POLIS

Macro managing Micro mobility

Taking the long view on short trips.

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Contents

Food for thought.

Karen Vancluysen[1]

Shared micromobility is a hot topic. For many cities, it has been more of a 'hot potato', as the 'invasion' of e-scooters and e-bikes triggered a public outcry, inflamed debates in the media and put mayors, deputy mayors, and transportation officials on the spot: "Do something!".

The problem with reactive approaches is that they often miss strategic opportunities. And the **strategic potential** of shared micromobility is clearly what came out of the **intense dialogue** we have been conducting on this topic, for over a year, with many cities and regions, with the major players in this industry, and with many other relevant stakeholders, from pedestrian and cycling advocates to public transport operators and innovation & disruption experts, among others.

This dialogue has been enhanced by the **active participation** of several members of POLIS' working groups on Governance & Integration, Health & Active Travel, and Road Safety & Security, in countless conferences, workshops and meetings.

New studies, reports and guidelines have been coming out regularly, along with a steady stream of news and editorials. It has become a crowded debate, polarised by technological break-throughs and regulatory crackdowns. Interesting, for sure, but how **helpful for cities**, really? Dialogue on these topics must empower cities to work for the long-term public interest, instead of being rich in jargon and poor in purpose.

As a network of cities and regions dedicated to transport innovation, it's our duty to go beyond the media frenzy. We clearly need a constructive framework to stimulate **strategic dialogue and cooperation** among all parties – that's the only way of shaping win-win solutions.

This is a paper for discussion. It brings together the issues at stake that emerged in the numerous conversations we had with our members and with the industry over the past year. This is a paper to **continue the discussion**, to feed and frame that discussion, to help focus and further the dialogue between the cities and the industry in a solutions-driven manner. We strongly encourage your feedback and contributions. This is a living document.

Things have been moving fast, and they'll keep moving, probably even faster. So, it would hardly be useful to focus this paper on technical details, deployment numbers or regulatory developments. That would be outdated in less than a year. What we really need are **insights**, a sense of perspective and strategic purpose.

This new mode of transportation is still in its infancy. How does it work? How will it evolve? Is it here to stay? How can we make it work for cities? How can we build a new way of cooperation that meets the needs that need to be met, in the long term? Cities will decide within their own context, which means we have to accept that in some cities shared micromobility makes sense and has a meaningful and sustainable role to play, and in others it doesn't.

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[1] POLIS Secretary General

Solutions involve **trial and error**, and many issues are context-sensitive. We don't have all the solutions, but many cities and regions have been coming up with them – we analysed several, and will be sharing them in a companion volume to this report (we will also be sharing case studies online, in the 'Micromobility Series', coming soon to POLIS' new website).

Big cities have been getting most of the attention in the media. But it's crucial to consider as well the importance of the many European **small and medium-sized cities** (SMCs) and the challenges they face. The need is definitely there – many SMCs have large surrounding suburbs with big service gaps, where people are very car-dependent. And institutional potential is also there – some SMCs are open and committed to innovation in transport[2], have forward-looking elected officials and qualified staff, and are eager to attract more transportation options.

In a year from now, we'll probably be shown wrong on some issues. But we have to bring these issues to the table **now**. And we look forward to continuing the conversation on the basis of this document.

So, readers beware. This is not an exhaustive and comprehensive study on all aspects of shared micromobility. It's not a report on e-scooters (they're 'the thing' now, but that will change). And it's certainly not 'neutral'. It's opinionated – policy discussion has to be grounded in facts, of course, but it must be guided by values and goals. And our goals are clear, we all know **what we want** – cities and regions for people; sustainable and safe mobility; and a decent, liveable future for our children.

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[2] We should know – several of them are POLIS members!

1. What's happening?

Futurists and transport dreamers of the early 20th century, who pictured flying vehicles and colossal motorways with neat traffic flows, would be appalled to know that, in the early 21st century, many cities are struggling to fix… **micromobility**.

For centuries, cities and towns grew within walking distance. Public transport allowed cities to expand, and cars enabled urban agglomerations to rise and sprawl. Suburbs led to the urban commute, which flooded the urban core with cars. As public spaces were carved away to make space for the circulation and parking of large private vehicles, aka "automobiles", conditions for **pedestrians and cyclists** steadily deteriorated.

Walking and cycling became unsafe and uncomfortable, which in turn reinforced the trend towards private motorized vehicles, not only in medium distances (any trip by bus or train always starts and ends with walking), but also on **short distances** (e.g. travel to school).

Walking and cycling (i.e. micromobility in its original form) became a **missing piece** in urban mobility policies and plans. Its problems were seen as the inevitable by-product of motorized progress, and its needs were addressed, if ever, as a nuisance for efficient traffic flow that had to be minimized.

In the last decade it became clear that this mobility paradigm is unsustainable, as global climate started changing, urban congestion rising and air quality worsening, and as cars and truck kept killing or seriously injuring thousands of pedestrians and cyclists in their natural habitat, city streets.

The need for change became an opportunity for new approaches. Things started changing fast – and Micromobility is becoming a key piece for sustainable urban mobility policies and planning. Mostly for two reasons:

- **Short distance** car trips account for a large share of motorized travel (including parasite traffic looking for parking), and most of them could (and should) be walked or cycled;

- Public transport networks cannot make door-to-door trips, which raises the question of what happens in the **first and last miles** of each trip.

With the successful experience of several Dutch and Danish cities, **cycling** became a very attractive option, and a staple of sustainable urban mobility policies. To promote this active mode, several cities started investing in traffic calming, cycleways and bicycle parking structures near public transport hubs.

To further encourage cycling, and spare potential users from the (perceived) hassle of buying, carrying and parking their own bikes, cities also started launching **bike sharing** programmes. The way these early bikesharing programmes work is rather simple – the user walks up to a fixed station, to find "docked" bikes. These bikes must be unlocked to start the trip (there are different ways to do that), and at the end of the trip they must be locked again at another fixed station.

Thus, "**Shared Micromobility**" was born – people can cover "micro" distances using vehicles that are "shared". In a short time, this "micro" concept grew to become a "macro" challenge to cities. We can generally describe three "waves".

This "**first wave**" of Shared Micromobility was public, docked and planned:

- It was started by local government, through public procurement or public private partnerships (namely through branding);

- Bikes can only be found (and left) at fixed stations (called "docks");

- Choice of location for stations and (consequently) areas for circulation was painstakingly planned, often in tandem with design and construction of the city's cycling network.

These first bike sharing programmes were visibly successful. The number of people cycling grew significantly, and made clear to many what cycling activists had been insisting on for a long time – that cycling is a viable mode for urban mobility. This was also true for hilly cities, as shared fleets started including **electric bikes**.

It also became clear to entrepreneurs that there was potential demand waiting to be served, i.e. there was money to be made by the private sector, above and beyond advertising. At this point, technological developments quickly enabled start-ups to overcome key obstacles to create and enter the **micromobility market**: users could pay with their smartphones; bikes could be located, picked up and left anywhere; new batteries became lighter and lasted for longer; and service platforms enabled operators to make the most of the sharing economy, sidestepping hiring and facilitating logistics. It was a new, largely unregulated ocean of opportunities.

And so, the "**second wave**" of shared micromobility landed in some European cities by surprise, around 2016. Cities would wake up to find their streets filled with coloured bikes, with QR codes and short instructions painted somewhere in the bike's frame or handlebar. City administrations were informed on a very short notice (if at all) and had little or no opportunity to influence operations – also because most of these new operators were headquartered in Asia. Urban transportation, one of the most regulated markets, had been cracked open.

The way this new type of bike sharing service worked was quite different from the existing public programmes. The user had to own a smartphone, download an app, and use that app to look for an available bike. These bikes could be anywhere, since they weren't fixed to predetermined docks anymore (thus, they were "**dockless**", or "**free-floating**"). The app was also used to remotely unlock the bike, and to lock it back at the end of the trip.

Plus, users no longer had to go through all the motions of a public programme subscription – it was enough to provide (through the smartphone) a credit card and some other personal data. These fleets had no electric bikes, but they were everywhere, especially in areas that existing public bike sharing programmes **weren't going to reach** anytime soon.

This second wave was fully private, dockless and unplanned. Was this a free market blessing for sustainable mobility? The seemingly pleasant surprise gradually turned to **nightmare**, as lots of bikes were stolen or vandalized (in social media posts they were hanging from trees or rotting at the bottom of public fountains), and ineffective maintenance showed that the equipment and supporting logistics hadn't been well thought through, nor adapted to the European market. And then, as quickly as they came, they disappeared – which left many registered clients thinking about what was going to happen to their personal data.

Things settled down for a while, and public bike sharing programmes were back to the default solution. Until change returned... with a "vengeance".

The "**third wave**" of shared micromobility is similar to the previous one, in the sense that it is private, it is dockless, and it is unplanned, i.e., not limited by the city's cycling network planning. There are, however, five striking differences:

- Bikes don't have exclusivity anymore, as many, if not most, operators are deploying **electric scooters** (commonly called "e-scooters");

- Many fleets are **fully electric**, and that includes bikes (e.g. Uber's Jump bikes);

- Logistics are well planned, and seem much more effective (for deployment, battery charging and maintenance);

- Large investments of **venture capital** provide for massive deployment, explosive growth and staying power;

- Public authorities are no longer left in the dark – after an initial "deploy first, ask questions later", operators now seek their support (in more and more cities, permission) before starting operations, and hire dedicated staff to deal with public affairs.

