cerre Centre on Regulation in Europe

REPORT

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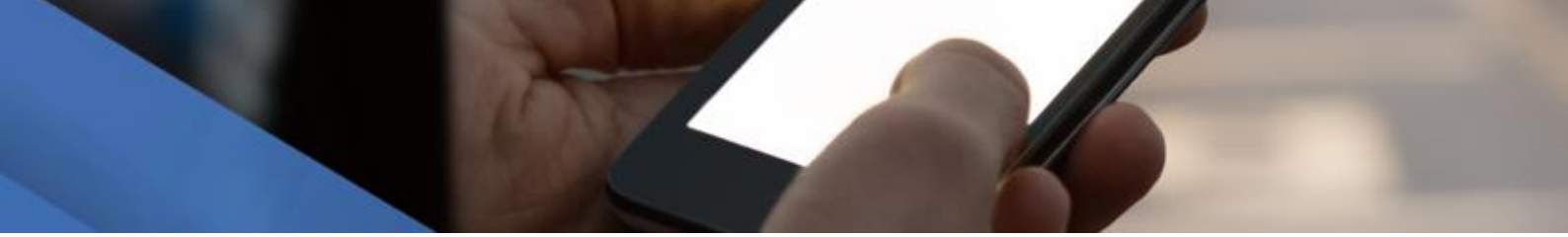
Yves Crozet
Jean Coldefy

MOBILITY AS A SERVICE (MAAS)

A DIGITAL ROADMAP FOR PUBLIC TRANSPORT AUTHORITIES



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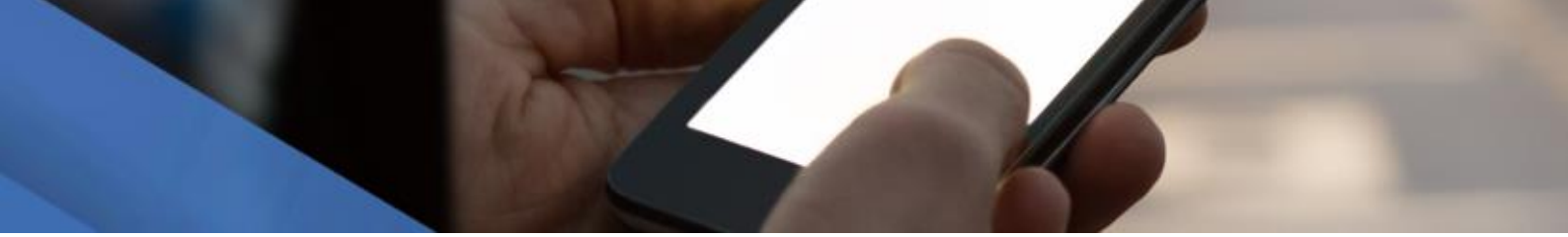

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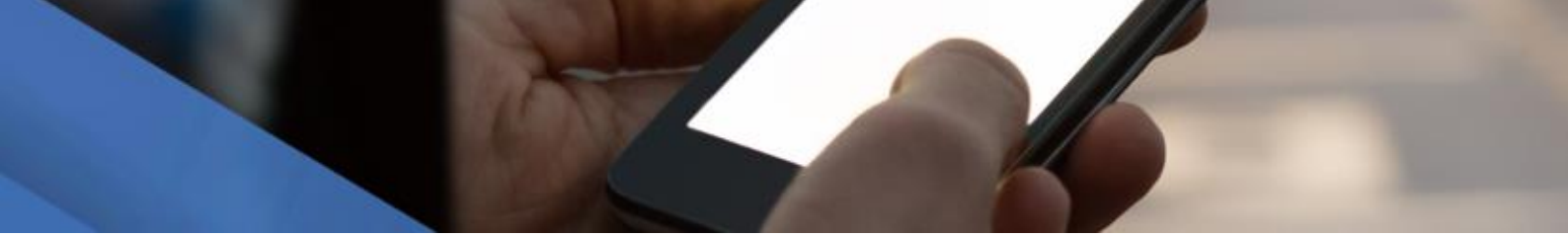

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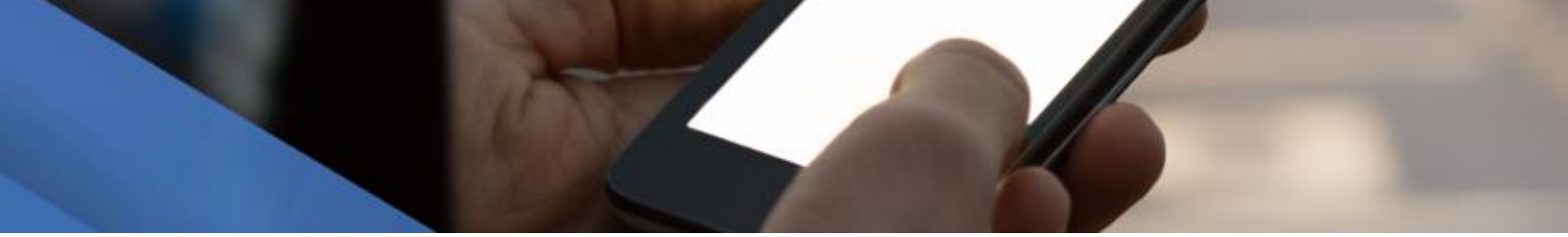
- Its original, multidisciplinary and inter-sectoral approach;
- The academic qualifications and policy experience of its team and associated staff members;
- Its scientific independence and its impartiality;
- The direct relevance and timeliness of its contributions to the policy and regulatory development process applicable to network industries and the markets for their services.

CERRE's activities include contribution to the development of norms, standards and policy recommendations that relate to the regulation of service providers, the specification of market rules and the improvement of infrastructure management in a rapidly changing social, political, economic and technological environment. The work of CERRE also aims to refine the respective roles of market operators, governments and regulatory bodies, as well as aiming to improve the expertise of the latter, given that - in many Member States - the regulators are relatively new to the role.



About the authors

Yves Crozet is a researcher associated with CERRE and is emeritus professor at Sciences Po in Lyon. An economist specialising in the transport economy, he is a member of the Laboratory of Urban Planning, Transport, Economics (LAET) at Lyon University, where he was director from 1997 to 2007. From 2010 to 2015, he was Secretary General of the World Conference on Transport Research (WCTR). Since 2009, he has been President of the think tank French Road Union (URF). He is also a member of the quality control committee for the transport services of Ile-de-France and is a member of the CITEPA administrative council and the Conseil National Routier (CNR). In 2016, he published a book in Editions Economica titled "*Hyper-mobility and public policy: a new era?*"

Jean Coldefy is an independent expert, Director of the programme 'Mobility 3.0', by ATEC ITS France. From 2010-16, he was Deputy Director of Mobility for the Grand Lyon Métropole. In this position, he supervised the development of large-scale projects such as Optimod'Lyon (winner of the World ITS Prize in 2013) and OptiCities. More recently, he was heavily involved in the planning of the Mobility Orientation Law (LOM) in France, alongside the Ministry of Transport and the cabinet of the Transport Minister. He is a graduate of the Central School of Lille, where he obtained a Master's degree in business management and computer science.

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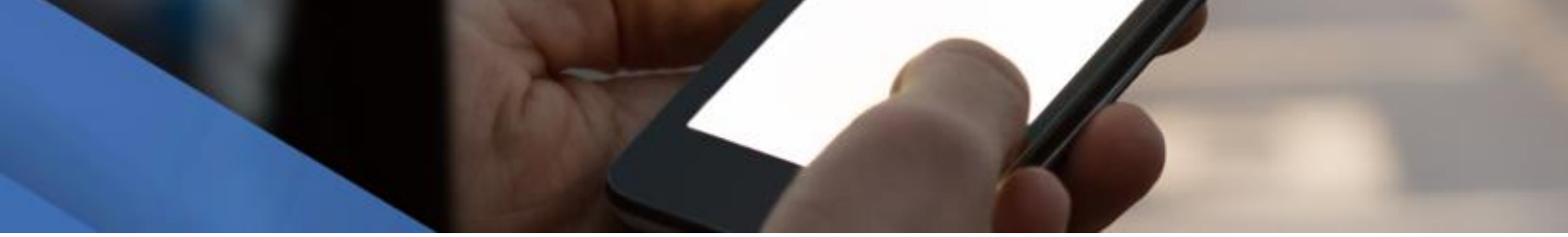
EXECUTIVE SUMMARY



Executive summary

On 9 December 2020, the European Commission issued a communication for "a strategy towards sustainable and smart mobility".[1] The mobility of people in urban areas is important, in the context of both the transition to climate neutrality and the impact of the digital revolution. As the title indicates, the themes of decarbonisation and digitalisation are also at the heart of this report. It follows on from the report that CERRE published in September 2019 on shared mobility and MaaS. While providing a perspective on the current potential of new mobility services, the report invited public transport authorities (PTAs) to show greater ambition in the digital field and its applications. This new report will deepen these recommendations with concrete content. It will present what could be the digital roadmap of the organising mobility authorities (OMAs[2]), whose tasks exceed solely organising the traditional modes of public transport such as buses, tramways, metros, and trains.

For the OMAs, this also includes responding to questions arising from the data platforms and apps offered to the residents of urban areas. It is important to distinguish between 'front office' and 'back office' services.

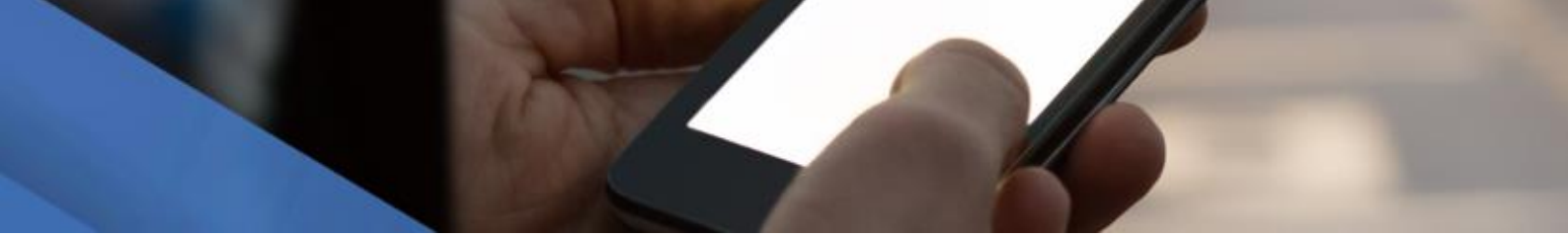
- For 'front office' services, the provision of information and the sale of tickets to passengers do not need to remain a monopoly. Commuters must be able to benefit from innovation and services offered by new entrant companies.
- However, for competition between apps and operators to remain fair, the OMA must establish clear rules for the 'back office'. To achieve this, they must acquire new skills and position themselves as a **'trusted third party'**, one which can incorporate all data into a public platform for all stakeholders, while ensuring equal rights and obligations for all parties.

The platform and the rules outlined above undeniably carry weight. These must respond to the commitments that have been made towards climate change, which will demand a significant change in the way that urban transport is regulated. From this perspective, the OMAs' digital roadmap provides a method for improving the policy response to three key issues:

- How should multimodal transport be developed in those urban areas where individual travel still represents the primary mode of transport? This will help heighten our understanding of the fact that **changing from the existing single-mode approach will represent a cost for commuters. Digitalisation may not be a magic wand, but it can facilitate change.**
- One such change would take the form of sharing new road space. The current pandemic has dramatically accelerated the adoption of new cycle path movement in city centres. However, such transformations must also now occur in the suburbs. **It is assumed this will help bring about an evolution of services (carpooling, cars express, longer cycling routes, etc.). These will require additional investment.**
- **Financing is crucial**. Increasing the availability of public transport relies on increased public funding, including new mobility services. If general taxation is to provide the only source of funding, innovation would need to remain modest. However, **digitalisation represents an opportunity to introduce an intelligent pricing system. Making public transport free, conversely, would considerably undermine the potential benefits of digitalisation on distances travelled through overuse and overcrowding**. Pricing incentivises users to behave in a more virtuous and sustainable manner, i.e. reducing rush-hour and long-distance travels and limiting the use of personal cars. Overall pricing of transport, including by car, therefore needs to be considered. **A MaaS that focuses on public transport alone**

[1] European Commission, Sustainable and Smart Mobility Strategy: https://eur-lex.europa.eu/legal content/EN/TXT/?uri=CELEX%3A52020DC0789.

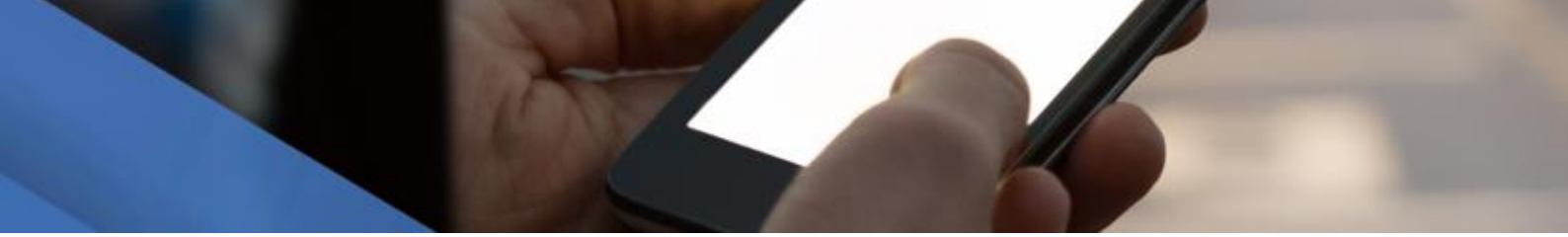
[2] OMAs stands for Organising Mobility Authorities. Mobility goes beyond public transport, it also encompasses all urban mobility methods that require use of public spaces: car use, bicycle, walking, e-scooters, taxi, etc. Public authorities should therefore shift to a more holistic mobility perspective than their traditional public transport focus.



would not help regulate mobility in the suburbs, where the use of personal cars dominates. The regulation of traffic and transport need not be limited to rules and regulations; it can also be done via pricing.

Due to COVID-19, transport habits have undergone a dramatic transformation. They are disrupting the existing benchmarks of the OMAs, who are in the process of dealing with issues arising from climate change and digitalisation. **This report argues in favour of taking a joint approach to tackling these three issues simultaneously. Resolute action is required; otherwise, environmental commitments will not be met, and the opportunities presented by the digital revolution will not be realised.**

GENERAL INTRODUCTION



General introduction

The acronym MaaS (Mobility as a Service) only came into existence recently; yet, it is already at the core of every current discussion on urban transport. The idea of treating mobility as a service first appeared within Finnish academia, and was substantiated by the launch of the 'WHIM' app in the autumn of 2016. MaaS is one of many consequences of the digital revolution, which is progressively impacting all human activity.

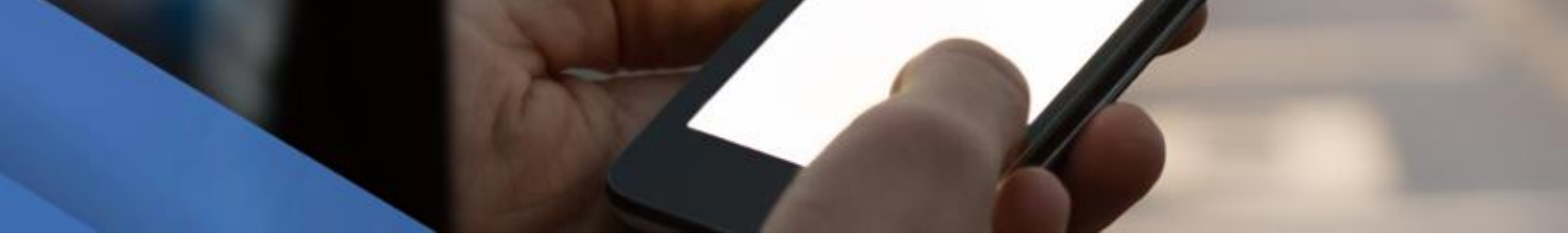
In 2019, several reports on MaaS were published, most notably by the International Association of Public Transport (UITP) and the European Authority of Metropolitan Transport (EMTA). Shortly after, in September 2019, the Centre on Regulation in Europe (CERRE) published a report on MaaS and the regulatory issues of shared mobility. The CERRE document pointed out that not all new mobility services - presented as products of the digital revolution - were heading in the direction of a more sustainable urban mobility system. Furthermore, their economic models were relatively fragile, while their market shares remained confidential. This observation led to us advising PTAs to apply a degree of perspective to the benefits that new mobility services could bring. At the same time, we suggested that they should broaden their ambitions, and take the view that a public transport system combines diverse mobility services, not restricted to traditional public transport modes (bus, tramways, metros and trains). It must also be noted that these PTAs are generally responsible for specific regions or large metropolitan areas; they are not directly linked to the State and are generally not present in smaller towns.

Realising these fresh ambitions would require careful reflection on the implications of the digital revolution in the field of urban mobility. As a result, 2020 saw an increase in the number of conferences and reports discussing MaaS and public transport. Examples include an October 2020 panel of the International Transport Forum (ITF-OECD)[3] and a new UITP report[4] in November 2020. On 9 December 2020, the European Commission issued a communication for "a strategy towards sustainable and smart mobility". The impacts of the digital revolution on mobility are discussed through the concept of intelligent mobility and the questions it poses. The Commission announced (No. 20) that in 2021 there would be an overhaul of the 'Urban mobility package (2013)' and in 2022 a new framework for the role of platforms and digitalised mobility services (No. 37).

At the heart of the questions arising from this work is data, which lies at the centre of all ideas that drive MaaS. This is why this report will focus on setting out a 'digital roadmap' for public authorities, and in particular local authorities, which have been encouraged to replace their PTAs with OMAs. This digital roadmap cannot be disconnected from the general objectives of the OMAs.

- The first section of this report will examine the background to the development of MaaS and the challenge presented by multimodality, which is supposed to contribute to achieving the climate ambitions of large metropolitan areas.
- The second section looks at the proliferation of actors in urban mobility. The advancement of MaaS often has to deal with the great complexity posed by institutional hierarchies.
- Development of platforms and questions around data lie at the heart of this complexity, and are thus central issues in the third section of this report. As well as the existing fears posed by 'Big Data', what ambitions and strategies can OMAs adopt?
- The fourth section examines the OMA strategies in detail, to tackle the issue of urban mobility financing and the evolution of pricing that MaaS could enable, which is directly related to the core objectives of these strategies.
- Following this dual focus on the topics of data and financing, the fifth section of the report will return to the wider topic of the approach to regulation and the regulators of urban

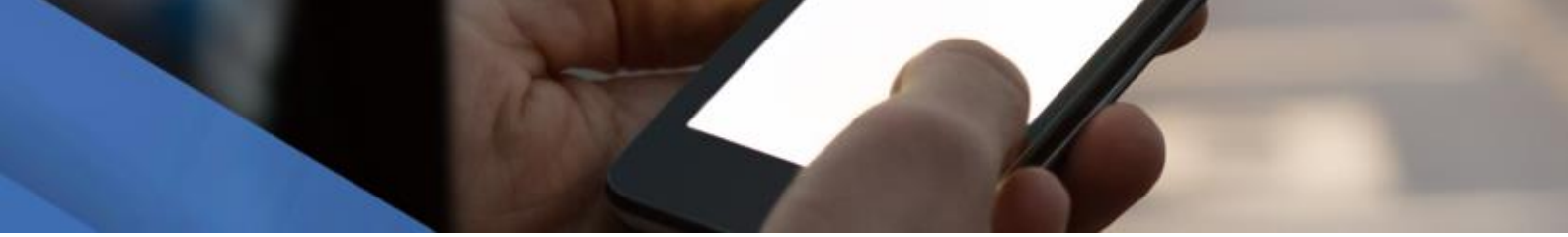
[3] Integrating Public Transport into mobility as a Service: https://www.itf-oecd.org/public-transport-mobility-service.
[4] Sharing of Data in Public Transport, Value, Governance and Sustainability: https://www.uitp.org/publications/sharing-of-data-in-public-transport-value-governance-and-sustainability/.



mobility data. There needs to be serious consideration given to this topic when establishing the OMAs' digital roadmap.

1

MAAS, DIGITALISATION, AND CHALLENGES OF URBAN MOBILITY



1 MaaS, digitalisation, and challenges of urban mobility

MaaS seeks to allow people to access a variety of transport services - old and new - via their smartphone. The development of new services, based on the principle of shared mobility, is also directly linked to the success of the concept of MaaS. Its ambitions go beyond simply launching a smartphone app that facilitates access to a range of mobility services. The desire to adopt MaaS as a solution is now widely supported, and will depend on the notion that urban mobility must rapidly become fully multifaceted, to minimise the negative impact of increased external costs. **It is important to take the time to examine in detail the double challenges of multimodality and decarbonisation**.

1.1 MaaS and the challenge of multimodality

In the field of urban transport, the digital revolution manifested itself in the form of new mobility services offered by private operators to residents of large cities. These operators made new services available that could be booked via a digital app. Uber is probably the best-known example of such services, but is far from the only one. Other companies, such as Lyft and DiDi, have also developed worldwide networks of chauffeured vehicle transport (CVT) hire, which have disrupted the taxi driving profession.

Uber, Lyft, and Didi now have billion-dollar turnovers and have either been launched on the stock market or are considering an IPO. However, profitability remains an issue; since their introduction to the stock market, the value of Uber has dropped by 40% and that of Lyft by 70%. Their activities were made possible through fundraising in the financial markets; indeed, mobility services have been heavily represented in the world of start-ups. These innovators were not simply seeking market share; they also had ambitions to revolutionise the supply and demand for mobility.

