Urban Mobility Next #4

Integrated and safe: how innovation can increase micromobility end user adoption

EIT Urban Mobility

October 2021

eiturbanmobility.eu

Supported by SPIN

Co-funded by the European Union

EIT Urban Mobility

October 2021

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Co-funded by the
European Union

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Co-funded by the European Union

Acknowledgements

EIT Urban Mobility wishes to thank the following experts for their contributions and insights.

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Luca Pascotto, Fédération Internationale de l'Automobile

Philippe Crist, International Transport Forum

Remco Evers, Achmea

Wolfgang Inninger, Fraunhofer IML

Introduction

The present report draws on the discussions and insights shared during an online workshop organised by EIT Urban Mobility on 15 and 16 September 2021. The report puts in perspective the different views expressed by the experts who contributed to the discussions (see Acknowledgement section), in a consolidated and reader-friendly way. Views and opinions expressed do not necessarily reflect the position of EIT Urban Mobility.

Central to the paper is the question of **increasing user engagement with diverse forms of micromobility**. In other words, what are the levers public and private stakeholders can activate to reach this objective?

First, the report addresses the topic of multimodal integration, exploring the main enablers making the adoption of micromobility easier, attractive, and more intuitive from a user point of view. Secondly, safety is being looked at as one of the most important aspect to consider, from city infrastructure, vehicle design, to performance-based indicators. Finally, recommendations highlighted by workshop experts are summarised.

The definition of micromobility considered in this report is the one adopted by the International Transport Forum (see Figure 1). Since vehicle design in the sector is evolving quickly, the definition is based on maximum speed and mass, as it directly impacts the kinetic energy of vehicles. The definition is further refined according to vehicle speed and weight (type A, B, C, or D vehicles).

Figure 1: typology of micro-vehicles (International Transport Forum, 2020)

	Type A	Type B	Type C	Type D
	unpowered or powered up to 25 km/h (16 mph)		powered with top speed between 25-45 km/h (16-28 mph)	
KG	<35 kg (77 lb)	35 – 350 kg (77 – 770 lb)	<35 kg (77 lb)	35 – 350 kg (77 – 770 lb)

Source: International Transport Forum[1]

1. Improving multimodal integration of micromobility services

Integrating micromobility in sustainable urban mobility offerings is a priority to increase user uptake. This requires a more inclusive definition of current mobility systems, better access to and exchange of relevant data, and a focus on high-quality operations.

1.1 Mobility coordination and integration in cities

Recent changes in urban mobility have blurred the lines between traditional and new, shared mobility options. To adapt to this evolution, Public Transport Authorities (PTA) need to become orchestrators of the local mix of mobility options, thereby incentivising sustainable behaviours. For most PTAs, new mobility and Mobility as a Service (MaaS) offers should meet public transport policy objectives and thus integrate all mobility offers available in a specific geography.

Delivering on this objective requires **the implementation of region-wide networks (not only inner-city ones) to best cater for the mobility needs of population living in the outskirts of larger metropolitan areas.** However, the current lack of integration and coordination among mobility players often leads to a poor offer in suburban or rural areas, where mobility needs are most acute. Path dependency and car-centric planning make it hard for micromobility solutions such as e-scooters to expand outside city centres, not least because of lacking political support in some suburban areas.

Enhanced cooperation is needed to tackle this challenge and unlock shared mobility services: on the one hand, more work needs to be done on the vehicle deployment and user perception side. On the other hand, competition for public space calls for innovative, more just solutions than is the case today, questioning the place allocated to cars in our streets.

