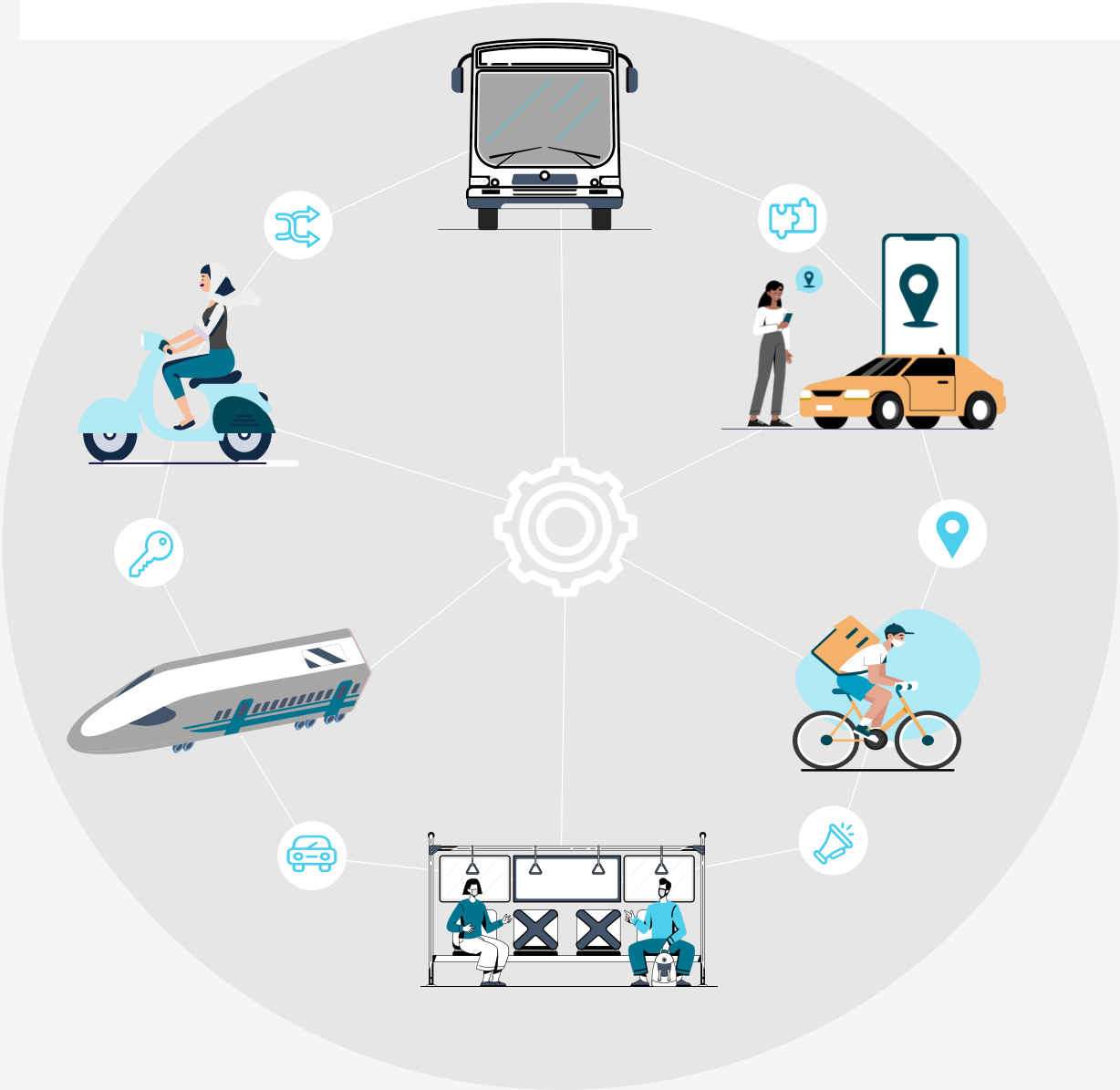
Time to Reinterrogate our Mobility Ecosystem

Sept 2022



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Introduction:
Time to Reinterrogate our Mobility Ecosystem

Now is a great time to question our transportation networks – the way we move around or move things around us – and (re)imagine the future of mobility. The global covid-19 outbreak has made us stop for a moment, listen and has given us some time and perspective.