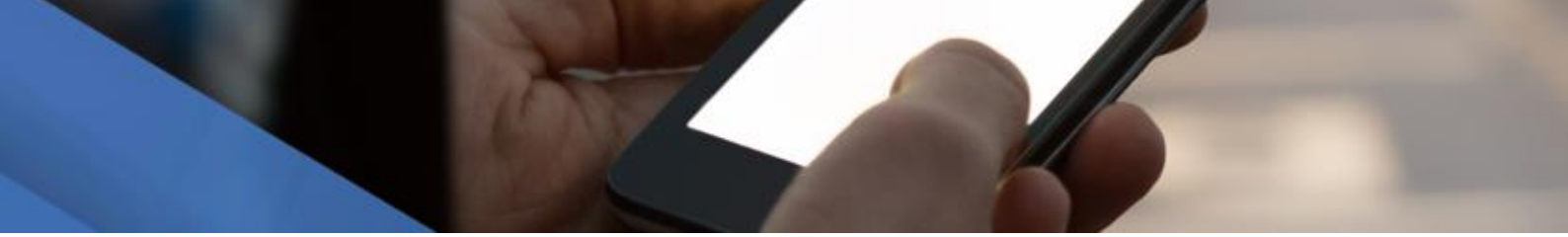
An even more radical change could prove to be the breakthrough innovation of self-driving vehicles. If organised as a fleet of so-called 'robot taxis' (according to its proponents), this will lead to the more collective - rather than individual - use of automobiles. An increase in the occupancy rate of vehicles provides a path to sensibly reducing both traffic congestion and the cost of transport. The occupants will no longer need to own a car, while the absence of a driver will reduce personnel costs - a significant share of cost of running a taxi fleet. With the help of a smartphone application, any person who wishes to travel can do so by robot taxi. The digital platform used to manage these robot taxis will optimise their journeys and their occupancy rates.

Is this idyllic vision representative of a possible future?

Studies led by the International Transport Forum in Lisbon, Dublin, Lyon, Auckland, and Helsinki (Furtado 2017, Martinez 2019) have indeed shown that shared mobility has the potential to significantly reduce traffic congestion and pollution - as well as travel time – assuming that this approach would replace individual vehicles entirely and even some under-exploited forms of collective transport, such as some bus lines. Only the heavier forms of transport, such as metros, trains and trams, would be conserved, and then only for the busiest lines.

However, are such conditions realistic? Is it possible to strongly reduce individual driving and even personal vehicle use? This scenario would be conceivable in the centre of large conurbations, where the supply of collective transport is already very dense. However, it would be a much greater challenge in suburban zones, where collective transport is already becoming less prevalent. Besides, other economic studies[5] have pointed out that the unitary cost of travel in a robot taxi - at approximately €0.70 /km - would be two to three times higher than that of a regular combustion-powered vehicle. Even accepting that the robot taxi approach would be revolutionary, it is far from

[5] See study of the transport circle https://www.cercledestransports.fr/mobilite-du-futur/.



clear whether it has the potential to rival the use of personal cars, the running costs of which would be halved by the launch of electric vehicles.

The idea of revolutionising urban mobility through the use of autonomous vehicles may seem tempting (Viegas 2016, 2017), but it is based on the assumption that one major difficulty has been overcome: the question of critical size. Dreams of futuristic cities, where a wave of a technical and institutional magic wand would allow – or even oblige - every resident to travel using an autonomous vehicle service managed by a multimodal app connected to a digital platform are all well and good. However, the focus should lie on determining the critical size for such services; the objective should not centre on a potential idyllic outcome, but rather in determining the steps of the transition process that would establish the universality of shared mobility. However, myriad obstacles are revealed when examining the current status of shared mobility in large cities; most importantly, determining the critical size.

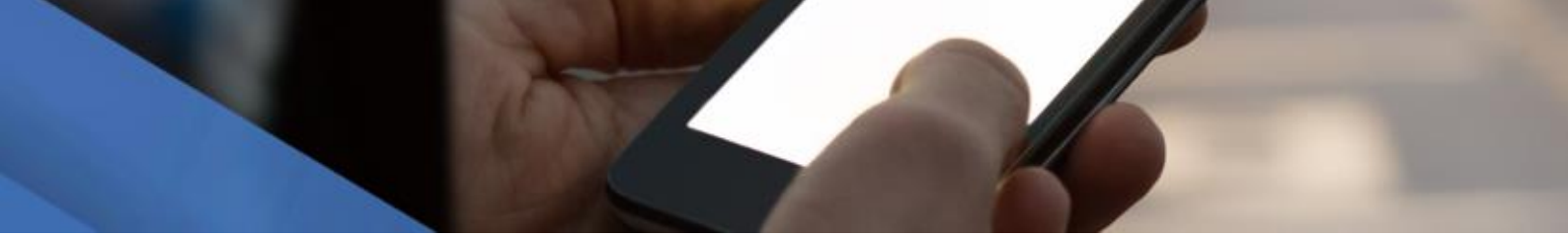
The low number of users who resort to shared mobility can be linked to the fragility of those businesses investing in the sector. Bankruptcies are frequent and market exits are almost as numerous as entries. As for those businesses that have survived, they often must operate within a framework of a tightly-restricted clientele. Examples include:

- Carpooling (Autolib', Zipcar, etc.,), which remains a niche activity, aimed at a financially comfortable and educated population. Its impact on road traffic levels remains very weak. Vehicle hire between individuals (Getaround) can limit the number of household automobiles; however, this market remains in its infancy.
- Free floating bikes and scooters, which are, after their initial success, having to deal with increasing cases of vandalism and issues sharing public spaces with other occupants. Even then, it remains a niche activity that only works under specific circumstances, such as where there are a high number of tourists or high-income residents for electric scooters.
- Carpooling, which is very promising as a way of reducing traffic and pollution. It has demonstrated its potential for long-distance trips through BlaBlaCar, although a question mark remains over the latter's profitability, particularly given the current pandemic. However, for short distances, the drivers and passengers may even require subsidising. As developing carpooling services aimed at individuals encounter difficulties, firms such as Karos or Klaxit have leaned on company travel schemes with community funding.

The main issue confronting newcomers to the market is achieving critical mass. In order to survive, these firms must swiftly find a sufficiently large clientele to ensure that their fleet of vehicles is used at an intensive level.[6] This can be difficult to achieve for several reasons.

- Users must pay for the service. The economic model for most new mobility services falls under the category of B2C. This is why they were initially so attractive. While public transport relies on state funding, these new mobility service providers seemed capable of revolutionising the sector without the need for public funding.
- Where the numbers of users are lower than hoped, this is can be the result of having other travel options, mainly personal cars. Outside the centre of many cities, private cars remain the primary mode of transport. Following the sunk cost of acquiring a car, marginal travel costs are relatively low. In France currently, the total cost is €0.20 / km (bearing in mind that fuel only makes up €0.06 - €0.07 of these costs). A taxi ride costs between €2.50 - €3.00 / km, while in Paris a trip on an electric scooter is close to €1.00 / km.
- There is competition between modes of transport for public space (Murphy 2019, Schaller 2018). Free-floating or self-service bicycle systems (Ofo, mobibikes, etc.,) seemed set for a bright future. For a few months, they flourished in hundreds of cities but often disappeared

[6] This is not the case with car rental between individuals, but low activity in this market is also its main weakness.



as quickly as they arrived (Nikitas 2019). This often resulted from a range of problems (vandalism, premature deterioration of vehicles, financial losses…), but also because public road authorities quickly wanted to take control of public space usage, in many cases even putting in place their free-to-use bicycle services.

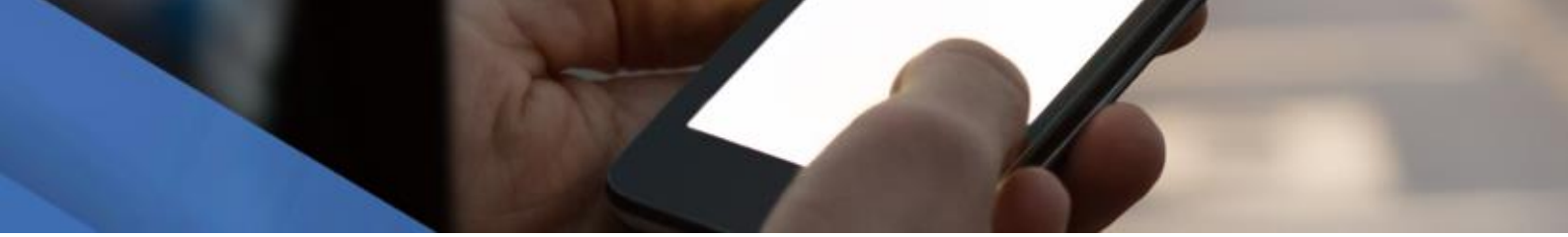
These three obstacles to developing new mobility services lead us to an important observation: **mobility habits are difficult to change**. At the time of its launch in Helsinki, the WHIM app was presented as a way of 'liberating door-to-door travel'". It was meant to offer a solution that would make the lives of commuters easier, based on the assumption that the reduced transaction costs brought about by the digital revolution would in turn reduce the overall cost of travel. **However, in reality, this assumption clashed with the fact that the diversity of modes of transport, load factors and the uncertainty that goes with them are potential factors leading to an increase in the cost of mobility.**

Therefore, it came as no surprise that the number of users WHIM attracted remained relatively modest. The study carried out in Helsinki by CEREMA (2019) revealed that around 6% of the population were using the app. However, this number was sourced from WHIM itself and was thus difficult to verify. This modest achievement stems from the fact that – as previously highlighted - the use of a personal car, particularly in suburban settings, remains the most convenient way to travel door-to-door. As a result, urban trips are often based on routine and monomodal. **Abandoning these routines and adapting to a multimodal system made possible by a digital app will initially incur a temporary cost for travellers.**

This observation leads to a more nuanced vision for MaaS. The increasingly distant vision of autonomous vehicles needs to be set aside, and with it the new paradigm it suggests. We must focus our attention on a more tangible horizon, that does not demand such radical change to our daily lives. Certain market sectors could evolve, as is currently the case with the emergence of two-wheeled travel, motorised and otherwise. **However, in the current pandemic, collective transport – rather than personal vehicles – is losing market share to active travel.** Many of these new bicycle and scooter users have realised that this mode offers a genuine monomodal, door-to-door journey alternative to public transport or walking.

Currently, championing the benefits of multimodality poses a challenge. For commuters with ingrained habits, multimodality is far from intuitive and the benefits of the digital revolution remain to be proven. Here, the OMAs need to take initiative. For decades, OMAs strove to offer high-quality, collective transport that helped avoid the negative consequences of the all-pervasive automobile. Achieving this meant changing mentalities and existing public policies, as well as questioning the strongly-held belief that increasing the road network capacity was the solution to time lost through traffic congestion. It took many years to address the issue of urban accessibility from any other angle than that of time lost or gained by road users - simply looking at how to optimise the use of the – scarce - real estate represented by road space. Nowadays, road users would prefer consistent – even if lower – speeds of travel, rather than higher speeds that are erratically attained.

Developing MaaS presents similar challenges. It will take time and considerable effort before public attitudes - and policies - evolve, as MaaS cannot be distilled down to the launch of an app - however multi-faceted and user-friendly that app may be. Instead, change will come about as the result of multimodality becoming the primary objective of public policy, with apps and digital platforms playing a leading role. Moreover, in order to ensure that multimodality becomes a genuine priority, it is vital to remember that it lies at the heart of another challenge faced by urban conurbations – decarbonisation.



1.2 Multimodality and climate commitments

Over 60 large metropolises around the world have committed to achieving carbon neutrality by 2050. To this end, there must be immediate efforts taken. The Paris Agreement and several UN documents (United Nations 2015, 2016, 2019) highlight the need to reduce greenhouse gas emissions by 40% over the next ten years. Recently, the President of the European Commission has even advanced a revised objective of a 60% reduction, suggesting increasing the ambition of the European Commission 2019 Green Deal. However, based on the data from CITEPA (2020), greenhouse gases from road traffic in France have decreased by a mere 1% since 1992 and the Kyoto Protocol. The modal share of cars, expressed in passengers per kilometre, remains unchanged at over 80% (CCTN).[7] Despite the 2008 financial crisis and the recession that followed, traffic emissions have only reduced by 3% between 2008 and 2018. **It is vital to accelerate action if we are to achieve the required level of decarbonisation**.

Car traffic is one of the leading factors contributing to greenhouse gas emissions in France and Sweden, and the second-largest factor in other European countries with less-decarbonised energy sectors. **Efforts must be concentrated on local travel, i.e. distances less than 80 kilometres, as these account for 70% of all emissions**. In France, travel in rural areas contributes to 20% of emissions, compared to 80% in urban zones. In both cases, electrification of the car fleet could improve things, but this will not happen rapidly. The individual emissions of the cars in circulation are slowly dropping. As illustrated below, the work of CEREMA and urban planning agencies demonstrates that - within large urban areas - travel from outside towards the central zone creates more than half of all emissions, while travel within city centres contributes only 2 - 3%. In these densely populated areas endowed with a public transport network, mobility is already sufficiently decarbonised.

With the emergence of the motor car and the resulting significant increase in travel speed, cities have become progressively less densely populated. With the same day-to-day travel time, it became possible to cross distances approximately ten times larger than those achievable on foot. The resulting spread of urban areas is often viewed as a problem, but for many residents, it remains a solution to the increasing price of land.

[7] National Transport Accounts Commission

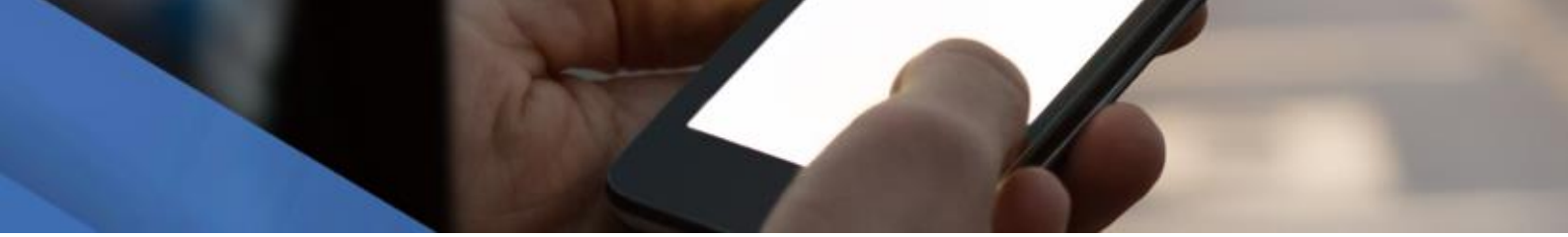
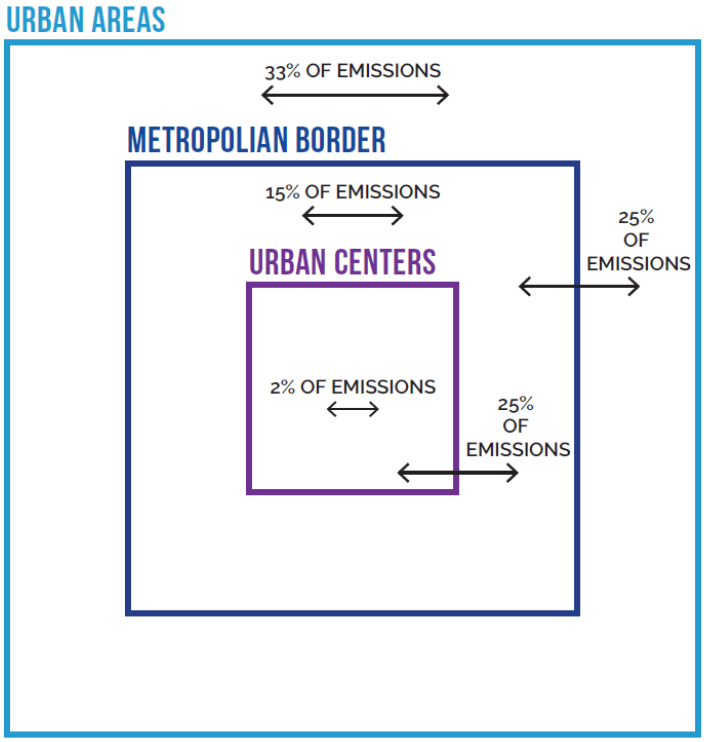


Figure 1: Urban GHG emissions according to trips type



Source: Cerema/DEEM, urban planning agency (in this case Grenoble)

For the majority of the time, neither public rail systems nor urbanisation policies have accompanied the shift to suburban living, and that has resulted in strong dependence on cars in these areas, as shown in Figure 2 below. In Ile-de-France, in 2018, travel in personal cars with the 'Grande Couronne' (Paris and the four departments on its outskirts) as origin and destination constituted 60% of all personal car travel in the region. Meanwhile, public transport use within the Grande Couronne still represented only 13% of public travel within Ile-de-France. In 2018, private vehicles were used for over 60% of all motorised trips in the region.

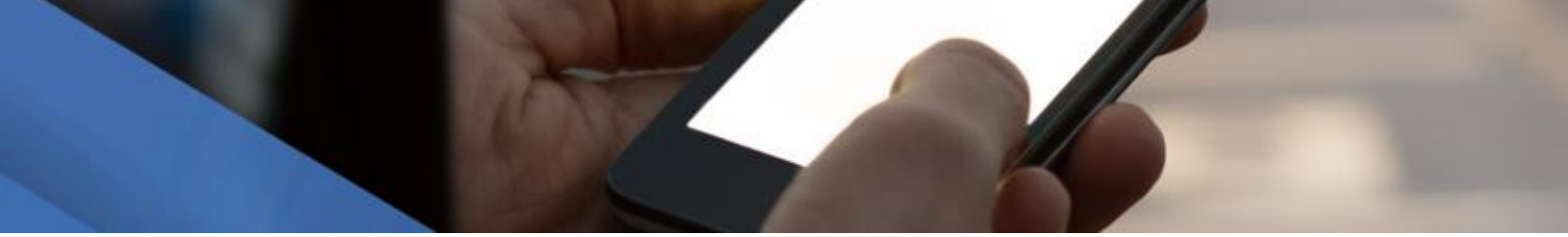
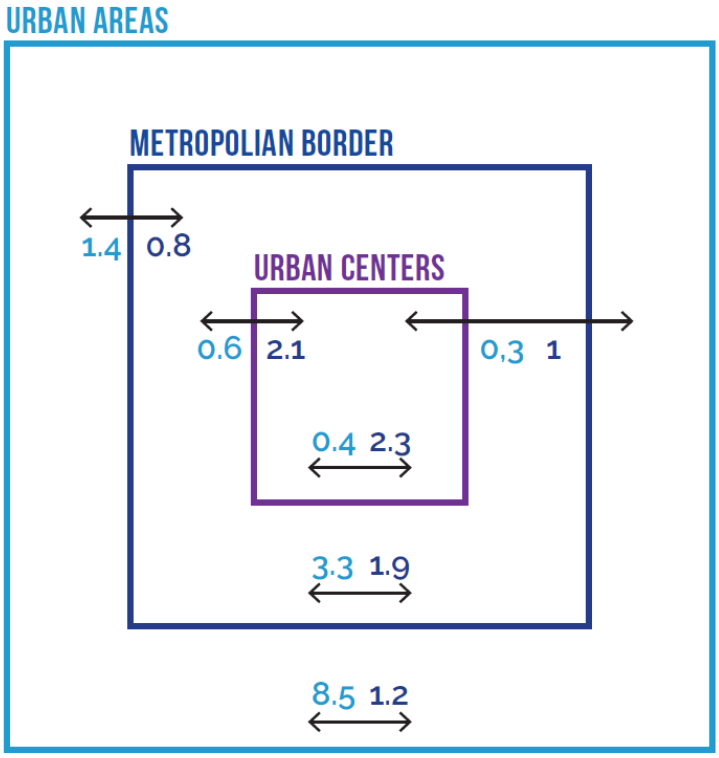


Figure 2: Flow of public transport and private vehicles in Ile-de-France

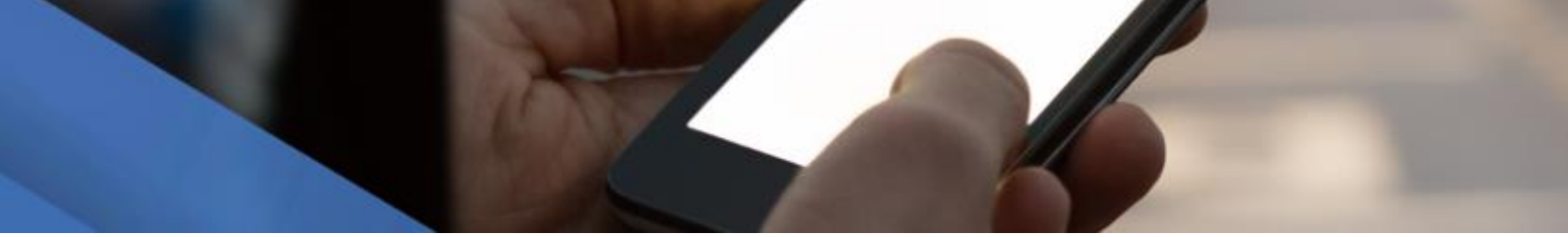


Source: Yves Crozet, from General Transport Survey 2018 (Omnil), public transport in dark blue, cars in light blue, expressed in millions of trips per working day

In this context, MaaS appears to be a way to initiate a much-needed modal shift and to decarbonise transport, by simplifying and widening access to alternatives to private vehicles. The 2019 CERRE report, however, demonstrated that for this to function effectively, several conditions would need to be met:

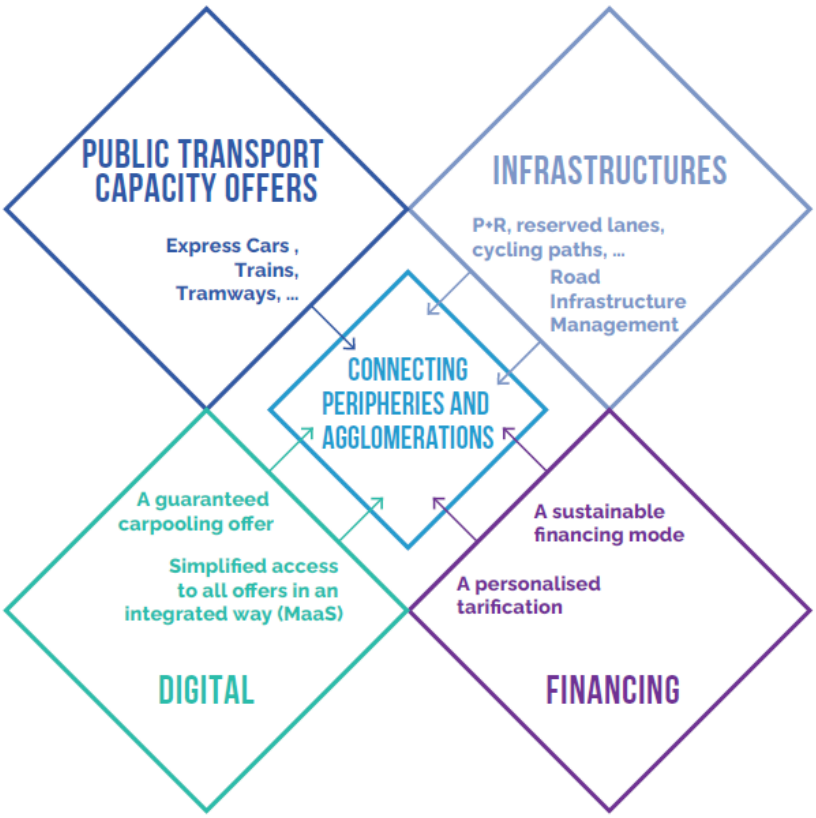
- The modal shift assumes that alternatives already exist outside city centres, which in reality is rarely the case. Daily commutes from home to work are mainly undertaken by private car. Addressing these is a priority as, only 11% of work commutes take place via public transport in France, country-wide.
- Alternatives to the personal car must also be able to compete with cars. Currently, new mobility services remain a luxury product for individuals. In France, a taxi trip, even with a hire vehicle, costs 20-25 times the price of public transport with a subscription and employer subsidisation and over ten times that of a personal car. New mobility services have no sustainable economic model on a B2C basis. This is also the case for car-sharing (upper-class clientele and chiefly used for weekend travel), carpooling, and electric bikes and scooters (five times more expensive than other forms of public transport). The clientele consists of higher socioeconomic classes, but this represents a narrow market. Without autonomous economic models, these services disappear or are forced to seek public funding. On-demand transport, previously touted as an alternative to public transport, cannot be overly generalised due to its high cost to the taxpayer (around €20 per trip).
- Access to this range of options must be made simple. Even if evidence suggests that digital platforms make it easier for users, contractual models and organisation are hugely complex (see Figure 4 below).

MaaS also faces institutional complexity. To develop properly, it must be part of a comprehensive mobility policy; the four key parts are set out in Figure 3, which illustrates the case of large urban areas. Too often, MaaS is presented only as a component of the digital dimension (as indicated



below) amongst the existing applications capable of providing simplified and integrated access to mobility services, and as a solution to the lack of efficient alternatives. However, this is not a reality. **Although significant, the digital component of MaaS can only be developed effectively if all other identified components of urban mobility are taken into account**. This includes road infrastructure management and, of course, the availability of public transport, its pricing, and its financing. Therefore, it is necessary to present the various actors in charge of these different missions and how their interrelationships could evolve to make MaaS a success.

Figure 3: The four key components of MaaS

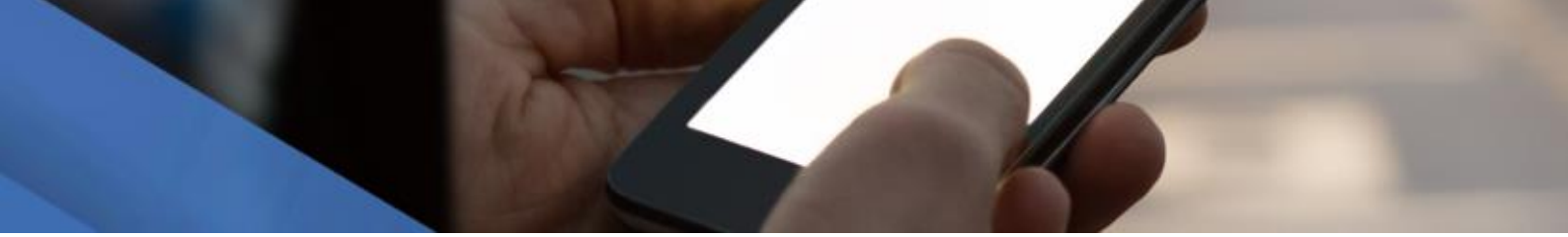


Source: Jean Coldefy

- P+R = Park and Ride, car parks adjacent to a public transport station

2

THE DIGITAL REVOLUTION AND ACTORS IN URBAN MOBILITY



2 The digital revolution and actors in urban mobility

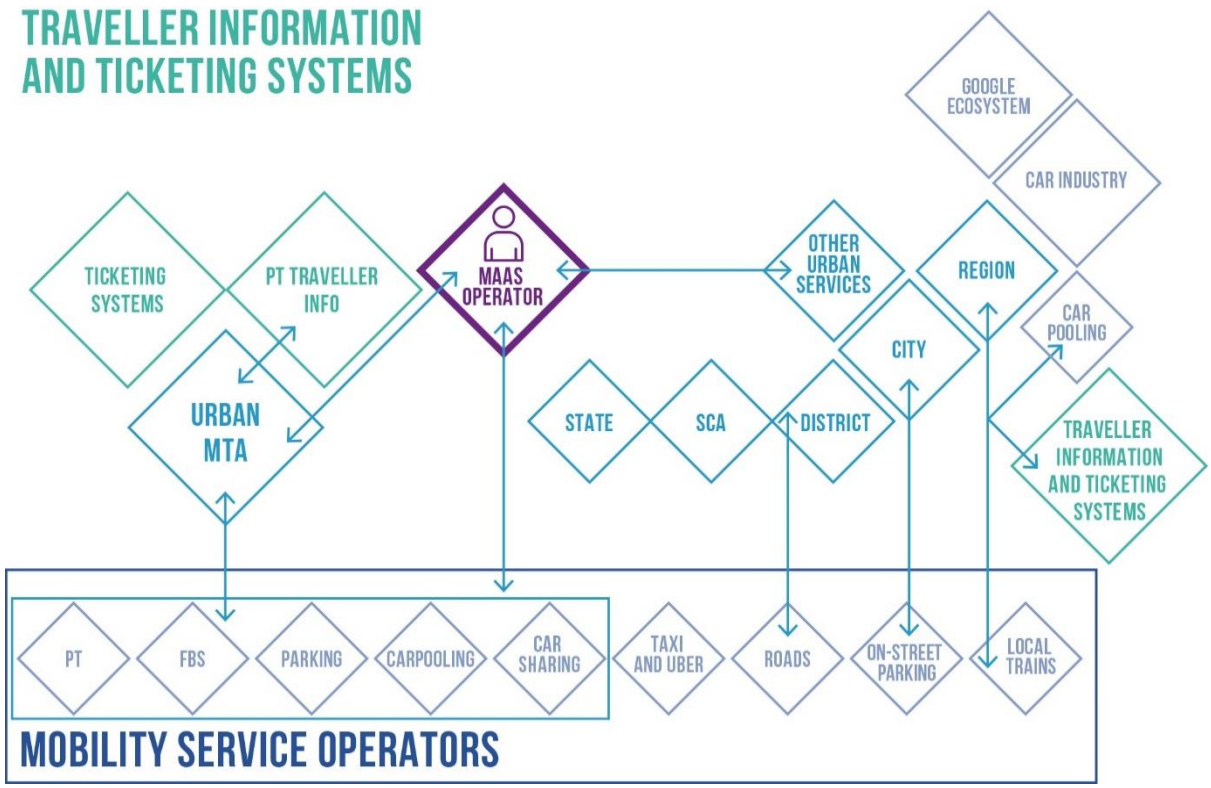
In CERRE's previous report, we outlined the issues stemming from the multiplicity of actors contributing to the regulation of urban mobility. In most large cities, there is usually an institutional distinction between the authorities in charge of public transport and those responsible for the road network. This is why we have insisted on the need to end fragmentation of regulatory bodies. Allowing the OMAs to develop ambitions for urban mobility as a common good is a key point in the digital roadmap. Another problem is the issue of overlapping responsibilities. As a result of these, rail transport can fall under a regional OMA, while public transport can fall under a metropolitan OMA. In suburban areas, there are sometimes even intercommunal OMAs.

2.1 The institutional hierarchy that challenges MaaS and vice-versa

MaaS is portrayed as a way of achieving seamless mobility, with low load-shifting costs regardless of the mode of transport, location or circumstances. This is a naive vision, as it is based on the needs of commuters and fails to take institutional obstacles into account.

The first of these obstacles is the entanglement between the key actors and existing contracts. Figure 4 illustrates what we can consider the institutional hierarchy where various OMAs (regional, metropolitan, etc.,) as well as several private operators (carpooling, car-sharing, etc.,) mix.

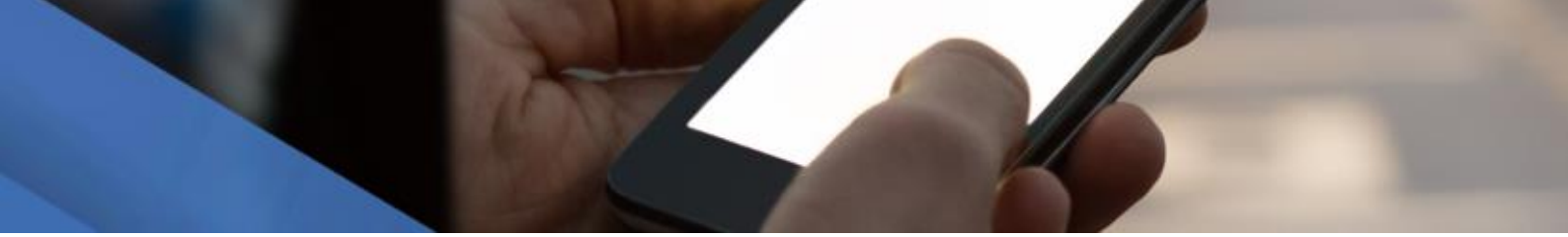
Figure 4: The institutional and contractual hierarchy of urban mobility



Source: Jean Coldefy

Myriad contracts, conventions, and local mandates are involved and intertwined. Co-ordinating all of them under a single body will not be straightforward. Furthermore, MaaS can impact economic approaches that may differ substantially. This presents several issues:

- How can public transport contracts - which in France include clauses to incentivise frequency - be managed if we decouple public transport operators from their customer relations?



- How can offers be constructed between organisations as disparate as financially autonomous services based on a 30-year concession, a subsidised public transport service that lasts six years, or a self-service bicycle service that may disappear virtually overnight (as happened when almost all private self-service bicycle services disappeared in Paris inside 18 months)? An effective MaaS operation requires sustainable services and sustainable business models.
- The logic behind different technical sales systems also varies vastly: all services provided by network industries are based on consumption, similar to the model used for, say, water or electricity. This is not the case for public transport, which gives unlimited access to the network for a specific period, regardless of the distance travelled and can even lead to a marginal cost of zero for a subscription. Car parks, on-street parking, self-service bicycles, motorways, etc., all base their pricing on consumption, linked to the duration of use or kilometres travelled. This tariff is applied post use; for public transport, the norm is to pay in advance.

In addition, combining subsidised services with private ones is even more difficult. One of the challenges for OMAs is to have partners with sustainable economic models. This is also a challenge for private integrators, even the largest ones, who do not have access to infinite resources to be able to finetune technical interfaces.

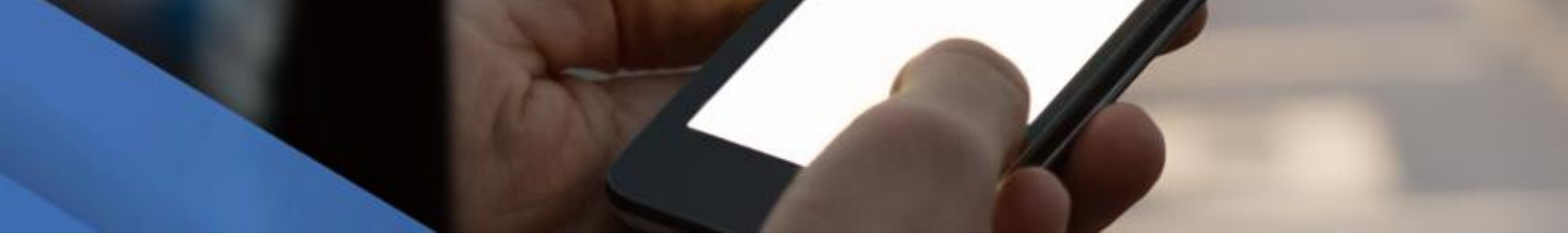
Avoiding this difficult situation and any *'Grand Soir'* illusion will require a progressive approach, such as that advocated by the Vienna metropolitan area. With the ultimate goal of MaaS for OMAs is a modal shift outside the centre of cities, and multimodality replacing the existing monomodal approaches playing a key role in this, the first question to ask does not relate to technical systems, but rather to marketing:

- Who is the target audience on a territorial level (origin/destination), a social level (socioeconomic classification) and on a behavioural level? The capacity for change can vary greatly, as shown in Vincent Kaufmann's (2010) studies on mobility.
- What combination of supply should be offered to meet the demands of the target audience?
- What will be the pricing and economic model for these offers?
- Which adaptations to individual mobility services must be undertaken?

The most obvious practices to consider are those of car / public transport multimodality, with park and ride facilities playing a key role. Two possibilities exist: car + parking + public transport, or bicycle + parking + public transport.

According to origins and destinations and how the territories are configured, there need to be more advanced studies to determine the full potential of any modal shift, both on a quantitative (volume of road traffic) and qualitative (ability to change) basis. This is the easiest type of shift to make from a contractual perspective, as the piloting process is often conducted by the OMA, who may also have delegated this task to the railway operator. However, it can be assumed that this modal shift would also involve car parks installed under the authority of local governments. For the service to be physically possible, available parking space – a scarce resource – would require strict management: securitised car parks for cars and bikes, increased availability of car sharing in park and ride areas, and access to dynamic information regarding parking space availability (see article L1115-1 in France's Mobility Orientation Law (LOM)). Bicycle infrastructure that allows secure access to park and ride facilities would also be required.

Priority access to park and ride areas, or even quotas for car-sharing service users, is one of the routes to incentivising shared use of the motor vehicle. This practice has already been put in place near Geneva and in several Italian cities. However, if filling up cars with passengers for home-to-work travel is a potential way of limiting traffic, it must be pointed out that carpooling services have yet to fully take off. The diversity of origins, destinations and daily habits is a real challenge. As a result, only strong cooperation between public and private figures will help champion



such an approach to this practice. This will also probably take place via road space management, in the form of lanes reserved for carpooling and reduced road space for single car users. Such experiments are already taking place in Ile-de-France and their results will have to be examined closely.

Finally, the pricing needs to balance economic sustainability against reasonable cost. At this stage, it must be remembered that the financial component of the overall cost of transport only constitutes 8% of the total, with the remaining 92% being made up in travel time and comfort (which can be evaluated with an equivalent to travel time). Thus, the ease of interconnection to limit transfer times is what needs to be maximised. Studies (Coldefy and Gendre 2020) carried out on coach services using reserved lanes on major axes (also known as express coaches; see the evaluation report by France Mobilités on this topic), demonstrated that the prices are ten times lower than those of a car for an equal or lower travel time. Prices can be raised easily to reduce the strain on public finances, without adversely affecting the use of the service.

Finally, the recommendations for launching MaaS towards seamless mobility are:

1. Deliver a marketing campaign that addresses both qualitative and quantitative elements, in order to prioritise target origins and destinations and to determine where the potential for modal shift lies. There has been too great an emphasis on the technical aspects of any app, while forgetting the overarching objective: what is the service on offer, to whom, at what price and with what aim?
2. Accept that seamless mobility will take time to put in place: experimentation is an essential element for fine tuning business models and technical systems.
3. Start with the measure that's easiest to see through to completion: services that mobilise a few partners at the beginning, in order to limit the impact on contracts and notably the issue of the after-sales service.
4. Avoid complex use cases involving too few customers.
5. Use the impact of the OMA brand to raise awareness of the services, integrate them into journey planning tools, prioritise shared mobility services (public transport and carpooling) by giving them priority access to scarce resources such as parking spaces, or even contributing to their financing to ensure that they do not cost more than public transport. There is great potential for the public sector to encourage private supply in this area.

The requirements to fulfil all these demands will not be spontaneously generated by a few algorithms. **It can only take place if the OMAs ensure cooperation between all key figures to protect the common good.**

2.2 OMAs and urban mobility as a common good

Urban mobility involves three main groups shown in figure 5. These entities, in theory, do not share the same objectives; there is only partial crossover in their interests. Someone who travels is sensitive to the general cost of their trip (time, money and comfort), compared to the utility they receive in return. At the same time, mobility service suppliers are mainly interested in the economic viability of their activity. Public figures must ensure optimal accessibility for as many people as possible, as long as this does not threaten their climate commitments, which are over and above the need to reduce pollution, noise, traffic congestion, etc.

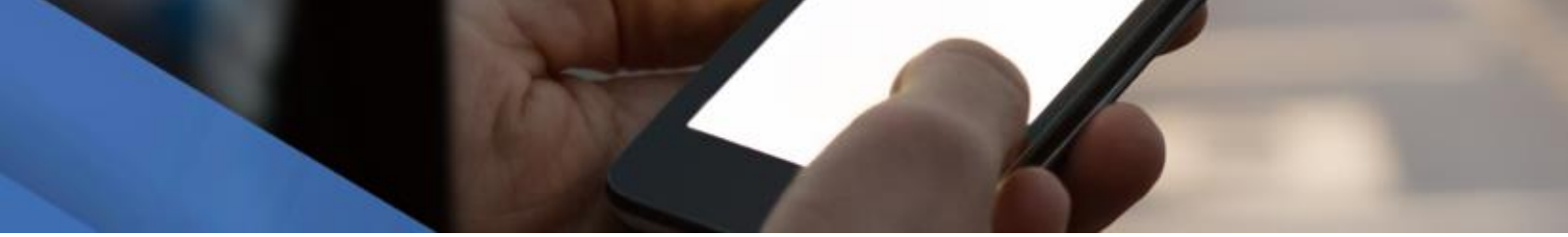
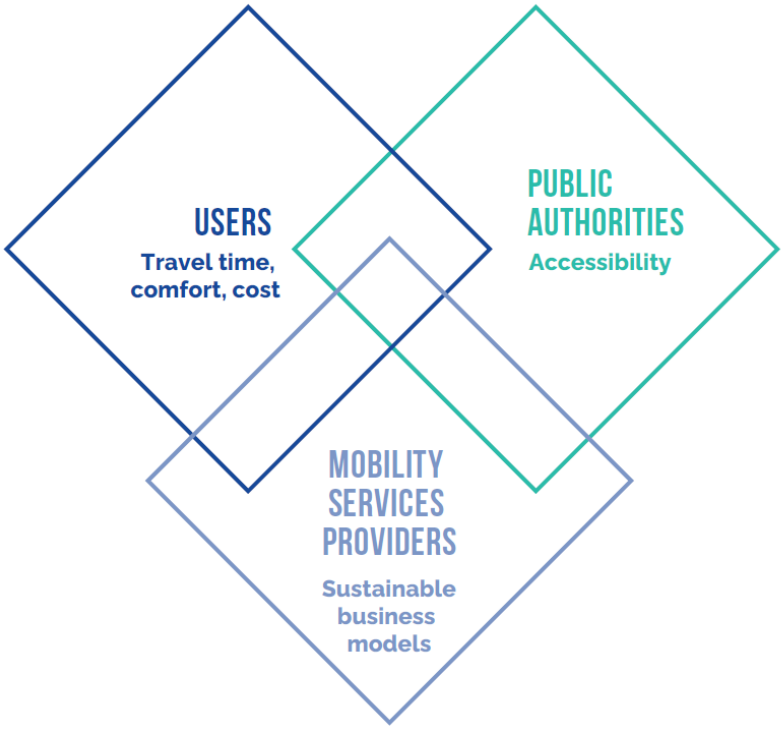
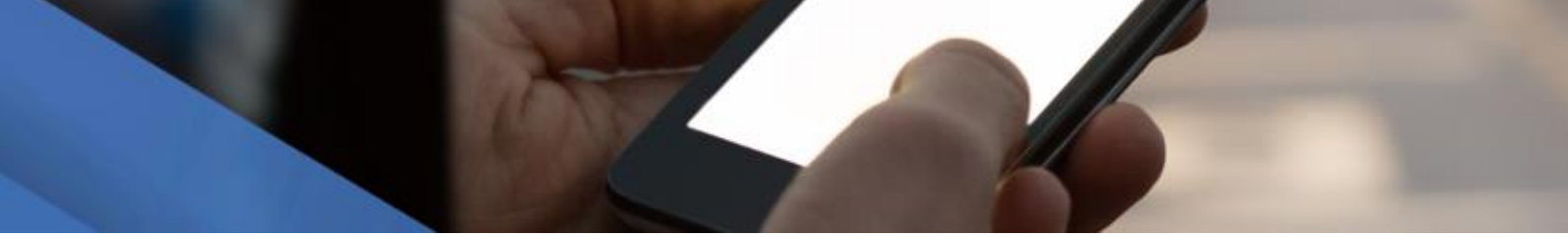


Figure 5: Actors in urban mobility



When considering the individual, digitalisation has brought about conflicts between optimising programmes around the individual need and the preservation of common goods. An obvious example of this is Waze, which occasionally redirects road traffic through residential areas to help individuals reduce the time (the rarer commodity in this case) spent in traffic. Where there is a choice to be made between service to the individual and protection of common good, by seeking to maximise speed, the digital industry will choose the former to the detriment of the latter. Therefore, the common good will differ from the sum of all individual interests of the digital app users. To bridge this gap, regulation will be essential. Only the OMAs, as public authorities, will have the power and thus the obligation to manage scarce resources such as public space.