This wave was big. It came fast. And it quickly swept over cities **around the globe**. Two years after launching their e-scooter operations in California (between June and September 2017), Lime and Bird had already entered more than 100 cities, reaching almost every continent. They had logged millions of rides (it took Lime just one year to get to 6 million rides on its shared scooters and bikes, and another two months after that to nearly double that figure[3]), and they were raising cash from investors at an unprecedented pace – Bird quickly became the fastest start-up to achieve a $2 billion valuation[4].

Suddenly, scooters were everywhere – hundreds, thousands of them. Teenagers and young adults were whizzing up and down streets, and parked e-scooters swarmed the sidewalks, often blocking the pedestrian path. Change soon turned into shock, triggering **strong reactions**. Can they ride among the cars?! Isn't this dangerous?! Aren't they breaking the law?! Shouldn't they be wearing a helmet?! Who's going to pick up all this clutter?! What about blind pedestrians?!

As the e-scooter craze swept city streets, residents and local media called on mayors and city councils everywhere to **"do something!"**

But what could they do? Many found out they could do little, close to nothing. Because existing regulations only… regulate what already exists. Seldom are they ready for innovation. Much less for so-called "**blue ocean**" business strategies[5], bent on creating new markets by deliberately exploring regulatory gaps. As Bird's CEO explained in October 2018, "there are very few places that explicitly outlaw e-scooters. The places where there are no laws, that's where we go in[6]."

As e-scooters proliferated, and cities scrambled to figure out what to do, the debate became polarised. Is this a new product with great potential for getting people out of their cars, or just one more tripping hazard for pedestrians? Are we dealing with fresh and well-intentioned start-ups, or young irresponsible

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[3] Source: Lime
[4] Source: Bird
[5] Kim, W. Chan & Mauborgne, Renee, 2004, "Blue Ocean Strategy", Harvard Business Review.
[6] https://fortune.com/2018/10/09/bird-ceo-scooters-laws/

CEOs trying to make fast money? Must cities exterminate them, hold operators on a short leash, or wait for the market to self-regulate?

A few but revealing financial reports show life isn't simple for these operators either. The mushrooming of e-scooter companies and their quick 'gold-rush' expansion has been fed by huge injections of venture capital, but that doesn't mean these companies are turning a profit. On the contrary, they're **losing money** with every ride, and the cut-throat competitive environment created in many cities doesn't make it easier for them. Plus, they'll have to struggle for survival, as venture capital moves out and new stock-owners take a good look at the numbers – will raising prices increase revenue, or just make customers run for some other trendy new transport service and or gadget, or an 'old school' more affordable option?

So, to regulate or not to regulate, is that **the question**? Yes, and no.

In a way it is, because some sort of rules are indispensable. The public right of way is a limited space which must serve the public interest. Letting transport modes and services "fight it off" amongst themselves is not an option. Cities need order, and so does business – at least serious business with a stake in the long run.

But is regulation all there is to the matter? Definitely not. We are witnessing a **revolution** in urban mobility, and there is a global call to action because of the climate crisis. For cities, the way forward is clear: we want urban mobility to be sustainable, and to be safe (it has to be both, or it won't be neither[7]). There's a lot to change, and we need all the help we can get. Regulation needs a purpose, and general principles won't provide enough guidance here.

We can't just be reactive. We have to be **proactive and strategic**.

We must remember there's only one way out of urban congestion and pollution – modal shift, towards public transport, walking, cycling, and ABC[8]. This could be the **critical mass for change** we've been hoping for, just not in the shape we were expecting. This challenge goes beyond e-scooters – they've just shown how far behind we are in creating conditions for cycling, for active and now also 'light' modes.

Now, **what are we going to do about it**? And what are some regions and cities already doing?

2. Who are we dealing with?

Naturally, shared micromobility companies differ among themselves, and there's much uncertainty in the horizon. But all stakeholders have to keep in mind that shared micromobility will only produce real and sustainable benefits for cities if it becomes a safe, viable and attractive business – and this, in turn, will only happen if these services become a source of strategic opportunities for cities, and not a problem. For fruitful dialogue to happen, we have to understand where these operators are coming

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[7] Cf. "The New Paradigm for Safe City Streets", 2019.
[8] Anything But Cars.

from, what's driving their business, and what kind of developments we can expect. In short, their perspective.

2.1 They are not "e-scooter companies".

We're dealing with web-based platforms that provide transport services. Those services consist of moving people and data – users pay as they go, and data will be monetized. Their founders probably didn't look at an e-scooter and think of ways to 'make money' with it. It worked the other way around, i.e., these vehicles are just the current enablers of a business model where their platform and registered clients are the most precious asset.

In the coming years, we will most probably see a diversification of vehicles[9] (e.g., improved e-scooters, e-bikes, e-cargo bikes and other one- to four-wheeled rideable 'gadgets') and of service options (e.g., to increase customer loyalty).

We can also expect these operators to undergo a Darwinian process of mergers and acquisitions, of market consolidation, which will make them bigger and fewer, but also different in their vocation – UBER, which 'dealt with' cars, came into micromobility after buying JUMP. If one of these shared micromobility operators is bought by, for example, Amazon or Google, 'what' will cities be dealing with?

2.2 They think global. And cash local.

These are internationally-minded business strategies deploying local operations. When asked for tailored responses to local requirements, they will naturally ponder the implications those requirements have on national and global strategy – especially from a policy point of view (e.g., sharing certain data may be felt as setting a dangerous precedent).

If experience is of any use here (cf. Amazon, which went from selling books to selling everything, sucking up local business everywhere), we can expect these services to have, in the medium and long term, a profound impact in the economy of urban transportation. How? It's difficult to tell yet.

But it's not far-fetched, though, to predict that in their drive for growth (and long-term viability) they'll try to obtain dominant positions in local markets, with competitive prices 'subsidised' by venture capital. We've got to make sure that won't make public transport harder to sustain, nor leave citizens 'trapped' in some sort of new monopoly.

2.3 Now is the time to set the right course.

We call them "micro", but they may be the start of something big. They can help cities deal with mobility problems (e.g., replace car trips), but can also make some problems even harder to deal with, like curb space management.

Left alone, they pose the risk of a purely commercial approach to urban mobility, that dis-incentivizes (or cannibalizes on) trips that don't generate income, like walking (and we do want to promote walking,

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[9] VOI, which started operations in September 2018, is currently in its 5th scooter model.

or the congestion and pollution currently caused by cars will not be solved, along with several public health problems).

As planners and managers of public space, cities can influence these developments, and try to set them on a course that serves the public interest. But to do so, it's crucial to act now. Later it will be much harder to make changes. To set a course, we need to know where we want to get to, and how these innovations can help us get there. Here's a key role for political vision.

2.4 Shift happens.

People were moving somehow before these services came, so obviously there is a shift. But what kind of shift? How big and permanent? Is it the shift our cities need? Operators mention millions of rides worldwide and tout their contribution for modal shift away from the private car as a key selling point to local authorities. Although they've grown fast in a short period of time, these services still account for a tiny minority of the modal share, and the numbers on which trips they replace aren't very clear yet.

Surveys of e-scooter users show that scooter trips do replace car trips, but that they also replace walking, cycling and public transport trips. Of course, context matters, and there are significant differences between Europe and the US. There are important nuances as well in the results.

For example, a survey conducted in 3 large French cities in the Spring of 2019[10], showed that 44% of local users would have walked to take their last trip instead of using a free-floating e-scooter, had the latter mode not existed – but only 6% of users walked less overall since they started using e-scooters. 30% would have used public transportation, but again only 6% took transit options less often since they started using e-scooters – and, what's more, 23% of these trips are intermodal, meaning they combine the use of the e-scooter with another transportation mode – public transport for 66% of them, and walking for 19%.

Early results of Brussels' Mobility's Good Move poll (Summer 2019)[11] point, at least partly, in a similar direction, indicating that around a quarter of respondents said the scooter substituted trips made by car or motorbike – but for the rest, scooters were used instead of taking public transport or walking.

And what kind of purpose are these trips serving? Commuting? Inner-city displacements? Routine or sporadic trips? Probably a mix, which isn't necessarily bad – for those who change their commuting modal choice and leave their car behind, the question remains of moving in the city during the day. We'll hardly find alternatives that fit their full travel pattern, but shared micromobility can have a surgical impact in some trips and help make cars dispensable.

2.5 They can free up space, and bring us people.

Elected officials who want to change their city's public space have a limited time frame to do so. Usually, only four years to plan, design, build, and hope for public approval. Resistance to changes in traffic and parking is tricky to deal with. And it's especially 'dangerous' in such tight schedules: it can delay the project, or make complaints subside after its completion… right before the elections.

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[10] 6t-bureau de recherche, (2019), "Uses and Users of Free-floating Electric Scooters in France".
[11] Full results not available to the public at the date of publication of this report.

Among the top complaints are, of course, "nobody's using the cycleways", and "if you take away the parking, people will stop coming here". Relevant public space improvements necessarily imply taking space back from private cars... and offering alternatives for reaching those areas – not only to access them, but also to circulate inside them (they can be quite large).