From growing fast-moving cities in 2019, we went to empty streets in 2020 and, since then, the levels of mobility are slowly rising up. These months of limited mobility have made us realize that the way things were are not necessarily the way things have to be. It has opened the door to alternative ways of thinking and push forward some notions like no-mobility or immobility, proximity and quality of life in cities.

It has also given us time to breathe and take a new look at the transformations that were already underway before the pandemic. The “revolution” or “disruption” in the mobility sector driven by technological breakthroughs (electrification, automation, MaaS*) is now more understandable and rather appears as a decade of transitions.

This paper will take you through these main changes driven by diverse players and their underlying challenges.

** MaaS: Mobility as a Service*

#1 2020s: a decade of transitions in the mobility sector

The traditional ownership model questioned

Challenging the traditional car ownership model is at the core of this step-by-step transition. Over the last century, OEMs and governments have largely pushed one model – the individual ownership, fossil fuel-powered and manually operated model – through the massification of car production, the construction of the physical infrastructure required by cars (road, bridge, tunnel, parking) and its matching funding system (parking ticket, toll, taxes), as well as the enforcement of driving laws.

Globally, this mixed private-public system in which consumers pay for their vehicles, while public bodies pay for the infrastructures and systems that enable their use, has largely contributed to the development of automobiles. The global motorization rate has increased from 20 vehicles per 1000 inhabitants in 1950 to approximately 143 in 2015[1] In Western countries, this rate rises above 550 vehicles per 1000 inhabitants with the United States culminating at 837 in 2018.

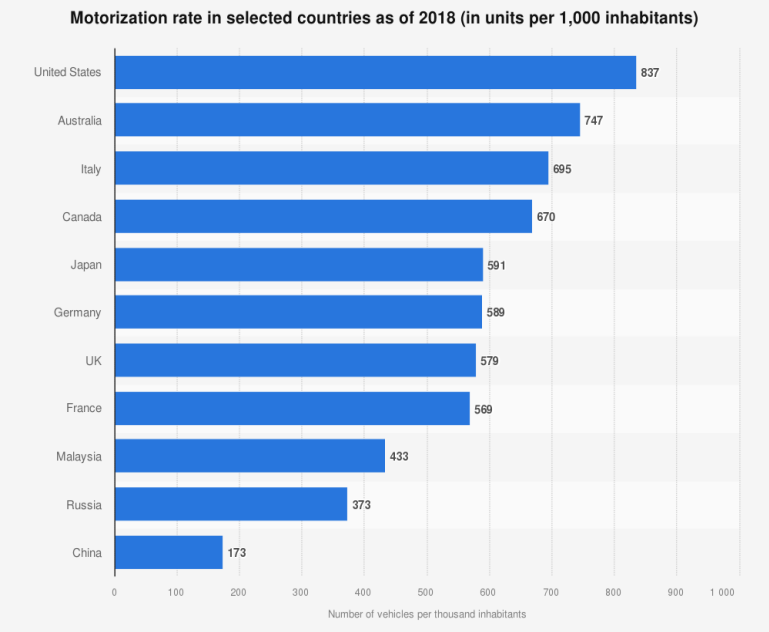

Figure 1: Motorization rate in selected countries as of 2018 (in units per 1,000 inhabitants) | Statista 2021

But, for the past decade, the use of individual cars has been largely questioned by the numerous side effects it raises, among which accidents, congestion and massive pollution with the emissions of harmful gases like carbon monoxide, ozone, carbon dioxide, benzene and particulate matter. According to the World Bank, transport represented 42% of CO2 emission in France, 21% in Germany, 35% in Spain, 18% in Japan, 53% in Sweden and 33% and United States[2].