National laws and regulations will also play an important role. Waze is not used in Switzerland, as alerting people to police and radar traps is forbidden, with heavy fines for offenders. In France, the same ban exists and, although French digital actors respect this, Waze does not and yet it manages to avoid sanctions. There is, evidently, much to negotiate and regulate. Contrary to what is often claimed, local and national authorities are far from powerless in the face of large digital firms.



Box 1: Public goods and common goods

The idea of common good is used nowadays to remind us that there is a general interest, one that is different from the sum of individual interests. This was described in the late 18th century by English agriculturist Arthur Young. During his "Travels in France", shortly before the Revolution, Young showed the negative impact of overgrazing on public meadows. This concept was published under the name "The Tragedy of the Commons" (William F. Lloyd, 1833). More than a century later, micro-economists coined the term 'public good', which allows us to more clearly distinguish between a 'public good' and a 'common good'.

For economists, a public good is endowed with two attributes: Clearly different from private goods, it must be non-exclusive yet must not create rivalry or competition. For example, this would be the case for a radio programme that can be followed for free by millions of people (non-exclusive) without the growing number of listeners decreasing the quality of the service (non-rivalry). Technical considerations mean that it is impossible to prevent a new listener from tuning in, other than other than through encryption. However, in contrast to the mistaken vision of collective enrichment that we have known for two centuries, public goods have multiplied. They now encompass not only the basic responsibilities of the state linked to public order (police, justice, military,) but also education, healthcare and environmental protection.

The environment falls under the category of common goods; a good that is non-exclusive but can create rivalry owing to the potential for cases of over-use or saturation. This is typically the case for transport systems which, regardless of their nature, can fall victim to congestion. Thus a key mission of the OMAs is to try to prevent any manifestation of the "Tragedy of the Commons", which not only takes the form of congested infrastructure, but also the aggregated negative impact of mobility on the environment and climate. For OMAs today, the goal is both to manage transport systems and also to ensure the protection of common goods.

Private mobility operators (bicycle, scooter providers, etc.,) appear to require rational management of public space. This can be done through rationing and limiting access to only some operators or through dynamic space management. In the case of the latter, the OMA collects data from all operators and can subsequently promptly identify areas of overuse or underuse and ask the service providers to adapt accordingly. This is the *sine qua non-condition* of public space use, which demands operators to aggregate their data under the auspices of the OMA, with rules to avoid inconveniencing public transport users in the city. In June 2020, the European Commission launched a large-scale survey to prepare the Digital Services Act. Many of the participants in this survey demanded *ex-ante* regulation of structural platforms.[8]

The main idea here is that common goods need public regulation. This is because they are available to all with no discrimination, and can be subject to over-use which penalises society as a whole. It is thus preferable, perhaps even essential, to set limits on people's pursuit of greater speed and less travel time. This quest appears to be placing a strain on public space: the individual car consumes the most space, as shown in Table 1. In areas where public space is limited the regulation of mobility has to promote the transport modes using less urban space per passenger.

[8] https://ec.europa.eu/digital-single-market/en/news/consultation-digital-services-act-package.

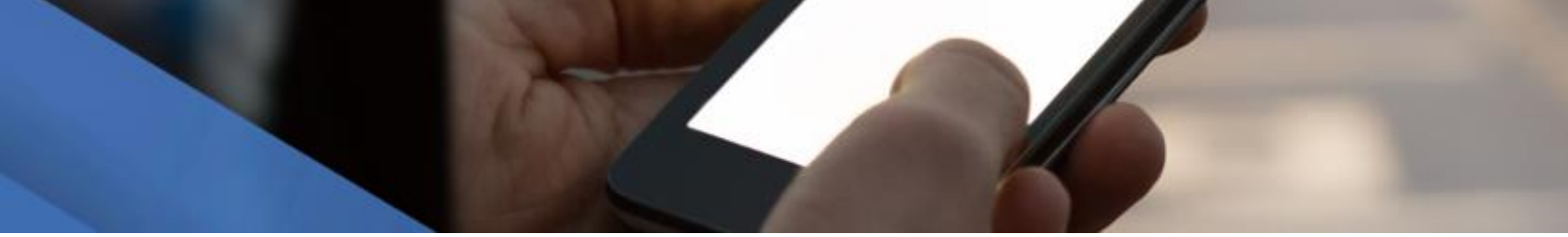


Table 1: Road space consumption by vehicle type compared to walking

	Space used at average speed (m^2 x hours/vkm)	*Average vehicle occupation rate*	*Space used per traveller (m^2 x hours/km)*	*Difference compared to walking*
Walking	*0.3*	*1*	*0.3*	*1*
Bicycle	*0.6*	*1*	*0.6*	*2x*
Motorcycle	*1.7*	*1.05*	*1.6*	*5x*
Car	*1.8*	*1.3*	*1.4*	*5x*
Bus (12m)	*7*	*17*	*0.3*	*1.4x*
Bus in peak hours	*7*	*50*	*0.15*	*0.5x*
Articulated bus (18m)	*10*	*23*	*0.3*	*1.4x*
Articulated bus in peak	*10*	*70*	*0.15*	*0.5x*

Source: H. Héran and E. Ravalet 2009

Concerning economic models, we have already shown, in the 2019 CERRE report, that mobility services for all in urban zones (excluding private services limited for the financially well-off) require co-financing from public funds. In this section of the report, dedicated to financial models, we will explain - in further detail - how this can be made sustainable in the longer term. Intelligent mobility will accentuate both individual and public concerns with sustainable financing. This will regulate the use of digital technologies in areas where common goods - such as public spaces – risk being compromised by individual interests.

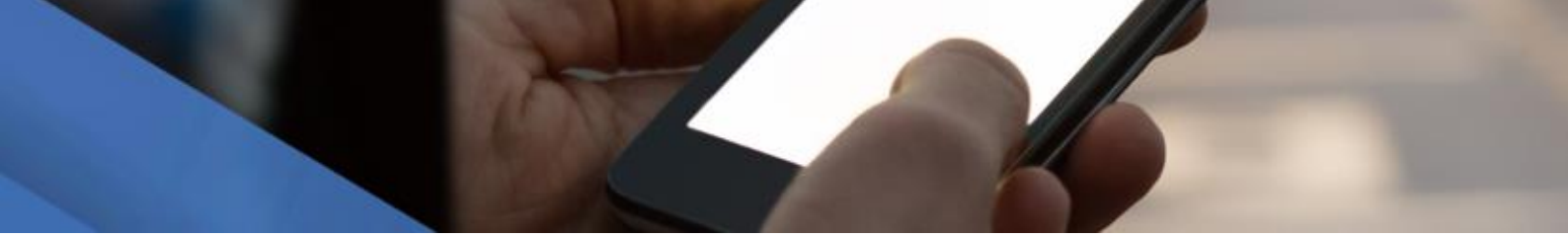
The OMAs are thus necessarily at the centre of this, by:

- Responding directly to the needs of the population or facilitating private services to respond to the needs of commuters.
- Regulating the common good of public space where necessary.
- Favouring the use of decarbonised mobility.
- Facilitating the economic models of service operators, or piloting them directly.

Nevertheless, it clear that the arrival of new mobility services or apps developed in the logic of MaaS has left OMAs with concerns. Will the rise in the power of new private operators marginalise OMAs, or confine them to a role within public transport? The previous pages champion a different approach. The digital revolution is a key opportunity for OMAs to update their objectives and renew their ambition with regards to data, platforms, and ticketing and pricing. OMAs must adopt a proactive approach, not a defensive or a protective one; they are at the centre of this game.

3

DATA AND PLATFORMS



3 Data and platforms

The question of data and its use is where the greatest concerns for PTAs lie, particularly as European legislation has now made open data a general principle.[9] Such fears do not concern new mobility service providers (chauffeured car service, carpooling, free-use bicycles and scooters, etc.,) to the same extent as they do the data platforms of internet giants (GAFA).

3.1 Platforms, data and apps: the strategic state of affairs

The OMAs' concerns are rational in light of the two-sided nature of markets in the data platform economy (as explained by Rochet and Tirole 2002). In this type of market, the platform plays an intermediary role between suppliers and customers and can - in certain cases - modify the value chain in its favour. When such platforms bring strong added value to users on either one or both sides of the market, they can attract a considerable fraction of the transaction fees. This has already been demonstrated in the field of hotel or accommodation reservations (Booking.com, AirBnB are prime examples). This could also be the case for urban mobility services if the following two forms of asymmetry manifest themselves between OMAs and digital platforms.

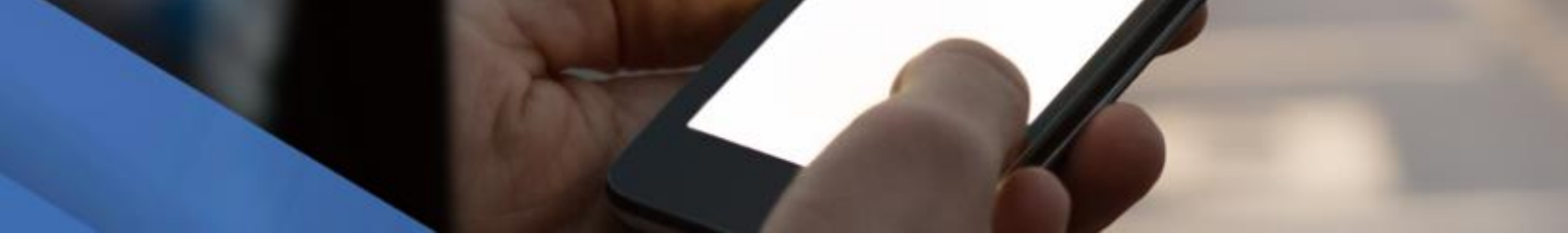
- The first asymmetry stems from the clients of these platforms' (Google Maps, Citymapper, etc.,) 'positive value' benefit. This is often provided for free, in the form of information (geolocation, choice of route, etc.). However, by being connected to these platforms, users provide them with key information on their preferences. This constitutes a form of hidden reward, which can sometimes be defined as a 'negative value'. As such platforms are capable of monetising this data on the other side of the market, data concerning mobility could conceivably become a part of their inventory and eventually increase their market power. This is particularly the case if they come from an actor already active or perhaps even dominant in their sector, such as a rail operator.
- The second potential asymmetry is linked to a new activity now rolled out in several countries: the possibility for platforms to sell travel tickets.[10] This activity creates direct competition for the existing systems already put in place by public transport operators under the auspices of the OMA. This could change purchasing behaviour, particularly if the platforms choose to sell tickets at lower prices to attract more customers. They could cover any loss from the reduced sale price by monetising data and thus benefiting from a hidden payment. This is why, in France, it is mandatory to apply OMA tariffs unless agreed otherwise.

Confronted with these two risks, it would be ill-advised to maintain the status quo of the current situation. If the objective of MaaS is to develop multimodality according to the direction envisioned by public policy (fewer personal cars, more public transport, more use of active transport, etc.,), then access to data and ticket sales is indispensable. Right of access to third-party platforms selling public and private services would be beneficial to the OMAs. It would also help OMAs overcome limitations where their administrative remit does not correspond with mobility and commuting patterns.

Such access would that would then would benefit from having the right to access those platforms selling public and private services. It will also help transcend the administrative limitations of the OMAs, which often do not correspond with living and mobility areas. Opening both data and sales platforms is necessary in order to develop apps capable of integrating different mobility services and of encouraging commuters to break their monomodal daily habits, most notably the use of personal cars. However, to avoid creating large asymmetries, regulation will be essential.

[9] https://eurlex.europa.eu/eli/reg_del/2017/1926/oj?locale=fr#:~:text=R%C3%A8glement%20d%C3%A9l%C3%A9gu%C3%A9%20(UE)%202017%2F,int%C3%A9r%C3%AAt%20pour%20l'EEE.%20).

[10] In France, the Mobility Orientation Law (LOM), passed at the end of 2019, opens up this possibility.



Confronted with these two risks, it would be regrettable

This regulation must take the form of strict rules on data. In this domain, perspectives contrast strongly between stakeholders. In the responses to the survey conducted to inform this report, opinions differed starkly depending on whether the respondents were OMAs or providers of new mobility services.

- For some survey respondents, data collected stems from private investment by the company and must remain their property. This is not the case for data held by OMAs and public transport operators, which is only made possible by public funding. This data should thus be largely available.
- In turn, OMAs consider that all data should be open but face great difficulties in making this a reality. Some private actors have real-time data on travel times and use of certain transport services at their disposal, but categorically refuse to share this information. Is this because they intend to use it directly to extend their mobility services by adding the sale of transport tickets to their map and route applications? Besides extending long-distance travel services to the local perimeter, it is unclear whether large platforms are pursuing this avenue. They could do this on a marginal basis, for instance by offering unitary public transport tickets to occasional customers (for example tourists or business users), as is already done in certain cities, such as Australia. If applied successfully, the result could be an increase in occasional customers, which the public authority would see as advantageous.

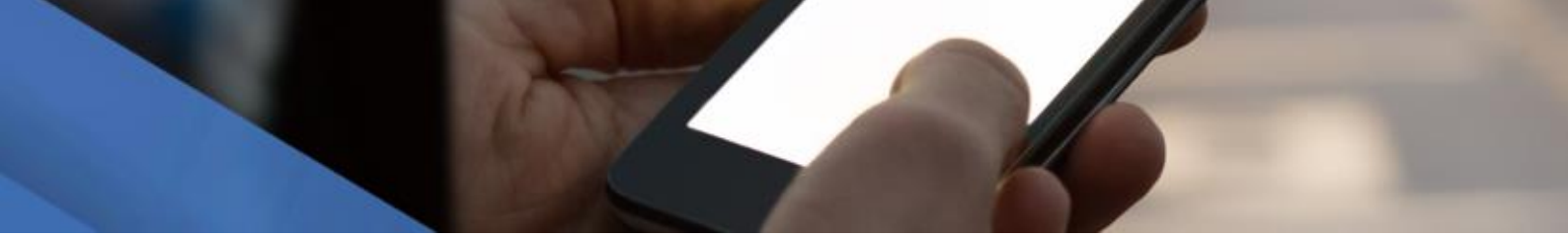
To be properly understood, the question of data must not be approached solely from the perspective of use in the mobility sector. The concept of 'negative value' should encourage us to consider data from every perspective and potential application, that need to be considered as part of a holistic approach to regulating GAFA companies. As recently suggested by Charles Cuvelliez[11] (Les Echos, 17 September 2020), such regulation should not adopt the same dismantlement approach that was applied to early dominant companies such as Standard Oil or AT&T. The heritage of data collected by GAFA must be considered a public good. From this perspective, data must be considered a non-competitive, non-exclusive good - exactly what lies at the heart of the principle of open data.

Charles Cuvelliez explains the key role of behavioural data extracted via artificial intelligence, citing the work of CERRE: *"There is no barrier to entry for e-commerce, web research or media platforms. It intervenes when one tries to offer the same quality of service as established platforms, which already know everything about their users. We can limit the collection of user data, to place everyone on a level playing field, we can ban actors from amassing data extracted from the use of different services by their customer. But then again, such steps would counteract the networking effects of data (...), the very same effects that lead to such a quality of service. We can, however, oblige them to share this data. We are referring only to raw observed data on user behaviour, how they use the platform, where they surf"*.

Behavioural data is what therefore must be considered as the public good if we are to maintain competition between platforms and to allow OMAs to use this behavioural data to promote multimodality. This is precisely the objective of Article 32 of the LOM, which will be addressed in section b) of this chapter. From this perspective, there must be a distinction drawn between 'front office' and 'back office' functions when opening up data.

- The *front office* concerns services to people. The opening of data and commercialisation channels must lead to a diversity of supply. Alongside apps offered by established service providers or by the OMA itself, other apps should emerge, founded on innovation aimed at seamless multimodality; if initially there is a competition between different apps, over time

[11] Professor at the Polytechnical School of the Free University of Brussels. See CERRE reports on data portability, June 2020 https://cerre.eu/publications/report-making-data-portability-more-effective-digital-economy/ and on data sharing, September 2020: https://cerre.eu/publications/data-sharing-digital-markets-competition-governance/.



may it be that one prevails? Is there room for several applications? The importance of brands and the fragility of economic models raise a degree of doubt over this, but the first thing is to ensure that the space is open to several potential providers.

- The *back office* refers to how the opening and provision of data will take place. Issues around data formats must first be resolved before it can be of use to shareholders. Standardisation is therefore essential, and it is up to a national or European public authority to enforce this. From a regulatory standpoint, opening and providing data, and standardisation are already largely underway for information provided to travellers in the transport space - although they remain to be put into practice and integrated into sales interfaces.The questions around the symmetry of rights and obligations on data access are pivotal.

3.2 OMAs' strategic choices

Digitalisation nowadays allows a multitude of functions within urban mobility: quality information for travellers, ticketing and payment of mobility services, optimal network use, highway tolls, etc. Also, it has made notable societal gains possible, such as the improvement of the commercial speed of public transport networks (priority tramways and buses); which has not only improved customer service but has also benefitted the public purse and helped optimise use of public road space. Thus, the management of traffic light crossroads by axes and zones according to the level of use further optimises the allocation of public space and allows for other uses besides cars.

Services are emerging on the borders between the public and private sectors. With all shared mobility services (chauffeured car services, carpooling, car-sharing, etc.), the private sector must cooperate with the public sector in the urban space, even if it is only to access public space. The scarcity of this space demands skilful administration by the OMAs to ensure the common good is maintained, thus creating recommendations or even requirements for private mobility actors.

To keep track of this new technological and entrepreneurial environment, the mobility orientation law (LOM), which became law in France in 2019, features three Articles (25, 28 and 32) that illustrate the proposal:

- Article 25 obliges mobility services to open their data to third-parties. Essentially, this concerns OMAs and also covers private services, like carpooling, but not taxis and chauffeured car services.
- Article 28 obliges mobility operators, both private and public, but mainly public (OMAs), to open their sales channel services to enable third parties to develop integrated mobility services (i.e. MaaS) that offer seamless mobility to passengers: the purchase of train and public transport tickets can technically be allowed. These offers must now be constructed, and be the focus of economic and marketing efforts (what do I sell, to whom, for what purpose, with which economic model…).
- Article 32 requires manufacturers of connected vehicles (automobile constructors) and navigation aids (Waze, Google, TomTom, etc.,) to share their historic mobility data with OMAs to improve wider understanding of mobility.

These three LOM articles are based on the premise of opening up data so that investment focuses on processing. Sharing data is not only beneficial to OMAs; it helps prevent the public sector from cannibalising those markets that may find a viable economic model with which to profit from the potential for innovation in the private sector. It is clear therefore that the pooling of public and private data creates more value than partial databases. Digital tools - and MaaS in particular - question the roles of the public and private sectors and their ability to complement each other.