Considering shared mobility providers as public transport operators would support the business case for suburban operations. **In the case of Munich, overall accessibility to public transport for inhabitants jumps from 21% by foot to 68% with micromobility vehicles, showing the contribution of these services to first and last mile connections.**[2] Bike and e-scooter sharing systems should be recognised as forms of public transport, being subject to similar responsibility (e.g. area coverage) and subsidised as is already the case for traditional public transport. Concepts such as micro-subsidies could help operationalise such solutions.[3]

Cities' PTA should plan for people's mobility in collaboration with both public and private partner organisation. For example in Amsterdam, micromobility operators are allowed to operate in the city centre only if they also operate outside the city centre. E-scooter deployment in cities has a direct impact on their infrastructure and transport network: in Barcelona, 72% of the inhabitants see shared e-scooter services as expansion of the existing public transport network, especially in dense urban areas and in city centres.[4]

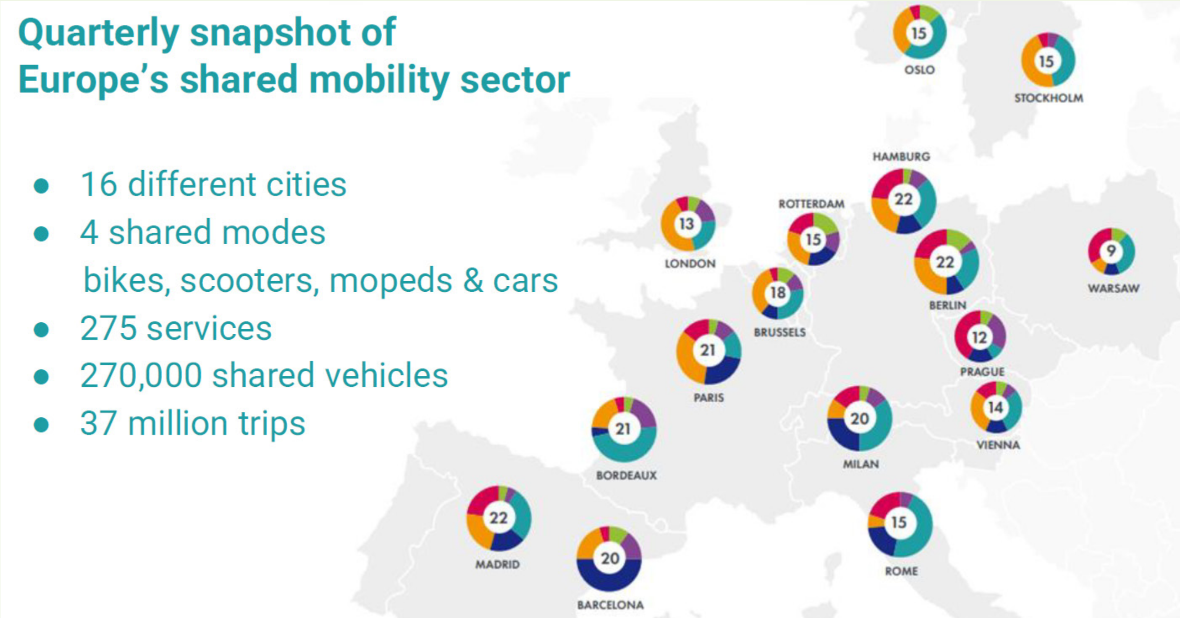
Besides PTA's central role in urban mobility coordination and integration, better city regulation is needed to incentivise sustainability of shared modes in general, facilitating their use case while limiting the abuses of each of the modes. To this extent regulation is blocking the uptake of more sustainable mobility, sometimes by being absent, or by focusing too much on private cars (which use up to 60% of city public space), while restricting shared e-scooter and bike operations.