The whole transport sector has entered a decade of transitions with digitalization, electrification, automation, shared mobility and MaaS to face the current challenges.

Main trends shaping the future of mobility

Digitalization, electrification and automation leading the way

Even though digitalization, electrification and automation are frequently associated and do share interconnections, they do not evolve at the same rhythm or place:

Digitalization has been one of the most persistent and notable large-scale trends shaping the modern era. It is a huge part of our daily lives, affects all sectors and shows no signs of slowing down whatsoever.

Electrification has reached a tipping point with the main OEMs now launching hybrid or electric vehicle ranges and the deployment of the charging infrastructure. It should from now on follow its growth and, by early 2030s, all the new vehicle fleet could be electrified. Ford Motor vowed in 2021 to sell only electric cars in Europe by 2030 by investing $1 billion in an electric vehicle manufacturing facility in Germany. General Motors declared that it will sell only emission-free vehicles by 2035[3].

As for the German automaker Volkswagen, it estimates that 70% of its brand's European sales will be electric vehicles by 2030[4]. The prolongation of the war in Ukraine can only accelerate this trend: the explosion of the price of crude oil (to over 110$ per barrel at the end of June 2022), will most certainly trigger an anticipated shift towards the purchase of electric or hydropower vehicles.

Automation, when understood as an optimization platform enabling the movement of people or goods with minimal human intervention, could be broadly used in the future. It could be key in suburban or rural areas to implement public transportation at a more affordable price – labor force being currently the main cost. For now, it is still facing some ethical, legislative and technological issues, and some key questions remain unresolved when it comes to autonomous vehicles: how autonomous and manually-operated cars will share the road? who will be held responsible in case of an accident: the driver, the automaker, or the insurance company? Moreover, according to the World Report on Metro Automation[5], more than 64 metro lines were automated in the world in 2018. More than 60 cities had automatic metros. In 2018, automated subway lines covered 1,026km and served 1,026 subway stations. Automotive metro kilometers are expected to triple by 2023. This automation is in very strong development in the world and does not limit itself to the metros. According to the global energy group Shell[6], trucks that transport goods are becoming increasingly automated. Although still being tested in the U.S., Australia is positioning itself as a world leader in driverless trucks and autonomous driving technology in the mining industry.

Covid impact on public and shared mobility: the regression to individual means of transport?

As for shared mobility and in general, the use of one means of transport or another, it is largely influenced by consumers' preferences and behaviors – which implies that its evolution is not linear.

In an initial phase, the use of individual cars has been associated with the myth of personal freedom and status (i.e. cars as cultural signifiers of independent travel and class distinction). However, with both the motorization rate and its negative side effects going up (e.g. congestion), these symbolic qualities tend to tarnish.

The role of car is consequently "shifting towards that of a personal space providing protection from a hostile outside environment (in terms of crime, weather, road-traffic safety, encounters with strangers and, paradoxically, air pollution) and 'cocooning' (through e.g. insulation and in-car entertainment systems)"[7].

This safety factor has been significantly reinforced because of the Covid-19 situation. All individual means of transportation – cars, bikes, motorbikes and new mobility engines like monowheels or scooters – are up compared to pre-pandemic levels across all markets.

On the other hand, public or shared transportation, including ride-hailing and taxis, are significantly below. Consumers are globally less comfortable when it comes to shared experiences and environments.

