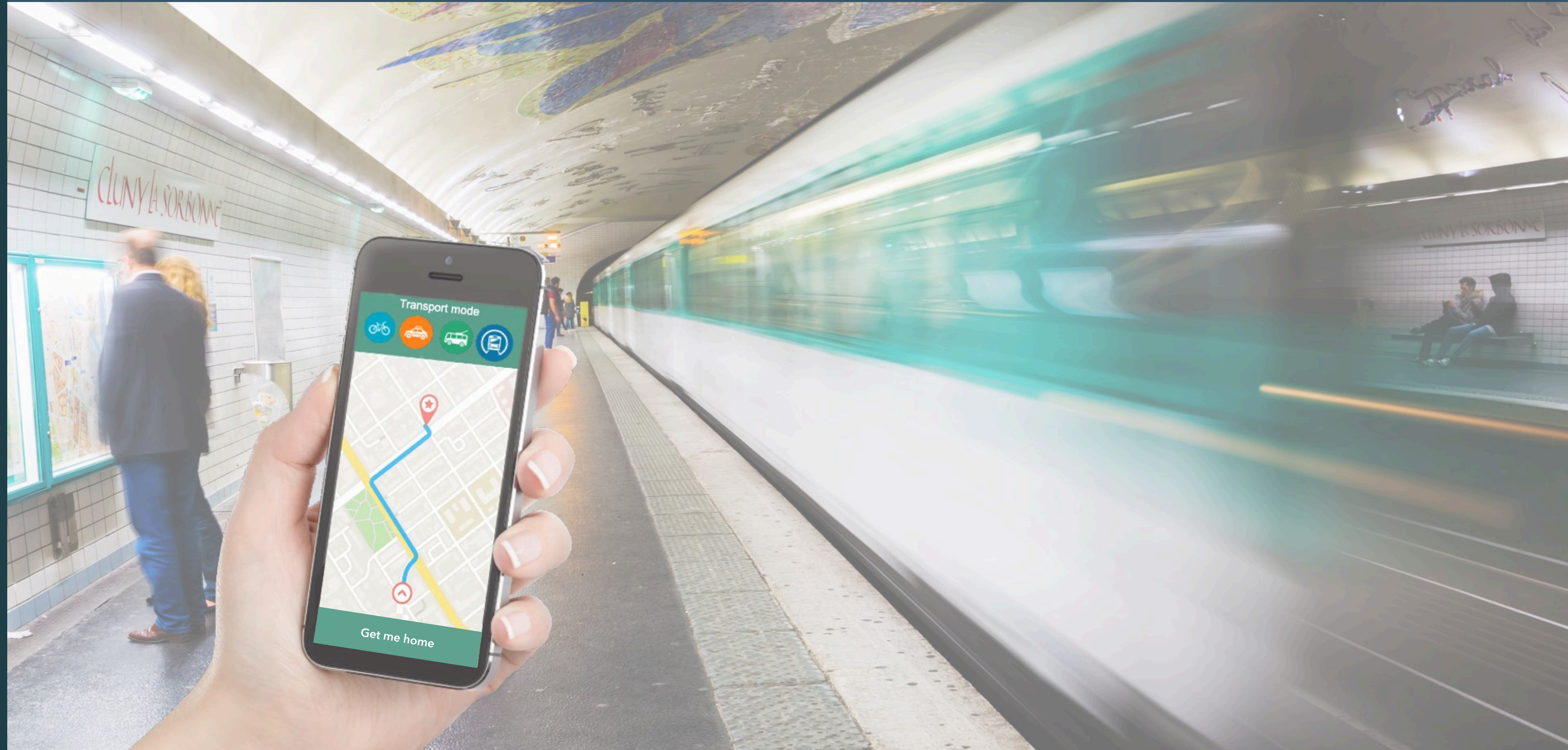


MOBILITY-AS-A-SERVICE

Market Report

FREE ABSTRACT

The first in-depth
analysis of the
European MaaS
markets



*Has the MaaS market growth reached its inflection point?
When and how can it take off?*

The European MaaS market is finally getting traction...

Dear reader,

I am sure you have experienced “bus bunching”. After waiting for your bus for 30 minutes, you then see 3 buses show up at the same time...

Could it be that MaaS follows the same pattern?

In the last 2 decades, multi-modal mobility has generated much activity in Europe but the **emergence of MaaS has been slow**, with supply that generally remained at city level and pilot stage.

Most MaaS initiatives have remained local.

Suppliers have offered either public MaaS, corporate MaaS or private B2C MaaS, with most of their trips happening in just 1 transport mode.

Key Mobility Service Providers (MSPs) have not built a real full-scale* solution.

No legislation has forced stakeholders to open up. In particular, public transportation ticketing & payment, the biggest market, has largely remained closed to third parties.

So the supply could have been the main roadblock to a MaaS success.

Our 8-month research has found that almost all leading PTOs have integrated multimodal offers into their apps (cf. Bonjour RATP, Renfe’s dōcō, Hochbahn’s hvv switch), and some of them are finding the right formula to beat private MSPs at the national level. For example, Rejseplanen in Denmark has more downloads and better reviews than Google Maps.

Meanwhile, **leading mobility service providers such as FreeNow, Moovit and Uber, are rapidly integrating multiple modes, notably public transportation.**

The **22 selected MaaS providers profiled** have all **expanded their offer to include**, on average, **9 mobility services** in their MaaS platforms with some including up to 14 mobility services. Furthermore, **50% of the private MaaS suppliers profiled have expanded to more than 20 European countries.**

Thus, **in this post-COVID period, MaaS is finally taking off, driven by increasing competition, national and EU legislation, and the emergence of new transport modes and mobility models.**

... but who will be left to provide MaaS at scale?

Several initiatives pushed by European transport ministries will ease broader integrations and cooperation among the different players in the value chain.

In 2022, Germany launched *Deutschlandticket*, a nationwide single ticket for public transport, and France is also in the process of launching its own.

Other European countries are also moving in this direction. In **Italy, authorities started to fund ambitious MaaS initiatives in the country's 3 largest cities. Belgium has created an inter-regional vision of MaaS to foster its implementation**, which among others considers that PTOs must comply with competition rules and include the possibility to re-sell tickets through MaaS subscriptions.

In addition, recent EU-level actions are accelerating the trend.

The European Commission's MaaS4EU project provided frameworks and tools to remove the barriers and enable a cooperative and interconnected EU single transport market for the MaaS.

In addition, the Commission is amending **Directive 2010/40/EU, which extends the scope for deploying Intelligent Transport Systems (ITS) to include emerging services** and further opening multimodal information and ticketing & payment.

Among the goals, the new ITS framework foresees multimodal integration to facilitate modal shift and improve efficiency and accessibility to transport modes.

As ticketing & payment are opening up, competition getting fiercer, and authorities removing cars from urban areas, we expect MaaS-enabled transaction revenues to grow from €22 to €105 billion between 2021 and 2030.

However, **while multi-modal transport is taking off, end-users will not pay anything for it!**

MaaS is rapidly becoming an hygiene factor for all MSPs and platform vendors will need to aim for scale, not margins.

Which means, that, beyond local PTOs, we expect **only a few players to subsist to serve the mass market**. The acquisition of CityMapper by Via could be the sign of things to come...

This will push towards concentration on the supply side too.

The MaaS market take off could be the result of this commoditisation.

Sincerely,

Alberto Lodieu

Project Director

This in-depth market analysis is the first decision-making tool for mobility stakeholders to design a successful MaaS strategy

- A **260-page** analysis of the current and future state of the MaaS market in Europe, based on:
 - **10** years of constant market surveillance
 - PTOLEMUS' experience of almost **200** client assignments across the mobility ecosystem
 - **10** months of research and analysis, including interviews with **22** key MaaS stakeholders
 - **118** MaaS deployments & pilots analysed
 - More than **150** figures presented in the report
 - More than **130** organisations mentioned
- **An examination of the regulatory, business and technological context behind MaaS**
- **An in-depth analysis of the MaaS supply and demand:**
 - The building blocks of a MaaS solution
 - The different MaaS business models
 - The most relevant European public MaaS initiatives, including 10 case studies
 - The MaaS value chain
- **An assessment of 22 MaaS stakeholders including 10 PTOs and 10 platform vendors**
- **An evaluation of the future MaaS market, including evolution scenarios, analysis of the segments' needs, and current and future drivers of supply and demand**
- **Bottom-up 2022-2030 MaaS market forecasts**
 - Volume of trips for **8** mobility modes in **10** major European countries
 - MaaS-enabled transport revenues for **8** mobility modes in **10** major European countries
- **Recommendations to key industry stakeholders, including:**
 - Public Transport Authorities (PTAs)
 - Public Transport Operators (PTOs)
 - Billing & ticketing systems providers
 - Mobility Service Providers (MSPs)
 - MaaS platform providers



More than just market research.

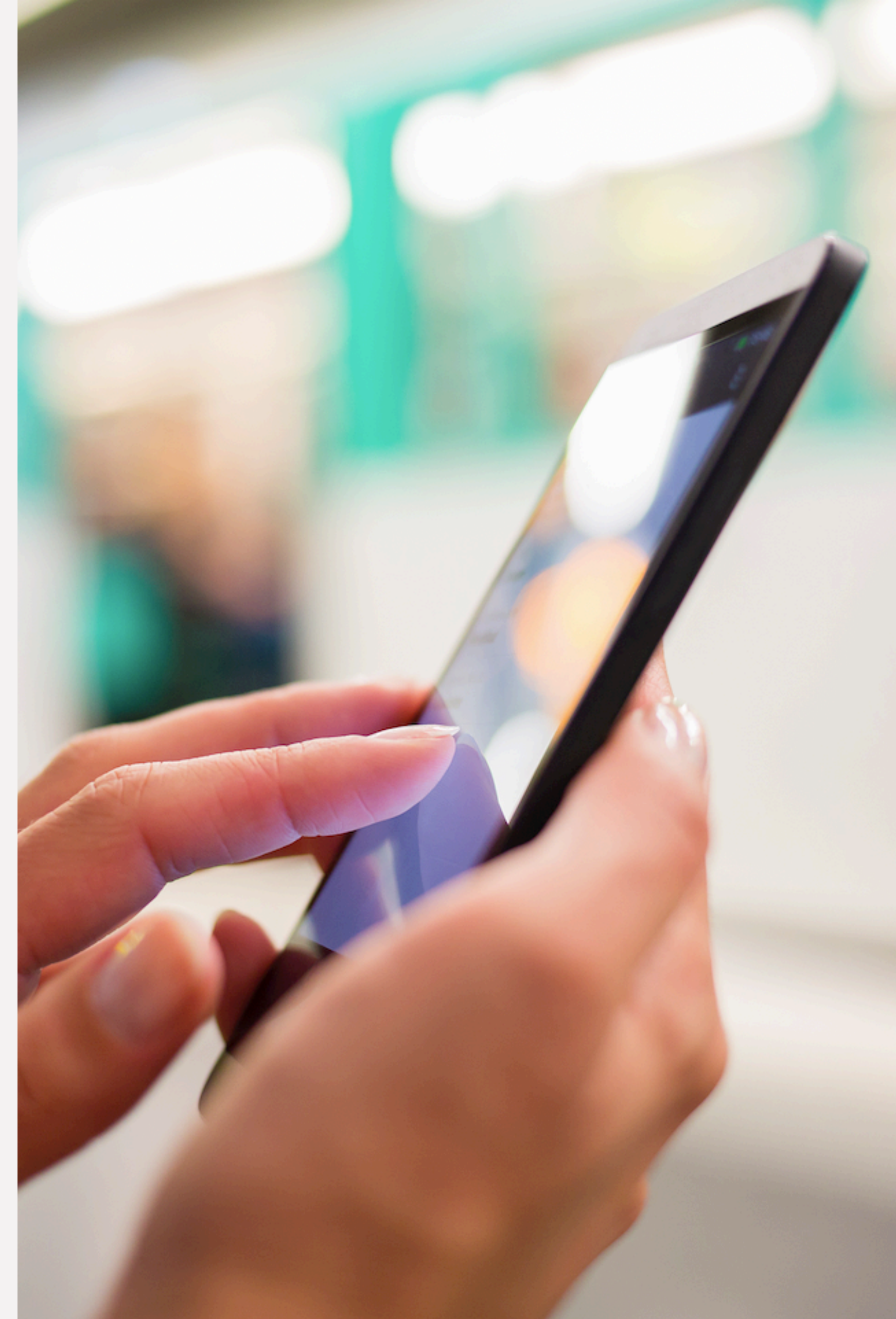
In-depth strategic analysis and a complete tool to help your organisation make the right decision in the MaaS market

In this report, we respond to 14 questions that are absolutely crucial for the future of mobility