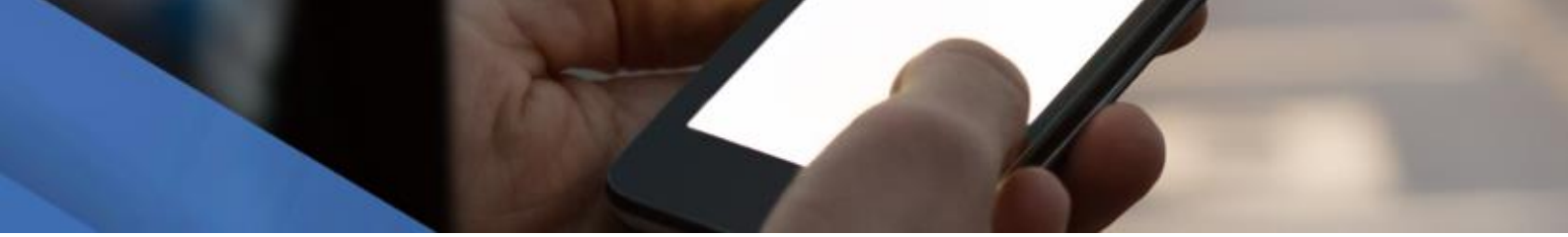
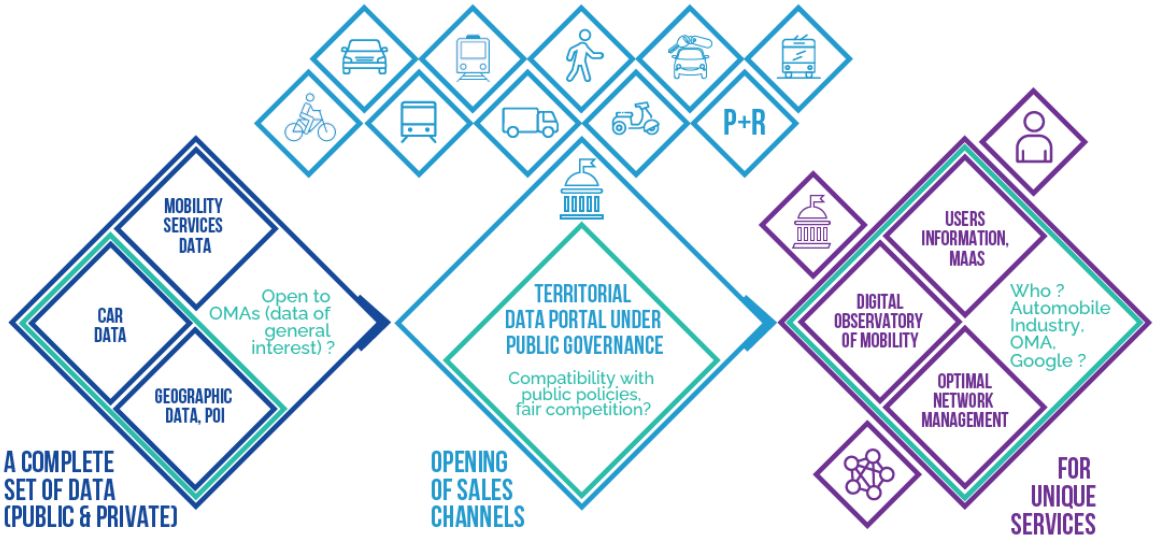


Figure 7: Public governance of data



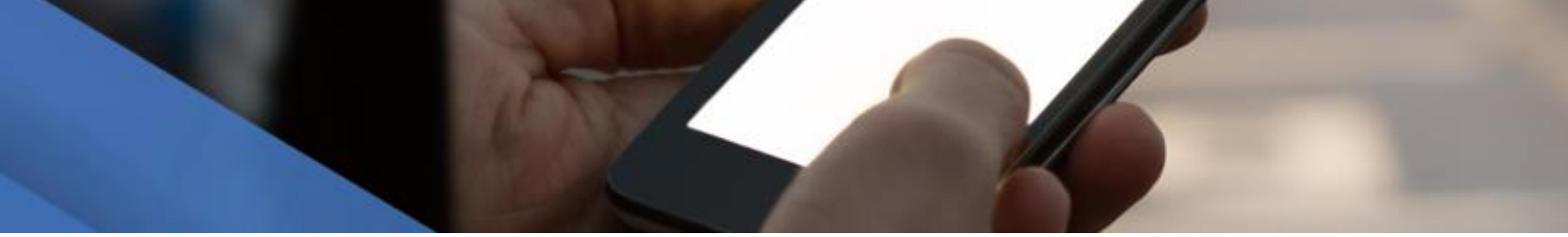
Source: Jean Coldefy

The solution resides in the cooperation plans established. If, as previously discussed, we consider intelligent mobility as combining the interests of the traveller with the collective interest, re-use of public data should be repurposed for the general good. In the field of mobility, this can, for instance, be translated into the **integration - by private apps using public data - of constraints on public space use. Examples include observing lane hierarchy on roads, the peace and quiet of certain areas, and, of course, respecting the Highway Code which forbids revealing the precise location of law enforcement officers.** The objectives of non-discrimination outlined for MaaS in Article 32 in the data display used (see article L1115-10 in the Mobility Orientation Law (LOM) in France) are relevant. Conversely, for public authorities, **access to private partners' data** - also proposed in Article 32 of the LOM and which should be included in common law, is another urgent reform that needs to be put in place. This is the core of the notion common good: access to data from connected vehicles and navigation aids allows OMAs to manage the common good of public space more efficiently, by providing them with reliable insights into the mobility demands and allowing them to evaluate their strategies.

A joint approach by public and private figures, with common rules and a principle of open data are the key to a smart city. It was following this logic that saw the city of Lyon put in place a data provision licensing system, ensuring that the reuse of public data is compatible with public policy. This enabled the rollout of the most complete open dataset in Europe - also the most re-used in France - simply by building trust between data providers and the re-users.

This innovation needs to inspire public policies, which in turn must not forget that regulation is essential. Those who are content to simply advocate for the openness of data are likely to end up as the 'useful idiots' of digital giants. As recently - and correctly - pointed out by Sébastien Soriano, former president of ARCEP, "To regulate is to give power to the masses, it is to dissolve power from where it is concentrated, to the benefit of the many".

Therefore, viewing the private sector as being a vector of unfair competition for the public seems an outdated and overly defensive view. **Global warming should, to the contrary, lead us to be more aggressive in accelerating the deployment of efficient alternatives to the car, ones that are easily accessible via MaaS.** Indeed, as outlined in our previous study, private urban mobility services are aimed solely at a financially comfortable clientele. Also, their sustainability remains unclear. The same goes for private entities in MaaS who, even if they are internet giants, do not seek to replace public entities. Rather, they will focus on business and tourist clientele to sell



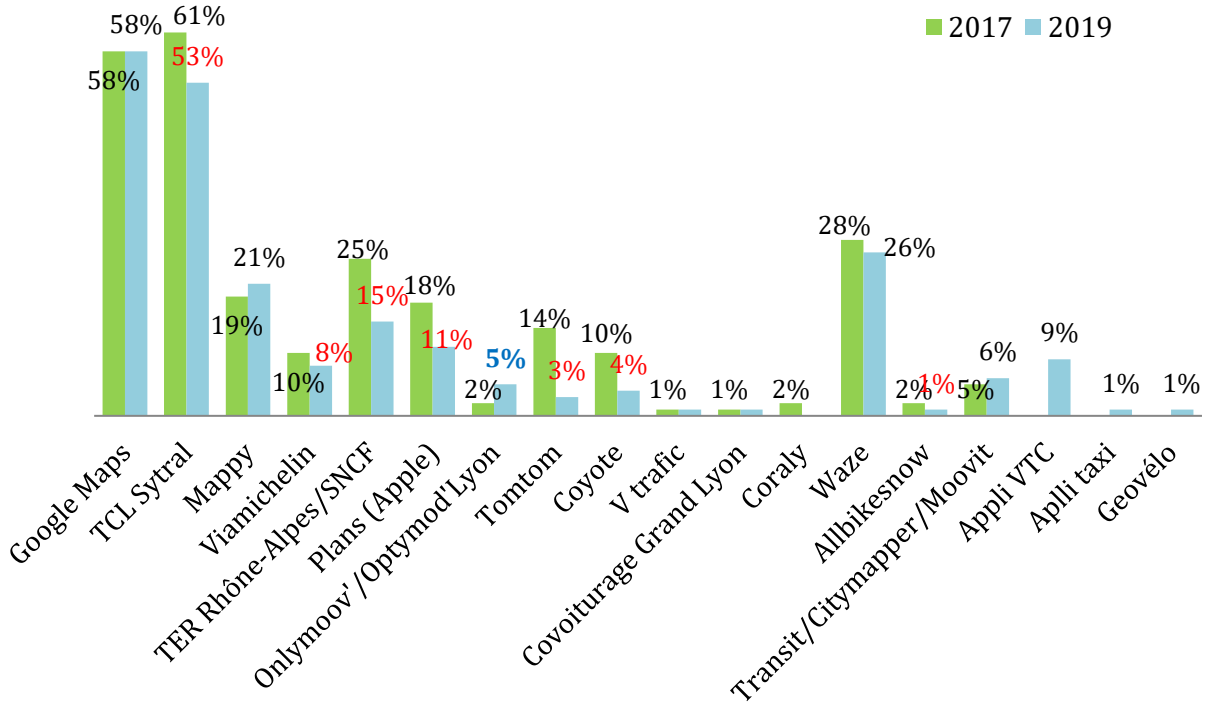
occasional travel tickets without a transaction, thus using the digital sales interfaces of OMAs. This could be the case for local transport ticket sales as well as the sale of long-distance journeys.

This will allow OMAs to have more clients and thus more income, without touching the heart of their clientele: regular users. For OMAs, the key is to ensure that improved access to mobility services does not lead to a loss of revenue. For example, people who take out a subscription for ease of use could have the same convenience by purchasing single or book tickets with the savings made being a key factor. In big city centres, this can have a considerable impact on public transport revenues, which have already been put under huge strain by the COVID-19 crisis. This point will be dealt with in section 4, where pricing is examined.

In addition, it would appear crucial that private firms cooperate with the public authority to operate their new services. The OMA is the entity piloting the majority of mobility services and with the competence to grant access to the scarce resource of public space. Private players in the digital world also need to make themselves visible to the public. Yet, in urban mobility, branding is not decisive; in fact, only two brands emerge reputationally ahead of all others: the local public transport operator and Google. The surveys on Paris and Lyon demonstrate this.

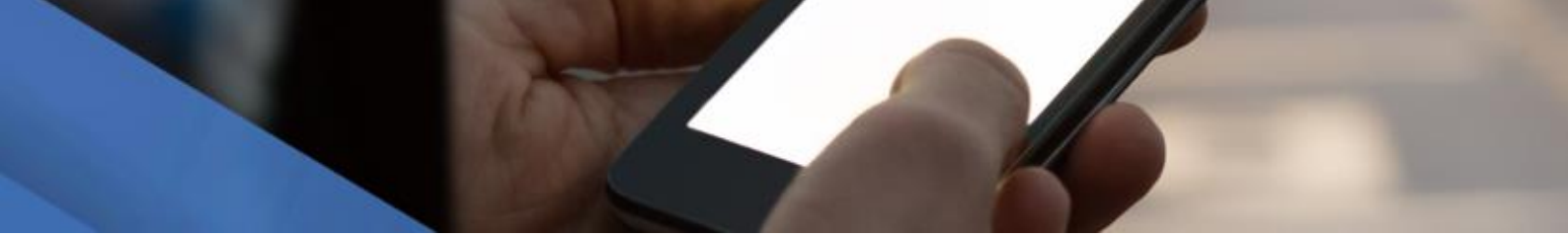
Figure 8: Media source audience by residents of the Lyon metropolis

What services do you use for your trips in the city?



Source: Lyon Metropolis - Barometer of urban services - 2019 survey

Following cooperation between public and private sectors, the deployment of MaaS services - piloted by the OMAs and distinguished from the operation of public transport - is undoubtedly one of the preferred scenarios in large urban areas. However, it requires adapting the tools of operators and those of the OMA to MaaS. Operators need access to client databases and to MaaS tools to provide an efficient service because they manage customer relations on an operational basis. Logic would suggest they abandon their current information tools in favour of one available to users. In so doing, they lose a channel of communication with users which must then be restored to ensure effective operational management of the service. At the same time, the OMAs also need some of the public



transport operators' know-how and capacity for innovation. Such a win-win approach – to the benefit of the user - can be achieved if the OMA deploys MaaS services.

Box 2: Citymapper - a case study on the limits of digital platforms

Citymapper is a traveller information service active in 40 cities worldwide, which is in development. Citymapper has been trialling a "public transport pass" for 18 months in London (Zones 1 and 2) for £31 compared to £36 for the same ticket sold by the OMA (TFL). A great package also exists for £39, including - alongside public transport - 30 minutes free bike hire.

This is a typical case of economic distortion engendered by the functioning of two-sided platforms. The economic model of Citymapper is obviously not based on the sale of its services; there are no possible benefits to subsidised activity, apart from the users themselves benefitting from the subsidies. This is true such that Citymapper swiftly abandoned its London transport system. The Citymapper economic model collects and resells personal data to dominant players in the market, to help increase their knowledge of clientele. It is estimated that a user of this kind of application is valued at $60. To increase its own value, Citymapper needs a higher number of users even if that leads to initial losses. Citymapper has raised $40 million in two tranches: $10 million in 2011, a further $30 million in 2016 and is currently set to lose $25 million. It is apparently valued at less than $300 million. Will Citymapper's gamble pay off like Waze, bought for $1 billion by Google, or more recently Moovit, bought for $900 million by Microsoft?

The challenge for Citymapper is to ensure a rapid sale. Yet, usage indicators of these apps in France suggest they are not gaining traction. It is also striking to see that the service offered by Citymapper exists only in London. In France, the pricing discount is only possible with prior agreement from the OMA (as is likely the case elsewhere in Europe).

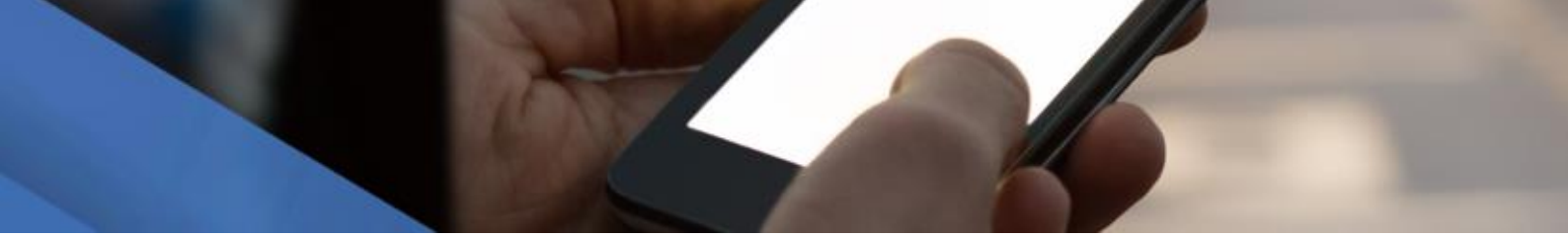
What is specific to Citymapper is its target, the daily user. This target is the most complicated, owing to the differences in behaviour between the 40 cities in which Citymapper is active. Extending the service will require specific and costly developments. Furthermore, Google is already launching sales interfaces in a number of cities for unitary transport tickets, and could also do so in France, targeting the occasional user (tourists, business clients) at a price range that is homogenous from one city to another. The other difference is cash flow, as Google does not collect the money but simply provides an interface for the sales system of the OMA. It seems probable that, with both technical and targeted marketing, this is this model that will likely prevail.

Finally, since MaaS's target is multimodality that decreases the use of the car in suburbs and on centre-suburb links, the integration of personal cars and parking into its toolkit is required, two key functions that Citymapper does not have. In summary, Citymapper is certainly a well-designed app, but is only known by a very small number of users. It suffers from low recognition beyond students and higher socioeconomic classes. It aids only residents of city centres who are already seeking alternatives to the car; it does not target the suburbs, which - in Ile-de-France - constitutes 80% of the population.

Transit, Citymapper and Moovit combined only account for 5% of overall digital platform usage. The 2018 surveys in Ile-de-France delivered very similar results. This confirms that offering a service - even of high-quality - does not guarantee success, a costly lesson already learned the hard way by many start-ups.

In sum, OMAs have the legal and technical tools enabling the deployment of MaaS for meeting the interests of individual users, public policy and mobility operators. They must address these through three separate approaches:

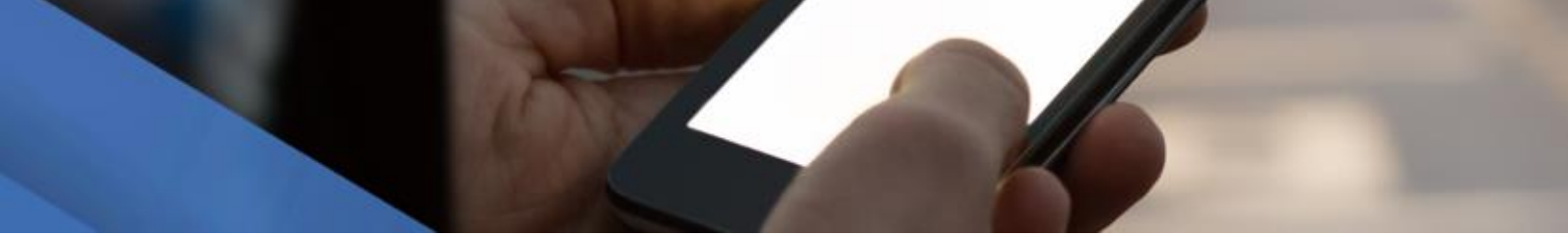
- The distribution of licenses for reuse of public data, for the coherent use of public space and a user information ecosystem that allows for better competition between large firms and others.



- Access to data on connected vehicles and navigation aids - data which can be defined as being a public interest - in order to gain knowledge on mobility. Regulatory changes currently underway at European level - no doubt inspired by the major innovations introduced by article 32 of the LOM - must encourage French actors to ensure the Directive corresponds with the expectations of the OMAs. Experimental projects should be launched in Ile-de-France with car manufacturers and Google as soon as possible.
- The launch of marketing campaigns aimed at defining targets for MaaS in terms of origin and destination, socioeconomic class and capacity to change the mode of travel. In addition, constructing partnerships with other public and private entities to build appropriate supply and economic models. Following engineers' efforts for MaaS, which established digital systems that have enabled its deployment, it is now time for the marketing teams and the economists. For the latter, let us now turn our attention to the issue of financing.

4

DIGITAL REVOLUTION, PRICING AND FINANCE



4 Digital revolution, pricing and finance

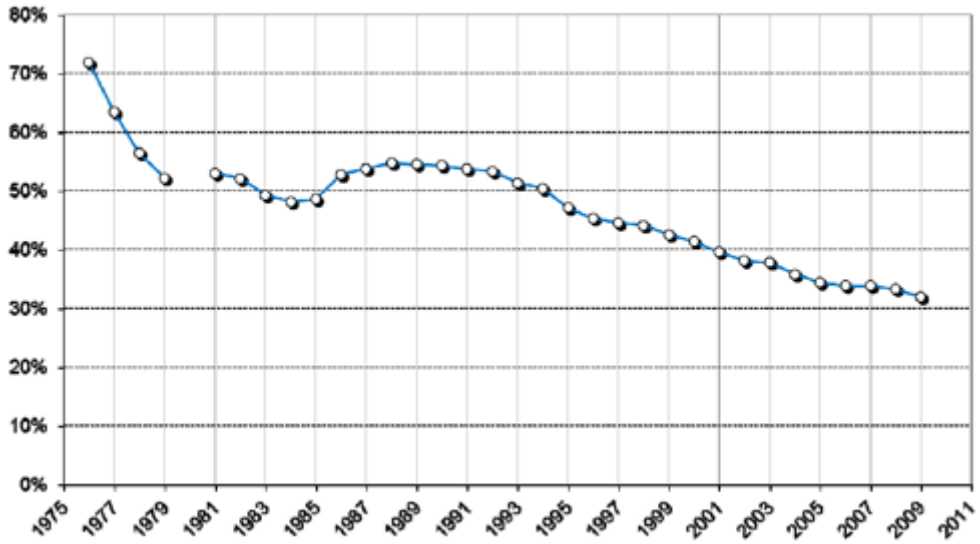
Collective transport will remain the backbone of urban mobility in the coming years. By collective transport, we mean an enlarged vision, one which incorporates new mobility services such as free-to-use bicycles and carpooling; such services requiring public financing. The latter can, as is the case for buses and metros, be run by private operators, but with public project management. In France, free-to-use bikes rely on an average yearly subsidy of around €3,000 per unit. The development of multimodality and MaaS will not be free - quite the opposite. OMAs will need to find resources. However, while MaaS incurs costs, it can also generate savings by optimising current distribution channels. It also allows pricing to be adapted and is, therefore, a way of generating revenue or returning it as an incentive to users.

4.1 Urban mobility financing and the free use vs pricing debate

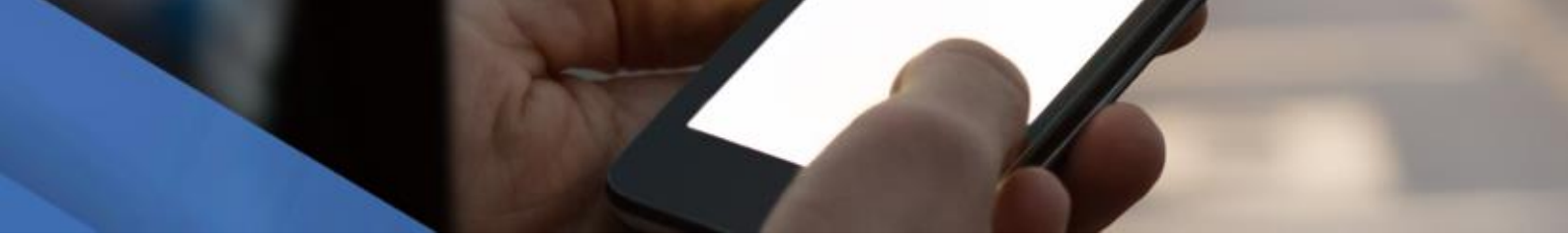
In light of the need to stimulate the use of collective transport, elected officials and researchers have advocated for the free use of public transport. This has already been established in France in over 30 metropolises, including some of over 100,000 inhabitants, such as Niort in 2017 or Dunkirk in 2018. As of the 29 February 2020, all public transport is free in Luxembourg. This covers all modes of transport with state financing; buses (including in Luxembourg City), trains and trams. Since France's spring 2020 municipal elections, several cities such as Montpellier, Rouen and Grenoble are contemplating making public transport free.

This idea was also raised in 2018 by the mayor of Paris, Anne Hidalgo, as well as in several German cities. This is not by chance; France has been working towards free public transport for several decades (B. Faivre D'Arcier 2019), as shown in Figure 9. Here, we can see – in cities of over 100,000 people – there is a gradual drop in the proportion of commercial income (R) compared to operating expenses (E). This drop is also noticeably in the larger cities. From 1995 to 2015, the R/E ratio decreased from 50.3% to 37.5% for the 12 largest urban areas in France (those with over 400,000 residents and excluding Paris). For example, it went from 54.5% to 30.5% in Grenoble, 49.7% to 29.2% in Lille, from 58.5% to 43.1% in Strasbourg and from 34% to 31% in Bordeaux.