Shared micromobility provides a practical alternative – not to everybody, of course, but to many. The scale and speed of its deployment can work wonders, quickly filling up cycle ways and bike-parking hot spots (one car-parking space can take up to 20 e-scooters). It can further enable cities to significantly restrict private car access for those who have other options, while improving (yes, improving) access for those who really need it (e.g. residents, deliveries, emergency vehicles, persons with disabilities).

2.6   Who are they aiming at?

It's a known fact that younger Europeans aren't as excited as their predecessors about getting a driver's license, let alone a car. No wonder. There's higher turnover on both ends of the commute (home, and place of employment), which means they can easily end up stuck with a 1.4-ton vehicle for which they'll have no use, and probably no money as well, as credit eats up a significant part of the family's income, along with insurance, fuel, parking, etc.

They still need to move around, preferably fast, and they want proper alternatives for that. Have you checked who is really whizzing around town? In a way, shared micromobility is the emerging mode for the emerging population.

That makes business sense for these companies – they're building a lasting customer base. Shouldn't it make sense for cities too? Shall we let traffic management for today delay planning for the users of tomorrow?

2.7   They can die. Or leave, just like that.

Transport providers always end up with a relevant share of steady clients. These clients count on their service and shape their routines accordingly. If the provider goes out of business, it leaves a 'hole' that the public sector is quickly called on to fix, with public resources.

These are private companies. They are guided by business goals, not public interest. And they're operating in a highly 'flammable' environment, with cut-throat competition and venture capital owners more focused on growing them fast for a lucrative sale, than on long-term viability and planning.

What if they go out of business? Or decide to leave town, just like that? To what extent can public authorities rely on these companies to survive and keep providing? And when they're weaned off venture capital, what changes will be operated to their business model, and how will that affect users?

2.8   They survive, cities thrive.

Operators need to achieve a certain number of rides per scooter per day. Fleet size is important, as larger fleets, being more visible and dependable (easier to find), may attract more customers to the platform, and enable economies of scale. Competition provides customers with choice and improves coverage for users subscribing to more than one platform. But the market has to be balanced and allow for healthy business.

Allowing into the city too many operators leads to lower revenues, which in turn makes it harder for them to comply with any sort of service requirements that are human resource intensive (maintenance, removal of damaged vehicles, charging, redeployment, customer support, etc.). A high number of operators also puts a strain on the City's human resources (often already stretched), who are forced to multiply their communication channels.

So, business needs order. In the longer term, it may also need public support, as venture capital steps out and operators shift from rapid-growth to sustainability mode. Will they become even more expensive than they already are, effectively making them a mode for the happy few?

If micromobility operators can prove they have a meaningful and sustainable role) to play in an urban mobility ecosystem (i.e. replacing car trips), we may need to think of new forms of public-private cooperation and partnerships, of new business models that make sure they won't disappear overnight and leave a service gap.

This opens up opportunities for the development of public-private partnerships, enabling cities to benefit from these services as tools to support modal shift, feed public transport, and more. This could take the form of public contributions to a privately-run mobility service. Public transport cannot survive on its own either, i.e. without being subsidised. In fact, integration of the new mobility services with public transport services may be a good way forward, also in a MaaS environment.

3. Key strategic issues

Shared micromobility has been raising several issues for cities. Some of these issues have key strategic value – because they affect important assets, and help us further our goals. The discussion below is in no way final, neither are the opinions stated necessarily the most proper for every context. Nevertheless, this short list of issues may help structure the debate on how cities should position themselves, and on which decisions are best aligned with their policy.

3.1 Public Space

There's an **elephant in the room**. Shared e-scooters and e-bikes are being blamed and shamed as a source of hazard and inconvenience, but they've just laid bare a century-old problem.

People are riding e-scooters on the sidewalk because they're **afraid** to ride among the cars (even in city centres and residential streets, where it shouldn't be that way). Dockless e-scooters and bikes are left all over the sidewalks because there's often no other place to leave them – almost all parking spaces are dedicated to cars, remember?

Even worse, this often points the traffic safety discussion dangerously away from what really matters: cars and trucks (not pedestrians, or bicycles, or e-scooters, or whatever rideable device comes next) remain the major source of risk. With or without helmets and reflective vests, shared micromobility users are **vulnerable road users**, and our streets – all our streets – must be safe for them.

We can't let this become a 'fight' between those who walk and those who bike (or ride these light vehicles) for the crumbs left on the table, after all the 'food' was given to cars.

Especially because this poses a much larger problem for local transport authorities: transport innovation takes place in the public right-of-way. Giving away most of that space to private cars has **frozen up the major asset** cities have for dealing with transport innovations. It's like forcing local authorities to "fight with their hands tied behind their backs".

Obviously, this goes **beyond**, much beyond, shared micromobility in particular, and transportation in general. The quasi-monopoly held by private cars over the public space of cities is also blocking other necessary improvements, e.g. from air quality to flood management.

In **consolidated urban areas**, the public-right-of-way is a limited and scarce resource. The way this space is distributed by the different transport modes is, simultaneously, an indicator of where the City's policy and practice really stand, and a major constraint on (or opportunity for) its evolution towards Sustainability.

In transportation, as in other economic sectors, monopolies distort the options, and effectively reduce freedom of choice. **Reallocating space** to create conditions for the safe and attractive use of walking, cycling and public transport, is not about "fighting" cars – it's about correcting a disequilibrium that persistently puts at a disadvantage those who do not have a car, and makes it harder for those who do drive to opt for other modes.

The rise of shared micromobility has brought with it the need, and the **incentive**, for cities to 'unlock the asphalt' for other modes, revive their public realm, and enable more citizens to step out of car-dependency.

Even cities where this unfair distribution of space is still predominant today as a legacy of the past, have started the process of giving streets back to the people and redesigning public space accordingly.

3.2 Infrastructure

Where do these 'things' fit? Unlike other innovations still in the talked-about phase, this one is here, and we've got to provide for the safety of its users, and others with whom they interact – now.

Segregated cycleways will hardly solve all the questions – they can help, but they'll be never be able to **match the demand** of these dockless services, that can go from anywhere to everywhere (especially now, that fully electric fleets can climb up the steep streets).

Looking at the current width of many cycleways, and at the resistance many City officials still face when implementing them at the expense of car-dedicated space, one wonders what will happen when demand **grows** (maybe exponentially) for these car-less lanes.

We've categorized traffic to set rules on the use of the infrastructure, i.e., to say what goes where. Our 'classic' categories seem to be less and less fit for current reality and expected developments. The way we plan, design and manage traffic in our streets needs some **rethinking**.

Where do we put these rideable devices? Do they count as cycling? Walking? Must they be segregated? Maybe what really matters is that these **aren't private cars**. And maybe, in due time, we won't be asking, in the denser areas, if we can insert a cycleway in a street, but rather questioning the feasibility of keeping that street exclusively dedicated to cars.

To have a fruitful dialogue about the insertion of these modes in the city's street network, we first have to **differentiate** the types of streets that we're dealing with. Is it, for example, a motorway or a ring-

road with large volumes of car-traffic and high speeds, where we don't want to go? Is it an arterial or a wide boulevard where we can convert one or more car lanes into segregated cycleways? Is it a residential street or a dense central area, where there's no space for cycleways, and the only viable option is to ride among the cars... and maybe also pedestrians altogether, in shared spaces[12]?

This may seem obvious, but the fact to the matter is that many policy and design discussions, let alone public hearings, are often derailed by a sort of **disjointed conversation**, where one side is reflecting on the potential of some measures for one type of environment, and the other side is refusing those measures because another scenario is being taken as reference.

This is for providing space for circulation. To provide space for **parking**, we have to start by acknowledging that sidewalks should be considered a last-resource, and never a default solution for bikes and e-scooters.

The default measure must be converting car parking spaces into 'hot spots' for parking bikes et. al. It's a fast and cheap solution, that just involves paint, maybe signage, and preferably bike racks. It's a rational investment – in a parking space dimensioned for a car, up to 20 e-scooters can be parked. Plus, the lower turnover of parked cars when compared with shared e-bikes and e-scooters means the number of people benefitting from this conversion is even higher.

In very dense areas with a high demand of these vehicles, the '**dockless**' mode raises some challenges that parking provision, by itself, won't solve. To safeguard the safety and functionality of the pedestrian infrastructure in areas with high volumes of walking (e.g. in the immediate vicinity of transport hubs) we have to make sure that hundreds of users, some of them in a rush, park these vehicles properly.

This requires some compromise on the part of operators. Mixed solutions must be considered, so that free floating doesn't mean chaos. Requiring designated parking in some areas, and allowing for free-floating in other, less dense areas. This means some trips could be docked to dockless, or vice-versa. At its current state of development, GPS cannot always ensure enough precision for remote enforcement, and solutions may have to be physical.

3.3 Safety

Safe operation of shared micromobility services poses three distinct challenges: the safety of its users, the safety of pedestrians, and the city's goals for traffic safety.

The discussion on the safety of **users** often gets centred on the use of helmets. They may help, but, unfortunately, there's little a helmet can do when the user is struck by a car at over 50 km/h. The same goes for reflective vests, if the driver is checking messages on his smartphone. The key steps to improving the safety of those riding these light vehicles will always be (1) reducing car speeds in the whole street network, (2) reducing the volume of cars in wide traffic-calmed areas (e.g. 30 kph zones), (3) freeing up public space currently 'monopolised' by private cars, to insert properly-dimensioned cycle ways and bike parking (thus reducing conflict on the sidewalks).