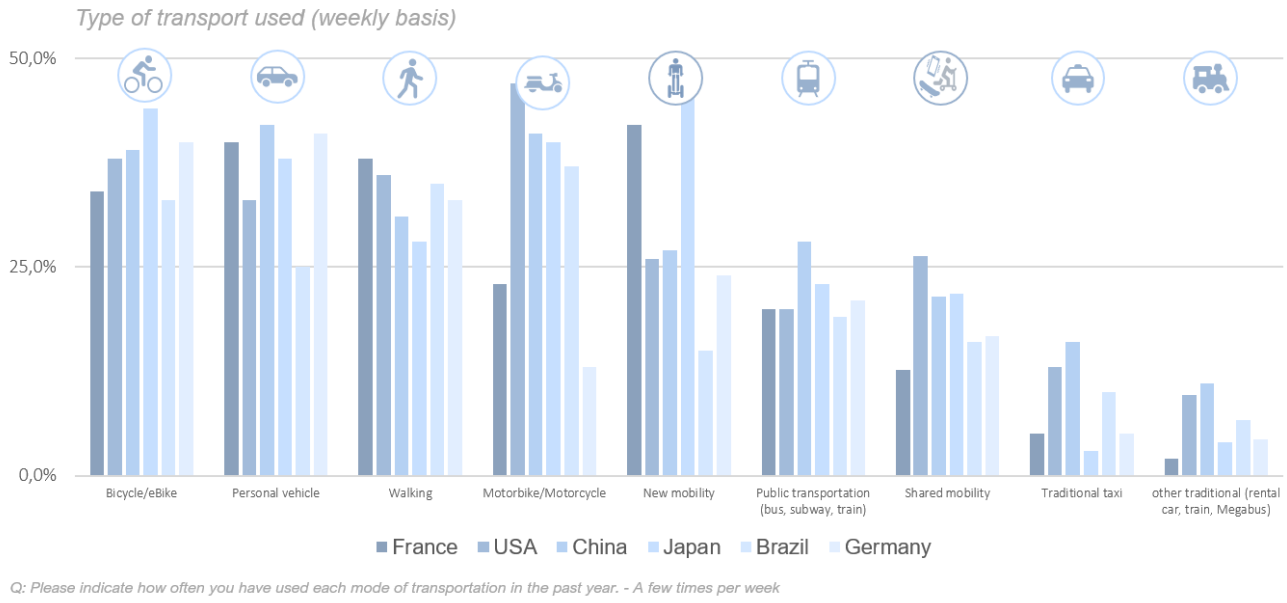

Figure 2: Navigator Survey - Oct. 2021 | Ipsos

Even since the end of the lock-down, it appears there is no massive comeback to the public or shared transportation solutions. It has yet to be verified whether this trend will continue in the long run or not and if so, how it will evolve.

Faced with rising fuel prices, many people around the world have opted for carpooling. In France for example, only 130 000 passengers were transported in June 2021 against more than 400 000 in June 2022[8]. The number of people using carpooling can therefore be explained by the increase in fuel prices.

> **I am convinced that 18 months of limited mobility has long-lasting effects on consumers 'behaviors. Some we already see, some we do not.**
>
> Alexandre de Saint-Léon
> Global Leader Automotive and Mobility Development | Ipsos

#2 The big game changer: the transportation systems in cities

Talking about “consumers’ preferences” implies they have choices, convenient and efficient options among which they can decide – which is not always the case. A lot of blame is put on the drivers when most of the problem comes from the design of our city’s streets.

It is crucial to focus first our efforts on transportation systems in cities since recent research shows that urban areas account for more than 70% of GHG emissions, of which 52% only come from 25 main cities. Stationary energy and transportation are the two main sources of emissions[9].

The city governance paradigm shift: from moving vehicles to connecting people

For a long time, cities supported the individual car ownership model *[cf. part 1.1]* by giving cars priority access to road space. The development of “pedestrian infrastructure” (zebra crossings, street crossing signals, pedestrian subways or bridges) had then the double goal of "making roads safe for pedestrians" while "keeping them out of the way" of motor vehicles[10].

Today, an increasing number of cities are reinterrogating their transportation system, taking back space from the car lanes and pushing alternative modes (bike, bus, pedestrian streets, subway etc.). In just a few years, San Francisco has become one of the most bike-friendly cities in the U.S. with no less than 464 miles of bikeways. The 2022 Sustainable Transport award-winning City of Bogotá now counts a fleet of 1,485 electric buses for its public transportation system – ranking the Colombian city among the three largest e-bus fleets outside of China[11].