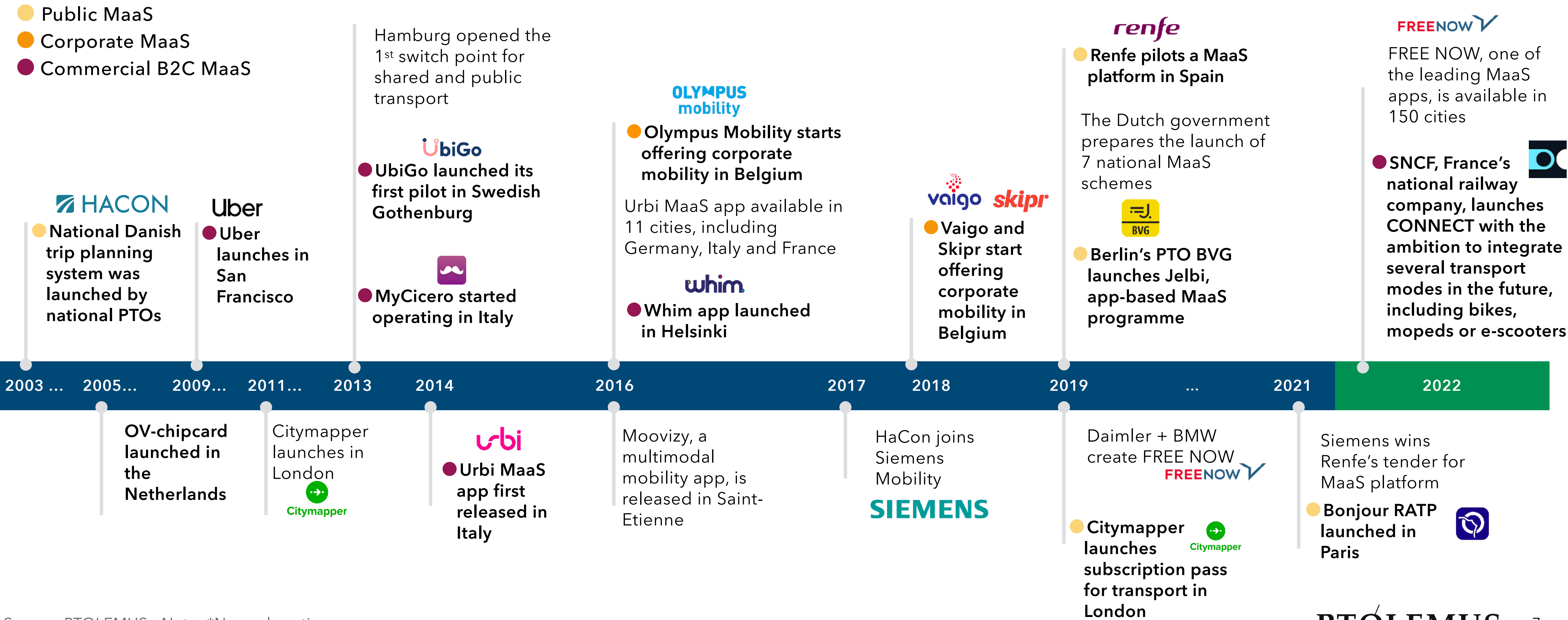
What is Mobility-as-a-Service (MaaS)?

- A service offered to travellers that enables access to a **seamless, unified, multi-modal transportation experience by combining routing information, booking, payment and ticketing from multiple transport operators**
- It can also integrate vehicle services such as tolling, parking, fuelling, electric charging and repair
- It can be offered as a subscription or in a pay-per-use model **through a smartphone application**
- **By making multi-modal, multi-operator mobility seamless**, MaaS enables users to make **more sustainable choices**, shifting from private vehicles to public transport and **integrating the fragmented mobility market**



The first examples of MaaS appeared 20 years ago, and yet, the MaaS market remains very small

Timeline of MaaS events and initiatives*















Source: PTOLEMUS - Note: *Non exhaustive

MaaS bring enormous social benefits in terms of accessibility, emissions, congestion reduction and cost

- MaaS can integrate all existing and new transport modes and technology developments including:
 - Public transportation
 - Shared mobility
 - Micro-mobility
 - Autonomous vehicles
 - Electric vehicles
 - eVTOL
 - For car owners, it can incorporate navigation, routing and payment services such as:
 - Parking
 - Electronic tolling
 - EV charging
 - Fuelling
 - Access to other transport modes
- The more transport alternatives commuters have, the better their ride is as they:
 - **Reduce time spent**
 - Avoid disruptions such as strikes or congestion by switching to other transport modes
 - Avoid searching for parking
 - Better time management thanks to routing prediction tools
 - **Reduce cost**
 - Choose the most cost efficient mode
 - Save on the cost of buying, insuring and maintaining a car
 - **Increase comfort**
 - Time to do other things than driving
 - Combining mobility services smoothly
 - Different transport modes to reduce time
- Improve health by shifting to cycling or walking
 - MaaS allows commuters to plan, move using different transport services and pay in a smooth manner
 - All integrated into a single planning and payment platform
 - Accessible through smartphones
 - A broad implementation of MaaS would support solutions to reduce transport externalities and other urban mobility issues:
 - Inefficient use of transport infrastructure
 - Congestion
 - Emissions
 - Lack of accessibility
 - Lack of coverage

Services offered by selected MaaS suppliers

| MaaS supplier | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|-----------------|---|---|---|---|---|---|---|---|---|----|----|----|
|  | Trains | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Metro | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Buses | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Bike services | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | e-Scooters | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
|  | Moped Sharing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
|  | Ride hailing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
|  | Taxi | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ |
|  | Infrastructure* | ✓ | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | ✓ | ✓ |
|  | Car sharing | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ |
|  | Car rental | | | ✓ | | | ✓ | | ✓ | | | ✓ | ✓ |
|  | Car pooling | | | | ✓ | | | | | | ✓ | | ✓ |

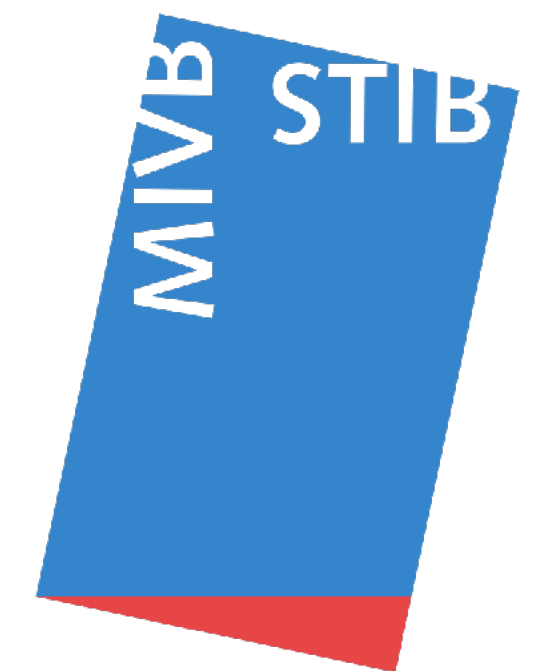
Source: PTOLEMUS - Note: *EV and fuel charging stations, parking, tolling, ferry;

MaaS will disrupt the mobility ecosystem, generating €105 billion in revenues in Europe in 2030

- Like video & music streaming, MaaS can be seen as a disruptive proposition as it is:
 - On demand
 - User-centric
 - Based on real-time information
 - Comparing alternatives
 - Optimised according to users' preferences
 - Traceable and rechargeable
 - Delivered through a cloud platform
 - Accessible with a click
- Still, MaaS faces major barriers, including:
 - The need to ensure the provision of the services (e.g. maintaining the fleet of bikes or mopeds) and build a robust digital platform
 - Multiple developments need to happen to integrate tracking, routing, payment and ticketing into a single platform
 - In most cities, the incumbent public transport operators keep the transport service delivery closed to other private or public stakeholders
- Service providers need to establish:
 - **Partnerships** for multi-modal integration and agreement on contractual responsibilities
 - **Rules for revenue share**
 - Agreements on the **rules to manage information rights and privacy**
 - Methods to protect the **security of digital transactions**
- Insurers need to develop new behaviour-based (vs. only asset-based) **policies for users and suppliers**
- Several **uncertainties** remain on MaaS' future development, including the following:
 - **The success of the subscription model**
 - **The pace of adoption**
 - **The winning model for each user segment**
 - **The dominant player(s)**
- Once service providers fully replicate the end-to-end journey, **commuters will have access to all mobility services with a single click**
- **We expect transport revenues from MaaS platforms to generate €105 billion in 2030**

“ The true added value of MaaS is the strong integration of multiple apps into a single one: you know the options and you can pay for them directly.

Thus it becomes much more than a map, it helps in promoting healthy mobility choices, it gently re-shapes the way cities look. ”



Europe offers the ideal conditions for the take off of MaaS



- Europe offers the **ideal conditions** as a testbed for MaaS because of its broad range of transport alternatives
 - Europe is the continent with the **highest rail density**
 - It has one of the **highest ratios of vehicles per capita**, resulting in large traffic jams in urban areas
 - Leading micro-mobility providers such as TIER, LIME and Dott have their largest fleets in Europe
 - Compared to Q2 2021, in Q2 2022, **the shared mobility ridership increased by 48% in several western European countries****
 - **Google Maps** covers transit most of European cities and **Citymapper** offers access to **76 cities**
- **EU institutions actively promote a new approach towards urban mobility**, based on access to **reliable public transport**, widely supported by multimodal travel
 - **MaaS is among the solutions** the European Commission has listed in its New Urban Mobility Framework
 - Regulation, pilot projects, and research funding address the **transition to new forms of mobility around EU cities**
- **The EU leads in the proactive regulation against the dominance of tech giants in the digital domain:**
 - The **Digital Markets Act** avoids the creation of monopolies by digital 'gatekeepers' and ensures technology neutrality
- **The upcoming Data Act is expected to force all connected device producers to give access to relevant user datasets**
 - This could greatly facilitate the access to connected car, connected bus, connected coach data

Based on our research, we expect a car-centric MaaS development to be the dominant model across most European cities in this decade

- **Urban mobility services are now rapidly being digitalised and are becoming:**
 - User-centric
 - Based on real-time information
 - Capable to offer multiple options
 - Optimised according to users' preferences
 - Traceable and rechargeable
 - Delivered through a cloud platform
 - Accessible with a click
 - On-demand
- **MaaS platforms will disrupt the market**
 - Improve how we move by integrating different transport modes into 1 app, making it a seamless user experience
 - It increases the value and practicality for users
 - Thanks to smartphone payments, reduces cost and improves efficiency for transport operators
 - Routing capabilities and integration of multimodal mobility reduces road traffic and congestion in cities
 - Improves the match of commuters with transportation alternatives
- **Ticketing & payment will now shape the future of MaaS**
 - While planning and routing has been the cornerstone of MaaS, as platforms evolve, payment & ticketing is becoming the most important building block
 - Players with the best planning and routing platform benefit from a unique positioning, but those providing ticketing & payment will control the market
- **We foresee 3 evolution scenarios as the most likely to happen in the European MaaS market**
 - (1) ***Car-centric MaaS development***
 - (2) ***MaaS dominated by PTOs slowly emerges***
 - (3) ***Multi-modal, multi-operator MaaS flourishes***
- **We expect that a car-centric MaaS development will be the dominant model in Europe, still each city will follow a different evolution depending on the characteristics of its existing mobility ecosystem and the national regulatory actions**



This report's 7 sections cover both qualitative and quantitative aspects

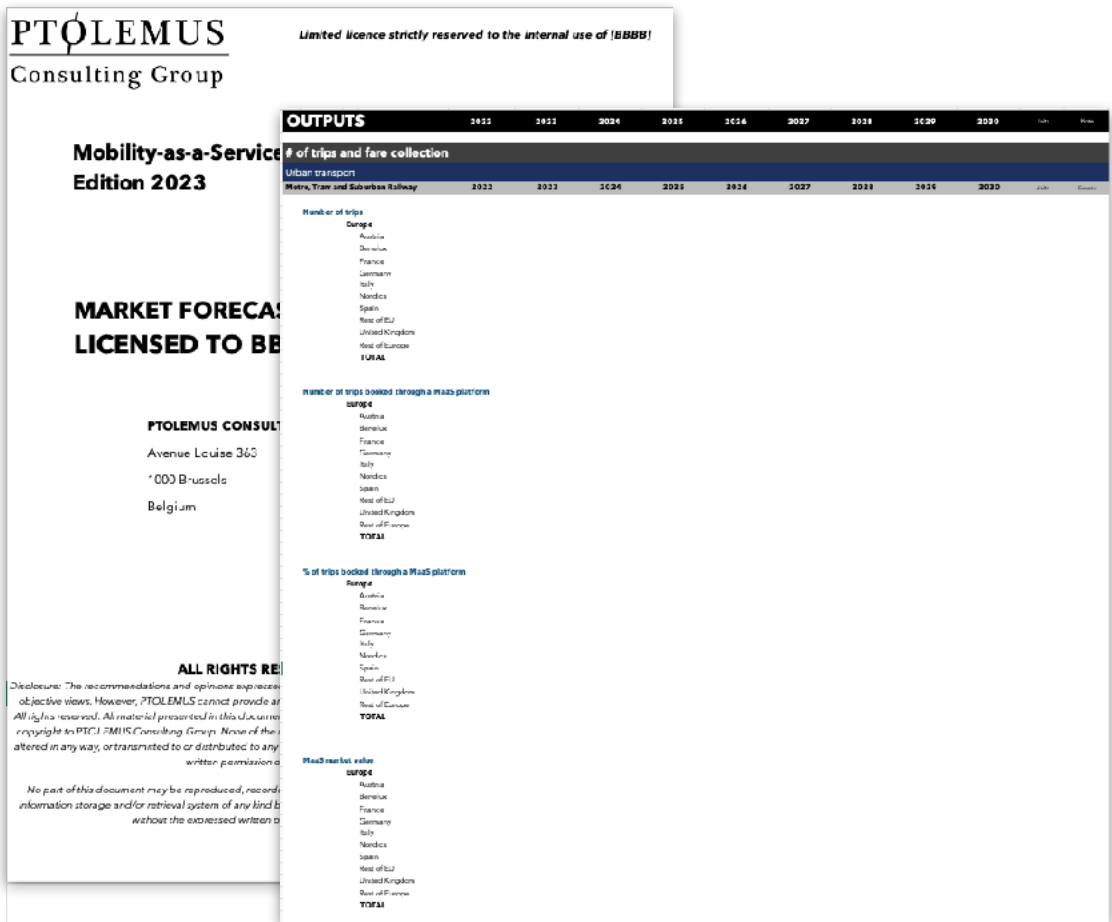
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The report is the first to provide bottom-up volume and revenue market forecasts for 10 European regions and 8 mobility modes