Use case 1: FLUCTUO

Fluctuo is Europe's leading aggregator of data on shared mobility services (bikes, scooters, mopeds, cars). Fluctuo has developed several solutions to support public and private actors:

- Data Flow is an API that provides real-time availability of shared vehicles (200+ services in 700+ cities)., indicating real time availability of vehicles: French railway company SNCF is using fluctuo's API in their app to display shared bikes and e-scooters are located next to train stations. Fluctuo aggregates data for their customers so they can access to the most accurate and up to date data on available shared mobility services.
- Fluctuo's city dive is a dashboard including 90 cities with fleet position of shared mobility services. This is key to understand how the market is evolving, to get the big picture of the industry and know what is going on in specific markets.
- Every quarter, fluctuo releases the European Shared Mobility Index, a report benchmarking 16 key cities on 4 shared transport modes, and accessible here:

https://european-index.fluctuo.com/



Source: International Transport Forum

These complementary services all contribute to fill the data gap experienced by the stakeholders directly or indirectly involved in the micromobility industry.

1.2 Data access and exchange

Data exchange remains a sticking point, especially in countries like Germany with very strict data privacy rules. While some operators can hide behind these rules, **some cities and PTA such as Munich's MVV work on solutions such as the safe sovereign identity to find compliant solutions to enable data exchange.**

As shown by the services of fluctuo (cf. use case 1), data access and exchange are also of interest for third parties such as railway companies, some of which cooperate with mobility operators to attract more customers to stations and improve their customer service, offering different mobility options to and from train stations. But with a lot of different operators launching in cities, these companies lack the granularity needed to deliver this high-level information to their customers in real time.

Shared mobility operators have recently been launching their services in more medium sized cities (30 000 to 50 000 inhabitants), which is an interesting trend but highlights at the same time the issue of missing data in many cities, which is complicating operations since shared mobility needs performing data exchange to become true alternatives of convenience to private motorised transport. In this regard, the work on a mobility data space in Germany is worth mentioning, as it should lead to the creation of a marketplace for data, enabling open and free data exchange.[5]

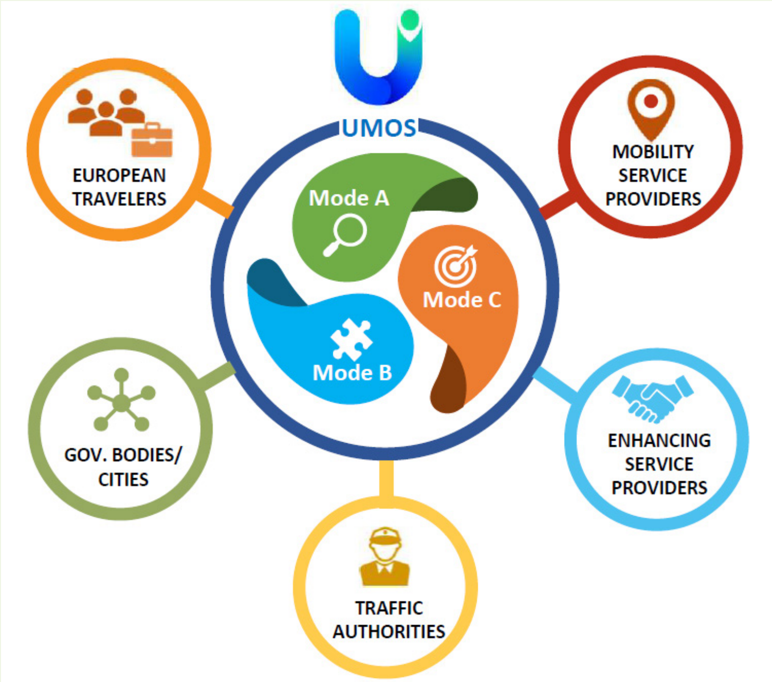
Data access and exchange between private and public actors can be facilitated by central regulation. National governments should, when regulating MaaS, consider it as an open market, thereby enabling the operations of back-end aggregators. This means all public transport or shared mobility operators would have to report basic data streams, including the nature of their offer and how users can access it. According to some experts, **the European Commission should define standards and what minimum data exchange requirements should apply, while enforcing free flow of information, so that operators would be encouraged to use interoperable data formats**. Alternatively, standards similar to Datex II in the traffic management and automotive industry or the mobility data specification (MDS) should be the end goal for MaaS to enable seamless booking of mobility services, giving a push to shared micromobility.