> **Cities are re-examining policies and priorities to undo the mistakes of the past by focusing on connecting people, not moving vehicles.**
>
> Timothy Papandreou
> Founder of ETA (Emerging Transport Advisors)

Cities tend now to think about how much city street space and resources are required to move one person or one thing. These considerations have become crucial in a world facing population growth, urbanization and climate change.

As the urban density is rising, the space given to individual cars – specially to parking space – is reconsidered to make way for less space-consuming modes of transport and for more living space. A moving car needs 64m² when a bike only needs 2m². Two parking spaces are worth the size of a two-bedroom apartment of about 60m².

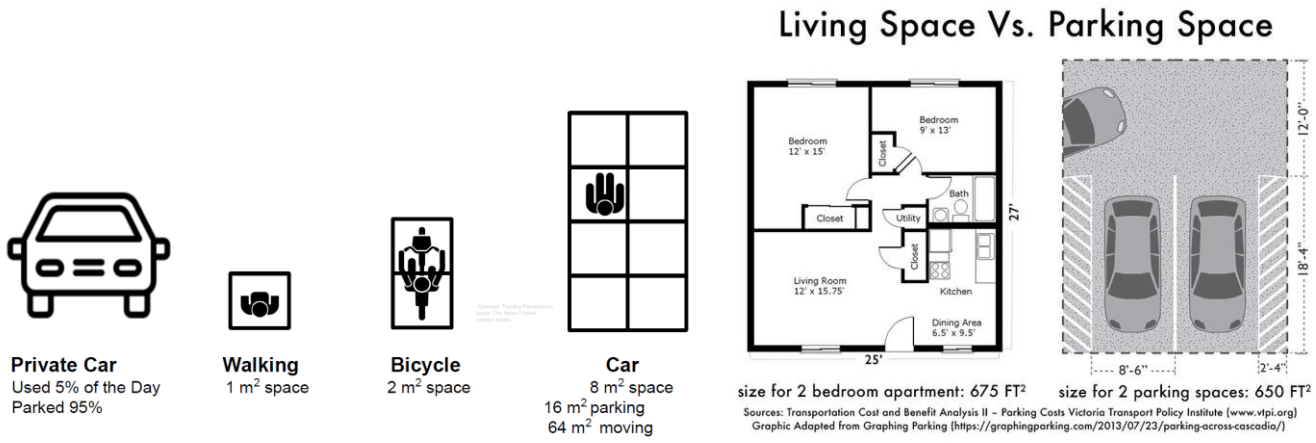

Figure 3. Concept: Timothy Papandreou. Icons: The Noun Project various artists

These initiatives on the part of cities are all the more important since the various levers for change in the mobility sector *[cf. part 1.2.1]* will not be enough if they are not combined with the right policies.

For instance, the sole electrification is not a viable long-term solution. The electrification of the vehicle fleet by 2030 should reduce by half our greenhouse gas footprint.

But this tremendous benefit could fade over time if the number of vehicles increases simultaneously, hence the need to work not only with electric vehicles but with matching policy tools: road, parking and curb pricing, walk/bike public transit and compact land use.

> *"What we have to do is work with governments and transport policies to create a package with every city in the world on road, parking and curb pricing, on building up the walk and bike public transport network and increase more compact land use.*
>
> Timothy Papandreou
> Founder of ETA (Emerging Transport Advisors)