Figure 9: Change in the ratio of commercial revenues to operating expenses (R/E)



Source: CEREMA



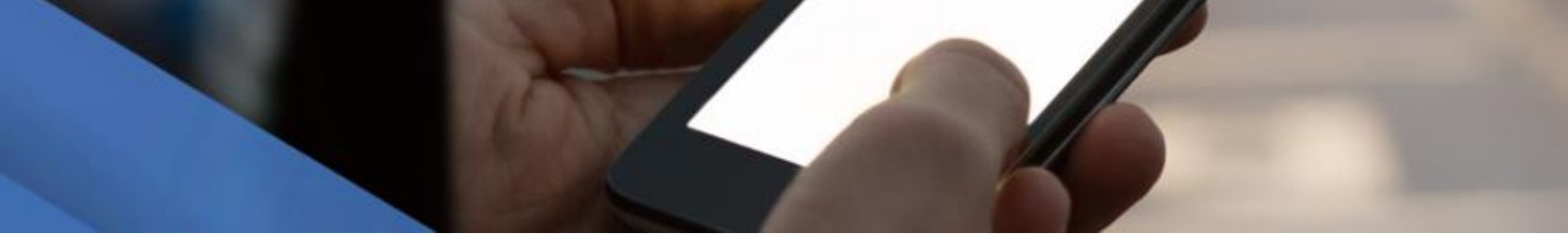
This decline, which started in 1975, stems from the introduction of monthly fees. These were intended to make life easier for users by allowing transport tickets to be bought monthly rather than daily. In so doing, the marginal cost of transport was reduced to zero, which in turn reduced the use of bicycles and walking. Had we been blessed with the current technology that allows easy access to the public transport network, we would never have put this system in place, which considerably reduced the financial contribution of users to their transport. The R/E now stands at around a 25% average in France and 28% in Ile-de-France. As shown in a recent report by the European Court of Auditors, the R/E ratio elsewhere in Europe is above 50%, and around 75% in large German cities. With an R/E of 60%, the Lyon metropolis demonstrated that this is not terminal; it is a political choice. Furthermore, Lyon is one of the rare metropolises to have reduced the use of personal cars in its city centre by 40% and increased use of public transport over the last 20 years.

This fall in R/E can be explained by social and commercial priorities; i.e. not penalising public transport users and attracting new customers. In most urban centres, the price of tickets and subscriptions has risen at a rate slightly lower than inflation. This near-stability in price is in stark contrast to increases of 40% for water and at least 60% for household waste, electricity and gas. However, the results in terms of traffic were not there. In the 12 largest French cities outside Paris, the number of public transport journeys has indeed risen by 92% between 1995 and 2015. However, in terms of a constant number of inhabitants, the increase is only 56% - roughly the same size as the increase in the number of vehicle kilometres. This means, proportionately, that use of public transport is stalling. Simultaneously, however, productivity fell (-7% per vehicle-km per agent) and, as staff costs increased (+ 8% per agent), the gap between revenue and expenses continued to grow (B. Faivre d'Arcier 2019).

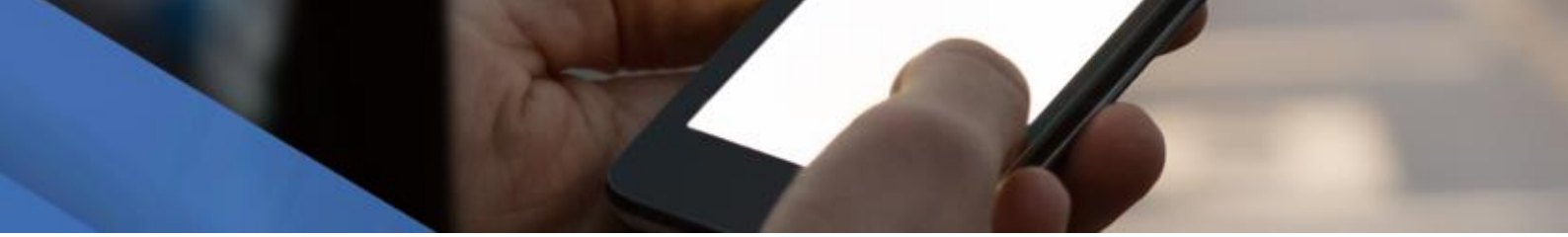
The road to free public transport results from a double headlong rush: firstly, from the R/E numbers with falling prices (revenue per trip is down by 30% in the 12 largest provincial cities) and, secondly, increased expenditure at the same time. The economic sustainability of this approach is therefore questionable, as is a weak environmental impact to date, demonstrated by the remaining overwhelming popularity of automobiles outside city centres. A little-known figure provides an insight into this relative failure: the supply of public transport per urban square kilometre. As urban transport perimeters have been gradually extended, the vehicle / km2 ratio decreased from 1995 to 2015 from 42,000 to 36,000 in the 28 metropolises offering public transport with exclusive lanes. Simultaneously, the average for the 249 urban public transport networks outside Paris dropped from 21,000 to 10,000.

Under these conditions, how could public transport possibly hope to compete with private cars? In many cities outside Paris, it is no exaggeration deem urban public transport outside city centres a failure on a social, economic and environmental level. Polarising attention towards free access is, therefore, a form of political alchemy, turning the *'base metal'* deficits into electoral gold. The size of supply, which is in need of significant public funding, is capable of increasing the use of public transport. In Dunkirk, for example, where the public transport modal share was 5% and the R/E was 9% before the introduction of free access, the improvement in supply made it possible to double the use - but not the modal share - of public transport. Here, free access is a political decision intended to support efforts to revitalise the city centre. However, it will soon face costs required to improve the supply. Public transport will remain marginal, and this is why free access is possible.

The equation is different for large metropolitan areas. There, even if free access is financially possible, the already very low R/E ratio would render the OMAs even more powerless. This is partly due to lack of resources and partly due to the impossibility of regulating usage through pricing, particularly during peak periods. Due to an inability to modulate pricing over time and area, free access does not make it possible to deal with the phenomena of increasingly prevalent congestion in large cities, other than through rationing. Free public transport in large cities is a romantic myth; not only for financial reasons but also because it strips the organising authorities of any regulatory power in the system, besides the headlong rush to increase supply and taxes.



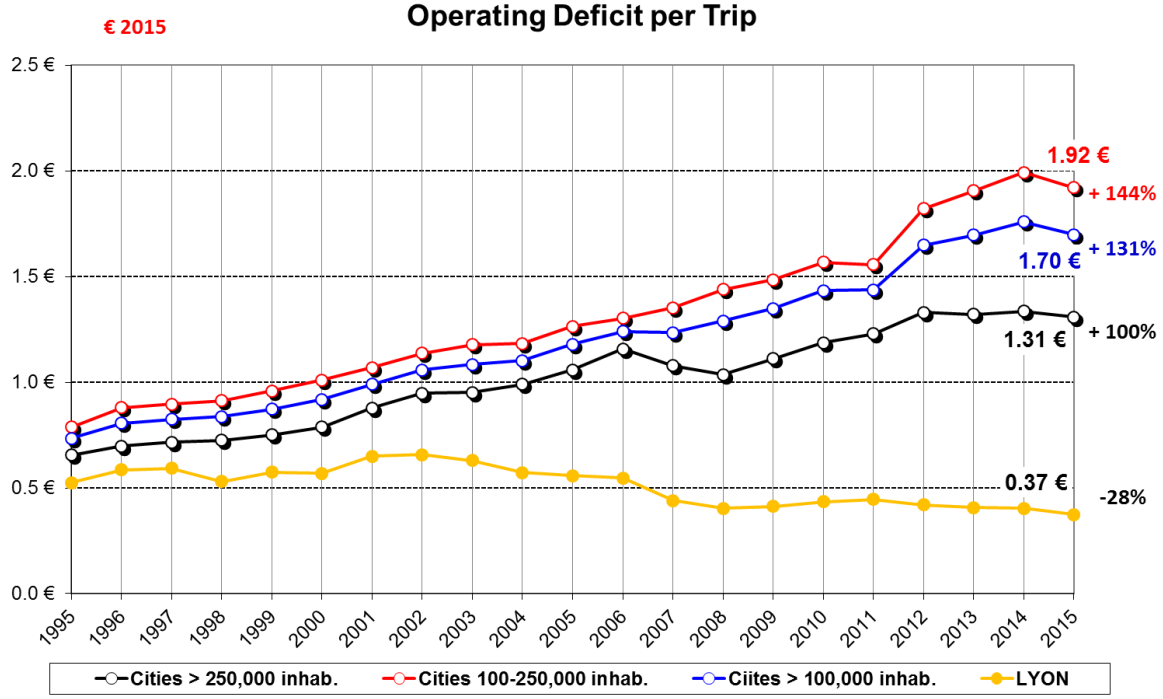
The idea of free public transport refers to an ideal concept of mobility borrowed from the road model in rural areas. It is based on a simple combination - tax funding plus the regulation of congestion. Even if this makes sense in sparsely populated areas, this model becomes problematic in urban areas, as shown by the persistence of traffic congestion and pollution. For large cities, economists have long called for a road use model based on another combination: user financing and regulation by pricing. However, as this logic of urban tariffs is difficult to establish, free public transport is seen as a way of getting around the problem. But this is wrong; the price of urban public transport has very little impact on modal choice. This will only improve sustainably with quality of supply. For this, investment to avoid the deterioration of urban transport operators' financial situation is necessary. It is from this perspective that MaaS must be implemented. The development of digital tools should make it possible to change pricing to a more dynamic model, to direct behaviour towards greater use of multimodal solutions, but also towards reducing the scope of travel and the use of public transport during peak hours. The following pages will attempt to illustrate this ambition using the case of Ile-de-France.



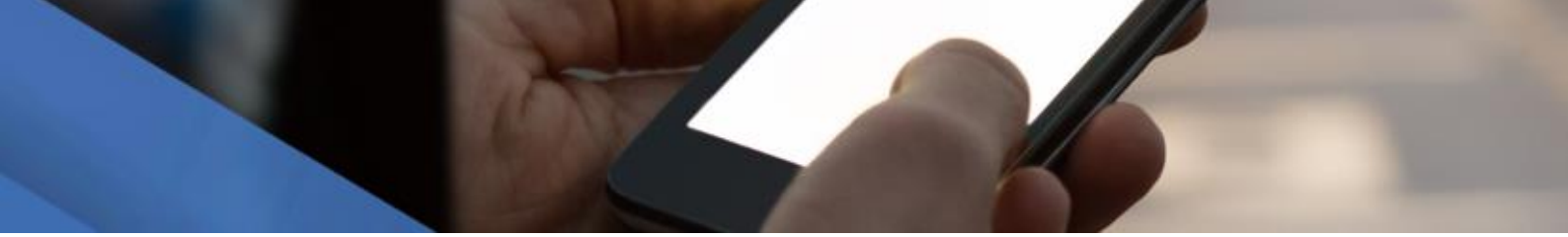
Box 3: Robust finance - the only way for OMAs to significantly reduce car use?

The current mantra of free public transport is based on a simple equation: free transport = fewer cars. However, reality shows that this is not the case. Currently, the car already costs twice as much as public transport, and yet road traffic still constitutes 80% of distance travelled over the course of 30 years in France. The problem is the lack of capacity for people who drive to then take public transport. Users seek supply and quality, not free use. It will thus require much more public transport services from the outskirts of large cities to allow people to leave their cars behind. For that, funds are needed. Free access therefore impedes the development of public transport networks that are badly needed to decarbonise mobility. Free access also unnecessarily drives pedestrians and cyclists towards public transport. It increases public deficits with zero increase in revenue; more buses and trams are needed to compensate for the saturation of short-distance journeys, when the focus should be on longer ones. Lyon is the only city in France where the user finances 60% of the public transport operating costs with long-term action on prices and supply. It is also the only city that has reduced road traffic by 40% in 20 years by increasing use of public transport by 30%. Therefore, free transport in big cities is not only inefficient, but - as the case of Dunkirk shows - it maintains levels of private car traffic at a high public cost, as shown in the graph below (B. Faivre d'Arcier 2019). It also increases territorial inequalities in terms of mobility. There is also an argument that this is a socially unjust measure; the few who have the means to pay have their trips financed by the many.

Figure 10:
Operating Deficit per Trip



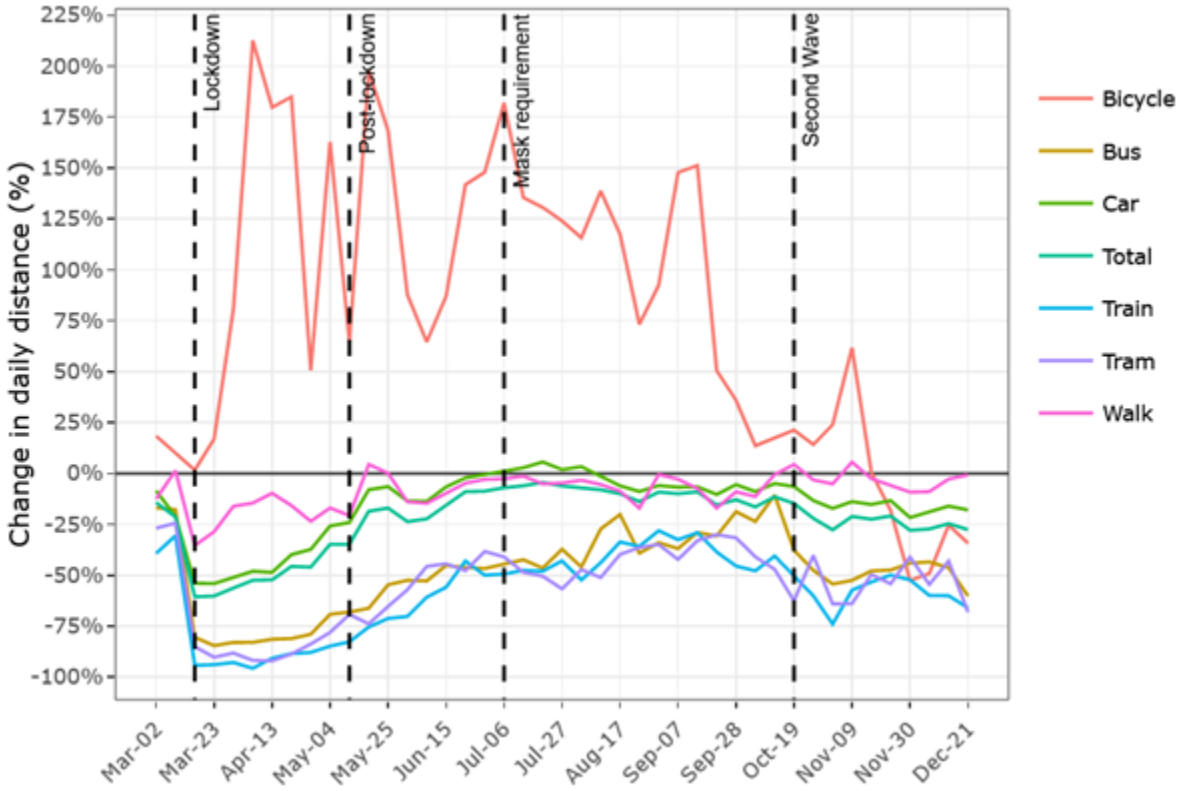
Source: Laboratoire aménagement économie transports



4.2 MaaS and structural changes resulting from the pandemic

The COVID-19 pandemic, and ensuing lockdown, has been an economic shock for many sectors, as demonstrated by the significant decline in GDP for many countries in the European Union. The public transport sector has been particularly affected, both long distance travel (air, rail, coaches) and daily commutes. During the periods of lockdown, use of urban public transport dropped dramatically. This phenomenon is not just a blip; currently, traffic remains considerably lower than it was at the same period in previous years. Figure 11 gives an indication of the situation in Switzerland during 2020. The use of public transport (bus, tram, and train) declined by 80% in the spring, during the height of lockdown measures. Yet in the months that followed, traffic levels remained low for public transport, while car traffic returned fairly quickly to previous levels. What is the root cause of this contrast?

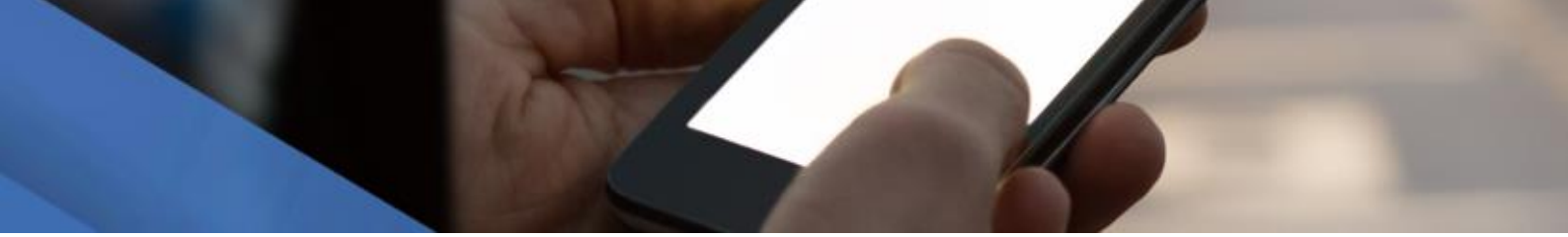
Figure 11: Change in average distances travelled by mode of transport



Source : https://ivtmobis.ethz.ch/mobis/covid19/reports/latest

The growth in distance travelled by bicycle is the first part of the answer to this question. There has been a strong growth in the use of bicycles, in Switzerland as in most major European cities. It was as if a modal shift from public transport to cycling, rather than walking, had taken place. Cycling has attracted new users, although not all have remained faithful to this choice. Once the rain and cold of autumn reappeared, the initial enthusiasm faded, especially in December. However, the new success of cycling, reinforced by 'tactical city planning' - which consisted of swiftly establishing 'corona paths' and reducing the amount of road space for cars - cannot explain the continuing very low levels of public transport use, nor the near-return of car traffic to previous levels.

A different explanation must be sought for the changes in activity brought by the pandemic. The rapid emergence of home working has modified habits. Not so much by generalising this practice, but by making it possible to rethink how trips were planned over the course of the week, or even the location of one's home. The opportunity for home office work, even just for one or two days a week, modifies flows, particularly during rush hour. It can also encourage people to choose a residence



further from their place of work, freed from the cost of using the car to reach a multimodal hub, or even their workplace.

However, the daily commute to work acts as a 'core structure' for all daily mobility. Trips are optimised, centred on a "primary" trip (i.e. to work) around which all the other activities of individuals and households ("secondary trips") are planned. With work from home, this primary journey is made less frequently, as already shown in a previous study.[12] Consequently, those trips that generally took place near to this core structure are less constrained by space and time, and thus can be reassigned or rescheduled. Individual freedom to improve schedules is therefore greater. Beyond the change in destination and the time slot of these trips, these activities are likely to evolve from the status of secondary to primary trips. The chain of activities is then entirely remodelled, and the associated mode of transport is redefined.

This analysis would explain why the pandemic heralds such structural changes for urban public transport. On the one hand, they will be permanently faced with reduced demand and, on the other, with an evolution of mobility needs where traditional public transport solutions (bus, tram, trains) will play a lesser role. Confronted with this situation, and as indicated earlier, MaaS can be introduced as the solution because it helps PTAs broaden the range of services offered to commuters. This wider offering is not optional, it is becoming an obligation. Taking into account the environmental objectives previously discussed, it is becoming imperative to integrate both two-wheeled forms of transport and cars in the PTA's regulation of urban mobility.

As already indicated, this will require action on road space (cycle paths, lanes reserved for carpooling, multimodal hubs, deterrent parking lots, etc.,) and action through a partnership with new providers of urban mobility services (fleets of vehicles, car-sharing, carpooling, etc.). But this diversification in service offering will come at a cost, even as commercial revenues from public transport decline. How can we deal with this margin squeeze?

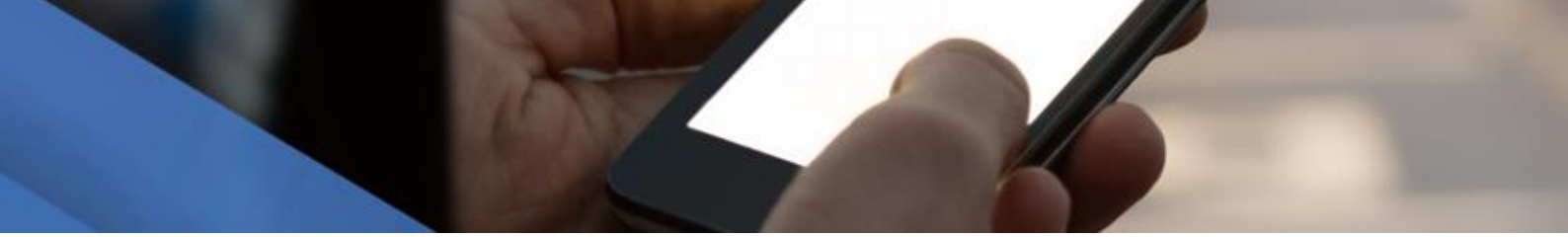
4.3 MaaS: a tool to rethink the financing of urban transport

As part of the support measures for economic activities impacted by the crisis, states have had to examine compensatory funding for urban public transport. At a national level in France, the Group Of Transport-Organising Authorities (GART) has estimated the loss of revenue at €2.5 billion, resulting from both the drop in passenger numbers and the reduction of 'mobility payments', a payroll tax due by companies that employ more than 11 people. In addition to the reduction in revenue caused by the fall in the number of jobs, there is another source of economic fragility: the mobility payment is a production tax, a form of levy that the government wants to reduce in order to improve the situation for businesses. Even without the complete absence of mobility payments, questioning the evolution of funding models for urban public transport is inescapable.