Use case 2: UMOS[6]

The UMOS project aims to create the first pan-European urban mobility open operating system to solve the current issue of travellers having to use several apps to travel across cities in Europe, with countless MaaS platforms being further developed and launched all across Europe. Some provider apps have limited interoperability, further complicating pan-European multimodality.

UMOS started in 2020 with a feasibility study, and now has grown to 24 partners across industry, cities, and universities. UMOS is currently developing a platform as minimum viable product, which will be launched in two cities this year.

Starting point for UMOS is the end-user, in this case the traveller. Central to the success of the solution is the trust to all ecosystem members, otherwise the goal of cross border seamless service integration cannot be met. Openness and transparency in the development of the platform are key components, like the reduction of barriers to cooperation for all parties. Trust between all partners is the main enabler of the UMOS platform, which acts as a clearing house between service providers and helps the user to access other MSP through the same app.



The main principles underpinning the UMOS platform revolve around smooth cooperation between different private and public actors. UMOS platform is open, not for profit, follows different operating modes and business models, supports mobility service providers and collaboration with governmental bodies.

1.3 High-standard quality of service

Refining the understanding of micromobility user groups is key to deliver high-quality services. The increase in remote working changed use patterns and typical age group of users, who might have specific needs that mobility operators can address. With such understanding in mind, regulators can define sensible criteria ensuring high-quality services are provided to citizens.

Many **cities have waited for the micromobility market to consolidate, before talking further about integration with specific operators in the hope to limit the waste of resources associated with operators withdrawing from some cities**, especially in case of multimodal integration of their services by the PTA or the city. However, market consolidation in the industry has not been happening at the pace it was expected two years ago.

In Paris, which used to have many different operators, the city therefore moved to a regulatory system based on a limited number of operators complying with specific criteria. This makes it easier for users to identify and select shared mobility options as the offer is clearer, and also helps the harmonised and safe deployment of e-scooters. But if the services are well regulated, the number of operators is not the key factor for users, and sometimes there is no need to have hard limits on the number of providers.

Currently, capital expenditures for shared scooter operations are relatively cheap, meaning barriers to entry are low, which in turns leads to many companies entering the industry. Scooter vehicle specifications are rather similar, but the services and price points offered by the operators vary and need the regulators' careful attention, as these aspects ensure overall sustainability of the services (environmental, social, and financial). Still, barriers of entry in a lot of European cities are vastly technical, but cities should require minimum service agreements from the operators, ensuring they contribute to public policy objectives. Such focus on service quality will lead to more market consolidation.

There is still a lot of hype among investors on micromobility, making it hard for cities to take decisions on cooperation with operators. In a relatively immature sector, setting high criteria for the quality of the service is key. For this, cities need to have minimum criteria upon which to evaluate providers. In the US, cities like Portland or Chicago have implemented minimum evaluation criteria operators have to meet to provide their services in the city.[7]