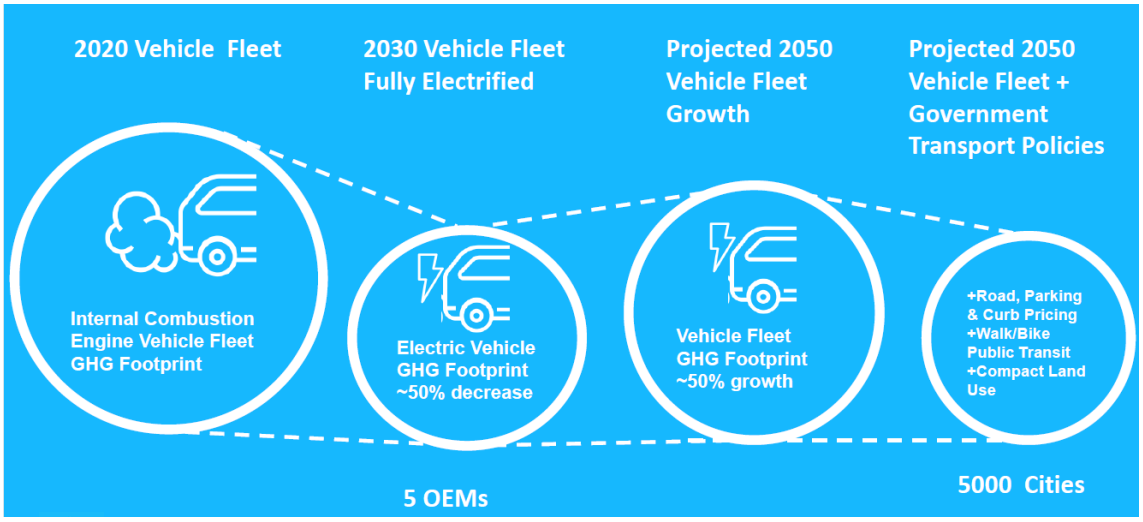

Figure 4. Concept: Timothy Papandreou. Icons: The Noun Project various artists

The missing piece: an effective MaaS ecosystem?

One of the main pain points facing today shared mobility users is that the means of shared mobility are not independent. One cannot serve for all purposes, unlike an individual car. People can easily ride a shared bicycle to go to work, but not to drop off their kids at school or visit their parents next town during the weekend. In that case, they would need a car-pooling option and a train subscription in addition.

In the end, consumers need a full ecosystem or "MaaS" (Mobility as a Service) ecosystem to access multiple transport modes and services through a digital platform for planning, booking and payment.

> *MaaS is a way to integrate new means of transportation into a broader ecosystem that will offer multiple options through one application.*
>
> Alexandre de Saint-Léon
> Global Leader Automotive and Mobility Development | Ipsos

Some technological developments have been made to move forward with this integrated model, such as IoT (Internet of Things), big data, digital wallet, blockchain, shared services, but there is still a long way to go. For now, several business models have emerged mainly in Europe and the USA, with players coming from different industries (e.g., digital players, transport operators etc.) developing their own solutions, often in competition with others. Several MaaS solutions, which integrate various means of transportation, often coexist in the same city (e.g., *SNCF Connect* and *Bonjour RATP* in Paris).

SNCF Connect[12] – the application launched in 2022 from the French railway company of the same name – enables consumers to buy long-distance train tickets (*TGV* and *Intercités*), regional and regional express train tickets (TER and RER) in Paris, as well as car rentals, bus trips and carpooling (*Flixbus, Blablacar*). The *Bonjour RATP*[13] application allows its Parisian users to buy tickets, consult the timetables in real-time, plan their routes and calculate their journey time (traffic alerts in case of disruption) among the following transport modes: bus, metro, *RER*, tramway, *Transilien SNCF*, *Marcel* ride-hailing, *Vélib* bike+, electric scooters, car with driver (*VTC*).

Nowadays, the levels of MaaS found in cities are levels, 0, 1, 2 and 3 for the most advanced ones, with higher levels being part of the medium to long term vision of most Western cities *[cf. table below]*[14].