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[12] In shared spaces, there is no segregation between different modes. Pedestrians have the priority in the whole width of the street. All elements that support segregation are removed (e.g., curbs, road surface markings, traffic signs, and traffic lights).

Improving the **pavements** where they ride is also essential – cracks and potholes pose a serious hazard, especially for vehicles with smaller wheels, like e-scooters. In many cities, the surface dedicated to cars (generally, asphalt) is in much better conditions than sidewalks and narrow cycle ways tucked away at the side of the carriageway – so, again, converting space currently dedicated to cars to other uses is the quickest and most rational way to improve safety.

Influencing user behaviour through **public education and awareness raising** is also an option to be pursued, but isn't enough, and thus must complement, and never substitute, for other, more effective, measures. How much can we expect users to respect Traffic Codes and be aware of all the risks involved, when many of them don't hold a driver's license and have no driving experience? And by the way, should we expect the same of cyclists and pedestrians? They also use the road, after all. And how far-reaching and effective can public education efforts be when, in an urban area, we have to consider several hundreds of thousands of users (many of which will, probably, try out these means of transport on an impulse)? Finally, of course, we must consider that, no matter how much 'educated' a user is, humans do make mistakes, and we have to make sure that those mistakes don't cost lives and serious injuries.

Imposing high **age limits** (e.g. you have to be 18 to ride) makes sense from a legal liability point of view, and may even be necessary in some countries, but, again, age limits for cycling, where they exist, are generally lower, and it's not rare to see teenagers riding these vehicles (many of them, probably, with their parents' permission). They are naturally attracted to these means – and maybe cities should also like the idea, since transport to and from school is a major source of urban congestion (and in safe residential areas this can be an option). This is not to argue for not setting age limits, but rather to point out that age limits protect companies and cities from liability, but aren't enough to protect younger people from harm.

The way the service operates can also **nudge** (or even force) users to drive in a safer way, e.g. not allowing for circulation in motorways and arterials where cycling is not allowed or is too dangerous, imposing speed limits (which can be set for different zones), pricing trips more on distance than on time (to discourage speed), facilitating access to helmets (which do help reduce the impact of falls), providing guidelines in the app and in printed materials attached to the vehicle, etc.

The design of the vehicles must also be considered. Starting with the functional issues raised by the most recent one, the e-scooters. In most cases, it's not subject to any type approval process[13]. Its small wheels are not compatible with today's imperfect infrastructure, and its structure aggravates, rather than mitigates, the risk – if the front wheel gets stuck in a pavement crack, the vehicle will easily roll over forward, and the moment of the force will throw the driver's face and upper torso against the ground. Off-the-shelf consumer market models are not fit for purpose. Operators are looking into improving the safety of the vehicle itself.

But safety is also paramount for the **other users of the public right-of-way**, especially the most vulnerable ones, i.e. **pedestrians** and, among them, persons with motor and visual impairments.

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[13] Type approval is a process followed by national authorities to certify that a vehicle model meets all European Union (EU) safety, environmental and conformity of production requirements before authorizing it to be placed on the EU market.

Chaotic parking of these vehicles on the sidewalks seriously disrupts the pedestrian path, generating tripping hazards and even forcing some people to step into the carriageway to walk, which naturally endangers them, plus, if they're hit by a car, they may be liable for not using the sidewalk.

Persons with **visual disabilities** need a functional walking path, as regular as possible, without unexpected obstacles. Dispersion and multiplication of these vehicles poses serious inconvenience and risk – they force frequent changes in direction, and when fallen to the side they are harder to detect and point up their handles (it hurts).

People with **motor disabilities** can see them, but have a hard time moving them out of the way. Bear in mind this type of equipment is pretty heavy – for example, a JUMP bike weighs 32 kg (70 pounds), and a Bird One electric e-scooter weighs 17.5 kg (38.6 pounds).

Finally, introduction of these services must be done in a way that furthers the city's traffic safety goals and strategy. Consistent with **Vision Zero and Safe System** principles, we must always keep in mind that victim-blaming is ineffective, and unacceptable.

3.4 Equity

Experience shows that innovation in transport always has an impact on society as a whole, even on those who cannot afford to use the new means of transport. Just look at what happened with the introduction of the car.

Although we don't yet know the full impact shared micromobility will have, we can already see that some people run the risk of **being left out** – and not because they don't need it. Research on Innovation[14] has shown that, because of issues of financial and social capital, those who would most benefit from an innovation are usually among the last to be able to access it.

Yes, privately-owned companies are oriented towards profit, not necessarily the public interest; and those who want to use their services are supposed to accept the way their services are provided. Case closed? Not really. It's actually a short-sighted way of approaching the issue, if we think of the **interests** of both cities and operators.

The most profound and lasting benefit of integrating shared micromobility services into a city's transport system is to improve accessibility for all citizens, no matter their socioeconomic status. It's good for the city, as it improves connectivity. And it's good for business, as it unlocks a much larger and dependable market (unless operators want to rely on tourists and young male adults).

If shared micromobility is really meant to serve the first and last mile, it must be made available not only to people who currently drive cars, but also to people who **currently use** public transport. And who have to move to and from it outside of city centres. This raises issues of geographical coverage, affordability, and technological gaps.

This is also an opportunity to improve connectivity in suburban areas where public transport is limited. Where people were pushed to by the housing market and are now 'held hostage' by car-centric planning, forced to choose between a **disproportionate toll** on their revenue, if they travel by car, or on their free time with their children, if they opt for public transport.

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[14] Rogers, Everett M. (2003), "Diffusion of Innovations", Free Press.

Regarding **geographical coverage**: can operators opt-out of serving low-income communities? Can they discriminate geographically, erecting no-service geofencing around these areas? Lack of commercial interest doesn't explain why people are blocked from starting or ending trips there.

Vandalism is a legitimate concern, but the issue is more complex. More importantly, it can be worked out, through dialogue and cooperation between the operators and the local communities. Looking at enforcement, at affordable prices, but also at local jobs, and maybe also at new service solutions, which in turn will open up new opportunities elsewhere. Cities can encourage and support this dialogue.

Affordability is naturally a key issue. Not only now, when prices are being 'subsidised' by venture capital and yet already expensive, but also in the future – are peaks in demand going to trigger price peaks as well? And if they do, will they affect lower-income users the same way as the rest?

If we want people to shift in their commute, we need to provide them affordable prices. True, many of those who drive today[15] have to spend a significant proportion[16] of their income in credit instalments, fuel, insurance and parking. Shared micromobility prices, when compared to those costs, are probably competitive. And they definitely seem to be competitive when compared to many bus tickets bought on board (which are usually more expensive). But that's the 'rational' perspective, which isn't necessarily the most used by prospective consumers.

And what about the many potential customers, who require no previous modal shift, and could start benefiting from these services right now, in their long suburban walks to and from bus and train stops? These services could be instrumental in providing a public service, and a public-private partnership could definitely benefit both sectors. There are already solutions working in practice[17].

The **technological gap** poses another important challenge. What about those who do not have a smartphone? Or who do not have a bank account or a credit card? What about those who do have smartphone and card, but don't want to share their data?

In many countries it's not clear how much regulatory power cities can have on this matter, if any. But maybe that's not the main issue at stake here. Alternative solutions have been found, and they don't involve any overhaul of the service protocols, only the creation of complementary low-tech options, e.g. being able to purchase prepaid cards and using SMS. Furthermore, centring on user needs is the core of design thinking, and often leads to innovation. Isn't it worth the effort?

Finally, preventing **discrimination against persons with disabilities** requires special attention, much more than it has been given so far.

First of all, because people with visual and motor disabilities have been seriously and disproportionately affected by the deployment of these vehicles on sidewalks and in the vicinity of crosswalks and bus stops. This is seriously degrading public space accessibility and safety, including in cities that in the past few years have been making significant investments in the elimination of physical barriers.

It's ethically unacceptable for those with power and responsibility in this domain, be they private or public sector officials, to accept or tolerate this regression in rights and public safety as a 'price to pay' for innovation, even if temporary.

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[15] At least those who do so at their own cost, and not their employer's.
[16] This proportion is higher for those with lower incomes.
[17] See, for example, Jump in Paris, France, or GROW in São Paulo, Brazil.

From a service and vehicle design point of view, making a serious effort to inquire, ponder and respond to the needs of users with disabilities will be a driver for worthwhile innovation. The European population is ageing, and there is a direct correlation between aging and disabilities. People who grow older and stop driving want to remain active, and using wheelchairs and walkers still carries a strong cultural stigma. Will the coming autonomous vehicles support them running local errands, participating in community life, stopping on the way to have a chat with the neighbours? Hardly. But shared micromobility will.

For some time now, development of solutions for persons with disabilities has been achieved through Universal Design, which is focused on products and services that can be easily accessed, understood and used to the greatest extent possible by all people, regardless of age, size, ability or disability. There is already a long list of examples where the Universal Design approach has driven relevant and scalable innovations in usability and safety and comfort.

3.5 Environmental Impact

Operators must support sustainability. That starts with helping the city meet its goals for air quality, reduction of greenhouse gas (GHG) emissions and congestion, and more. Providing a service that deploys silent, electric vehicles, and supports non-auto modes can go a long way.