MaaS market forecast



- **Excel file with 2022-2030 market forecast, including:**
 - Volume of trips
 - Volume of trips enabled by MaaS platforms
 - Revenues of transactions enabled by MaaS platforms
- **Covering 8 mobility modes:**
 - Metro, tram & suburban railway
 - Bus
 - Taxi
 - Ride hailing
 - Shared mopeds
 - Shared bikes
 - Shared scooters
 - Shared cars
- **For 10 regions:**
 - Austria
 - Benelux
 - France
 - Germany
 - Italy
 - Nordics
 - Spain
 - Rest of EU
 - UK
 - Rest of Europe



The report mentions 130+ MaaS stakeholders, including...

| Company | Type | Company | Type | Company | Type |
|--------------------|---------------------------------------|-----------------|----------------------------|------------|----------------------------|
| Conduent | Billing & ticketing systems providers | Breng | Mobility Service Providers | Helbiz | Mobility Service Providers |
| Cubic | | Brixlane | | Hochbahn | |
| Init | | Cabify | | HTM | |
| IVU traffic | | Cambio | | Imbric | |
| Logpay | | Check | | INRIX | |
| Scheidt & Bachmann | | Citymapper | | Jelbi | |
| Skyss | | Cityscoot | | Karhoo | |
| Thales | | Cooltra | | Keolis | |
| Trapeze | | Cozy car | | Kinto | |
| Luminus | Energy suppliers | Donkey Republic | | Kolumbus | |
| TotalEnergies | | Dott | | Lime | |
| Metromile | Insurers | DR | | Lyft | |
| Nationwide | | DSB | | Lyko | |
| Amaze | Mobility Service Providers | Emmy | | Mile | |
| Arriva | | Entur | | Miles | |
| Avocargo | | Europcar | | Mobiflow | |
| BerlKönig | | Freenow | | Mobileeee | |
| Bip&Drive | | Fynbus | | mobilleo | |
| Bird | | Gaiyo | | MOIA | |
| BlaBlaCar | | Gett | | Moovit | |
| Blue-bike | | Google | | Move About | |
| Bolt | | Hacon | | Moves | |

The report mentions 130+ MaaS stakeholders, including...

| Company | Type | Company | Type | Company | Type |
|-----------------|----------------------------|---------------|-----------------------------|-------------------------|------------------------------|
| Movitaxi | Mobility Service Providers | Uber | Mobility Service Providers | ATM | Public Transport Authorities |
| myCicero | | Urbi | | Île-de-France Mobilités | |
| Nabogo | | Vaigo | | Ruter | |
| Octo Telematics | | Velib | | Transport for London | |
| Pony | | Via | | VY | |
| Poppy | | Voi | | 9292 | Public Transport Operators |
| Qarin | | Waymo | Parking Solutions Providers | BVG | |
| Qbuzz | | Waze | | DeLijn | |
| Reby | | Wegfinder | | EMT | |
| Rivier | | WeShare | | Hochbahn | |
| ShareNow | | WienMobil | | MEL | |
| Sigo | | Yego | | NS | |
| Sixt | | BePark | Platform Vendors | OBB | |
| SkedGo | | EasyPark | | RATP | |
| Skipr | | Inrix | | Rejseplanen | |
| SNCF | | Passport | Platform Vendors | Renfe | |
| TaxiBerlin | | Fluidtime | | Rheinbahn | |
| Telepass | | Here Maps | | STAS | |
| Tier | | Mapbox | | Transdev | |
| Trafi | | Mappy | | VBB | |
| Travis | | OpenStreetMap | | VRR | |
| Troopy | | Siemens | | | |
| Turnn | | TomTom | | | |
| | | Whim | | | |

We would like to thank these forward-looking organisations for sharing their views with us!

ATEC ITS FRANCE

BEMOBILE
a revolution in traffic

citygo

ENTUR


Fluidtime

REGION H
The Capital Region
of Denmark

 **instant system**

Lyke

MIVB STIB


NSGO

OCTO


RTA
هيئة الطرق والمواصلات
ROADS & TRANSPORT AUTHORITY

SIEMENS


STAD ANTWERPEN

Parkopedia

TIER

 **transportapi**

 **universität
wien**


vaigo

voi.


WhereIsMyTransport

The report leverages PTOLEMUS' mobility experience and the expertise of 8 consultants and researchers (1/2)



Frederic Bruneteau

Managing Director



Alberto Lodieu

Senior Manager



Andrew Jackson

Research Director



Svetlana Tvorogova

Research Consultant

Experience

27 years

The founder of PTOLEMUS, Frederic has accumulated 25 years of experience of the mobility and transport domain.

He has become **one of the world's foremost experts of connected mobility** and is interviewed on the subject by publications such as the *Financial Times*, *Forbes*, the *Wall Street Journal* and *The Economist*.

He has **led over 180 consulting projects and helped many world leaders define their strategy and implement it.**

Clients he has served include A-to-Be, Abertis Mobility Services, AGC Automotive, Allianz, Axxès, AXA, Baloise, Bombardier, BP, Bridgestone, HERE, the European Commission, Hitachi, Octo Telematics, Orange, Société Générale, ST Engineering, Telepass, TomTom, Toyota, Transurban, wejo and WEX.

Frederic supervised the research of the Mobility Platform Suppliers Handbook in 2018 and fully reviewed this report.

14 years

Alberto has 14 years of experience in strategy consulting, and has participated to over 60 consulting assignments.

He has specialised in connected mobility, location-based services, electronic toll collection, road usage charging, autonomous vehicles, and usage-based insurance.

He has assisted 40+ organisations in defining their mobility strategies, launch new services, perform commercial due diligence

Alberto has been leading our work to build a global picture and forecast of mobility trends: new players, new vehicle types, new business models, smart city initiatives, etc.

Alberto is a regular speaker at mobility, location-based services and fleet conferences.

He led the research and writing of our landmark 750-page Global Mobility Roadbook (2019)

Alberto coordinated the research, writing and review of the report.

15 years

With a career in market research spanning 15 years, Andrew has over 11 years of experience working in the automotive and industrial sectors.

Andrew has led and participated in many automotive and telematics market research projects:

Provided forecasts for the growth of EVs in the UK, to a leading automotive media company;

Provided insights to a major telematics technology provider regarding the future of connected vehicles

Led the global research and created 5-year sales forecasts for a major geospatial data analysis company's go-to-market strategy;

Provided insight and analysis on the automotive aftermarket for some of Europe's key tier-1 suppliers.

As PTOLEMUS' Research Director, Andrew supervised and contributed to the research and writing of this report.

20 years

Svetlana has gained experience with a very large set of organisation such as Arthur D. Little, Bamberg University (Germany), Erasmus University Rotterdam, the Higher School of Economics of Moscow, EuroWejo and the World Bank.

For more than 10 years, Svetlana taught at the Research University - Higher School of Economics (Moscow, Russia), which nominated her for the Nation's best lecturer, and at Bamberg University, Germany.

Some key projects Svetlana completed include:

Helped a vehicle data hub understand fleets' use of telematics and interest for vehicle data services in Europe and North America;

Helped a private equity firm evaluate the future demand from insurance companies for UBI solutions in Europe and North America;

Svetlana led the primary research, and participated to the writing and review of the report.

Biography

The report leverages PTOLEMUS' mobility experience and the expertise of 8 consultants and researchers (2/2)



Laura Pájaro
Research Analyst



Damien Orsoni
Business Analyst



Nan Chu
Research Analyst



Claudia Lozano
Senior Business Analyst

Experience

4 years

An architecture, transportation and mobility technologies enthusiast, Laura holds a master degree in Urbanism from the VUB and ULB, Brussels.

Since Laura joined PTOLEMUS she conducted first and secondary research on Mobility-as-a-Service and User-Based Insurance.

She participated fragmenting regional research reports and creating case studies.

Key projects she completed include:

Suggested possible functionalities and case uses for a master mobility centre operating in Flanders and Brussels, Belgium

Helped to understand the likelihood to choose specific tracking technologies for the implementation of RUC in Brussels

Revised business plan to consider opportunities to expand architectural services to the middle east market

Laura participated in the research, writing and review of the report.

3 years

A passionate of strategy consulting and new technologies, Damien Orsoni has studied in France, the Netherlands and Italy. Within PTOLEMUS he has developed an expertise on Usage-Based Insurance (UBI), Telematics and Connected Mobility.

Damien's most important consulting assignments include:

For a major US telecommunication operator, he helped defining its entry strategy into European and Asian emergency services markets,

For a major European assistance group, he designed their connected vehicles strategy, value proposition, MVP and implementation roadmap,

He participated in the research and writing of PTOLEMUS' Connected Auto Insurance Global Study, an in-depth analysis of the connected auto insurance industry, and contributed to the design of the 2020-2030 market forecast.

Damien participated in the research, writing and review of the report.

3 years

Before joining PTOLEMUS, Nan has worked in marketing research covering China & Europe, enabling stakeholders in industries such as ICT, logistics and biopharmaceutical, to identify, explore and leverage business opportunities.

Nan's recent projects include:

For a European telecoms company, he helped identify the top Chinese companies in the mobility business that require cellular connectivity.

For a human resources consulting firm in Europe, he helped organising a major advertising campaign targeted for Chinese speaking clients.

Within PTOLEMUS, Nan has contributed to our new Commercial Fleet Telematics Global Study.

Nan participated in the research and writing of the report.

6 years

A Toulouse Business School alumnus, Claudia worked at Accenture on strategy consulting assignments for the mobility sector:

For a multinational car manufacturer, she helped determining the User Recognition technologies to implement on the connected vehicle.

For several User Recognition technologies, Claudia performed benchmarking analysis including OEMs and OESs, identified relevant use-cases.

For a leading railway company, she supported the definition of a governance structure for the infrastructure projects.

Claudia has also worked on business transformation out of the mobility sector.

Claudia also acquired experience during her internship at IBM as a Junior Consultant on a business transformation project.

Claudia participated in the research and writing of the report.

Biography

Mobility-as-a-Service Market Report

Report purchase options and pricing



The report comes with a single, worldwide company licence, market forecasts and an introductory workshop



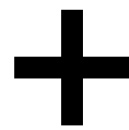
For more information about the report, email contact@ptolemus.com



You can purchase the report by requesting an invoice or buy online** (Visa or MasterCard) on our website

| | Report | Market forecast | Introductory workshop |
|------------|---|--|---|
| Contents | <ul style="list-style-type: none">• A 260-page analysis in pdf format of the relevance, evolution and main dynamics of the MaaS market• An examination of the value chain of the MaaS market and its main power players, with 12 company profiles and multiple use cases• A detailed forecast of the number of trips in Europe, and the corresponding total addressable market for MaaS operators | <ul style="list-style-type: none">• Excel file with 2022-2030 market forecast outputs for 10 regions:<ul style="list-style-type: none">- Austria- Benelux- France- Germany- Italy- Nordics- Spain- Rest of EU- UK- Rest of Europe• Covering 8 mobility modes:<ul style="list-style-type: none">- Metro, tram & suburban railway- Bus- Taxi- Ride hailing- Shared mopeds- Shared bikes- Shared scooters- Shared cars | <ul style="list-style-type: none">• The full report presented to your board or strategy team• 2-hour workshop* |
| Group-wide | €3,995 | | Included |

The report's licence can be purchased together with the Google in Mobility Report



| | Mobility-as-a-Service | Google in Mobility |
|--------------------|--|---|
| Contents | <ul style="list-style-type: none">• A 260-page analysis of the relevance, evolution and main dynamics in the MaaS market• An examination of the value chain of the MaaS market and its main power players, with 12 company profiles and multiple use cases• A detailed forecast of the number of trips in Europe, and the corresponding total addressable market for MaaS operators• Excel file with a 2022-2030 market forecast for 10 regions and 8 mobility modes | <ul style="list-style-type: none">• A 140-page investigation of the current and future Google’s strategy in the urban mobility market<ul style="list-style-type: none">- An in-depth analysis of Google’s successes to date- An analysis of Google’s partnerships and actions in urban mobility- An overview of Google’s strategy and initiatives in the mobility field, including- A detailed analysis of 4 strategy alternatives that Google could adopt in MaaS, including booking and ticketing & payment- An evaluation of the future MaaS evolution scenarios, including customers’ segments needs and future drivers of demand and supply- An assessment of Google’s future role, position and strategy in the market based on<ul style="list-style-type: none">• The 3 main evolution options we identified and their likelihood to happen• A forecast of Google’s EBITDA generated by MaaS in Europe in the 3 main strategy options |
| Group-wide licence | €4,495 | |

Note: Prices in Euros, excluding VAT (VAT only applicable to clients located in Belgium); *Conditions apply; **Online pricing might differ due to exchange rates

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The 260-page report is structured in 7 sections

1. Introduction
2. Understanding MaaS
3. Most relevant PTO and government initiatives
4. Value chain and leading MaaS platform suppliers
5. MaaS evolution scenarios
6. MaaS market forecast
7. Conclusions and recommendations for stakeholders



In section 1, we analyse the key driving factors of the MaaS market

1 Introduction - What is MaaS?

While there are several definitions of MaaS, the basic elements remain the same

- Multiple definitions emphasise different aspects of Mobility as a Service
- Most of them share the same basic elements:

"Mobility as a service (MaaS) is a type of service that, through a joint digital channel, enables users to plan, book, and pay for multiple types of mobility services."