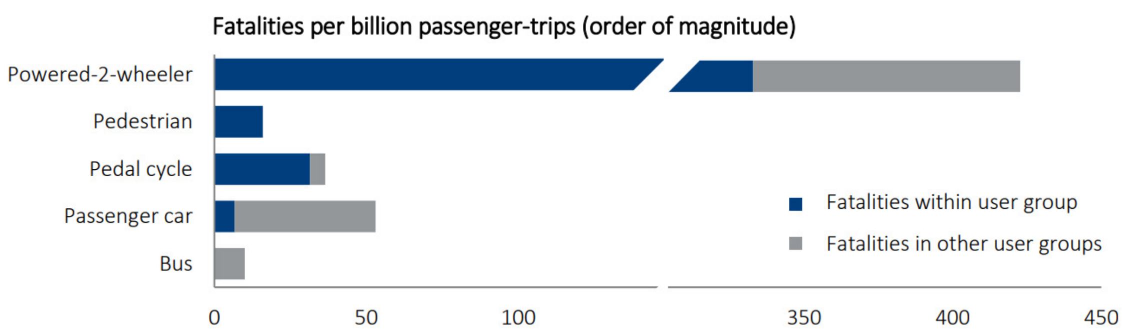
2. Enhancing safety of micromobility

Safe rides are crucial to attract more users to micromobility, thereby fostering sustainable urban mobility. To get there private and public stakeholders need to ensure that street infrastructure is adapted to users' needs, that education and vehicle requirements are in line with public policy objectives, and that efficient performance-based regulation is in place.

2.1 Safe cycling & micromobility infrastructure

Cycling safety data is a good proxy to infer how safe micromobility trips are, as data shows that there is no significant difference on fatalities per number of trips between bikes and e-scooters. **The FIA-funded Safer City Streets initiative[8] has revealed that cycling fatality risks vary 10-fold between cities**, with strong variations from region to region. In cities where data is available, the ITF found a micromobility trip to be five times safer than one by powered two-wheeler. It is also safer than a car trip once the number of people killed outside of vehicles is accounted for, as illustrated in figure 2. Overall, as far as safety is concerned, the benefits of active and shared modes compared to powered-two-wheelers and cars are clear.

Figure 2: Fatalities per billion passenger-trips (International Transport Forum, 2019)[9]



Sources: International Transport Forum. Fatalities, trips and travel distances from Auckland, Barcelona, Berlin, Greater London, Paris Area. Crash matrices from Bogota, Inner London, Paris City

Up to 50% of micromobility trips replace car trips in US, a figure that is below 20% in Europe. **Crash statistics show that motor vehicles are involved in 80% of bike and scooter deaths.** Reducing the number of cars creates safer cycling and e-scooter sharing conditions, and by making people feel safe when riding on streets, it encourages users to stop riding on sidewalks.

The statistics about e-scooter injuries (mostly US-based) shed light on the main risk factors among micromobility users: first-time riders make up 33% of scooter rider injuries, highlighting the importance of user education. 10% of all e-scooter injuries and up to 50% of serious e-scooter injuries are associated with drug or alcohol use, calling for more user sensitisation over such risks.

From this data, the most efficient way to make e-scooter rides safer is to create protected spaces for cycling and micromobility on large streets. Painted lanes are not sufficient as they do not alter the distance to traffic, and do not increase user safety feeling as a result. An additional problem of painted cycle lanes is that delivery vehicles and cars can still park on them, so paint rarely works as an effective way to protect cyclists and micromobility riders. **Painted lanes do not increase safety, neither favour inclusion of children, women, and elderly who might lack confidence to cycle under these conditions.**

Proper infrastructures come at a price in terms of planning complexity and changes in urbanism. In addition, inhabitants might resist the reallocation of road space in favour of micromobility and at the expense of private cars. Most cities are already aware of these challenges, but tailored guidance through best practice exchange – for instance Sevilla, where low-cost infrastructure work resulted in big results in terms of cycling and micromobility promotion - or leading think tank recommendations can further support the creation of safe infrastructure for bikes and e-scooter.[10]

The strong uptake in cycling and micromobility in many European cities has stressed the need to rethink and replan cycle lanes, as current paths are too narrow in the case of cities like Munich. A similar issue emerged in Paris during the COVID-19 pandemic, where pop-up cycle lanes have been introduced in many streets.[11] ITF research[12] shows that best practice bike lanes are perfectly suited for e-scooters and cargo bikes, which means that wider bike lane could serve all forms of micromobility.