There are, however, other issues to be considered, that also have an environmental impact. The **electric batteries** are a key element to consider.

Their recycling, to start with. Operators first deployed off-the-shelf commercial products that weren't originally designed for this purpose – neither for sharing, neither for riding rough cobblestone pavements as part of their daily routine. Although companies haven't been disclosing data on the life-span of their vehicles, we can assume it's rather short. This has led to frequent and complete replacements of entire fleets. What's happening to their batteries? How, and where are they being disposed?

The recharging of batteries is another important issue. These vehicles have to be collected for their batteries to be recharged, usually during off-peak hours, at night. They are spatially dispersed, and that generates very irregular, and long, travel patterns for those doing the collection. What kind of vehicles are being used? Plus, several operators resort to the gig-economy to get this job done, i.e. individuals can register in a platform to collect, charge and redeploy, being paid-by-the vehicle. Types of vehicle are hardly controlled (i.e. they may be highly polluting), and collection routes aren't rationalised, but rather made up by unconnected individuals. Having said that, many operators have in the meantime come to realise this is not a sustainable way forward, and are changing their operations in this respect.

3.6 Cooperation

Emerging mobility services and local authorities must engage and collaborate with each other, and the community, to improve the city and its transportation system, making it sustainable and resilient. Promoting a **sustainable** urban transport system requires vision and courage to take steps that serve the greater public good, but that aren't yet necessarily optimal from a market point of view, at least in the short term.

Public authorities and private operators have to see whether they want to comprehensively integrate these services into the city's transport system, as **trip building blocks**. Real, substantive cooperation, capable of providing a long-term perspective and delivering win-win solutions, starts there.

Public transport must be the backbone of sustainable urban mobility, and shared micromobility services must support it. Bear in mind, however, that this concept, "public transport" is bound to change. As fleets and business models diversify, it will go beyond trains, trams and buses, and 'public property' lines will become less precise. And as the shared economy rises and privately-owned cars tend to become a thing of the past, major shifts will create new and increased pressure for change. How is it going to cope with booming demand, both in terms of the volumes of people carried, and of the diversity of trips and travel patterns?

The most obvious challenge to start with is the **urban commute**, which everyday injects millions of cars into European cities, and blocks change in many centres, fearful of losing jobs and business.

We all know mass public transport is the way forward. And it's fair to ask: are these services operating where cities most need them? Micromobility operators say they're providing solutions for the first- and last-mile. But... since when is the last mile a problem in compact city centres? The real challenge sits on the other end of the commute, in dispersed and mid- to low-density **suburbs**.

If we want commuters to shift to public transport, how can we help them **access the network**? Winding and endless bus lines would be a drain on resources. And building parking next to public transport hubs is a costly, space- and time-consuming solution that solves only part of the issue, and often for a limited time.

Naturally, this setting may not seem as attractive to micromobility operators as city centres. But this is something that must be pondered – if not, what are these services actually solving? It can also be incentivised by **public-private cooperation**. After all, they would be bringing customers to the public transport network, and could also become a cheaper option to provide proper service for some users and some trips, especially in off-peak periods, when public transport doesn't run, or runs with much lower frequencies.

Public spending for service in the suburbs could be covered, or at least partially supported, by the **fees** collected from micromobility operations in the city centre. The concession of bus lines done by many cities may be an interesting example, whereby private operators apply for 'concession packages' that include some easily profitable lines, but also less promising ones.

There are good reasons to cooperate **inside the city centre** as well.

In some cities where public transport already has problems of capacity, these services can absorb shorter trips (e.g. one- or tow-stop subway trips) and reduce crowding. They can also help bus companies spare their impatient bus passengers the hassle of waiting too long at the stop, and turn a 30-minute walking trip into a 10-minute (or less) e-bike ride.

As public bike sharing programmes are successful and more and more people start cycling, the new challenge becomes **supporting continued growth in the cycling share**. Due to budget limitations and long "time-to-market" cycles (planning, design, funding, contracting, building, hiring for operation), it's difficult for public authorities to keep up with the rhythm. If they don't, the combined offer for the mode becomes less reliable, growth may stall, and momentum may be lost.

There are win-win solutions to be developed in logistics as well. Well-organised e-hubs in denser areas, especially next to public transport, will make it easier for passengers to find a charged, clean and working vehicle ready to roll out. That will increase profitability and save a lot of time and hassle to operators and enforcement officials.

Finally, if shared micromobility works on web-based **platforms**, and those platforms are an important asset for business and a tool to influence customer choice, we must consider them in a long-term vision for cooperation.

Some degree of integration with other modes has to exist, for an operator to provide trip building blocks. Otherwise how can people plan their trips? Or, more accurately, how can automated systems build options for people to consider and choose?

Mobility as a Service (MaaS) platforms definitely seem the most rational way to go, and the way of the future. Nevertheless, they raise important strategic questions for shared mobility operators, as well as for cities.

That includes micromobility operators with their eyes on bigger things to come. There are at least two legitimate concerns. What if the operator has the capacity to grow, join forces with other companies, and in time become a major platform with a leading position in the local market? What if the operator becomes 'trapped' in an aggregator platform that, in time, diverts customers, forces down prices and asks for sales commissions[18]?

Cities also have legitimate concerns. Private for-profit platforms that aggregate more than one mode use algorithms to **influence decisions** – consumer decisions, that is. Are the modes being prioritised by these platforms the ones that are more useful to the city? Cities want to favour public transport and active modes (walking and cycling), to avoid unwanted modal shift, and nudge towards the right mode for the right purpose. Should an operator that doesn't cooperate with local transport stakeholders have the same rights as one who does?

For cities with the power to control access to their local market, setting conditions on this matter is an important issue to consider now. Even if it doesn't seem relevant today – it will become so in the long-run. Maybe some requirements will scare away some large operators. However, there are many companies now, and we must also allow for smaller operators, who are more open and responsive to local needs. It is clear that public sector oversight in the roll-out of MaaS is a prerequisite, and this may take different forms. Polis' Working Group on Traffic Efficiency is currently exploring different MaaS governance models for that purpose.

3.7 Fees

Generally, cities charge fees for private services that use public space as a key resource to conduct their business. This is such a case – if not for the circulation, at least for the parking of the vehicles.

Discussion on the value of the fees and on its collection should be preceded by a discussion of its **purpose**. What will they serve for? To provide additional revenue for the city's general budget? To somehow compensate for the extra operational costs the city will incur, with staff and other resources for proper monitoring and enforcement? To enable the city to invest in traffic calming and cycling

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[18] This has happened in the past, e.g. with hotel chains and companies like Booking.com.

infrastructure, thus directly benefiting shared micromobility? Or to nudge operators and users towards behaviours that serve the city's goals?

If the fees will just feed the **general budget**, the amount to be charged will be dependent on what the city expects the market to be able and or willing to pay. The value can be fixed, or vary according to fleet size (without a fleet cap, this may have a perverse effect). The problem with this approach is, obviously, that nothing guarantees that this revenue will be spent in the new needs generated by the deployment of these services.

Calculating the fees to cover **new operational costs** implies, in reality, two calculations, i.e., how much the city needs, and how much we can expect operators to cover. Even if they cannot cover the totality, and if the city decides to downsize its monitoring and enforcement mechanism, it is useful to estimate the needs and to be aware of the costs.

Most cities need significant **investments** in traffic calming and cycling infrastructure, and operators cannot be expected to cover all the costs. But fees and other funding schemes can make a visible difference, especially if we consider conspicuous and low-cost bike parking hot-spots, which basically involve paint, signage and bike racks. Or flagship projects to create cycleways on well-known central areas. Earmarking fee revenues may create some difficulties for some cities, and other options may be explored, including direct contracting by the operators, to execute city designs under city supervision.

To be effective in **nudging** users and/or operators towards desired behaviours, the value of the fees needs to be relevant for the 'targets', not necessarily the city, so that charging (or waiving) the fee does make a difference. Then, goals need to be clear. Do we want to encourage use in the suburbs, or in trips that start or end at public transport hubs? Do we want to discourage use in the centre, or for trips that in the interest of public health should have been made on foot?

There are other possible goals, beyond mobility behaviour. Shared micromobility operators are global companies, and the revenue they collect from providing local services goes out of the local economy. It's legitimate for the city to try and make this business generate as much local economic advantage as possible. So, do we want to encourage operators to support the city's local hire principles, promote equitable job training opportunities, and maximise procurement of goods and services from disadvantaged business enterprises?

3.8 Data

Shared micromobility operations generate large amounts of data. A recurrent issue in the debate has been about operators sharing relevant data with the cities. The first question is, **relevant for what**?

Yes, cities want, and need to know, 'what's happening' in their streets. That's not enough. This vague expression designates, at the same time, too much, and too little. It provides no focus, and no purpose.

Questions have to be asked in this **order**, not the opposite: (1) what do cities want to do, because of their core mission, and their strategic goals; (2) what capacity do they currently have, or can get in the not too distant future, to collect, store, manage and interpret data; (3) which data do they need, and can they manage, for that purpose; (4) what standards in terms of data format and quality do they want to the operators to comply with, and (5) which data can they agree on, or demand from, the operators (bearing in mind, of course, that it's not feasible to wish for data that operators don't have and cannot provide, either for operational, technical or legal reasons, e.g. GDPR).