The case of France is unique in the sense that - thanks to mobility payments - commercial revenues represent a decreasing share of public transport resources. However, this special situation is also part of a wider problem. If, in future, commercial revenues decline without public transport also reducing its capacity, where will the funding come from? There are two possible response options. The first would be to broaden the scope of potential resources. The second is to review the pricing principles.

- With broadening the scope of potential resources, there are fees and/or taxes allocated to public transport without being linked to their use. The French mobility payment system falls into this category, but a share of the revenue from urban tolls can also be found in cities such as London, Oslo or Stockholm. This model was also recently chosen by the city of New York, which is faced by a metro network desperately in need of renewal. The development

[12] Pendyala, R.M., Goulias, K.G. and R. Kitamura (1991) Impact of telecommuting on spatial and temporal patterns of household travel, Transportation, 18 (4) 383-409.



of MaaS is an opportunity to raise, on the public policy agenda, the issue of pricing for car use in urban areas.

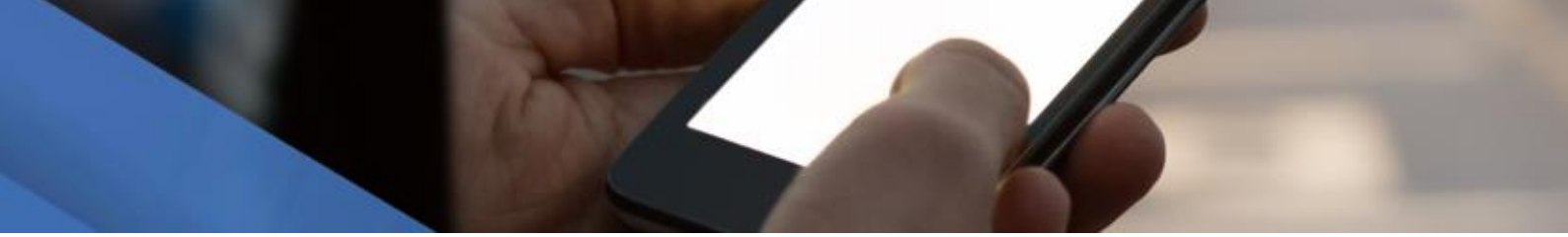
- It is surprising to note that the 'polluter pays' principle is not implemented in the field of mobility, yet it is integrated into the management of household waste, drinking water or electricity production. In the latter case, consumers pay considerable sums in their utility bill that are intended to finance the development of renewable energies. Why is this principle not implemented in urban areas, despite the fact that the precise measurement of external car costs have been shown to be considerably higher than fuel tax revenue, as per the European Commission's 2019 "Handbook on external costs"?[13] To address this problem, there must be a much-needed broadening of the role of OMAs. Crucially, the electrification of the vehicle fleet will require the establishment of specific pricing for electric vehicles, as is the case in the territories of South Australia and Victoria.[14] This is an example of future development - the use of pricing to regulate road usage in urban areas.
- The above future development model particularly concerns France, where the mobility payment has acted as somewhat of a barrier to this route. The margin squeeze that PTAs currently face must lead to a reopening of this debate. The great advantage of mobility payments is that they constitute a set revenue, one which has made it possible to finance the modernisation and extension of the networks. Its main flaw, however, is that it is a payroll tax, which creates threshold effects that are detrimental to business development and employment. Thus, the French 'model' of a public resource allocated to public transport may be of interest to European countries faced with declining commercial revenues from public transport. However, the basis of this resource should not be a simple payroll tax, as this also allows companies to take less responsibility; they pay the tax and no longer feel concerned by the process of employee commutes.

- This ultimately leads us to the question of principles of public transport pricing. As previously indicated, the free-use solution is valid for those small networks that are used scarcely and require little investment. However, when the financial needs are substantial, and as new mobility services develop, the appropriate pricing is necessary to ensure that the funding matches the demands. But on what basis should this pricing be established? What about the principle of flat-rate pricing implemented in many networks via subscriptions, which provide unlimited access to transport services, irrespective of the time (i.e. whether peak hour or not) or even the distance travelled? During a Panel of the International Transport Forum on the integration of MaaS in public transport, D. Hörcher and D. Graham[15] underlined the unwelcome effects of such systems. How can they be encouraged to evolve? There are several possibilities:

  - The first was presented by S. Proost during a Panel of the International Transport Forum,[16] held in Auckland in 2017. For him - just as it is necessary to charge for car use in urban areas - public transport users must be made aware of the costs they generate for the community when they travel during peak hours. With the digital revolution and MaaS, it is possible to set up incentive systems to reward those commuters who are willing to favour off-peak hours and, at the same time, charge more during peak hours.

  - Using the same logic of tariff modulation, one could also envisage varying the tariffs according to the quality of the service provided and, in particular, the speed of travel.

[13] https://ec.europa.eu/transport/themes/sustainable-transport/internalisation-transport-external-costs_en.
[14] https://www.lesnumeriques.com/voiture/l-australie-impose-une-taxe-au-kilometre-pour-les-vehicules-electrifies-n157575.html.
[15] https://www.itf-oecd.org/pricing-and-efficient-public-transport-supply-mobility-service-context.
[16] https://www.itf-oecd.org/reforming-urban-transport-pricing.



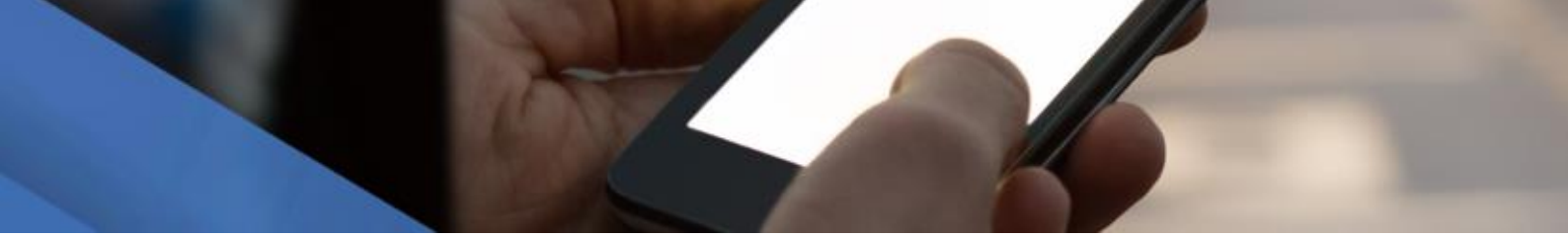
The question particularly arises in the Ile-de-France region, where the Grand Paris Express lines will make it possible to travel long distances at high speeds.

- Taking distance into account is a common practice in many networks like the one in Washington. In countries like South Korea or Taiwan, it is common to have to use a badge or pass when entering and exiting public transport. The price applied then takes the distance travelled into account. The same system also makes it possible to penalise the use of public transport for trips that are too short and thus encourage walking.

These different methods of determining public transport fares must, of course, be designed to take issues of equity in mind. Commuters do not all have the same capacity to pay. There have long been questions asked about the unfair nature of having a single price, one that is the same for all, regardless of income. The response was to develop pricing that takes household income into account. Such solidarity pricing already exists in several French cities. The price of the monthly subscription can vary from one to five, or even one to ten, depending on the income per household. This broad scale can greatly improve the acceptability of tariff modulations depending on distance, speed or degree of congestion, which will soon be essential in order to make the regulation of urban mobility more efficient.

5

DIGITALISATION AND REGULATION OF URBAN MOBILITY



5 Digitalisation and regulation of urban mobility

In terms of the pricing and financing of urban public transport, the digital revolution opens up new potential approaches. It can be accompanied by the establishment of more efficient incentive systems to regulate public transport rush hour flows. This approach can be applied to all measures for regulating urban mobility. Digitalisation can not only support the technical innovation of vehicles (electrification, automation, etc.,), but also decarbonisation, the development of new services, and so forth.

The last section of this report will therefore attempt to use the insights raised in the preceding pages to answer two simple questions. **How can the digital revolution help in implementing new urban mobility regulations? How can data platforms and apps facilitate the profound changes outlined in large cities' climate commitments?** By answering these questions, we can determine the main components of a digital roadmap for OMAs.

To do this, we must remember that data governance must be shaped in a way that collectively optimises mobility services. These will have to change significantly in the years to come, which will require new regulation for urban mobility.

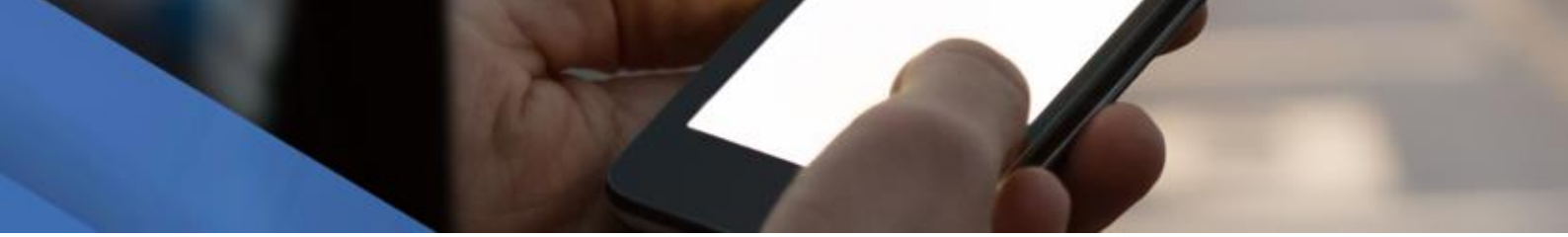
5.1 Data management

The low market share gained by shared mobility reveals that it does not deliver an improvement in mobility for the vast majority of commuters. The low success of apps among the public (Ramboll 2019) leads to the same conclusion. **There is a risk that the digital revolution will remain an epiphenomenon, generating only marginal changes. If the objective - in view of climate commitments - is to push for profound change, one must return to the evidence that public transport is, and will remain, the backbone of urban mobility**. MaaS in metropolitan areas must therefore be built on this basis, and therefore logically both OMAs and public transport operators must play a key role. Databases are central to this, but here concerns over GAFA are disproportionate.

The concerns sparked by digital giants in the field of urban mobility stem from the idea that these firms have the technical and financial means to gradually expand their mobility services offer. Information for travellers (location, choice of transport and route) could be supplemented with accurate information on travel times, frequency, public transport timetables and delays, as well as ticket sales. Such a scenario is likely, as European legislation has been geared towards opening up data and sales channels to use competition to encourage players to improve their services and performance. In what way does this pose a threat to OMAs?

The answer lies in a brief theoretical detour into the economics of digital platforms. The economic analysis of two-sided, or multi-sided markets (Rysman 2009), has shown that in market economies, digital platforms pose two types of generic issues for regulation.

- The first concerns antitrust measures and the regulation of natural monopolies. In order to develop, a platform must reach a critical mass, so that increasing returns are put in place via network effects. Attempts to maximise network effects therefore risk resulting in the presence of a single platform, which will find itself holding a natural monopoly. This is currently the case for the social network Facebook, search engine Google and online sales platform Amazon.
- The second is regulation. How can the natural monopoly of platforms be prevented from leading to an unwanted situation? It is generally accepted that unregulated natural monopolies tend to apply sub-optimal pricing. However, the most important risk is to free entry into the market and propagating innovation. Thus, digital giants are sometimes presented as a hindrance to innovation because they have the means to buy out competitors that threaten their hegemonies (Hyppolite and Michon 2018).



How do these two problems relate to the mobility of persons, particularly in urban areas? The question is important because OMAs also have a regulatory role, in some cases setting the rules of the game.

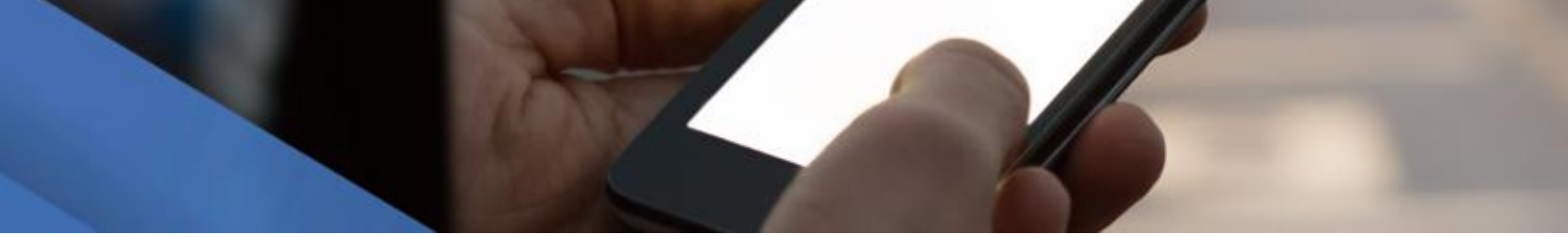
In terms of platforms, the difficulty for mobility services in reaching critical mass is more frequent than that of a monopoly. New mobility services need to address the narrowness of their market, which in turn further reduces the chances of achieving critical mass. This is the case for carpooling, electric scooters and even chauffeured car services. To date, there are a few cases of platforms that have succeeded in establishing themselves, attracting a large number of users; namely, Waze where motorists sought the best route available. However, the Waze model reinforces dependence on cars and monomodal routines.

These examples show that the question of data regulation arises in specific situations. The main concern for OMAs is not about promoting free and undistorted competition; that is the role and responsibility of national and European regulators. **The OMA must determine if and how a particular type of app and/or service contributes to the objectives of urban mobility policies**. Here are a few examples:

- Drivers using Waze's services are often highly satisfied with the information provided, which helps them avoid as much traffic as possible. However, all along the suggested routes, residents have complained about traffic tending to be diverted on to secondary roads. Just as Lyft and Uber services have led to increased car traffic in some American cities (Schaller 2018), a platform like Waze can also encourage to travel by private car. **Regulation has to balance the choices made at a local level in terms of road management (traffic plan, pricing, etc.,) against those made at a national level on the use of such apps (see above).**
- A similar observation, but in reverse, can be made for carpooling. If the objective of public policies is to increase the average fill of vehicles, then local public policies must encourage this type of service to develop. To do so, dedicated roads can be established, meeting areas set up, or even drivers or passengers subsidised. With such measures, they can help this type of activity reach critical mass. Here, the main objective is not to control the platforms but to **know how far public policies can be pushed in order to discourage solo car use and encourage carpooling**.
- **Sharing public space between different uses is also a key issue for free-hire bicycles or scooters.** Many start-ups have offered this type of service in a wide array of cities, but have rarely been successful. Due to multiple failures – reaching critical mass, vandalism, and higher operating costs than expected – economic models remain fragile. The negative effects on health and safety (accidents) and on the use of public space, in particular pavements and places of conflict with pedestrians, must also be taken into account. Local authorities therefore have had to intervene, either to prohibit such services or to supervise them by limiting the number of operators and setting rules on road use.

These examples highlight the fact that – faced with the digital revolution – reticence must be turned into action. If OMAs or local authorities are content to react by regulating or banning the arrival of new mobility services, the outcome will be more or less the status quo. On the contrary, OMAs could use the digital revolution to change the scope and shape of their action. To illustrate this approach, one can look at the projects underway in three pioneer cities: Helsinki, Vienna, and Oslo.

In a comparative study, particularly in the cases of Helsinki and Vienna (CEREMA 2019), it was shown that in these cities, all local and regional public transport (buses, trams, subways, regional trains, etc.,) are accessible via a single app. In these urban areas, public transport has long been integrated into a single transport network, both for information and ticketing. However, beyond these common aspects, comparisons between these cities confirm that there are different ways of implementing MaaS.



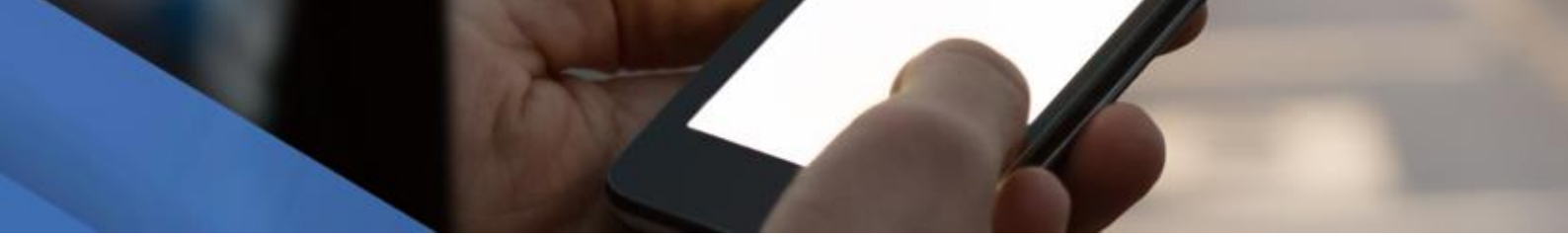
- Helsinki demonstrates a 'bottom-up' integration model, undertaken by a private actor (MaaS Global) offering its app (Whim). This is now also available in other cities in Europe.
- Oslo's system, meanwhile, is based on a 'top-down' logic of aggregation, following the leadership of RUTER, the OMA, whose main objective is to reduce car traffic. In Oslo, public transport and roads fall under the authority of the same deputy mayor. At a lower administrative level, however, they are still managed by two separate entities. There is also a congestion charge in Oslo, the revenues of which cover around 20% of the costs of the public transport system. Many traffic restrictions have been put in place, in particular to limit the circulation of vehicles equipped with internal combustion engines. This management of public space gives priority to the circulation of pedestrians, bicycles and public transport. The result is that car traffic is notably low there in comparison with similarly-sized European conurbations (A. Tenoy & O.H. Hagen 2019).
- Vienna has chosen a middle-ground solution between integration and aggregation. The MaaS WienMobil service is offered by the transport operator Wiener Lienen. Here, MaaS is both an example of integration by the public transport operator and of cooperation between them and the OMA. The local authority has set up a platform, developed by a subsidiary of these two public entities, in which data on various mobility services (timetables, choice of route, ticket office, etc.,) is integrated.

The example of Vienna and certain responses to the survey have led us to elaborate on the observations made in the 2019 report. Here, we stated that there were two possible models for integrating the data needed for the operation of mobility platforms: either a 'bottom-up' approach and the actions of one or more private entities; or a 'top-down' aggregation, enacted by public authorities.

The case of Vienna, and also that of the Brussels-Capital Region, has demonstrated that there is a third, intermediate option. In this, the public authority delegates their aggregation objective to the public transport operator. These three models in turn lead to three different forms of data governance.

- With the 'bottom-up' strategy, a commercial integrator signs a separate contract with each mobility provider to resell their services. The OMA does not participate in any of these agreements, nor the management of the platform. There are two symmetrical risks with this approach. Either the private operator enters a monopoly situation, and the regulatory power of the public authorities becomes very weak, or the operator fails to achieve the required data integration and the MaaS remains uncompleted.
- With the 'top-down' strategy, an open public platform centralises data from all mobility services and makes them available to all stakeholders. This structure includes different operators, whether it is a technology integration company or a mobility operator. Public regulation is limited to providing the same level of information for everyone, with competition remaining between the different mobility providers.
- Delegating the job to a public transport operator is a particular form of aggregation. The public transport operator brings the benefits of its expertise on the most structured modes of mobility. It also has a powerful and historical link with the local community, who trust it to turn MaaS into reality. But, in this case, two risks also exist: an asymmetry between mobility figures and a weak capacity for the public authorities to govern data.

Consideration of these three cases highlights the need for OMAs to address the issue of a common data platform. As underlined in the third section (Figure 4), the establishment of a common platform by a trusted third party that represents the OMA is the key to an effective MaaS. The OMA digital roadmap stems from this founding action. This is because once this responsibility of the OMA is established in the 'back office', it is possible to open up competition for the 'front office', particularly,

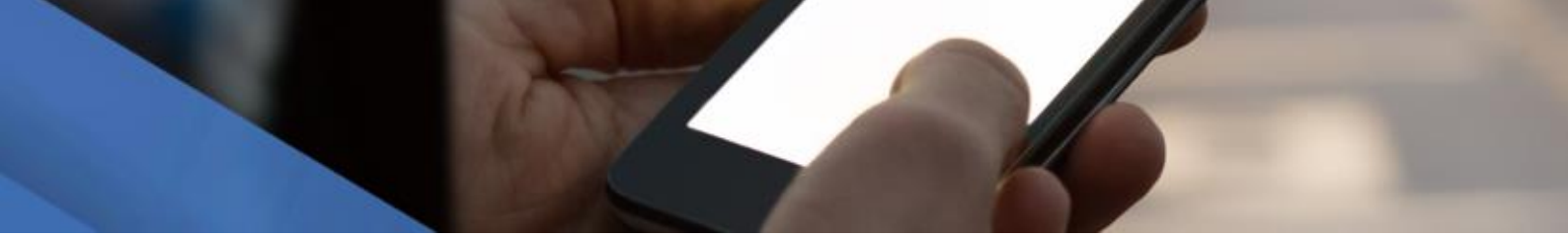


but not exclusively, for apps. The mobility services offered to residents must correspond to the general objectives of the OMAs, each of which has their digital version.