> *A lot of the transformations we will see in cities are linked to MaaS.*
>
> Alexandre de Saint-Léon
> Global Leader Automotive and Mobility Development | Ipsos

Level	Description	Explanation
0	Base level, corresponds to existing status quo in most cities.	There are account base systems, where individual models of transportation already have a digitalized interface and the traveler has information available online for each type of transportation.
1	There is one-to-one integration between some private services.	Duets of services which start to develop joint offering (e.g., tolls + car park, private car + ferry, and car + ride bus services).
2	Integrate payment and ticketing across modes of limited public and private modes of transportation services.	At this level, greater integration occurs, although this time between a private operator and a public transport mode of operation. Integration shows promise, but other PT modes are skeptical and continue to remain aloof.
3	Unified interface single account used in multiple modes of transport services.	Instead of having multiple channels, interface is unified across the modes, provider, and services that the traveler finds necessary for journeys, which are provided by a single meta-operator through a traveler account.
4	All modes are integrated, private and public, including routing, ticketing, and payment.	Open data and standards are defined and commonly used by all transportation providers and MaaS meta-operators to provide services for travelers.
5	Active artificial intelligent choices are taken based on travels preferences and near real time data for ad-hoc changes to a journey.	Based on traveler-specific behavior and profiling, minimal (to none) intervention is needed by the traveler for an end-to-end journey—based on the traveler's preferences, past travel history, and filters.
6	MaaS connects beyond mobility, interfacing with internet of things (IoT), smart buildings, and smart cities.	As MaaS evolves, so do the other systems that are involved in the traveler's day, such as smart workspaces, smart homes, smart cities, and general services (e.g., food, groceries, entertainment, sport, culture) in order to provide convenient and seamless interface with the traveler's eco-system.

Source: Carlos Oliveira Cruz, J. M. (2020). "Mobility as a Service" Platforms: A Critical Path towards Increasing the Sustainability of Transportation Systems. Sustainability, 12, 63-68.

Who will lead the transformation?

The MaaS market is still open – with a greater visibility of technological players

For now, the market for MaaS is still extremely open since, apart from individual initiatives from some players there is no intent of complete integration of both private and public transport modes, including routing ticketing, payment at a large scale.

Who will then assume the leadership? When asked "what providers would be the most legitimate to offer multiple transportation and delivery services within a single application?", consumers are globally indecisive with a slight preference for technology providers (Google, Apple, Amazon) though – followed then by mobility providers (Uber, DiDi, Hertz), local public authorities and transportation providers and OEMs. It is partly explained by the importance of data management and AI to optimize transportation solutions, as well as the great awareness and reach of these global brands.

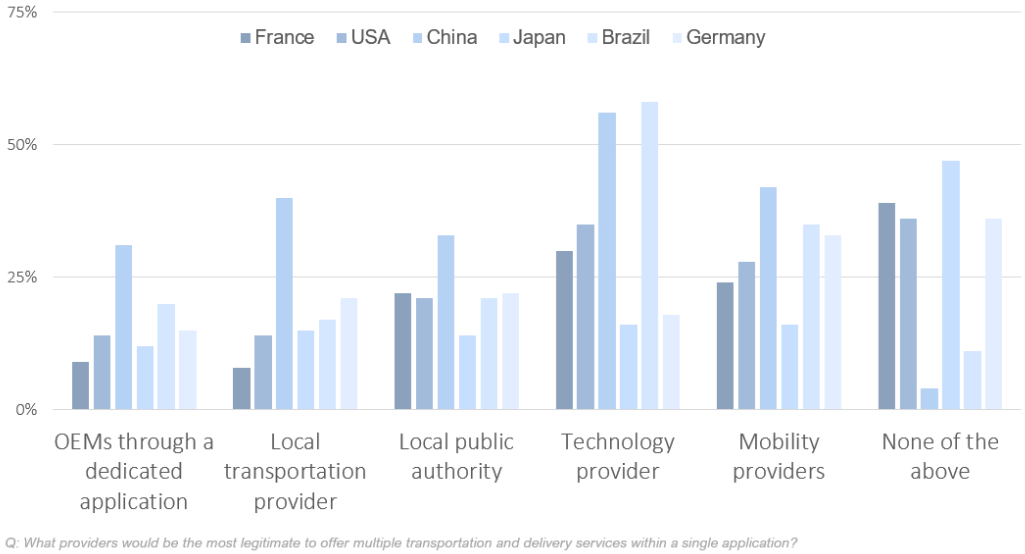

Figure 5: Navigator Survey - Oct. 2021 | Ipsos

Public authorities are holding the cards

In the end, public authorities, even if they are sometimes less visible than other players – especially in the case of local authorities vs. global brands – are the ones that pull the strings. They own the physical platform (bridges, roads, tunnels) and define where they allocate space on the streets.