And what is data going to be **used for**?

For statistical analysis of user characteristics and behaviour? For example, for research on the gender and age of users, or of what modes were substituted by a sample of e-scooter trips? For spatial analysis of trips, including starting and end points, date, time and duration? For a more complex analysis, with carefully anonymised samples, considering both the trips and its users? Inquiring into the impact this is having on the urban mobility ecosystem?

Before expert dialogue with operators takes off into high tech discussions that escape the understanding of seasoned transport officials, it's very useful to start by exploring the options for low-tech data sets and mundane **research needs**. For example, the operator may be willing to contribute to research on behaviour change or traffic safety, by providing data for that research or performing statistical analysis in a way that safeguards both privacy concerns and commercial proprietary data[19].

Is it going to be used for **real time monitoring** of operations? In that case, what is the city going to do, to act on that information? Verify deployment numbers and demand redeployment of fleets when quotas aren't being met? Direct resources for enforcement in areas that have more traffic? For that purpose, larger cities can hardly do with company provided dashboards, they need to see the full picture, i.e. all fleets on the same screen.

Data on operations, when stored and analysed in time series, will enable local authorities to visualise and better understand how this mode works in their cities during the hours of the day, the days of the week, and the months of the year. Namely, when and where traffic is more intense, and parking has more peaks. They will also be able to identify priority areas for improvement. The next questions is – will they **act on the information**? Will they calm traffic, provide a protected lane, or prioritise bikes and other rideable light vehicles? Will they convert more car parking spaces into bike 'hot spots'? Will they somehow plan for change?

The available capacity to store, manage and use the data is also a very important factor, which is often forgotten in the data discussion. These are not simple traffic counts. And it's not enough to just 'get' them. For starters, there are important issues to discuss with the operators regarding **data standards and data quality**. Sharing data comes at a cost for the operators, and if cities want tailored data, that cost is multiplied by dozens of cities. It's not viable to have each city develop its own data requirements and specifications. Polis is therefore looking into the data approaches and specifications that are emerging and exploring whether they are suitable for transfer and replication across a larger group of cities. This includes the US-initiated Mobility Data Specification (MDS) and the Dutch MaaS pilot standards.

Furthermore, the use of GIS databases, the conversion of data formats and the resolution of the countless technical difficulties that always arise is not something that a planner can learn 'quickly'. It requires formal training, technical support, and time. Contracting it out will only solve part of the issue, and also involves risk, because, for the city's staff, making the most of the GIS potential requires being able to discuss and explore with experts, on an ongoing basis, planning and operational needs.

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[19] Cooperation with Lime is what enabled 6t to conduct the survey on uses and users of free-floating e-scooters in France. It was and remained an independent survey, conducted with funds from 6t and the support of ADEME (Agence de l'Environnement et de la Maitrise de l'Energie).

Finally, it's useful to consider an oft-forgotten fact. A lot is being said about how shared micromobility operators should provide data, because their cities need to know 'what's happening' in their streets. Well, the reasons to collect data from shared micromobility operators are **also valid for collecting data from other mobility operators**, shared or not, that have a bigger impact in traffic flow and safety.

If it's interesting to know where e-bikes and e-scooters are operating, what about, for example, **delivery trucks**? These, as well as many other company-operated fleets, already carry GPS equipment for centralised fleet management. Having those companies share that data with cities would hardly create privacy problems and could help deal with relevant problems. In this way, micromobility could be a sandbox for testing out other data sharing procedures.

4. Tools for cities and regions

Cities can use a wide set of tools to regulate on the issues discussed above.

4.1 Integrate in Planning

They're out there, and they've come to say. They must be considered in the City's strategic outlook, and in the planning tools that guide (or will shape) its decisions on Mobility.

a) Research on Use and Users

This move does not require political decisions on the hot issues. It just means "we're studying the issue" and will feed the planning approach. It can include, for example, traffic counts, structured observations, surveys and (or) focus groups with current and prospective users, and good practice or state-of-the-art reviews on several issues (regulation, infrastructural measures, enforcement, data management, cooperation with public transport, etc.).

b) Dialogue and Deliberation

Purposeful interaction among diverse stakeholders (city officials, transport operators, NGOs, citizens, etc.) about the challenges these services raise, especially for the city's or region's vision and goals. This should be a structured process, not oriented towards detailed positions, but bent on creating shared principles and goals that will provide decision-makers with clear guidance and much needed flexibility.

c) Planning Instruments

Several urban and mobility plans and schemes provide opportunities to deal with, and provide for, various aspects relevant for shared micromobility. Many of these instruments have regulatory power, or at least will hold a strong influence over decision-making. Sustainable Urban Mobility Plans (SUMP) and Vision Zero Plans (for Traffic Safety) are the most immediate, but we can consider a host of other ones, e.g. schemes to restrict urban vehicle access or to create Low Emission Zones, strategic development plans for public transport, parking or cycling, public space improvement programmes and internal public space design standards, etc. It's probably more useful to know

what to integrate and then look for opportunities, than to just focus on an isolated piece regulation (which takes time to develop) and in the meantime miss all other opportunities.

4.2 Types of Rules

Cities and regions from across the European Union have been pursuing different approaches to regulate access to the market and operations once in the market. Policy options vary to some extent from country to country, depending on the overarching legislative framework and on the degree to which the local authority itself has any regulatory autonomy in this domain[20].

Local authorities cannot authorize what national legislation forbids – this point seems obvious, but has often been forgotten in public debates (in national, local and social media) that go around in circles demanding cities to 'do something'. On the other hand, the power to regulate activities taking place in their street networks provides cities with several tools. From mandatory national legislation to non-binding agreements, there's a spectrum of types of rules to consider.

a) National regulation

In Europe, traffic code law and other road traffic rules are covered under the subsidiarity principle, and are the responsibility of EU member states. Transport has been a highly regulated sector for many years (you couldn't just 'start' a taxi or bus service). The appearance of web-based service platforms for mobility turned the market on its head, leaving many cities short on regulatory power. In the wake of the Uber vs. Taxis 'clash', some member states have been regulating shared mobility. Although for ridesourcing much of the licensing was kept on the national level, regions and cities are potentially very powerful for regulating shared micromobility services[21].

In many European countries, cities are also responsible for the implementation of national mandatory standards on accessibility for all in the public domain. In some cases, failure to comply or enforce these standards may trigger liability in case of accidents (e.g., pedestrian falls) and structural discrimination (e.g., tolerance for chaotic parking of e-scooters, which disproportionately affects persons with disabilities).

b) Regional or local bye-laws[22]

Cities and or regions generally have the power to regulate on at least three domains that are key for 'taming' shared micromobility operators: traffic management, parking, and use of public space.

c) Binding agreements

Establishing controls for selective access to the market (e.g., through pilots, permits or concessions), enables local authorities to set binding requirements. Selected operators are granted access on the

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[20] CIVITAS 2020 PROSPERITY, (2018), "Regulating dockless bike-sharing schemes".
[21] There are exceptions. In the UK, electric scooters are outlawed on roads and pavements because the Department for Transport defines them as "powered transporters", a type of vehicle that can only legally be used on private property. Segways, hoverboards, u-wheels and powered unicycles all fall into the same category.
[22] Bye-laws are rules or laws established by an organization or community to regulate itself, as allowed or provided for by some higher authority. The higher authority, generally a legislature or some other government body, establishes the degree of control that the bye-laws may exercise.

condition of complying with those requirements, and failure to do so enables the local authority to eject them (after a reasonable warning procedure).

d) Non-binding agreements

The soft approach. Ground rules developed by the local authority, on its own or through conversations with current and prospective operators. Have no direct binding power from a legal perspective, and unclear implications in terms of liability. Usually materialized through a Memorandum of Understanding (MoU), that can be updated as deployment advances, new operators join in, or new issues arise.

4.3 Control Access to the Market

Some cities have legal power to stop operators from deploying, and can, on that basis, establish procedures to control access to the market. Other cities don't have that power, or have it in a very limited way. Within this framework, there are several options to consider.

a) Hands-off approach

No regulation in place. No conditions, nor enforcement, except regarding compliance with Traffic Code (of course). Any operator can deploy. Cities cannot (or choose not to) block access or even set any procedures. A courtesy call on City officials before starting operations is good practice.

b) General ban

The City blocks access to all (or certain[23]) shared micromobility operators, exception made for its own shared bike program (f there is any). This ban can be permanent (because of national regulations, or because these services go against local strategic interests) or temporary (to make space and time for development and implementation of regulatory mechanisms of a stricter nature). This move implies the removal of deployed vehicles, preferably by the operators.

c) Pilots

Short- to medium-term trials to test and improve mechanisms and tools for regulation, monitoring and enforcement, and to assess the capacity of selected operators to comply with performance requirements. Also, to better understand the impact these services can have on the local transport system. Pilots generally involve previous establishment of requirements, selection of operators, and definition of parameters and procedures for monitoring and evaluation. Can be developed in phases, with fleet sizes growing in stages. Evaluation of the pilot phase is generally be published.

d) Concessions

A more traditional process, whereby the City sets a cap on the maximum number of operators allowed, along with several performance requirements (and eventually desired counterparts for the public sector), and establishes a competitive procedure for companies to submit their best offer. Concessions can be made for the whole city or divided by sectors. Licenses are valid for longer time periods.