Space reallocation must be part of a broader change in the way city streets are designed. In Amsterdam, a 30km/h limit in all the city will help achieve behavioural change, with less attention put to the car, and more attention to active modes, including micromobility. Similar measures are being implemented in Brussels, Paris, and other European cities.[13] Safer, wider bike lanes need reduced space for cars, otherwise they cannot be implemented. The safe use of micromobility in pedestrian areas is a field where future research is needed, for instance thanks to the development and deployment of remote speed control, also known as geo-fencing, allowing operators to automatically slow vehicles down in specific areas.

Better street design and a more adapted building environment is still a need for many cities. Planning skills at local level should be improved and include more adequate design guidance not only for cars, but also for bikes and e-scooters. The same applies for dedicated parking areas for micromobility vehicles, identified as an important solution to facilitate collaboration of different modes in cities.[14] In parallel, innovative solutions to improve safety behaviours using technology (bonus, rewards, helmets on vehicles, etc.) can help here. **Business models can also contribute to safer micromobility, for instance moving from the pay per minute mode - which might give users the incentive to increase their speed in order to limit trip duration - to a subscription model.**

2.2 User education and in-vehicle technology

The role and importance of user education, training, or licencing prior to using micromobility services is still subject to debate among experts. Training for micromobility users has not been identified as a key safety factor in the past, as opposed to vehicle design and technology, which proves more important. Nevertheless, cyclists, riders, and road users in general should have access to training if they wish to, since some users might feel the need to upgrade their skills. However, mandatory trainings would do little to improve safety and would make it less attractive for people to switch to micromobility. Current mobility systems revolve around solutions focused on the dominance of the private car, which is why car users should be also targeted in training offers, in order to increase awareness of other modes of transportation. As explained in section 3.1, the most acute danger comes from faster and heavier objects, so vehicle technology equipment is of utmost importance. Driver training could improve the situation a little, but not profoundly as learnings from a training might not stick that long with users.

In parallel to trainings, improving user safety requires tackling the highest risk behaviours of all road users: the focus here should be on limiting intoxication by alcohol and drug use of riders and drivers as these lead to higher number of injuries. Likewise, user awareness needs to be further improved, so people are aware micromobility devices are not toys but actual vehicles, subject to requirements and regulation. Some e-scooter providers show a high level of commitment with courses to police and city officials, so they know who the contact points to alert in case of misuse or bad behaviour are. It enables a system where every crash is directly reported to operators by the police. This level of commitment needs to be generalised – for example Spin gives access to Populus data in cities where they operate.

In-vehicle technology and design contribute to increasing the safety of micromobility vehicles, with for instance better braking systems, wider, larger, and softer tires equipped on the vehicles, or the introduction of more stable three-wheelers. Such vehicle technologies also include automation features like remote parking of the vehicles or pavement area recognition, which enhances pedestrian safety, especially among vulnerable groups. Vehicle homologation may play an important part in improving safety in the future, but technology implementation is key. For instance the camera positioning system (CPS) technology has features with high safety improvement potential but entails risks where competitors use similar technology that is cheaper and not as well performing.

Similarly, ADAS (Advanced Driver Assistance System) cameras are technologies -like the ones deployed in cars – that can improve safety and which minimum standards for service quality of e-scooter operations can help generalise. More generally, some e-scooter companies are making considerable investments for each city they operate in, while some others just operate on the lowest possible costs (with no or low technology, basic safety features) and take advantage of the micromobility ecosystem already in place. This accounts for the difference between very cheap scooters and safer devices, that can be up to ten times the price. Introducing vehicle regulation at the correct pace has a role to play here, as it can favour high quality products and services at affordable costs.

Use case 3: Spin

Spin has a vision zero, a holistic approach aiming to increase safety and comfort of people – not vehicles - moving through spaces, with a focus on reducing severity of injuries and preventing injuries especially for vulnerable groups (pedestrians, micromobility users, children, people with disability). Complementarily, Spin is using technology and vehicle design to reduce the number of collisions and reduce the consequences of human errors.