The concept describes a shift away from personally-owned modes of transportation and towards mobility provided as a service.

This is enabled by combining transportation services from public and private transportation providers through a unified gateway that creates and manages the trip, which users can pay for with a single account. Users can pay per trip or a monthly fee for a limited distance."



Source: PTOLEMUS, Wikipedia, The MaaS Alliance, Siemens, UITP, EU Commission

"MaaS is the integration of various forms of transport services into a single mobility service, accessible on demand."

For the user, MaaS offers added value through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations."

"MaaS combines intelligent journey planning, seamless integration of ticketing and booking as well as big data analytics combined in flexible and secure MaaS. It can make it easy and convenient for stakeholders to find their individual way through the mobility jungle and empowers transformation of transport to efficient intermodal mobility - for the benefit of travellers and operators alike."

SIEMENS

"MaaS is the integration of, and access to, different transport services (such as public transport, ride-sharing, car-sharing, bicycle-sharing, motorcycle-sharing, etc.)"

1 Introduction - Why MaaS now? - Smartphone as a mobile access to online platforms

Smartphones are the nexus between users and mobility service providers

Smartphone-based mobility service providers



Source: PTOLEMUS

Smartphone as a mobile access to online platforms

- An integrated fare system and online payment via smartphones
- Smartphones' GNSS positioning capability

• Smartphones act as portable accesses to mobility

1 Introduction - Why is MaaS such an important mobility development?

MaaS can lead to reduced emissions and congestion in urban areas

- MaaS will integrate all transport modes, mobility services and technology developments, including:
 - Autonomous vehicles
 - Electric vehicles
 - Shared mobility
 - Micro-mobility
 - eVTOL
 - Public transportation
- For car owners, it can incorporate services such as:
 - Parking
 - Tolling
 - Charging infrastructure
 - Fuel stations
 - Access to other transport modes
- MaaS puts the commuter in the centre, not the vehicle
- The more mobility alternatives commuters have, the better their ride is as they:
 - Reduce time spent
 - Avoid disruptions such as strikes or congestion by switching to other transport modes
 - Avoid searching for parking
 - Better time management thanks to routing prediction tools
 - Reduce cost,
 - Choose the most cost efficient mode
 - Save on the cost of buying, insuring and maintaining a car
 - Increase comfort
 - Time to do other things than driving
 - Combining mobility services smoothly
 - Different transport modes to reduce time
 - Improve health by shifting to cycling or walking
- MaaS allows commuters to plan, move using different transport modes and pay in a smooth manner
 - All integrated into planning and payment platform
 - Accessible through smartphones
- A wide implementation of MaaS would solve many of today's biggest issues in urban mobility!
 - Non-efficient use of transportation
 - Congestion
 - Emissions
 - Lack of accessibility
 - Lack of coverage
 - Limited space and areas

Source: PTOLEMUS, fluctus

- This first section includes **over 20 slides**
- It **defines MaaS and its key driving factors** and the advanced state of the European market in the MaaS domain

Utilisation of shared mobility during public transport strikes (Paris, 10th November 2022)

We have chosen to start this analysis with a European focus



Source: PTOLEMUS - Note: *World Bank 2019, **Fluctus European Shared Mobility index

We have chosen to focus the scope of this report in Europe for several reasons:

- Europe offers the ideal conditions as a testbed for MaaS because of its broad range of transport alternatives
 - Europe is the continent with the highest rail density*
 - It has one of the highest ratios of vehicles per capita*
 - It is one of the regions with the most relevant on-demand and shared mobility developments in the last years
 - Leading micro-mobility providers such as TIER, LIME and Dott have their largest fleets in Europe
 - Compared to Q2 2021, in Q2 2022, the shared mobility ridership increased by 48% in several western European countries**
- EU institutions actively promote a new approach towards urban mobility, based on access to reliable public transport, widely supported by multi-modal travel

MaaS is among the solutions the European Commission has listed in its New Urban Mobility Framework

- Regulation, pilot projects, and research funding address the transition to new forms of mobility around EU cities
- Finally, the EU leads in the proactive regulation against the dominance of tech giants in the digital domain:
 - Google's market dominance is among the primary targets for the recently adopted Digital Markets Act

While mobility differs in other continents, we believe that most large cities, whether in North America, Asia or other regions, will need to consider MaaS to make mobility sustainable

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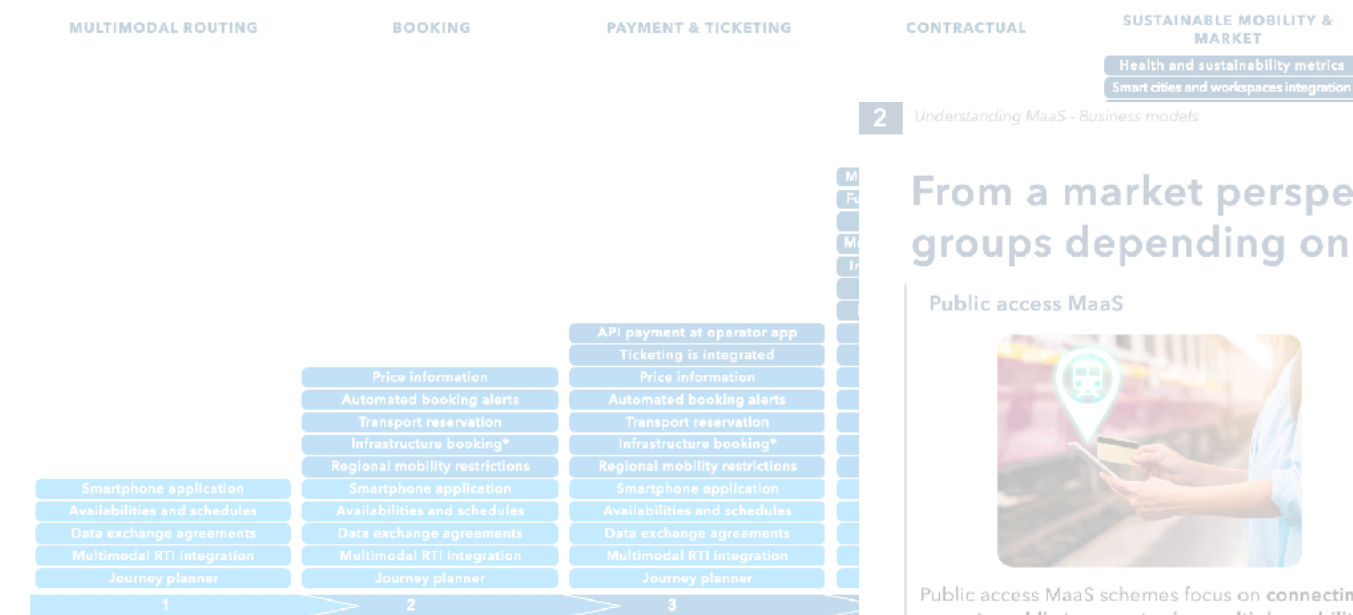
- We chose to focus on Europe for several reasons, including
 - The **broad range of transport alternatives** available in the European market
 - The **promotion of a new approach towards urban mobility** by EU institutions

In section 2, we analyse the MaaS building blocks, delivery models and 7 Dutch regional pilots

2 Understanding MaaS - The 5 levels of a MaaS solution

24 building blocks are needed for a fully integrated MaaS solution

Building blocks required for each MaaS integration level*



Source: PTOLEMUS - Note: * Adapted from Sochor et al., 2018; TSP= Transport Service Provider; RTI: Real Time Information; *EV or

2 Understanding MaaS - Business models

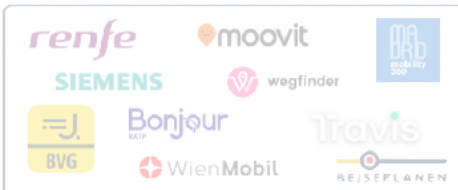
From a market perspective, MaaS initiatives can be classified in 3 groups depending on their business model

Public access MaaS



Public access MaaS schemes focus on connecting users to public transport using multiple mobility services.

They aim to improve accessibility to city transport services by leveraging several transport modes.



Source: PTOLEMUS

Commercial MaaS



Current commercial MaaS schemes focus on mobility solutions other than public transport such as ride-hailing, car sharing, short-term car rental, and leased or owned vehicles.

They rely on a pay-per-use or subscription model.

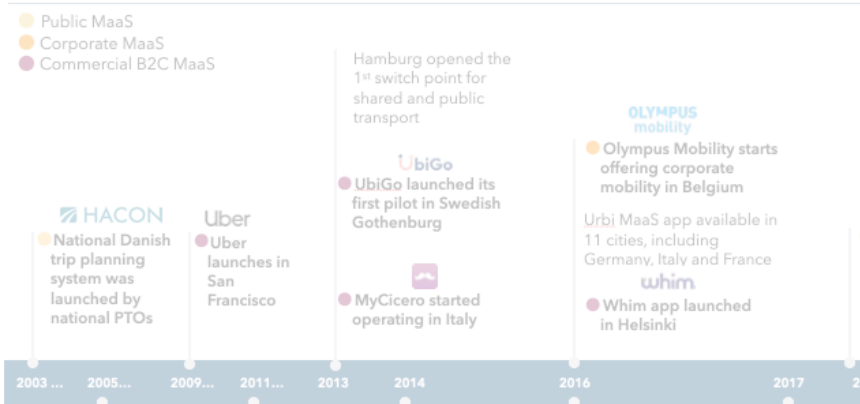


Corporate MaaS



The first examples of MaaS appeared 20 years ago, and yet, the MaaS market remains in its infancy

Timeline of MaaS elements and initiatives*



Source: PTOLEMUS - Note: *Non exhaustive

2 Understanding MaaS - Dutch deployments

The Dutch government has been pushing MaaS through 7 regional pilots, but none has yet created a large customer base

| | |
|--|--|
| | Amaze Focused on business traveller, users can locate, use and pay for several transport modes (shared bikes, scooters, cars, PTs and ferries) with an app Number of downloads: 1,000+ |
| | Moves It provides access to several transport modes in Rotterdam (PTs, shared vehicles and shuttle services) Number of downloads: 1,000+ |
| | GAIYO Users can plan, book and pay for a shared car, scooter, bike or PTs, and even parking Number of downloads: 100,000+ |
| | Rivier A joint venture with Siemens Mobility, the Dutch rail operator and the operators in The Hague / Rotterdam region, it also includes shared bicycles, cars, scooters and taxis |
| | glimble Users can plan, book and pay for PTs and other shared mobility services, such as scooters, bikes or taxis, directly in the app Number of downloads: 100,000+ |
| | TURNN Turnn is a programme aiming at unburdening organisations with their employees' mobility-related issues Number of downloads: 5,000+ |
| | Goan Launched in Twente, users can search, book and pay for their preferred transport mode (PTs, bike, scooter, taxi, cars) Number of downloads: 1,000+ |

Source: PTOLEMUS, amaze, GAIYO, glimble, Goan, Moves, Rivier, TURNN, Dutch Ministry of Infrastructure and Water Management; - Note: *To be launched; PT: Public Transport

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- This second section includes **over 15 slides**
- It details the **5 levels to climb to build a fully integrated MaaS service**, including the 24 key building blocks required for each MaaS integration level

- We examine the **3 main MaaS business models**: Public access, Commercial and Corporate MaaS
- We present **7 regional pilots in the Netherlands** and compare the transport services they offer

In section 3, we describe and examine the 10 most relevant PTO and government MaaS initiatives in Europe

- This third section includes **over 35 slides**
- It dives into **10 European public MaaS initiatives**

3 Most relevant PTO and government initiatives

In the next slides, we analyse 10 European public MaaS initiatives

Major MaaS schemes in Western Europe



Source: PTOLEMUS - Note: PTOs: Public Transport Operators, TSPs: Transport Service Providers, PT: Public Transport

- Bonjour RATP is a MaaS programme in one of Europe's most populous cities, Paris in Europe
 - Launched in 2021, the app-based programme is run by the City's PTO, RATP
 - It has reached 10 million downloads
- dōcō is Spain's national travel plan system, operated by the state-owned railway company Renfe, launched in 2022
 - dōcō is the first nationwide MaaS programme in Spain, intending to cover all major cities
- Entur was founded in 2016 by Norwegian railway operator VY to offer common ticketing solutions for rail services
 - Since 2021, its app has integrated shared mobility services, including bicycles, e-scooters and car sharing
- hvy switch is
 - The app is r
- Jelbi, an app
 - Jelbi has ov
- OV-chipkaart single public
 - 9292 was d
- Rejsekort and of users
 - Since 2020, mobility ser
- The Smart wa
 - It is open fo
- Travis is the fi
 - Since 2021,
- Launched in 2 in Europe
 - It has integri

3 Most relevant PTO and government initiatives - The Bonjour RATP case

Bonjour RATP is the first MaaS app in Île-de-France

Nature of the initiative

City programme

Monthly users

Overall description

Geographical scope

Objective of the initiative

Why is it relevant?