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[23] In the UK, shared bicycles are allowed, but scooters aren't.

e) Operational permits

The City sets operational conditions and issues permits. Operators must apply for a permit and undergo a licensing process, that generally involves demonstration of compliance with requirements on equipment, staffing and operational capacity, a formal commitment (with binding value) to comply with a Code of Practice, and payment of fees.

4.4 Regulate Operations

Along with their light rideable vehicles, operators are also deploying digital applications and payment methods, and a host of other resources – some of which are their own, and some of which are contracted out (e.g., for charging batteries). Shared micromobility operations integrates all of these 'pieces' – they can impact public space and affect the users... and they can be regulated.

a) Limit the number of operators

The bigger the number of operators, the higher the number of vehicles deployed, and the more demanding for the City to monitor developments, keep in touch with local operations managers and enforce the rules. Also, the harder for operators to turn a profit and financially sustain appropriate staffing for day-to-day street management, charging and maintenance.

b) Limit the size of the fleet

The city or region sets a limit on the total number of vehicles allowed on the streets (more exactly, on the number of each type of vehicle). This limit can be set for each operator, but also for sectors of the city (monitoring can be real-time, or according to time periods, e.g., per month, semester). Limits can set maximum numbers, but also a minimum number of vehicles (e.g., to ensure proper coverage for equity concerns). To establish these limits, or 'caps', public authorities can consider factors related to the city (e.g., demographic density, building uses, available space, etc.) but should also bear in mind the needs of a sustainable operation. Limiting the size of the fleet only makes sense if done in an intelligent way. Setting random caps on a certain number of vehicles doesn't benefit anyone. Cities can work towards dynamic fleet capping, where, based on the actual usage of the vehicles (e.g. number of trips per day), an operator can extend or reduce its fleets. For this to work, data is needed.

c) Rebalancing & Fleet Redistribution

To ensure compliance with maximum or minimum fleet sizes in different sectors of the City, and especially to avoid cluttering and ensure proper service in underserved areas, the City requires operators to regularly (e.g., daily, monthly) monitor their fleet deployment against pre-set parameters, and to move their vehicles accordingly.

d) Geofencing for Service Limitations

The city sets areas where devices are not allowed to park (i.e. where users cannot start nor end trips), where they have to circulate at lower speeds, or where they can't even circulate at all. These limits are set into digital maps (geofencing) with which the apps communicate. Thus the apps can, according to the position of the vehicle, prevent parking (disabling locking and unlocking

mechanisms) or act on the electric engine. Improvement of technological solutions is enabling geofencing to become more precise and detailed.

e) Parking Guidelines and Areas

The City forbids parking on the pedestrian path, and makes parking mandatory in "mobility corrals", or "bike hot spots". This, of course, implies the City must create (alone, or in partnership with operators) these corrals in sufficient number and distribution. General guidelines for "proper" parking on sidewalks are difficult to comply with (there are hundreds of thousands of users), and even harder to enforce. There are some interesting examples (e.g., requiring the user to send a photo of the parked vehicle after use), but scalability of those solutions is a question.

f) Dockless-to-Docked (and vice versa)

The local authority requires docking in specific areas , especially in denser areas or in places where higher pedestrian flows may be seriously harmed by dockless vehicles (e.g., public transport hubs). The growing precision of geolocation mechanisms will enable the development of "digital docks" that do not require securing the vehicle. But some operators already have solutions for fixed docking that include electric charging of docked vehicles (which helps operations).

g) Removal or Repositioning of Vehicles

The City requires operators to remove vehicles that are improperly parked (these can be simply repositioned), or damaged, or were left in difficult access areas (usually because of vandalism, e.g. inside ponds and waterways). This implies implementing easy-to-use alert procedures (by the local authorities, but also by users and the general public) and setting specific and proper timeframes for the operator to handle the removal requests, and log and communicate (for monitoring purposes) compliance with those time frames.

h) Speed Limitation

The City requires the operators to adjust their apps and vehicles to make sure users have no other but to comply with speed limits, which can be set for the street network in general, but also for special areas and spaces (e.g., wide plazas or other highly-congested pedestrian areas).

i) Insurance

The City requires operators to hold an insurance that covers damages by their users and vehicles to the city's public space, as well to other users of the street (e.g., pedestrians, cars). The operator is also required to inform the public (starting with its users) about this insurance coverage, and the contacts and procedures to claim compensation for damages.

j) Vehicle Specifications and Maintenance

The City sets requirements on vehicle characteristics that are relevant for their safety and functionality (e.g., robustness, size of wheels, batteries, etc.), and on maintenance and inspection schedules (including repair, safe battery handling practices, qualified personnel, etc.).

k) Subsidized Fares

The City subsidizes types of trips that directly serve strategic urban mobility interests, e.g., trips to and from public transport hubs and schools, or in places or times of day where public transport service is poorer, or to events that attract large numbers of people and could overburden public transportation (the latter example can also be applied as condition by the City to the organizers of such large events). Subsidizing trips that feed public transport can directly benefit its monthly pass holders.

l) Nudging Fees

Instead of charging only one global fee for operation, the City sets a system whereby fees are charged (or waived) in a more dynamic way, according to desired behaviours, i.e., behaviours that serve the City's goals. For example, according to the area where the service takes place (e.g., charged if in the centre, and waived if starting or ending in the suburbs or a public transport hub), the hour (e.g., waived if in the morning or afternoon peak hour period), or even the duration of the trip (e.g., charged for shorter trips that cover reasonably walkable distances). The cost of the fees can be passed on to the user (preferably as use of cost, not 'City' imposed fee), but preferably also, in some measure, to the operator (to influence deployment).

m) End of Operations

The City sets up, at the start of operations, a list of actions to be fulfilled by the operator in case it decides to terminate operations in the city. This includes removal of all the vehicles (and eventually proper waste disposal, which may bear significant costs since these vehicles have electric batteries). A safety deposit for that effect may be required.

4.5 Protect Local Customers

Citizens expect legitimate businesses to have legitimate and proper business practices. Cities have the right to expect, and to verify, that operators are trustworthy and dependable, and do not discriminate negatively against any group.

a) Price

The City requires (or finds a way to reward) price stability during operation, preventing price hikes with peak demands (e.g., during public transport strikes), or sudden changes in management policy (e.g., after a merger, acquisition or IPO).

b) Non-Discrimination by Phone or Payment

The City requires (or finds a way to reward) operators to make alternative solutions available for people who don't have smartphones (and thus cannot use the app), or who don't have debit or credit cards (and thus need to resort to other means of payment). This is a measure to prevent discrimination, and thus cannot charge special fees. Low-income shouldn't be set as a requirement to use these alternative means, because people may just want to avoid sharing their personal data with the operators. Lower-tech solutions have been implemented, and don't necessarily require changes in the core service protocols (e.g., SMS, voice-activated, pre-paid cards or cash payment at local shops, etc.).

c) Outreach and Education

The City requires the operators to develop campaigns that can be aimed at users (safe and civil behaviours, e.g., where and how to ride, speed, helmet use, proper parking, etc.), and at prospective users (specially to make sure lower-income citizens feel welcome and supported in using micromobility services). Campaigns can involve advertising (on many supports, including social media), printed materials (that can be tagged to the vehicle, and distributed, e.g. at events and public information desks), dedicated or other public events, community sessions, meetings with local stakeholders.

d) Social Fares

The City requires operators to implement a system of lower fares to prevent lower-income citizens from being left out by shared micromobility services. Procedures to benefit from such a service should be easy to understand and use, and well disseminated (e.g. with the support of local or private not-for-profit organizations working with lower-income citizens). Criteria should also be clear and easy to understand, and preferably be based on already existing public criteria (e.g., for benefitting from lower fares in public transport). The city may consider subsidising trips made by these users.

e) Customer Service

The City requires operators to operate a proper customer support service, including a local point for face to face contact, and clear and well-publicized procedures and contacts for, e.g., filing complaints and insurance claims, and for requesting (if not automatic) the issuance of proper receipts, as required by law, for tax purposes.

f) (Non-)Discrimination of Users with Disabilities

The City requires (or finds a way to reward) operators to include adapted vehicles in their fleets (e.g., tricycles, hand-pedalled or recumbent bikes, etc.), and preferably also special procedures for reserving and accessing these vehicles (specific user limitations require specific adaptations, and these procedures should be focused on matching users with vehicles that respond to their needs, and in facilitating access). Disability rights legislation in some countries includes provisions on 'indirect discrimination', which happens when service provision procedures, by their own nature, put persons with disabilities at a disadvantage.

g) (Non-)Discrimination by Language

The City requires operators to use more than one language in their communication, and preferably to give special consideration to foreign languages most spoken (beyond English).