5.2 Digitalisation as another regulator of urban mobility

The digitalisation of urban mobility is not an objective in itself. Nowadays, it is found at the heart of many projects and debates without truly recognising what is at stake, aside from the "seamless mobility" slogan. It is now necessary to give meaning to this revolution. The core issue is not saving transport time for commuters; it is to enable the changes required to establish inclusive urban mobility that is also consistent with the climatic and environmental commitments of large conurbations. Once the issue of data platforms has been addressed - which are to be developed as a public good under the responsibility of the OMA - the OMA digital roadmap is organised around four issues.

- Multimodality is the first issue to address when regulating urban mobility. The OMAs can no longer limit their presence to the inner city centre, controlling the modal share between public transport and the private car. They must broaden their scope by taking new mobility services into account. The digital revolution plays a major role here, via applications that will help limit the costs of multimodality. It is essential to broaden the range of available options in terms of mode, route or period of travel. It is equally essential to explicitly state the constraints implied within the paradigm of sustainable mobility. We must evolve in our thinking when it comes to apps. Apps are not magic wands intended to reduce the general cost of travel, but a means of supporting the load-shifting that multimodality will impose. As the Oslo example shows, regulation of urban mobility needs first to be considered within its wider context, by defining the types of service to be set up for different origins and destinations (within the city centre, radial or concentric). Traditional public transport plays a major role here by innovating the offer; express buses on motorways, reserved lanes for rapid access to heavy forms of transport, etc. In partnership with new entrants to the market, it is also necessary to offer additional services such as carpooling (with a reserved lane) or free-hire bicycles.
- Controlling the use of public space is next to consider when regulating urban mobility. To make the overhaul of transport supply feasible - to reduce dependence on cars - the OMAs must take control of regulating road traffic. The same authority that will delineate public transport supply should also be responsible for the division of road space between different modes of transport and the regulation of traffic. Any impediment to these two entities cooperating must be abolished, because - in urban areas - public space is the scarcest resource. Public space should be allocated according to general objectives, not based on some insignificant timesaving for motorists. For MaaS to be a tool at the service of public policies, it must not operate 'above ground'; the physical aspects of travel must be considered before defining its digital features. MaaS must therefore be built to encourage commuters to abandon certain routines. The integrated information and marketing systems for transport tickets will only achieve their objectives if the physical alternatives to individual cars function properly. As such, MaaS can help put in place pricing policies that will penalise private cars and, more generally those modes of transport that are most harmful to the environment.
- Funding is the third factor to consider when regulating urban mobility. The development of an enhanced public transport supply assumes the availability of new public funding, including for new mobility services. Other social demands (education, health, safety, etc.,) compete for these public funds. Besides, it is not possible to constantly increase taxes on households and businesses. Therefore, if general taxation were the only financial assistance available to meet the new challenges of mobility, changes would be strongly limited by a lack of resources.
- The question of the quantity of resources required presents a further issue to consider: pricing. Not simply because of the revenue it raises for the OMA, but above all because of its

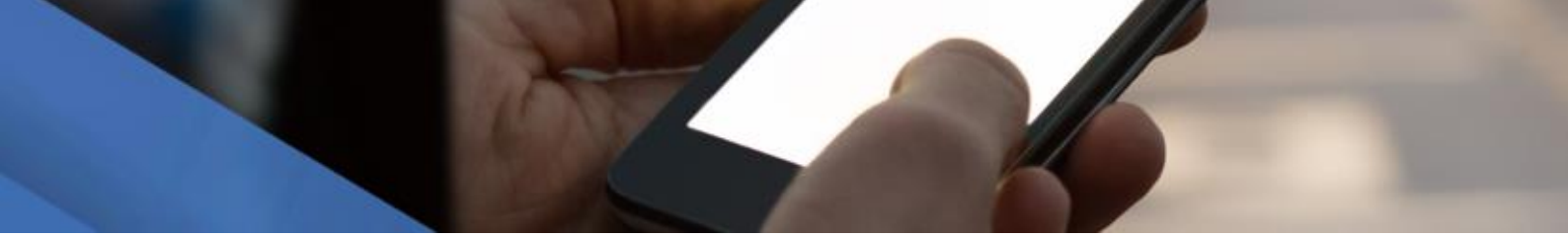


ability to encourage users to adopt virtuous behaviour; reducing trips during rush hour, avoiding overly long distances, or limiting the use of private cars. The pricing of mobility on the whole, including the car, must therefore be considered. A MaaS that would focus only on public transport, without dealing with the automobile, would not help regulate mobility in the suburbs, where the private car remains dominant. However, traffic regulation cannot be limited to prohibition and regulation. Indeed, these two instruments rely on the idea that the automobile could be fully eliminated from the landscape. This is not the case in sparsely populated areas. It is therefore because the private car remains at the heart of a practice that its use must be regulated through pricing. This issue of regulating and pricing car mobility in urban areas should become a key issue for the coming years in establishing MaaS. The 'urban toll' solution, suggested decades ago by economists, must be approached in a new way (Crozet and Mercier 2017). But it remains a work in progress.

Of course, at the heart of the OMA digital roadmap are the issues of data and apps. Here, it is necessary to distinguish the 'front office' from the 'back office'. Information to travellers and the sale of tickets need not remain part of a monopoly. But, for competition between apps and between operators to remain healthy, the OMAs need to establish clear rules for the 'back office'. They must develop new skills and reinvent themselves as a 'trusted third party', capable of offering all stakeholders' data integrated into a platform that ensures equal rights and duties for all. But this platform, and the rules of the game, should not be dismissed. **It must respond to the three key challenges of multimodality; controlling the use of public space, financing and smart pricing. MaaS is, above all, a means of responding to these challenges.**

6

CONCLUSION

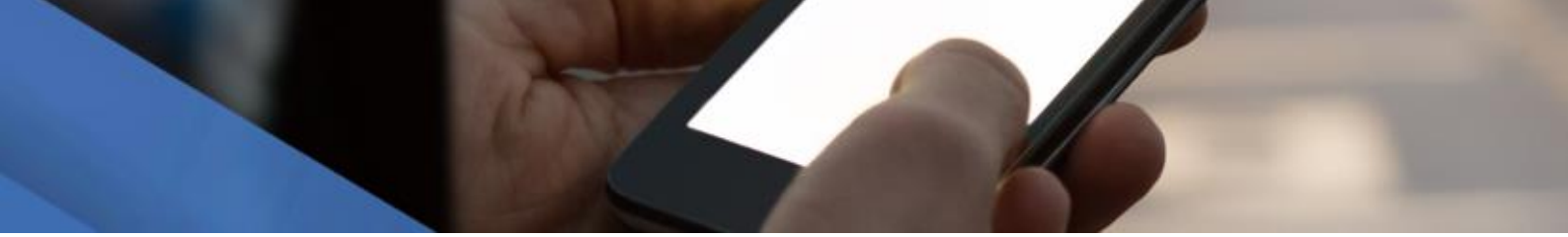


6 Conclusion

At the start of 2020, issue No. 519 of the journal "*Transport Infrastructure et Mobility*" devoted an edition to the relationship between digital technology and mobility. Its title "Back to Earth" neatly sums up the essence of this report on the digital roadmap of OMA in urban areas. In a way, we have reached a similar conclusion to that of the 2019 CERRE report on new mobility services. These services, as we then reported, were confronted with several structural limitations, the primary risks being that they would remain perceived as simple 'gadgets', the fragility of the economic models, and the risk - if successful - of conflict with the objectives of public policy.

The same applies to those applications that are supposed to revolutionise mobility-related behaviour. Presented as the 'armed wing' of MaaS, they now face a low rate of use, financing problems, and the risk of reinforcing single-mode automobile routines. **For the digital revolution to be fully exploited, MaaS must be considered as a way of managing the common good - public space - through the creation of another common good; a public data platform.** As public transport will remain the backbone of urban mobility, the public data platform will become a key component of public policy. **The combination of public transport supply and a data platform is the formula that will allow OMAs to develop multimodality**. This can be achieved by mastering the use of public space - notably through pricing - which will also be a channel for funding. As the saying goes, the ends justifies the means!

ANNEX AND REFERENCES



Annex

As the 'Digital Roadmap' project focuses on the issue of data and platforms, the survey begins with a series of open questions on practices and strategy. This is followed by both closed and open questions, making it possible to specify the expectations and the remaining issues on each of the four themes of the study. Depending on responses after one or two working sessions, we will see which themes take priority for development in the report, in relation to the information collected from other organising authorities.

1. Presentation from our partner on the issues of platforms and data

Do not hesitate to give detailed responses.

Have you put a data platform policy in place? If so, which one?

What is the origin of the data present on the platform?

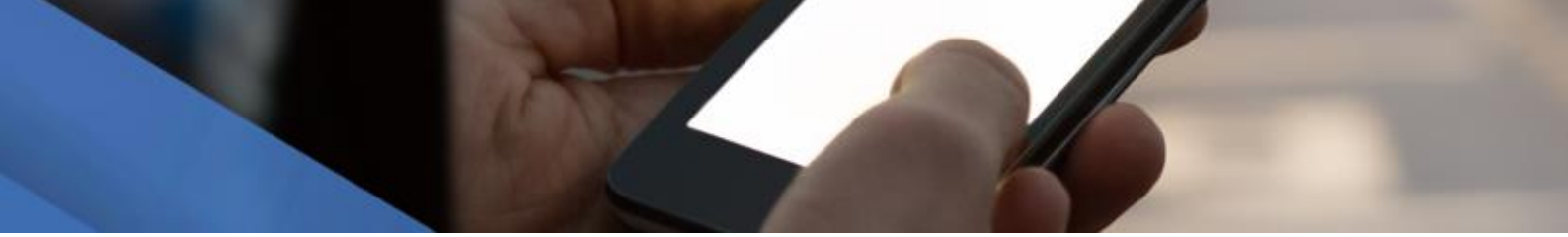
Is this platform open? Do other users have access to it?

Is access to data by other users charged for?

If there are other users, do they have to meet particular specifications? Do you know what use they make of the data?

Have you seen the emergence of any particular "business models" based - at least in part - on the use of this data?

What lessons have you learned from possible successes and failures?



2. Questions targeted on the topic of the project

Item 1: Pricing and Ticketing

Question 1: What is the relative importance of this topic to you?

- ☐ The most important of all
- ☐ Priority
- ☐ Secondary importance
- ☐ Not important

Can you expand on your answer?

Question 2: If for you this theme deserves special attention, then:

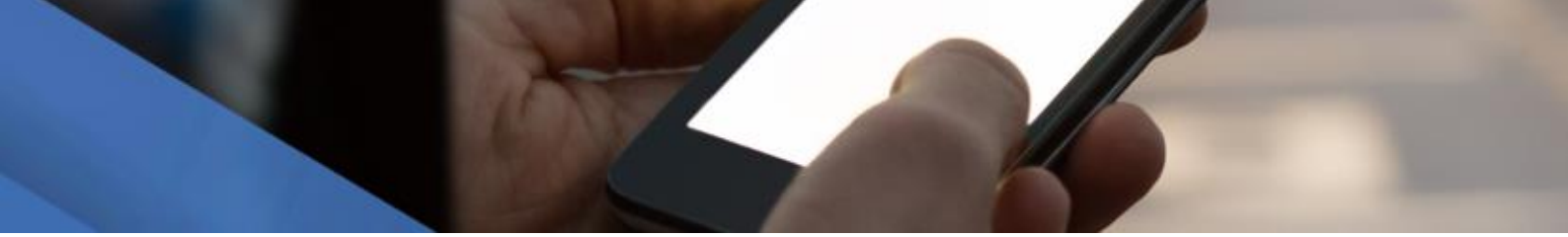
What are your expectations in this field? Is the current situation satisfactory, or are there plans to amend it? How can the new rules, in terms of open data and sales channels, be a game-changer?

Do you have one or more experiences specific to this area? If so, which, and what lessons have you learned (strengths, weaknesses, successes, failures)?

Question 3: In light of the above, what are the key questions for you?

What are the key issues to be addressed in order to improve things? What strategy have you developed with the new mobility players?

What changes in practices or regulations would be necessary?



Item 2: Regulation of open data

Question 1: What is the relative importance of this topic to you?

- ☐ The most important of all
- ☐ Priority
- ☐ Secondary importance
- ☐ Not important

Can you expand on your answer ?

Question 2: If for you this theme deserves special attention, then:

What are your expectations in this field? Is the current situation satisfactory, or are there plans to amend it? How can the new rules, in terms of open data and sales channels, be a game-changer?

Do you have one or more experiences specific to this area? If so, which, and what lessons have you learned (strengths, weaknesses, successes, failures)?

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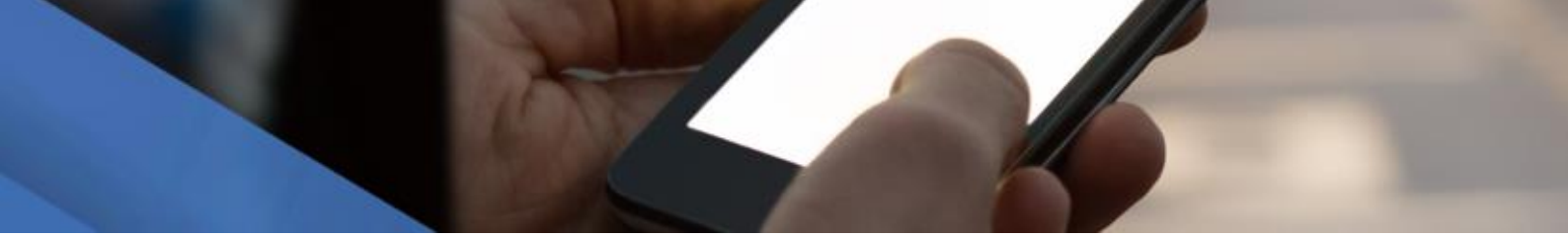


Item 3: Business models of new mobility services providers

Question 1: What is the relative importance of this topic to you?

- ☐ The most important of all
- ☐ Priority
- ☐ Secondary importance
- ☐ Not important

Can you expand on your answer ?

Question 2: If, for you, this theme deserves special attention:

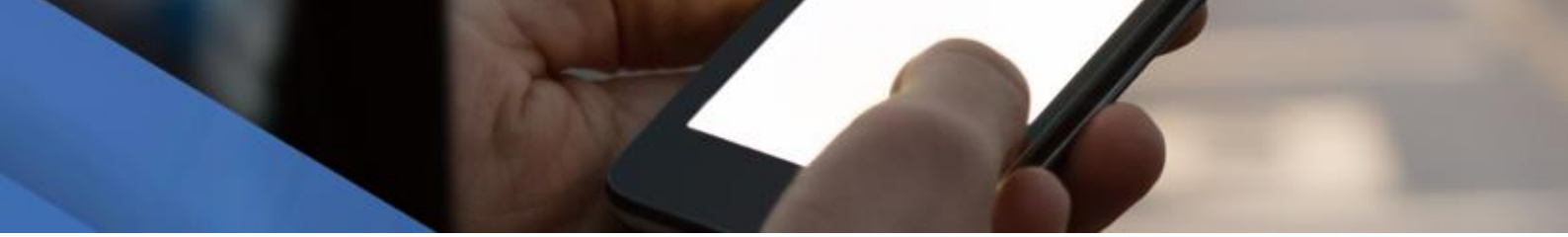
What are your expectations in this field? Is the current situation satisfactory or are there plans to amend it? How can the new rules in terms of open data and sales channels be a game-changer?

Do you have one or more experiences specific to this area? If so, which, and what lessons have you learned (strengths, weaknesses, successes, failures)?

Question 3: In light of the above, what are the key questions for you?

What are the key issues to be addressed in order to improve things? What strategy have you developed with the new mobility players?

What changes in practices or regulations would be necessary?



Item 4: New roles, new skills for the regulators

Question 1: What is the relative importance of this topic to you?

- ☐ The most important of all
- ☐ Priority
- ☐ Secondary importance
- ☐ Not important

Can you expand on your answer?

Question 2: If, for you, this theme deserves special attention:

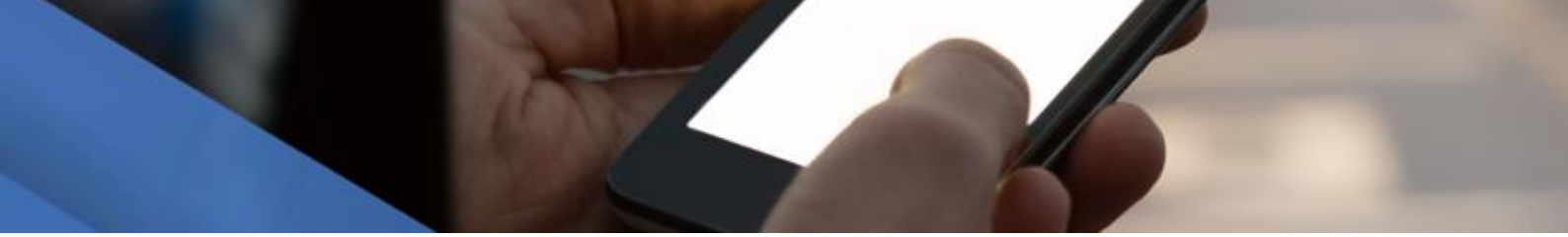
What are your expectations in this field? Is the current situation satisfactory or are there plans to amend it? How can the new rules in terms of open data and sales channels be a game-changer?

Do you have one or more experiences specific to this area? If so, which, and what lessons have you learned (strengths, weaknesses, successes, failures)?

Question 3: In light of the above, what are the key questions for you?

What are the key issues to be addressed in order to improve things? What strategy have you developed with the new mobility players?

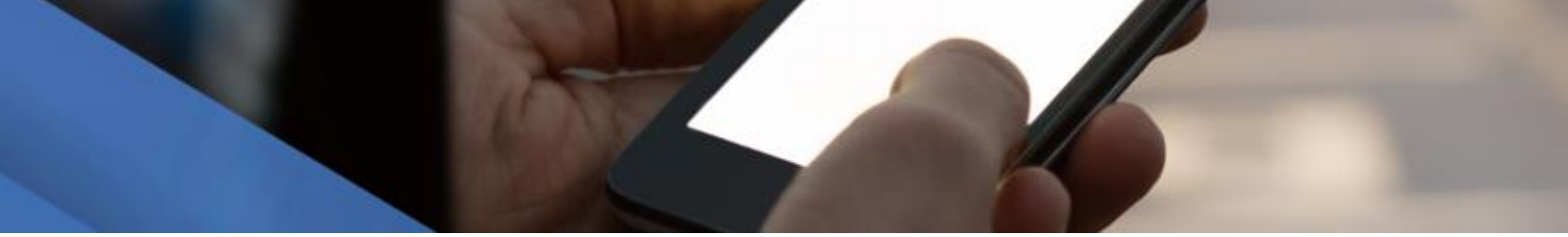
What changes in practices or regulations would be necessary?



Item 5: Impacts of COVID-19 crisis

What impacts could the current health crisis have on:

- Public transport use and pricing,
- The business models of old and new "mobility providers"
- Mobility behaviour?



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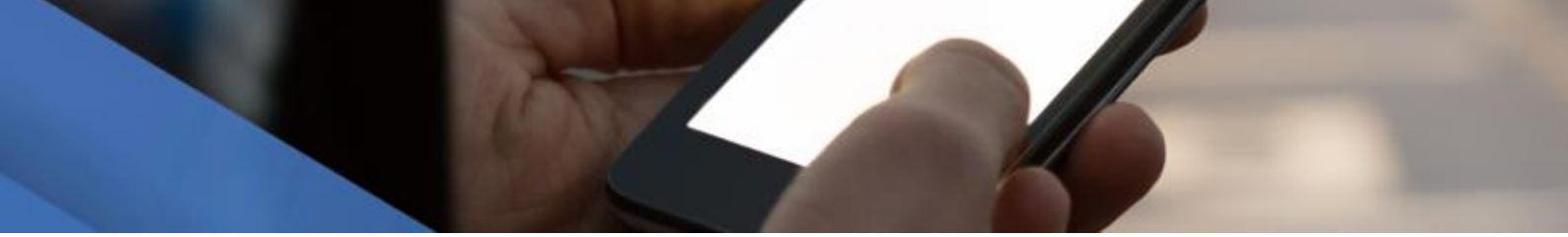

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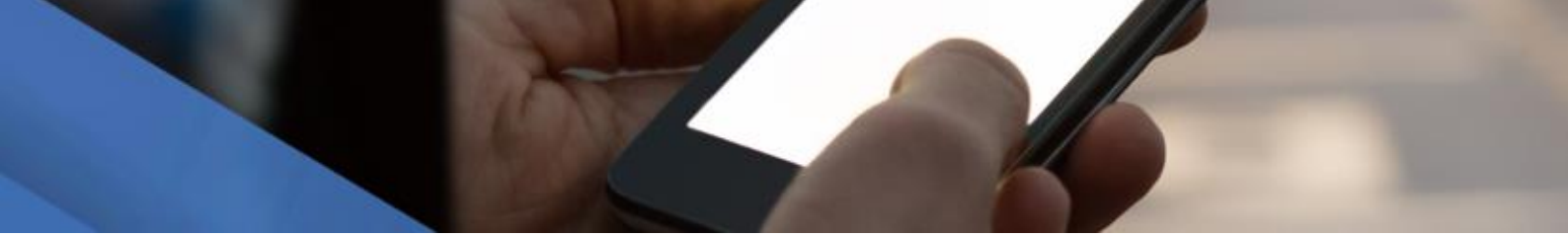

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cerre

Centre on Regulation in Europe

Avenue Louise, 475 (box 10)
1050 Brussels, Belgium

+32 2 230 83 60

info@cerre.eu

cerre.eu

@CERRE_ThinkTank