MaaS integration level

Transport services included

Source: PTOLEMUS, Bonjour RATP - Notes: TSPs: Transport Service Providers; PTOs: Public Transport Operators

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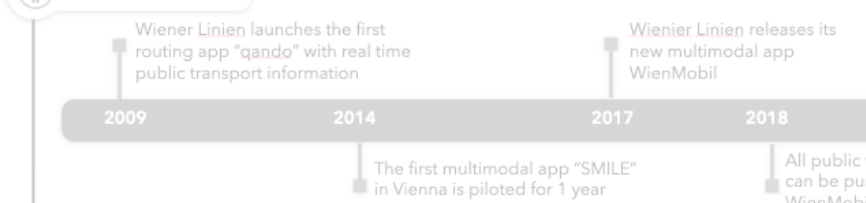
Source: PTOLEMUS, Bonjour RATP - Notes: TSPs: Transport Service Providers; PTOs: Public Transport Operators

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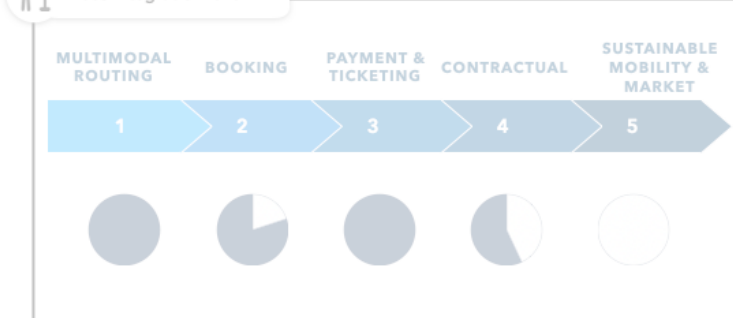
Source: PTOLEMUS, Bonjour RATP - Notes: TSPs: Transport Service Providers; PTOs: Public Transport Operators

WienMobil is focusing on the app services for end users and connecting to TSP partners

Timeline



MaaS integration level



Source: PTOLEMUS, WienMobil - Note: *EV and fuel charging stations, parking, tolling, ferry

Ride hailing, car pooling and car rental are not well-integrated into the MaaS programmes

Transport services included

| Transport mode | WienMobil | hvy switch | Jelbi | dōcō | OV-chipkaart | Bonjour | Travis | ENTUR | hvy switch |
|--------------------|-----------|------------|-------|------|--------------|---------|--------|-------|------------|
| Urban trains/Metro | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Regional train | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Urban bus/coach | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Tram | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| e-Scooters | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Bicycle | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Regional bus/coach | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Maped | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Taxi | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Car sharing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Infrastructure* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ride hailing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Car pooling | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Car rental | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Source: PTOLEMUS - Note: *EV and fuel charging stations, parking, tolling, ferry; **plan to be integrated in the future; ***passengers share rides on the pooling operator's shuttle bus based on their direction requests

- All selected programmes follow a public access business model and thus they are all centred around integrating public transport modes
- Public transportation is a standard choice for all these programmes
- Similar with micromobility, most players have been able to integrate e-scooters and e-bikes as micromobility service providers have open platforms and want to drive traffic into their network
- Ride hailing, car pooling and car rental remain unpopular services
 - In most cases the objective of these programmes is to promote alternatives to cars
 - Ride hailing in some of the regions is not legal
 - This situation reflects the complexity to coordinate private and public entities into a single platform
- For public access schemes, that have as an objective to improve public transportation access and reduce car usage, MaaS suppliers should also include transport schemes in MaaS platforms
 - Car sharing can give the alternative to car owners to still have the possibility of use a car
 - Enabling such services can improve the offer and move segments of users to public transportation that would not otherwise

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- It describes their main characteristics, including their **business model, partners or the transport services they include**
- It compares their **levels of integration** and **assess their position in the market**

We investigate the success of the leading European MaaS initiatives

Major MaaS schemes in Western Europe



Bonjour RATP is Paris' MaaS programme.

Launched in 2021, the app-based programme is run by the City's PTO, RATP. It has reached 10 million downloads.

dōcō is Spain's national travel plan system,

operated by the state-owned railway company **Renfe**, launched in 2022. dōcō is the first nationwide MaaS programme in Spain, intending to cover all major cities.

Entur was founded in 2016 by Norwegian railway operator VY to offer common ticketing solutions for rail services.

Since 2021, its app has integrated shared mobility services, including bicycles, e-scooters and car sharing.

hvv switch is Hamburg's latest MaaS payment app of all integrated TSPs,

introduced in 2020. The app is managed by the city's largest PTO and public transport network association.

Jelbi, an app-based MaaS integrating PTOs and TSPs in Berlin,

was launched in 2019. Jelbi has over 70,000 shared vehicles available.

OV-chipkaart and 9292 launched a MaaS initiative in early 2000s in the Netherlands to build a **single public transport solution for the country, which now integrates several TSPs.** 9292 was downloaded more than 5 million times.

Rejsekort and Rejseplanen joint MaaS initiative in Denmark took over Google Maps in terms of users.

Since 2020, the app Rejseplanen has integrated, in addition to public transport, shared mobility services such as bicycles, mopeds and e-scooters.

The **Smart ways to Antwerp initiative** was launched in 2016 as the city's **route planner.** It is open for MaaS players to incorporate it into their navigation system.

Travis is the first nationwide MaaS app in Sweden, launched in 2019. Since 2021, Travis has integrated booking and ticketing for e-scooters.

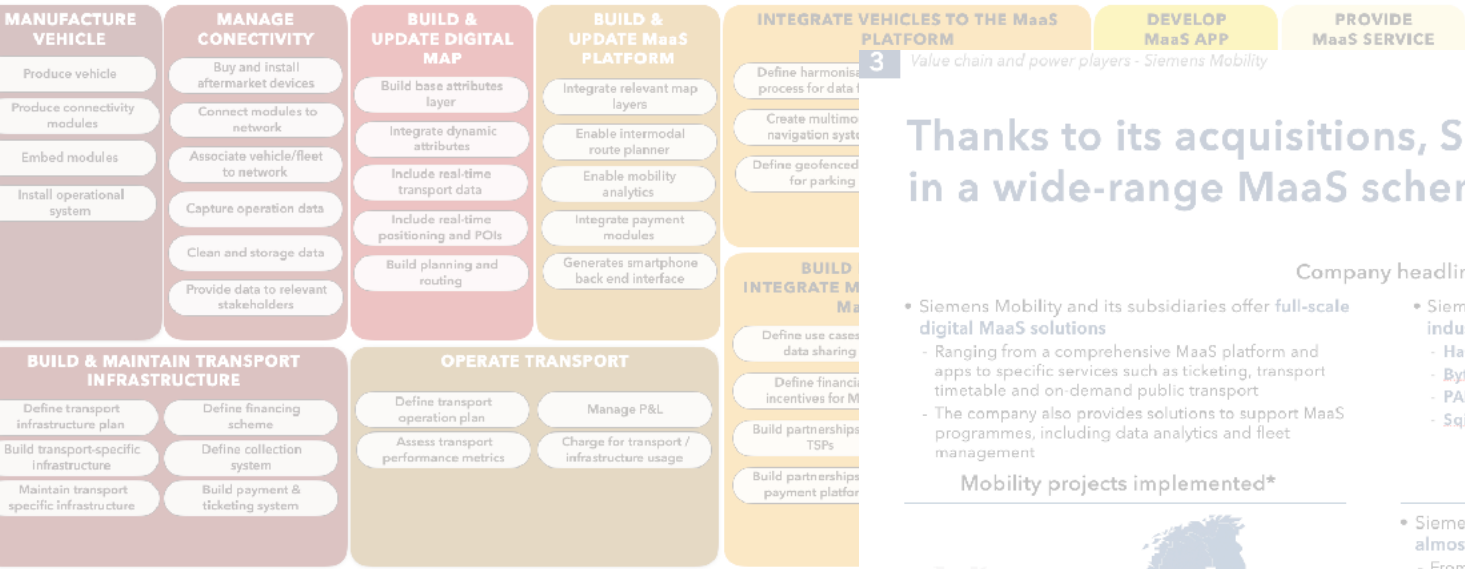
Launched in 2017, **WienMobil** is one of the earliest **MaaS apps led by the public institutions in Europe.** It has integrated almost all transport modes in Vienna.

In section 4, we dissect the MaaS value chain and benchmark the key MaaS platform & solution providers in Europe

3 Value chain and power players

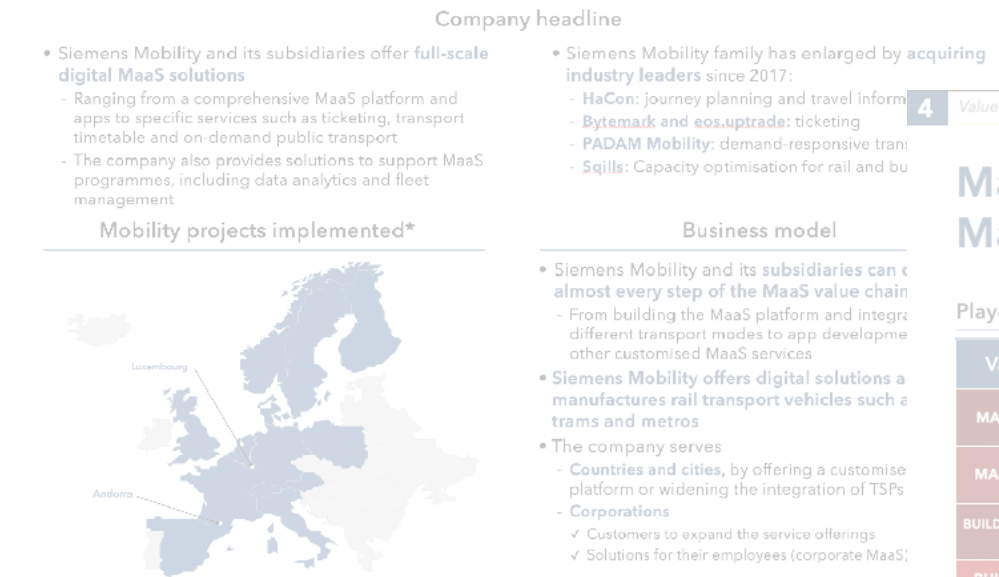
The MaaS value chain has 10 steps, starting with vehicle manufacturing and infrastructure management

MaaS Value Chain



Source: PTOLEMUS

Thanks to its acquisitions, Siemens participates in a wide-range MaaS schemes across Europe



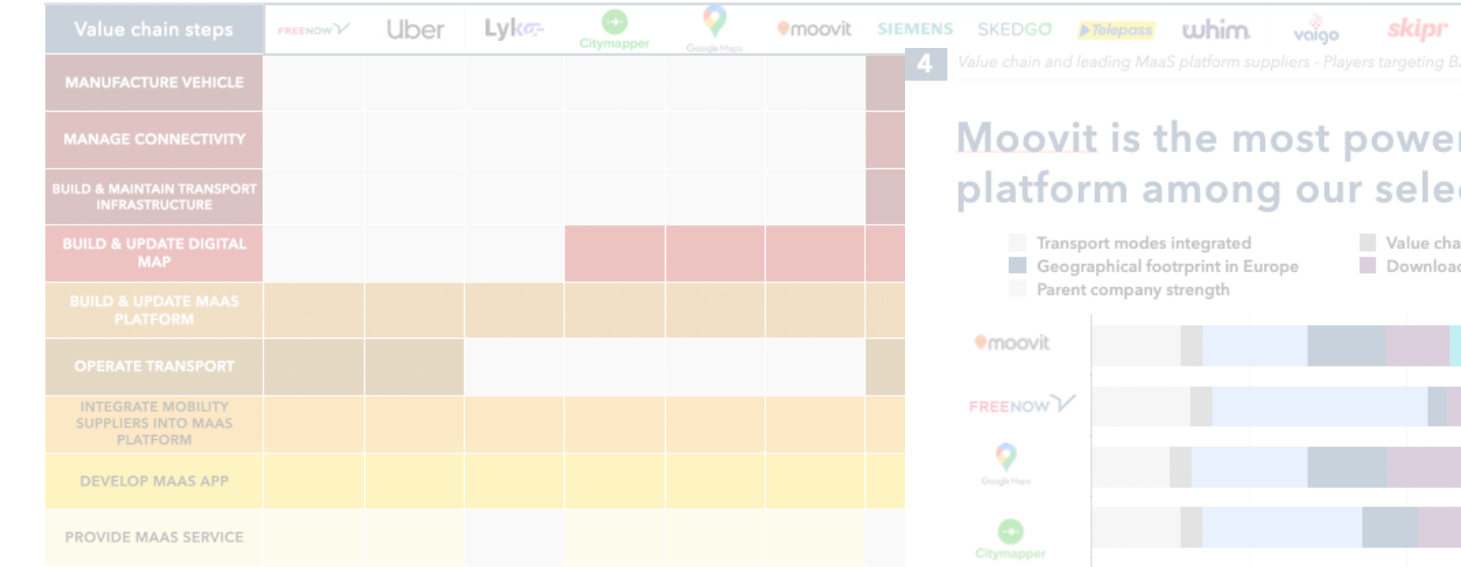
Source: PTOLEMUS, Siemens Mobility, Haco, eos.upgrade, PADAM Mobility, Sgills TSPs. Transport Service Providers. *Including the projects of Siemens subsidiaries before the acquisitions. **First MaaS project. ***With the presence of Siemens Mobility and its sub



4 Value chain and leading MaaS platform suppliers

MaaS platform building, TSP integrations, app development and MaaS service provision are the majors missions of a platform supplier