Technology supports the enforcement of safety requirements: Spin insight level 2 uses a camera positioning standard (CPS) that guarantees better accuracy compared to common GPS geolocation systems. Similar to ADAS in cars, Spin insight level 2 can identify whether micromobility vehicles circulate on the sidewalk or not and can slow down the scooter automatically if on sidewalk or in pedestrian areas. If vehicles are left parked unproperly, scooters can be steered remotely to be properly parked, reducing injuries for vulnerable communities, especially people with disability.

Spin street program support tactical urbanism with low-cost, high impact piece of smart infrastructure to make road and public space use a lot safer for pedestrians, micromobility, and car users.

2.3 A framework for outcome-based regulations

Collaboration between industry and policy makers is the way forward to encourage the deployment of new, fast-evolving services, and create a supportive environment for safe riding. Cities and operators need to better collaborate to identify bad behaviour and increase information exchange between them for sustainability reporting. The coordinating role of the city should ensure regulations are properly enforced and can be adapted to the evolutions of the sector.

One of the objectives of any regulation of micromobility services is to avoid unsafe technologies being placed on the market. Such regulations can either directly relate to specific technologies like braking systems, but can also be outcome-based, meaning that specific targets need to be reached. Outcome-based regulations are needed in the sector but mandating specific technologies could be risky as limiting competition and innovation.

Provided the vehicles are achieving eventual technical homologation standards and comply with existing local regulations, licence rights are a way to extract safety performance data from vehicles operators. This is the case in San Francisco with the proof-of-concept authorisation (POCA[15]), which allows operators to access the market based on a range of criteria being met, including safety performance. Basic homologation and monitoring should be part of the licencing process to ensure the best safety outcomes so when operators are licensed, they agree to be monitored on their safety outcomes.

To define how to structurally improve safety in cities, there needs to be performance-based oversight in place. Regulators shouldn't prescribe a specific technology into the licensing system. Cities shouldn't be in the position of picking winners but should be able to assess performance of solutions as they come to the market. This way they can best keep up with innovation, and ensure no companies are kept out of the market a priori. However, while cities need to assess performance, in many cases they still lack the necessary data to do that: for instance, in the case of injuries and hospital admissions, it would be helpful to record from what company scooters involved in crashes are operated.

Helmet regulation for micromobility is an important discussion point for micromobility experts. Some consensus was met meaning that **above certain vehicle speed (25 to 45kmh), mandating helmet can be a sensible option, and most governments have already regulated in this direction. For low speed micromobility vehicles, helmets can however remain a personal choice.**

Overall, helmet wearing requirements are a trade-off. Helmet storage on micromobility vehicles is a complex logistical issue, which can make it more complex for users to adopt e-scooters and can be a counter-productive measure. Instead of mandating helmet use, some micromobility operators collaborate with mobility clubs to improve their outreach to all different road users, such as Spin.

In the case of Amsterdam the local law changed to impose helmet wearing on mopeds, and this didn't lead to a drop in usage. The question of helmet storage is however different between mopeds and e-scooters, and its impact on ridership is not as well documented. This is an area where more works needs to be done.

Use case 4: MOBY[16]

The MOBY project designed a user survey (790 responses from respondent in Stockholm, Copenhagen, Munich, Tel Aviv, and Barcelona) to investigate differences in user needs in cities, allowing comparison between cities in terms of usage patterns.

The primary mode for work commuting is one of the most relevant questions serving as starting point for the project.

