoring the specific role of shared services in the urban mobility system and derive measures to counteract in case of negative developments.

How does public transport service quality spatially overlap with car sharing offers?

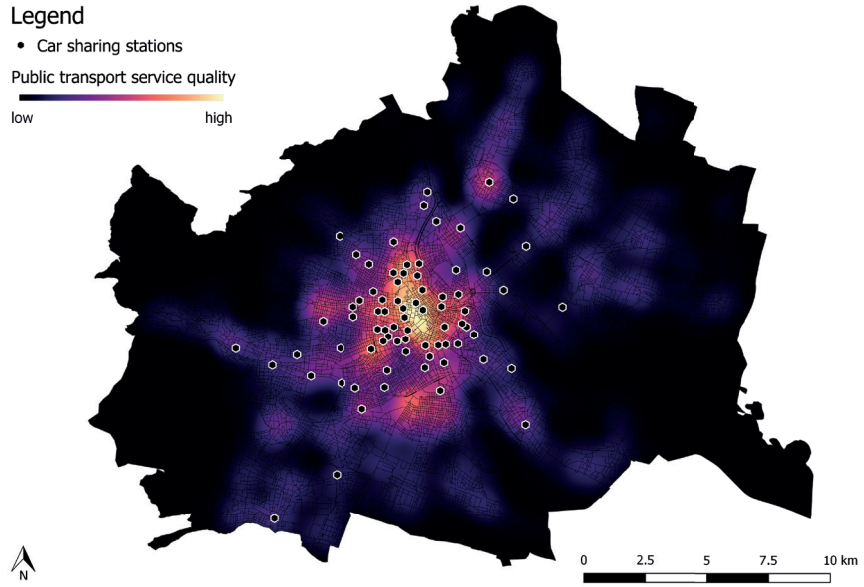


Fig. 1: Vienna case – model. Brighter areas indicate better public transport.
Source: tbw research GesmbH, Clemens Raffler; Data: data.wien.gv.at (2017)

City administrations that currently see electric mobility as a niche product should not leave it at simply surveying other cities, they should rather learn from the best and become a beacon of green urban transport themselves in order to reach environmental targets and to create an even more liveable and smart city. Good examples for electric car sharing can be found in Berlin (Multicity), or Amsterdam and Stuttgart (car2go).

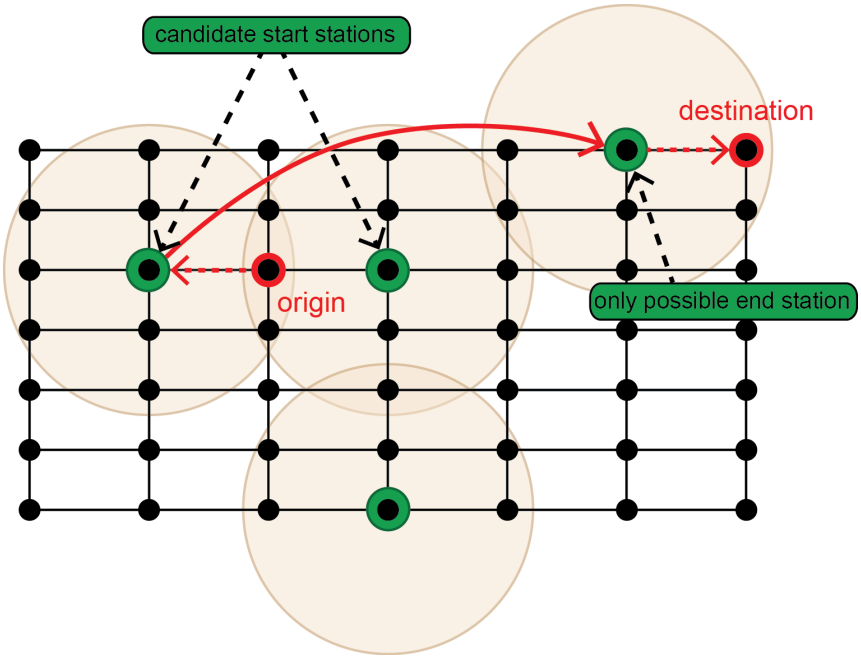
Know your users and involve them

As a shared mobility provider you can effectively reduce your workload for managing and maintaining your fleet by incentivizing users to perform routine maintenance tasks like refueling or vehicle relocation (picking up 'stranded' vehicles) in free-floating systems. This is particularly true for smaller sharing services who cannot afford to hire staff for these routine activities. However, there is no such thing as the 'typical user' of shared services. Everybody is different and has their specific needs and awareness or acceptance both for the service in general as well as in terms of performing maintenance tasks. In e4share it was found that the individual probability of accepting an incentive (such as free minutes or reduced rates) is determined by the user's (perceived) availability of time, their implicit valuation of time (in money terms), the previous experience with car sharing services, income and educational level. One of the main car sharing user groups consists of busy high-income employees between 20 and 40 years with little or no time on their hands. Another user group is made up of younger students with low income but greater perceived availability of time to spend on mobility. The latter group is generally more ready to accept incentives that make the car sharing more affordable in exchange for some of their time. Knowing more about the various sub-groups among the users enables operators to fine-tune their offers and specifically address users with dedicated incentives in order to increase their success rate. Naturally, there is a trade-off between incentive amount and savings in fleet management efforts which makes designing incentives a balancing act.

Make best use of big data and mathematics-based decision support

The e4-share project proved that common and recurring problems at the operators' end can be numerically solved and fleet operation can be optimized based on mathematical models. This includes specific non-trivial optimization tasks on strategic (e.g. number, location and sizing of re-charging stations), tactical (e.g. deciding on dimensioning of maintenance staff or incentives to users) and operational (when to best relocate or refuel vehicles) levels both for free-floating systems and stationary ones. In a number of test-run models (including Vienna using taxi trips as a proxy for transport demand) it was

How can we visualize a stationary car sharing system's operation?



More information about the project
www.univie.ac.at/e4-share/

Fig. 2: Abstract graph of a station-based system: road intersections, stations, walking range, customer requests. Source: University of Vienna, DSOR (2016)

demonstrated that solving these problems and optimizing the system can greatly improve the system's efficiency and profitability expressed in a set of dedicated metrics (e.g. number of trip requests served, profit, optimum number of vehicles / re-charging points). Moreover, the developed mathematical formalizations and optimization algorithms are sufficiently generic that they can be applied to a wide range of car cases. As a tool-box this will help to make market access easier for new service providers, particularly for smaller companies who cannot afford the research.

Recommendations to service providers

• Operators should underpin their decisions on key strategical, tactical and operational problems using optimization approaches derived from mathematical models.

• Users should be incentivized to perform maintenance tasks in shared fleets (e.g. vehicle relocation, refueling, etc.) thus helping to minimize management efforts.

• There is no such thing as the 'typical user' of shared services. Everybody is different. Hence needs, awareness or acceptance greatly varies among users and systems should be designed with this in mind.

• Operators should understand that the electrification of shared fleets offers unique chances of improving urban quality of life but poses specific challenges for both service providers and city administrations.

• Provide open interfaces for data exchange with other providers and to integrate your offers into a single mobility service accessible on demand (MaaS).

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