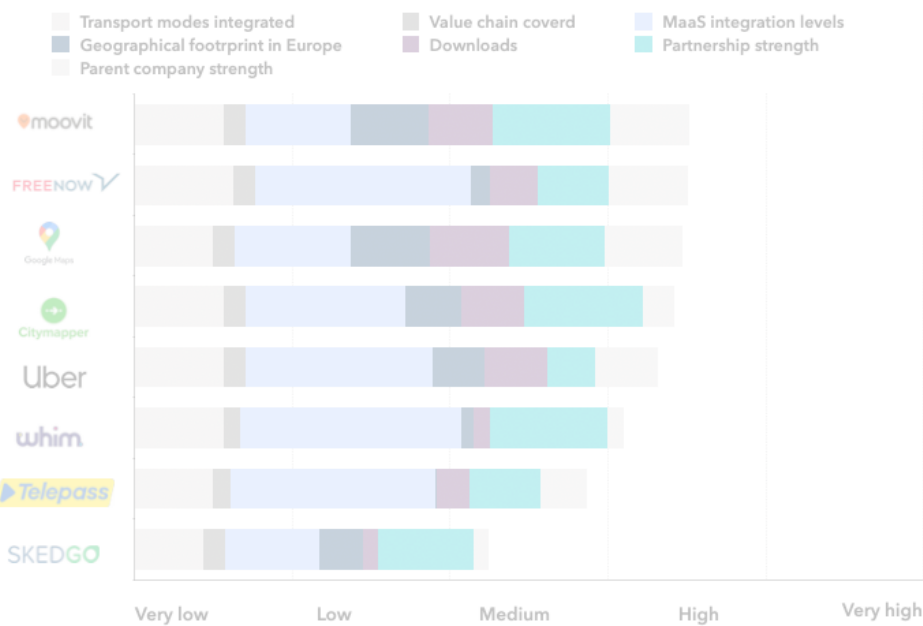
Players' positions in the MaaS value chain



Source: PTOLEMUS

- This fourth section includes **over 60 slides**
- It dives into the **9 steps of the MaaS value chain** and positions the **leading players** in each of them

Moovit is the most powerful B2C MaaS platform among our selected suppliers



Source: PTOLEMUS; - Note: TSPs: Transport Service Providers

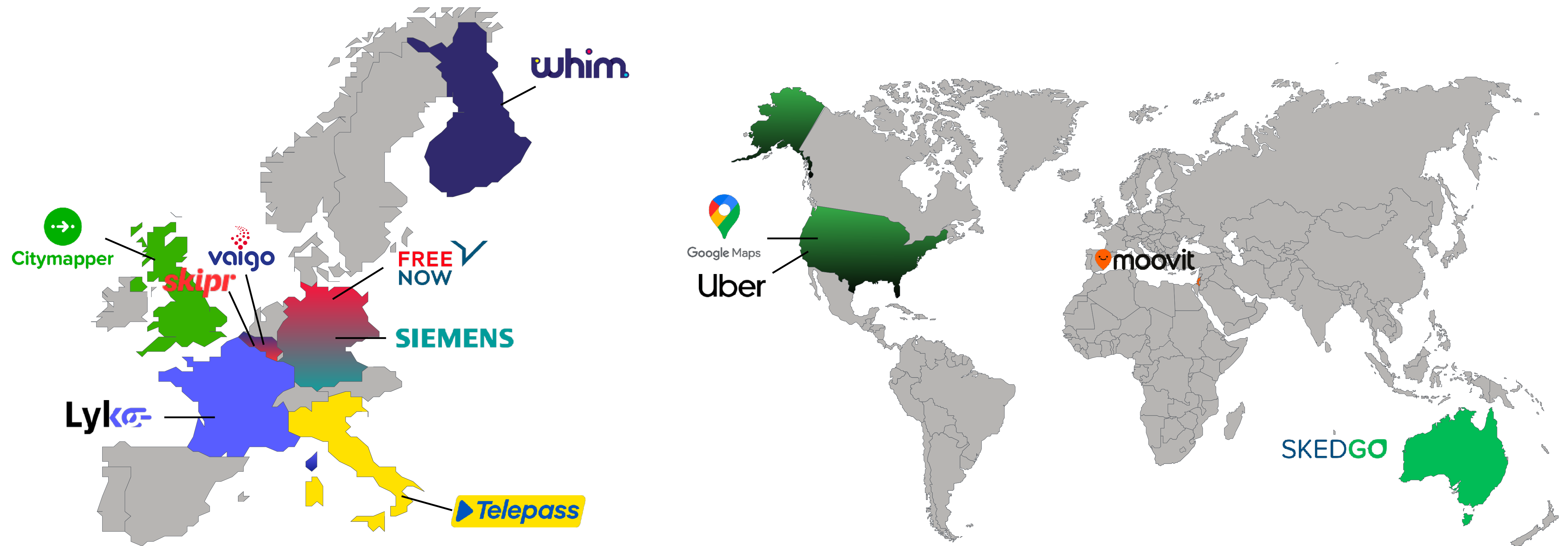
- When analysed by different dimensions, Moovit is the most powerful MaaS platform
 - Similar to Google Maps and Citymapper, Moovit initially offered routing services for car drivers and public transport users, which later expanded to include other forms of mobility services with detailed real-time data
 - With the support of its parent company Intel, Moovit has established strong partnerships with numerous TSPs across Europe, covering 9 different transport modes
- FREE NOW is the second most powerful MaaS platform
 - Just like Uber, FREE NOW was a ride hailing provider that now integrates other forms of commercial mobility
 - Although FREE NOW's services have a smaller geographic reach than Uber's, FREE NOW has integrated public transport with payment and ticketing in Germany, whereas Uber only provides basic public transport information for route planning
 - Compared to Moovit and Google Maps, FREE NOW offers fully integrated payment and ticketing without the use of deep links, while Moovit has not offered these services in Europe
 - FREE NOW benefits from the strong financial backing of its shareholders, BMW and Mercedes-Benz
- Google Maps stands out for its high number of downloads and cross-border integration, however, its MaaS integration levels remain low due to limited progress in payment and ticketing integration and lower transport modes integrated
- Whim, a platform with excellent MaaS integrations, falls behind its competitors due to the lack of financial support from major companies and availability in only 6 countries, despite being originally created as a pure MaaS platform
- Telepass offers several mobility options with integrated payment, however, it is currently only available in Italy
- SkedGo's B2C app in Europe has fewer transport modes integrated than its white-label B2B solution and only 100,000 downloads, and is not backed by any large companies, which has limited its reach and adoption

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- We profile the 12 leading MaaS suppliers in Europe
- We compare them based on 7 criteria, including their MaaS integration levels or their geographical footprint

We have evaluated all key suppliers operating in Europe

Headquarters of the selected MaaS platform suppliers



In section 5, we describe and evaluate the 3 main MaaS evolution scenarios

5 MaaS evolution scenarios - Factors affecting personal mobility

Door-to-door time and accessibility play an important role when choosing shared micromobility and public transport

Added value by transport services for users

Connectivity (origin-destination accessibility) plays a crucial role when deciding transport services for bikers and public transport riders

Biking and PT is the preferred modal choice

Regardless of the service they use, travellers highly value the ability to have companion while using transport

Previous knowledge of the system (ease of travel), from payment to navigation, is equally important across users

Travellers using shared micromobility and bicycles are more sensitive to longer door-to-door time

Source: PTOLEMUS Note: Assuming good cycling infrastructure *

5 MaaS evolution scenarios - Analysis of mobility modes utilisation

Private cars, taxis and bike hailing are the mobility modes with the highest perceived value for segment 1

Perceived value vs Price (per month)*

Category 1 - car owners

Source: PTOLEMUS Analysis Note: *assuming they heavily rely on the transport service for commuting, **Weighted average of val

5 Google in mobility - MaaS drivers and inhibitors

Lack of agreement on European regulation of digital services and consumer rights lead to slower MaaS adoption

Regulation inhibitors impacting MaaS in Europe

| Main inhibitors | Market impact |
|---|--|
| 1 Digital Markets Act and Digital Market Services | <ul style="list-style-type: none">The Digital Markets Act regulates market for consumers i.e. prices, service quality, and small companies i.e. terms and conditions of serviceThe Digital Markets Services regulates digital commerce in the EUBoth regulations will affect the entry of mobility platforms providers and services they can integrate and offer in the EU |
| 2 Anti-trust regulations | <ul style="list-style-type: none">Anti-trust regulation impedes monopolistic behaviour or any sort of arrangement that plays against free-market and fair competitionLargest platform providers for mobility, payment or information might find it difficult to enter the market |
| 3 Consumer rights protection and data privacy | <ul style="list-style-type: none">Different consumer rights directives and difficulty to comply with the obligations assigned to platform providers in order to offer the MaaS serviceInconsistencies in data privacy legislation between EU countries bring obstacles for international mobility platforms to penetrate local MaaS market |

Source: PTOLEMUS

5 MaaS evolution scenarios - Future scenarios - Scenario 2

Changes in preferences towards less polluting mobility and technological progress will attract users to all MaaS cases

Magnitude of Impact

Legend

Scenario 2 - Car restrictions drive MaaS

Source: PTOLEMUS

5 MaaS evolution scenarios - Future scenarios - Scenario 2

Changes in preferences towards less polluting mobility and technological progress will attract users to all MaaS cases

- Environmental and data policy
 - Taxation of all private cars increases the perceived value of shared mobility, and thus MaaS schemes gain relevance
 - Integration of APIs enables access to new mobility services, helping MaaS to gain added value
- Infrastructure and socio-economic developments
 - Densified grids for EVs enables MaaS access to data points to provide accurate information of status, traffic and analytics
 - MaaS gains relevance in denser urban centers due to the higher coverage of shared micromobility and PTs
 - The heavy incentives to reduce car ownership improve the business case for commercial MaaS
- Technological progress
 - Given there is digital and policy integration, customisable mobility bundles are the norm of MaaS
- Industry development
 - Commercial MaaS reduces the entry price of bundles and offers customisable multimodal packages more flexible than corporate mobility
 - MaaS is operated by a third party, who is the customer-facing brand, this can be a subsidiary, a small or a large player

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- We study the **regulation, market and technology drivers and inhibitors** impacting MaaS in Europe
- We build **future scenarios of MaaS in Europe** and assesses their **respective likelihood**

- This fifth section includes **over 50 slides**
- It **lists and analyses the factors affecting commuters' choices** when selecting a mobility mode

In section 6, we estimate and forecast the number of trips in Europe, and the corresponding MaaS addressable market

- This sixth section includes **over 30 slides**
- It **segments the MaaS market** to understand which business modes could serve each category and analyses the perceived value and the price of mobility services for each category

5 MaaS market forecast - Scope, sources and methodology

We have estimated the number of trips for metro, tram, suburban railway, buses and taxis for 10 countries / regions

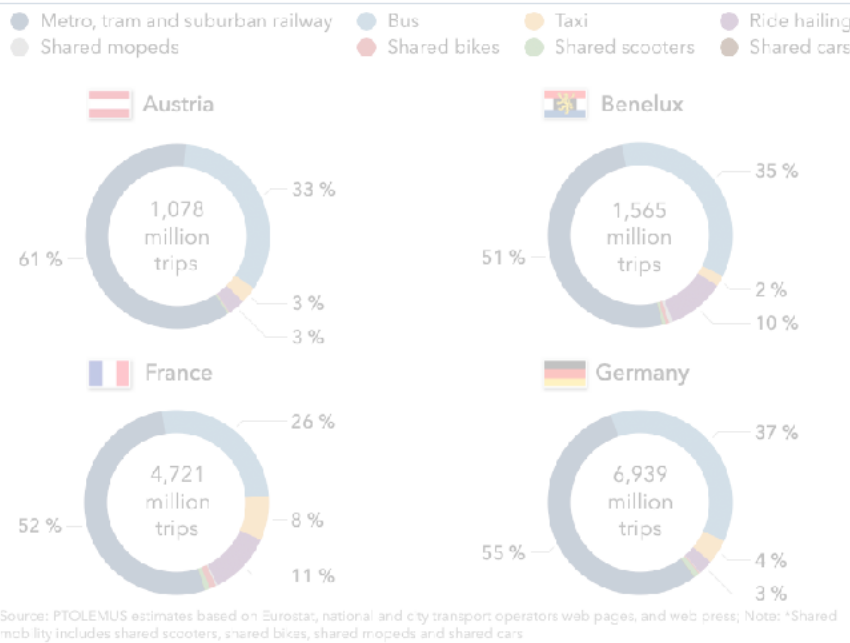
Scope, sources and methodology used for metro, tram & suburban railway, bus and taxis

| | Metro, tram & suburban railway | Bus |
|-------------|--|---|
| Scope | <ul style="list-style-type: none">Urban metro and tramShort train (suburban railway) connecting a city with its suburbsExcluded: Long distance train | <ul style="list-style-type: none">Urban busExcluded: Long distance (inter cities) |
| Sources | <ul style="list-style-type: none">Webpages, reports and press releases of 50+ cities, DOTs, government agencies, UITP and metro operators | <ul style="list-style-type: none">Passenger transport reported by Eurostat15+ cities, DOTs, agencies, UITP or webpages and reports |
| Methodology | <ul style="list-style-type: none">Either:<ul style="list-style-type: none">Collected country statisticsCollected city statistics and add them up to obtain country / regional number of trips | <ul style="list-style-type: none">Collected the number at country levelFor those countries we added information and bus operators them at country / regional level |