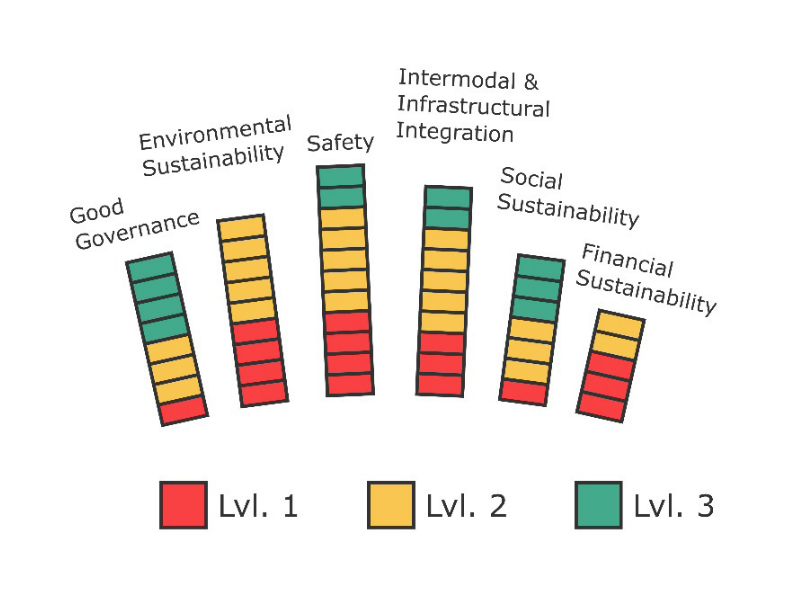
While the use of bikes in Copenhagen for daily commutes is high (68% of respondents there use the bike as primary mode for commuting to work), there is a high adoption rate in Barcelona for micromobility services (for 17% of respondents, e-scooters are the preferred way to commute to work).

Across the cities, leisure is the most frequent purpose of micromobility trip (44% of the cases), before visiting friends and family (37%)

Based on the safety data analysed, the most relevant aspects to improve safety are:

- to avoid e-scooters on sidewalk and in pedestrian areas.
- to avoid e-micromobility riders driving too fast or not paying attention.
- and to avoid scooters not being well parked.

The MOBY project developed a roadmap for cities with 50 indicators in 6 categories covering good governance, environmental sustainability, safety, intermodal & infrastructural integration, social sustainability, financial sustainability. It uses three levels (basic, medium, advanced) to carry out evaluation, as in the example of Tel Aviv. Cities can thus easily identify improvement potential and focus their attention on specific policy aspects.



Recommendations

Multimodal integration:

Enhanced cooperation between city authorities and mobility operators builds trust and help to overcome challenges when they arise. This could be operationalised by multiplying opportunities for dialogue between public and private mobility actors to foster knowledge and best practice exchange on specific topics.

European solutions are needed to tackle similar issues faced by operators and cities around multimodal integration, access, and exchange of data.

Regulated data sharing and integration can enable much better level of service for the city and users as micromobility would enhance (and benefit from) public transport networks. **A shared data standard** for all operators (both public transport and shared mobility) and mandatory reporting on service availability, price, and booking systems would help here.

Safety:

Proper infrastructure has been identified as one of the main enablers of micromobility in cities. To create safe cycling and riding conditions, it is crucial to move away from car-centred planning and parking rules favouring private cars. To get there, cities and citizens need to rethink space allocation, and **to deploy protected cycle lanes** for all users to feel safe.

Improving safety of micromobility users calls for efforts from both city authorities and operators. **Dedicated trainings** should be available to users, especially for high-speed micromobility vehicles, and **cooperation with local police and hospitals** should be generalised to better understand and tackle the root causes of injuries, and to make appropriate decisions based on safety performance data.

Vehicle type homologation needs to evolve and take into account technical evolutions, such as onboard safety features.

Regulations of micromobility operators should consider all dimensions of sustainability, including financial, social, and environmental aspects. To this end, **service level agreements are crucial** to establish minimum performance criteria on level of operation and safety.

National guidelines could also help cities evaluate mobility sharing systems, focusing on **outcome-based criteria**, against which shared mobility services should be evaluated regularly. These criteria should be improved gradually.

Above certain vehicle speed (25 to 45kmh), mandating helmets can be a sensible option. For low speed micromobility vehicles, helmets can remain a personal choice.

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Co-funded by the European Union