Through their vision, they can give indications to the technological and mobility services players on what their priorities are and the path to follow to operate in their physical platform.

From a car-dependent vision, governments are now opening to a more integrated vision of the transportation system, where congestion management and public spending optimization are both goals to reach, as is promoting a more sustainable and inclusive mobility system.

> *When we have a street of five car lanes, it's clear that car ownership is the way we want to move things. But, if we have streets with protected bike lane, bus lane and walking streets, the signal are really clear that shared mobility is the priority. Governments create that priority.*
>
> Timothy Papandreou
> Founder of ETA (Emerging Transport Advisors)

For instance, the mission of C40 – a network of nearly 100 world-leading cities – is to "halve the emissions of its member cities within a decade, while improving equity, building resilience, and creating the conditions for everyone, everywhere to thrive"[15]. Among other initiatives, C40 mayors have recently integrated the "15-minute city" model in their common agenda. The concept, made popular by the urban planner Carlos Moreno, is basically to "find everything you need daily within a 15-minute walk or bike ride from home." Basic needs should include: housing, work, supplies, health care, and access to culture and sports[16].

Conclusion:
The road towards a policy of the virtual transport world

The mobility sector is moving – driven by technological breakthroughs, new consumers' behaviors evolving towards a more flexible lifestyle and a paradigm shift from decision-makers – towards a more sustainable and inclusive future. A consensus has been in a way reached around the desirable objectives to follow.

But, how do we now translate this vision and objectives into an efficient legislative and operational framework? How do we articulate the physical platform (i.e. streets, bridges, tunnels etc.) and the virtual one (i.e. services, connections) that will be key to the MaaS of tomorrow?

Public authorities have already dealt with the regulation of their physical platform by defining economic (investments, control of routes, customs etc.), safety (speed, labor regulations, security) and environmental (GHG) issues. But when it comes to disruptive technological mobility services providers, they tend to adopt a reactive posture rather than a (pro)active one by voting measures bit by bit. For instance, Uber is trying to come back to Barcelona after having withdrawn a second time its services in 2019, following the application of a norm of the *Generalitat*, which required users to book the vehicle 15 minutes in advance.

However, we would like to highlight an encouraging sign in France with the adoption of the Decree n°2022-1119 of August 3, 2022 relating to the digital services of assistance to travel[17]. The adoption of this decree shows that the public authorities are moving more and more towards soft and shared mobility because it obliges the digital actors to communicate and encourage these mobilities. It is a progress in this field because they encourage to raise awareness, to facilitate travel by means of at least shared transport services and soft mobility and try to make information more accessible.

We believe all players could benefit from a clear framework of the virtual transport space that establishes the concrete conditions to operate and thrive. It would imply to overcoming various tricky challenges though, especially in terms of data privacy and data sharing.

Both public and private actors have access to a large amount of data but rarely communicate them to each other so there is still plenty of partnerships to explore. For instance, local public authorities could evaluate the possibility to add some bike lanes based on the insights provided by a private bike rental company. Some governments already tend to more data transparency, like France with its Law for a *digital Republic*, which aims to strengthen the opening and circulation of public data to boost the digital economy.

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Figure 2: Navigator Survey - Oct. 2021 | Ipsos

Figure 3: Concept: Timothy Papandreou. Icons: The Noun Project various artists

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Figure 5: Navigator Survey - Oct. 2021 | Ipsos

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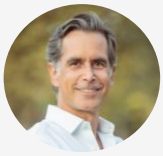

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