Source: PTOLEMUS

Metro, tram and suburban railway trips cover more than half of the number of trips in Austria, Benelux, France and Germany

Number of trips in Austria, Benelux, France and Germany (2021)



Source: PTOLEMUS estimates based on Eurostat, national and city transport operators web pages, and web press. Note: *Shared mobility includes shared scooters, shared bikes, shared mopeds and shared cars

Key takeaway

- Austria, Benelux, France and Germany have a similar distribution of the number of trips

5 MaaS market forecast - Taxi and ride hailing

Ride hailing already prevails over taxis in some countries, such as France and the UK

Number of taxi and ride hailing trips (2021)



Source: PTOLEMUS estimates based on Eurostat, national and city transport operators web pages, and web press. Note: **Rest of EU except Austria, Benelux, France, Germany, Italy, the Nordics and Spain. ***Rest of Europe** refers to all countries in Europe excluding

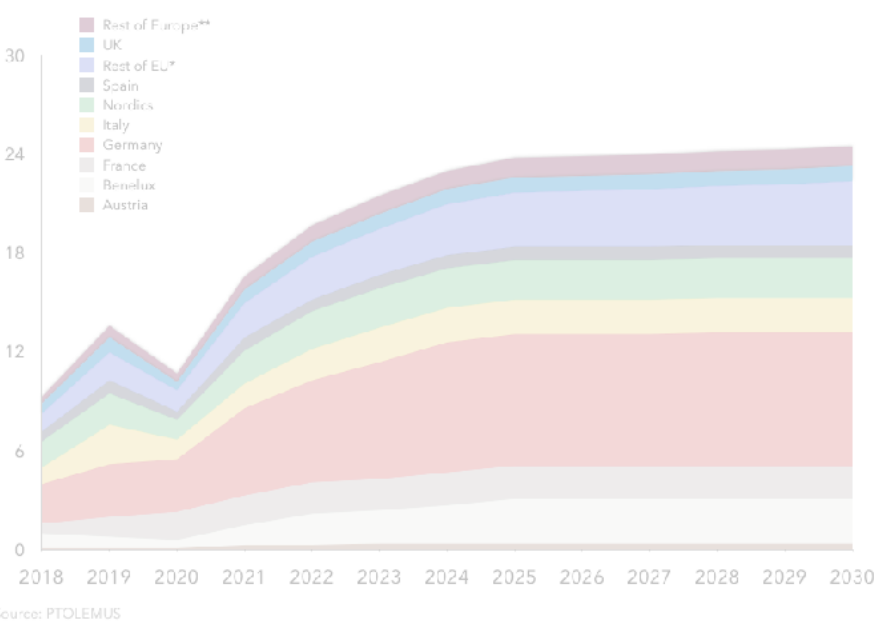
Key takeaway

- Taxis accounted for 2,704 million trips, while ride hailing accounted for 2,590 million trips in Europe in 2021

5 MaaS market forecast - Shared cars

The number of shared car trips will keep growing in Europe, but at a decreasing pace

Number of shared car trips (million)



Source: PTOLEMUS

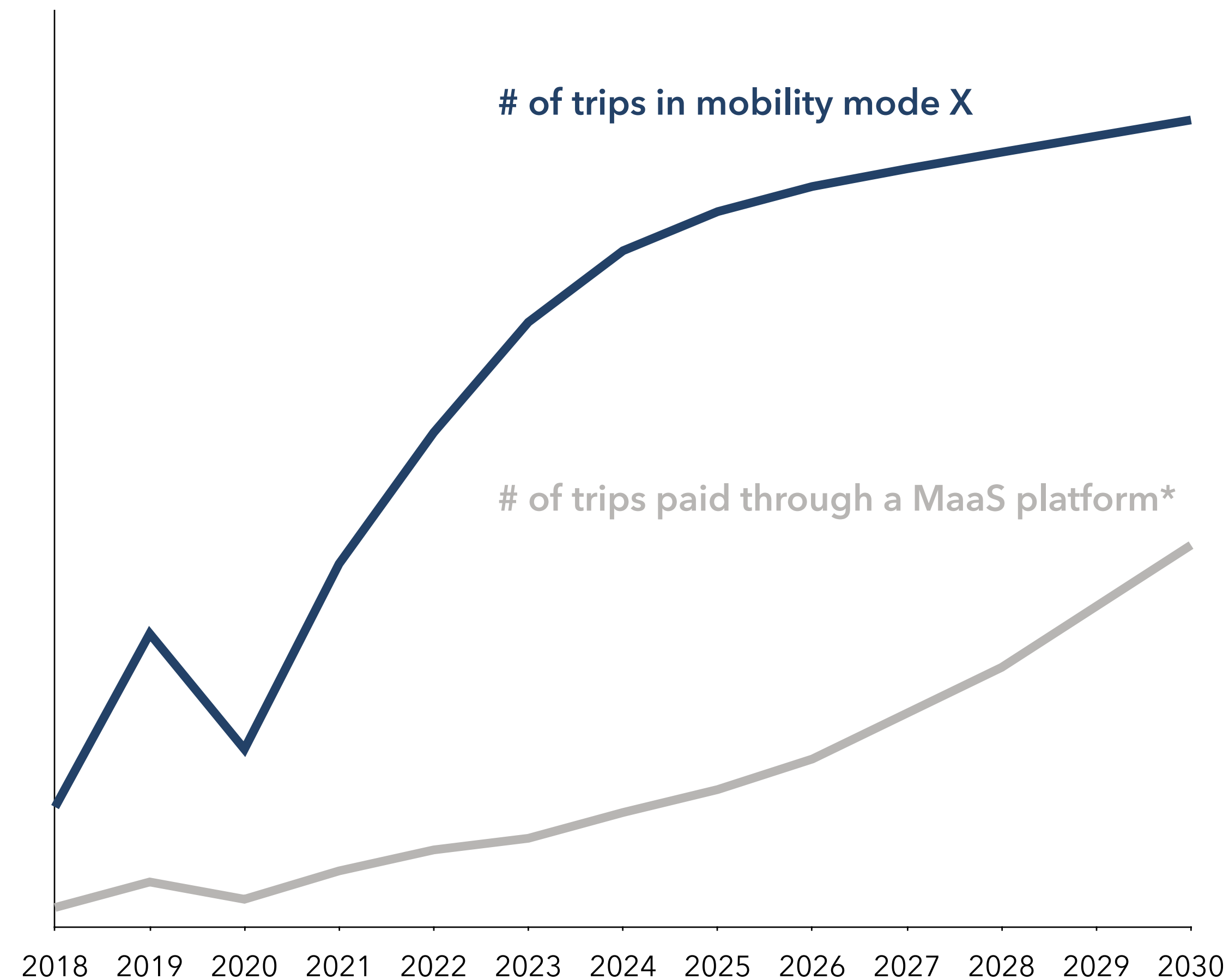
- From 2021 to 2030, we expect the number of trips on shared cars to increase from 16.6 million to 24.5 million, growing at a 4.4% CAGR
- The increase of the number of shared car trips will be driven by the increase on the European shared cars' fleet:
 - 10,000 new shared cars among Germany and Belgium added by MILES Mobility from 2023
 - 300 new shared cars in Vienna added by Wiener Linien and Eloop from 2022 to 2023
 - 200 new shared cars in Milan added by Eni at the end of 2022, with plans to expand the service to Rome
 - 500 new shared cars in Madrid added by Votio (shared car company of Mutua Madrileña) at the end of 2022
 - 2,000 new shared cars in Belgium added by Poppy Mobility starting from 2023

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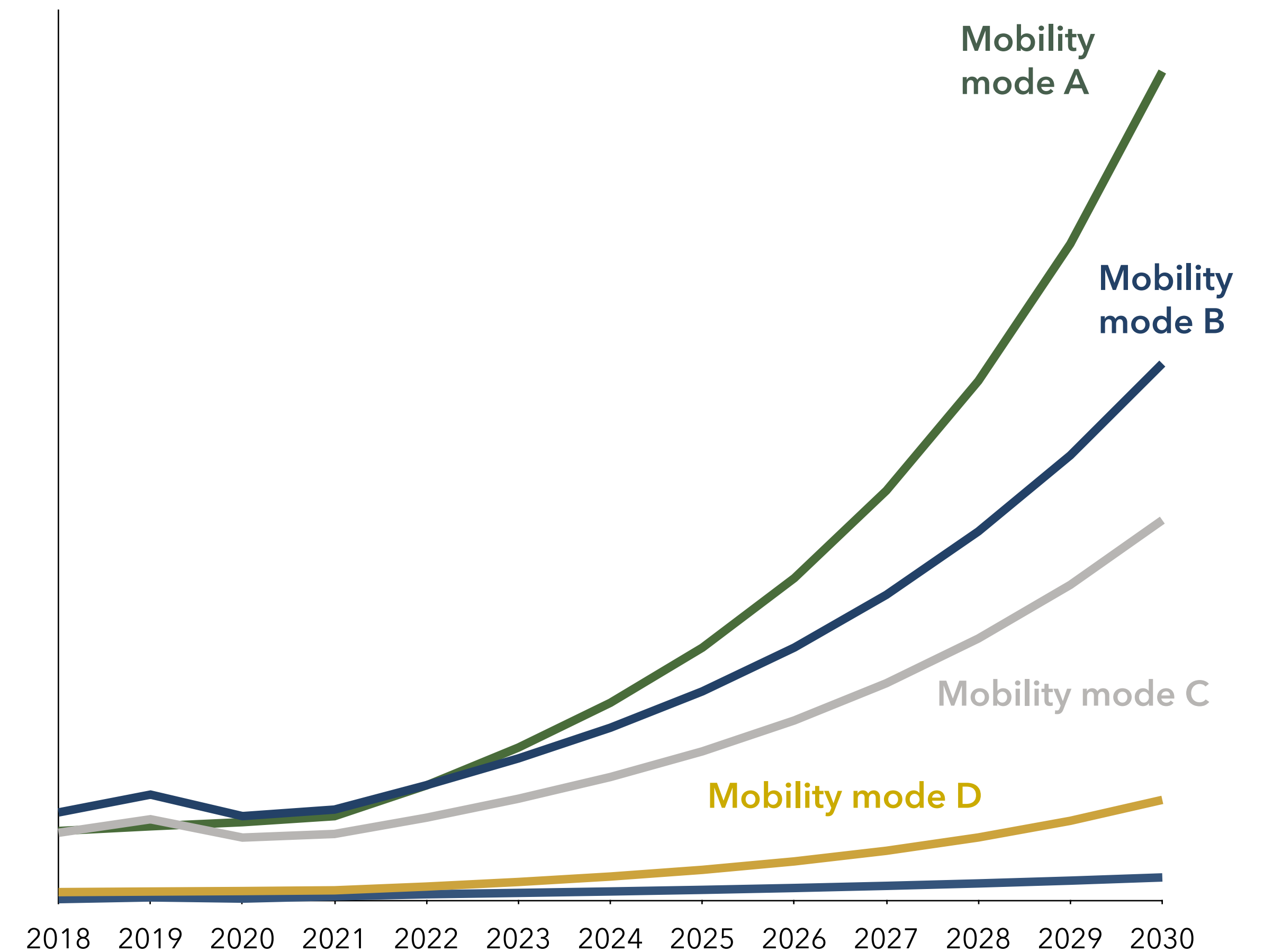
- We study the **regulation, market and technology drivers and inhibitors** impacting MaaS in Europe
- We build **future scenarios of MaaS in Europe** and assesses their **respective likelihood**

We expect that XX% of shared mobility trips will be payed via MaaS platforms by 2030

Number of shared mobility trips and MaaS penetration (million)



MaaS revenues in Europe by mobility mode (€ million)



In section 7, we provide our conclusions and recommendations to the key MaaS players

- This seventh section includes **15+ pages**
- It **classifies MaaS players into 6 different groups**

7 Conclusions and recommendations for players - Introduction

We have evaluated short and long-term challenges and recommendations for MaaS players

- Whilst more companies in the MaaS ecosystems keep entering and exiting cities around Europe, we see all players face multiple challenges in the short and long-term to address a market that remains volatile
- Based on the value chain in Section 3, we classified players of the ecosystem into 6 different groups:
 1. Transport Governance: governments behind the legislation of transport in cities and regions
 2. Citizens: people living in cities using transport services
 3. Back-end and systems players: companies building the back-end MaaS platform e.g. Lyko, Google Maps, City Mapper, and building the application e.g. Via, Whim
 4. MaaS providers: user-facing companies, which are the ones who provide the application users interact with e.g. Skipr, Uber, Whim
 5. Transport Service Providers (TSPs): companies providing commercial transport services e.g. Tier, Lime, Donkey Republic
 6. Public Transport Operators (PTOs): agencies providing public transport services e.g. RATP, DcLijn, EMT
- These players do not exclusively belong to one group and they can offer services in different non-consecutive parts of the value chain
- Based on interviews and commercial trends, PTOLEMUS identified some of their long-term goals
- In addition, for each one of these goals, we analysed their main challenges and gave recommendations to stakeholders
- With this section, we trace final conclusions on how players can foster MaaS implementation and how governments, TSPs and PTOs improve their services while securing their operations