4.6 Collect and manage data

Shared micromobility operations generally involve, daily, and across large expanses of the street network (if not the whole city), thousands of vehicles, users and trips. All these elements provide operators with data. Privacy issues may preclude operators from sharing part of the data on past use,

but the part that has more practical value to the City can be anonymized[24]. Data for monitoring and planning has more to do with past use (i.e., trips that occurred and what type of user made them) or real time status (e.g., where vehicles are currently located).

a) Data Infrastructure

The City sets up and funds the key resources necessary to collect, store, analyse, monitor and in general manage and use data bases. This preferably includes dedicated staff and expertise, state-of-the-art hardware, software and web-connections and a data management strategy.

b) Sharing Procedures

The City establishes the process through which data is to be made available. To provide real time access to data on ongoing operations, several operators are providing their own online 'dashboards', but these often don't allow the local authority to extract data and merge it with the data from other operators. This is obviously needed to get 'the full picture' – it makes no sense to force local authorities to simultaneously monitor five different dashboards. Cities can require the operators to share data in a specific format, that they can aggregate in their own data bases along with the data provided by other operators.

c) Data Specifications

Specifications are set on the format and on the content of the data, either by unilateral requirement of the City, i.e., as a binding condition for operation, or negotiated agreement with the operator. To set specifications on format, the City may adopt already existing solutions (e.g., Mobility Data Specification, or MDS). Content requirements are naturally limited by what is collected at the source, i.e., by the operator, during day-to-day operations, and by privacy legislation. Of course, since these are high volumes of data, both format and content must allow for automated processing.

d) Sharing Clause

The City requires the operator to include, in the contractual conditions it submits to users for approval when they download the app, specific provisions that will not block the operator from sharing anonymized data with the City, neither from allowing the City to perform inspections that necessarily imply personal data, especially on consumer rights and service safety.

4.7 Enforce Rules

Binding rules require enforcement procedures, and these procedures require resources. Good faith and cooperation do exist, but limiting enforcement powers and consequences always undermines the effectiveness of the rules, and may lead to spirals of non-compliance. When legal or contractual provisions provide cities (or other public authorities) with the legitimacy to enforce rules, they must be prepared to act – also because failure to do so may expose them to liabilities (e.g., in terms of discrimination of persons with disabilities).

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[24] Anonymized data sets have no personally identifiable information, so that the people whom the data describe remain anonymous.

a) Operational Stakeholder Meetings

The soft approach. The City establishes a procedure for regular meetings involving key stakeholders in shared micromobility, including all operators and, at least, City services (e.g., traffic and public space departments), public mobility authorities and or companies, and police forces that have enforcing power for traffic code violations. Operators are expected to participate, either on a voluntary or a mandatory basis (the latter only works if sanctions are applicable to those not participating). The meeting focuses on operational matters that go beyond a bilateral relation and need to be addressed by a wider and mode diverse group. It can also serve to encourage cooperation between different stakeholders, e.g., in outreach and education campaigns.

b) Warning Letter

The City issues a formal written warning to the operator for non-compliance with one or more requirements, preferably also setting a deadline for the operator to either comply or (in more complex cases) propose measures for compliance. Persistent non-compliance usually requires deeper changes at the operational level (and respective investments in staff and money). Formal warnings of a more frequent and simple nature may also be used for problems arising from daily operations, e.g. improper parking.

c) Impounding

A public authority with enforcing power (in some cases the City, in others the Police, or mobility companies with delegated power) seizes and takes legal custody of vehicles, because they are improperly parked (e.g., because they block pedestrian traffic, constitute a tripping hazard, disrespect parking zones, etc.) or may cause other types of problem (e.g., vandalism, damaged batteries with electrocution or fire risk, etc.). Recovery of the vehicle requires payment of a fine (this fine may increase if the operator fails to recover the vehicle immediately). Enforcement procedures may include previous warning (e.g., operators are given a short timeframe to act and avoid impounding, e.g., two hours to a day).

d) Fines

The local authority (or another entity with power for that purpose) issues fines to operators for improperly parked vehicles. Because traffic violations usually must be imputed to the offender, what may be at stake here is not applying a fine to the user who parked the vehicle, but to the operator for failing to remove it after a reasonable warning has been issued. Applying a fine to the user who parked the vehicle in the first place naturally requires access to his or her personal data. That is doable, if the enforcement authority has the power for that effect – but a lengthy administrative process, multiplied by dozens of cases, quickly strains the resources available for enforcement.

e) Revocation of operating permit

The local authority suspends or permanently terminates permits or licenses previously issued to the operator. Clear criteria and procedures to enable this sort of measure are necessary and must be capable of withstanding a legal dispute. Generally, this implies continued failure to comply with one or more legal or contractual requirements, and follows previous formal warnings and sanctions.

4.8 Improve infrastructure

Shared micromobility services are fuelling a quick growth of the number of light rideable vehicles in the street network. Classification of the vehicles seems to be work in progress, but it's already clear that they are transporting vulnerable road users. It's also clear that, without the provision of enough spaces for parking e-bikes and e-scooters, demanding (and enforcing) proper parking is a losing game. This is not about 'giving space away' to private companies – on the contrary, it's about acknowledging that the rapid growth of these services just exposed how much cities still have to do to support cycling and, more generally, sustainable alternatives to space-consuming private cars.

a) Traffic calming

The city can implement traffic calming measures to reduce car speeds and increase safety for all street users. These measures can target specific streets or intersections, but also wider areas where through-traffic[25] can (and should) be eliminated or significantly reduced, such as residential or commercial areas, school protection zones, the immediate surroundings of public transport hubs, etc. Reductions in the speed and volume of cars enables users of bicycles and e-scooters (and other light rideable vehicles, when they come) to safely ride in the same space as cars. Area-wide traffic calming, e.g. 20 or 30 kph zones, can quickly grow the proportion of the street network where it is safe to cycle.

b) Cycle ways

The city can implement segregated cycleways where bicycles (electric or not) and other light rideable vehicles are allowed to circulate, provided they don't exceed adequate speed limits. These cycle ways are preferably dedicated to facilitating commuting movements (e.g. penetrating axes towards the city's centre, placed in wider ways, like arterials, through conversion of existing car lanes), and longer distances inside the city (e.g. speeding up connections from one sector to another).

c) Dedicated parking

The City creates "mobility corrals" or "bike hot-spots". These are (preferably) former car parking slots converted (through paint, signage and bike racks) into spaces for bikes and light rideable vehicles. For the dockless component of the shared micromobility business model to remain viable, these spaces must be created in large numbers and systematically dispersed across the street network (e.g., along a street, one space per block). Denser areas and places where peak demand is to be expected (e.g. public transport hubs, stadiums, shopping centres, etc.), must be equipped with proper quantities. Operators may be requested (or rewarded) to contribute to the effort of creating these spaces.

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[25] Through-traffic is an expression commonly used to designate traffic that just wants to move through an area, i.e., doesn't start or finish the trip in that area. This type of traffic is generally faster and less attentive.

5. Looking forward

At this point, what can we conclude, and what can we recommend? The depth and the speed of change are increasing. We must be prudent. As a launching pad for further discussions, here's some short advice:

I. Keep your eyes on the goal.

How do we get people out of their cars? This remains a key point for the sustainability, safety and future of our cities. The technology hype attracts a lot of attention, but often pushes discussions towards jargon and away from purpose. Technology is only useful if it helps us reach our goals. We have to keep focused on the modal shift cities need, and see how shared micromobility can help us achieve that.

II. Shift from Reactive to Proactive.

We have to be clear about the long-term public interest and our core goals for cities. And we have to use that clarity to influence developments, not just regulate on their results. Our regulatory frameworks need to become more agile, deal with uncertainty, and build in the unknown, so that we won't have to run behind reality every time something new has flooded our streets. We have to learn to anticipate, and be ready to act when we need to.

III. Adapt the streets.

There is no other way. Public space is a limited resource, and has to be made available to sustainable modes. We have to take back from the private car monopoly the space our cities need to change and to breed the innovations that best serve our goals. Making sure that streets are safe for pedestrians and cyclists is the best way to ensure they're also safe for shared micromobility – which may become the critical mass for change we've been hoping for, just not in the shape we expected.

IV. Feed public transport.

Substantive change of the urban commute is essential. Public transport is the backbone of sustainable urban mobility, and our best asset to make this change happen. But for suburbanites in lower-density areas to leave their car behind and reach the public transport network, we must provide them with comfortable means to cover 5 km distances – and more. E-bikes, for example, offer a very attractive option, and shared mobility can quickly deploy them. Combined with super cycle highways, they could become a serious new commuter mode. The public sector has to step forward and find ways to make this work for the operators, while operators should think beyond city core and embrace entire regions.

V. Cities and regions have to lead.

These companies have a role to play, and if we want to use their energy to stimulate and support the modal shift we want, we need them to thrive. They have been living off their venture capital, but soon enough they'll need a sustainable business model to survive. The lines between public and private are blurring, and there's an expanding role of the private sector in mobility service provision. What could and should be the role of public authorities in the transport system of tomorrow? One thing is clear: public interest must lead, and cities must set the rules. Through public private partnerships, cities gain leverage, and in turn the private sector has long term stability to grow, and consolidate a viable, profitable business.

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About Polis

Polis is the leading European network of cities and regions focusing on urban transport innovation. We cooperate to develop sustainable urban mobility solutions for the city of today and tomorrow. Polis draws its expertise from a network of decision makers, technicians and managers working in authorities at local and regional level across the European Union. Building on results developed in European projects and in thematic working groups that touch upon key transport challenges, we link innovation and public policy orientations on urban and regional mobility with European policy development.

Polis has an active **Working Group for Governance & Integration**, managed by Pedro Homem de Gouveia (pgouveia@polisnetwork.eu)