Source: PTOLEMUS

7 Conclusions and recommendations for players - National ministries & regional councils of transport

Governments should increase efforts to identify the right KPIs to measure the success of MaaS and shared mobility programmes

| Goals | Challenges | Recommendations |
|--|---|---|
| Short term Transport governance <ul style="list-style-type: none">• Unify the transport network• Maintain accessible pricing• Reduce number of accidents• Maintain and create infrastructure• Increase digitalisation of transport services• Decrease the friction to shift between transport services | <ul style="list-style-type: none">• Define the optimal allocation of resources to improve weaker parts of the transport network• Ensure new platforms can smoothly enter the market• Provide infrastructure and guidelines to increase safety levels for micromobility modes• Improve the distribution of floating vehicles in public spaces• Manage unexpected events caused by forces outside of the transport realm e.g. demographic trends inducing changes on mobility | <ul style="list-style-type: none">• Decreased quality of the service from TSPs and PTOs working in silos and unwilling to open their ticketing and payment systems to third parties• Develop infrastructure and regulation for emerging shared micromobility vehicles• Create a resilient economic structure to handle with inflation and energy crisis |

Source: PTOLEMUS Notes; *Points Of Interest

7 Conclusions and recommendations for players - Transport service providers

In the long term, TSPs should push national and EU institutions to enforce strict car restriction regulations

| Goals | Challenges | Recommendations |
|---|---|--|
| Long term Transport Service Providers <ul style="list-style-type: none">• Build a robust and sustainable business model• Ensure sustainability across their operations• Maximise user satisfaction• Improve people's life by providing best-in-class mobility• Become a prominent TSP in the region of operation | <ul style="list-style-type: none">• Identify a robust and sustainable business model• Create financial plans allowing them to incorporate new services to business lines• Remain competitive against PTOs, OEMs and mobility integrators expanding to share mobility and adding new services to their platforms• Lobby for regulations that allow expansion of commercial mobility• Secure carbon neutral cycle from manufacture to service provision | <ul style="list-style-type: none">• Establish loyalty from costumers for current• Devise strategies to lead customer to explore new services within the brand |

Source: PTOLEMUS

- It analyses their respective **short and long-term goals**, and their **corresponding challenges**
- Finally, it gives **concrete recommendations** to these players

A citizen-first approach to platform design and TSPs integration to PT network can help to move MaaS forward

- Our analysis shows that all players must comprehensively engage on citizen's research to understand people's choice of transport:
 - From the research results, players can articulate a demand-based offer that relies on user segmentation to avoid underserving areas or increasing chaos in spaces where multiple transport modes co-exist
 - Engagement with users will help to build a more realistic business case for commercial providers, besides helping to establish a community for long-term engagement
 - A good way to engage with citizens is to create bottom-up approach to platform design
- For all players, it is key to understand their user cases to collectively design the ecosystem of MaaS platforms:
 - For this, multilevel and multi-stakeholder partnerships can help to strengthen relationship between commercial and public providers
- On one hand, governments and regulatory authorities should put more focus on choosing the right KPIs i.g. improved accessibility to POI, increased last-mile connections, to streamline resources into achieving priority goals
- On the other hand, they cannot rely on one-sided measures i.e. only integrating transport in digital platforms, but they need to offer visibility to TSPs through safe infrastructure
- Back-end and system players have clear opportunities for expansion:
 - As front-end developers and back-end providers, they will need to navigate in the political and economic landscape of cities
 - In particular, changes of administration are a real challenge when providing services that include public transport or infrastructure
 - As shown in the chapter before, Google and other apps in the mapping and integration realm are likely to stay in the back-end (suppliers) instead of becoming an official city MaaS
 - Thus, smaller players in systems and back-end need to focus on making coalitions to compete against tech giants with international TSPs, and lobby for protection and funding to local ecosystem players
- PTOs are increasingly more open to collaborate with TSPs:
 - Given that business models for shared micromobility providers are under construction, a fully two-ways cooperative model between commercial and public is not likely to materialise in the short term



Mobility-as-a-Service Market Report

About PTOLEMUS



PTOLEMUS Consulting Group

PTOLEMUS is the first strategy consulting and research firm entirely focused on geo-connected mobility and automation



Strategy consulting services

| | | |
|----------------------|----------------------|----------------------|
| Strategy definition | M&A advisory | Procurement strategy |
| Partnership strategy | Business development | Market forecasting |



Market research services

| | | |
|-----------------------|-----------------------|------------------------|
| Off-the-shelf reports | Subscription services | Custom market research |
|-----------------------|-----------------------|------------------------|



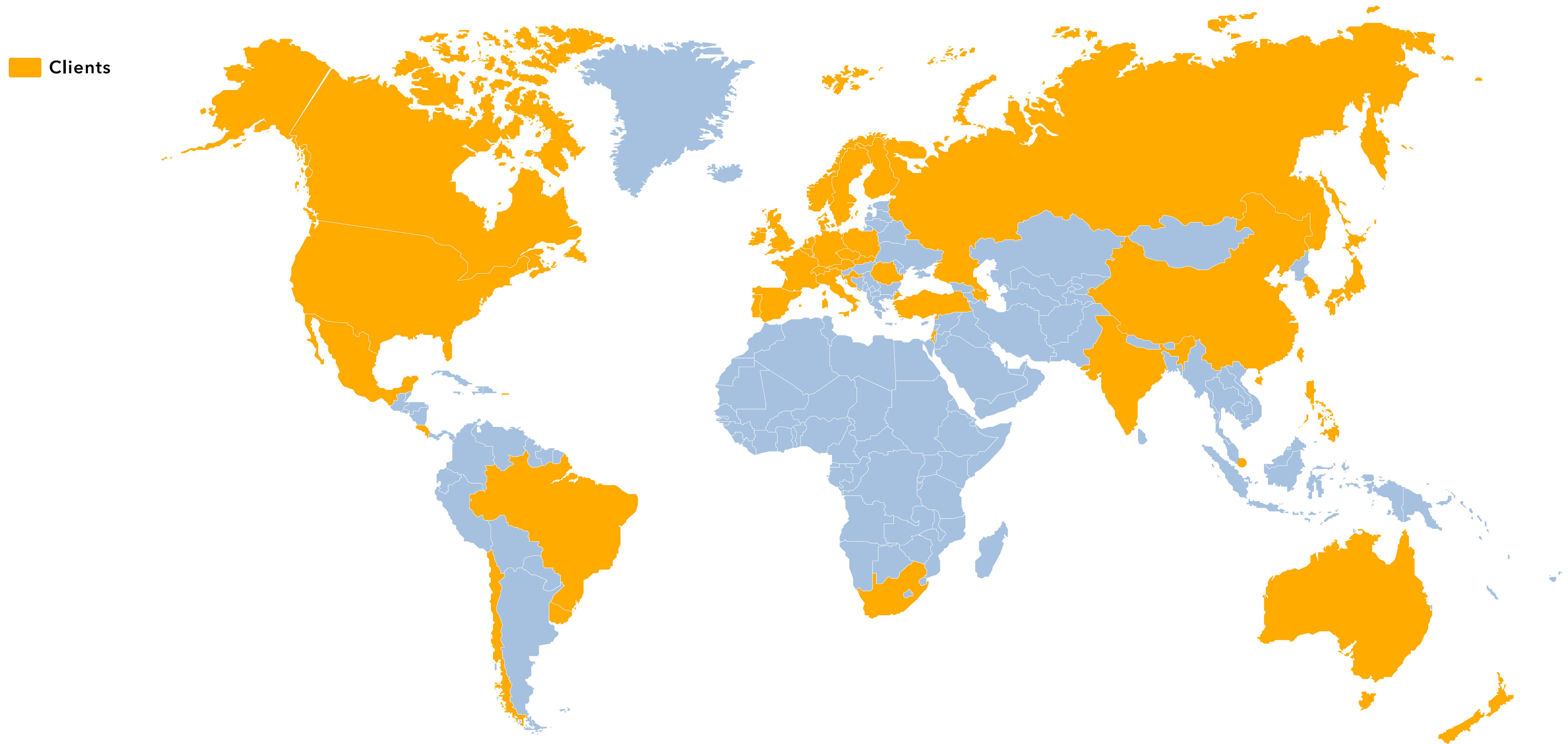
Fields of expertise

| | | |
|--------------------|--------------------|----------------------------|
| Mobility services | Motor insurance | Vehicle data and analytics |
| IoT & connectivity | Electrification | Connected vehicle services |
| RUC and tolling | Vehicle automation | Emergency services |

We serve over 350 clients across the mobility ecosystem

| Business area | Clients | Business area | Clients |
|----------------------------------|---------|--|---------|
| Analytics, maps & apps providers | | Insurers, aggregators & assistance providers | |
| | | | |
| Automotive OEMs & suppliers | | | |
| Banks & private equity investors | | Tolling & ITS | |
| Device & location suppliers | | | |
| Mobile telecom players | | Telematics solution providers | |

Our team of consultants, experts and analysts serve our clients in 41 countries



PTOLEMUS can help your organisation make MaaS a reality

• Strategy definition

- Mobility strategy assistance
- Scenario planning, simulation & analysis
- MaaS strategy development
- Multimodal mobility design and planning
- Connected vehicle payment integration
- Strategy orientation workshops
- Connection to city congestion charging & access management scheme

• Innovation strategy

- Vertical market assessments
- Product definition
- Consent management

- Data collection & analytics strategy
- App strategy & use cases
- Stakeholder consultation & engagement
- Pricing strategy

• Innovation delivery

- Proof of concept design & launch
- Architecture definition
- Data strategy
- Project management

• Investment assistance

- M&A strategy
- Commercial due diligence
- Technology due diligence
- Feasibility studies
- MaaS market sizing
- Business case development

- Cost benefit analyses
- Post-merger integration

• Procurement

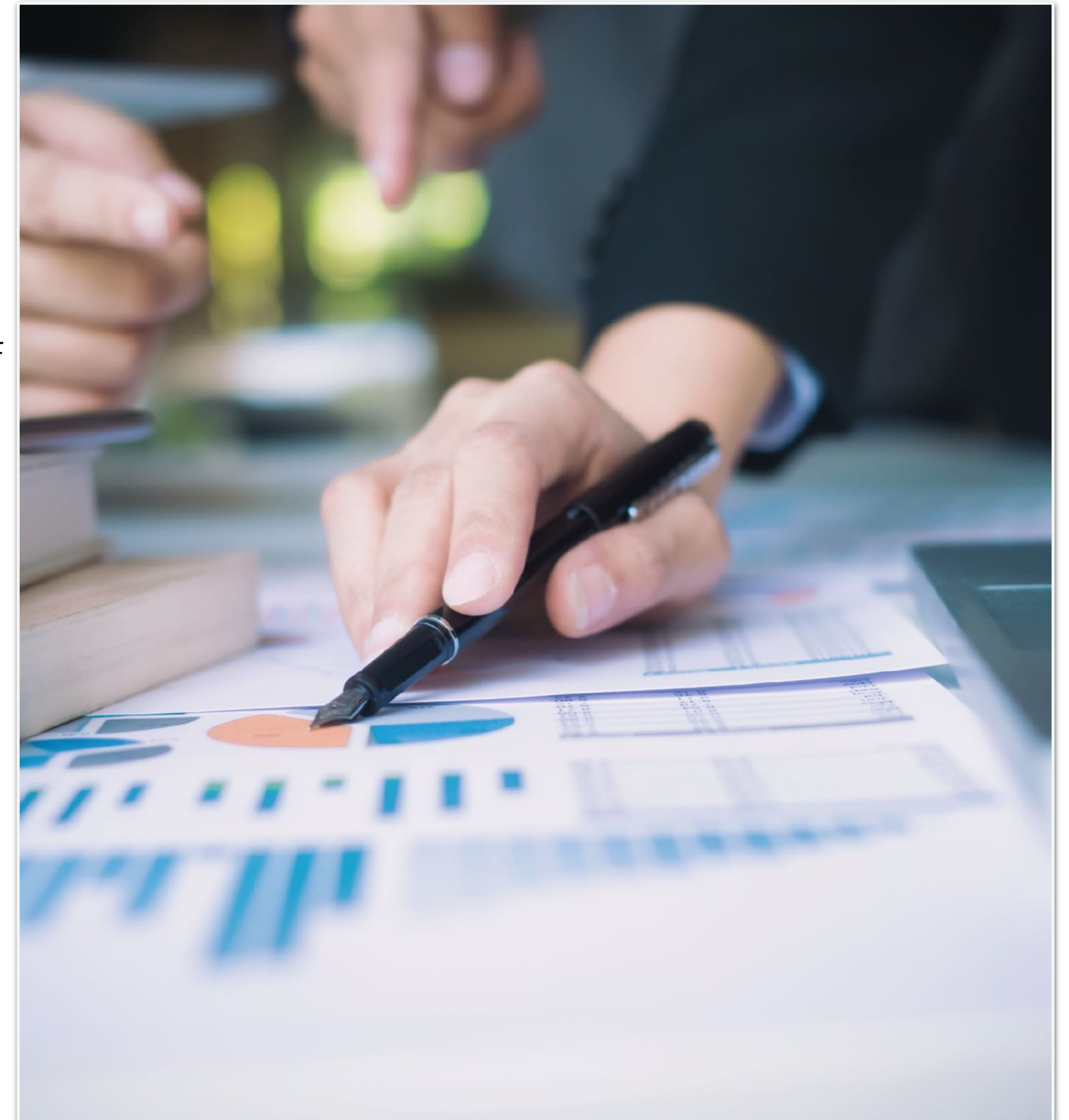
- Definition of MaaS platform requirements
- Assistance to tenders
- Selection and sourcing of MaaS platform vendor

• Partnership strategy

- Partnership strategy definition
- Assistance to tender response

• Project management

- Assistance in management of MaaS project implementation
- End-to-end quality monitoring



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