

# White Paper

Guidelines & Recommendations  
to create the foundations for  
a thriving MaaS Ecosystem

MaaS Alliance

September 4, 2017

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## MOBILITY AS A SERVICE (MAAS)

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*Mobility as a Service (MaaS) is the integration of various forms of transport services into a single mobility service accessible on demand.*

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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. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi, car rental or lease, or a combination thereof. A successful MaaS service also brings new business models and ways to organise and operate the various transport options, with advantages including access to improved user and demand information and new opportunities to serve unmet demand for transport operators. The aim of MaaS is to be the best value proposition for its users, providing an alternative to the private use of the car that may be as convenient, more sustainable, and even cheaper.

## THE MAAS ALLIANCE

Established at the ITS World Congress in Bordeaux in 2015, following the launch of the MaaS concept at the ITS European Congress in Helsinki in 2014, the MaaS Alliance is a public-private partnership working to establish foundations for a common approach to MaaS, and to unlock the economies of scale needed for successful implementation and uptake of MaaS in Europe and beyond. The main goal of the Alliance is to facilitate a single, open market and full deployment of MaaS services.

There are various stakeholders whose committed participation in the development and implementation of MaaS is crucial to its success. The MaaS Alliance facilitates stakeholder cooperation through a shared work programme engaging all relevant stakeholders, inter alia the following:

- Transport service providers and public transport operators
- MaaS operators and integrators
- IT system providers
- Customers
- Cities, local, regional and national authorities

MaaS Alliance members from all sectors collaborate to create the enablers needed for successful deployment of MaaS in Europe and beyond. The Alliance contributes to European policy-making, promotes the added value of MaaS to local government and business, monitors the MaaS market and facilitates the dialogue with the research community. Finally, the Alliance is the voice of the MaaS community for awareness and advocacy.

## EXECUTIVE SUMMARY

Mobility as a Service (MaaS) constitutes the integration of various forms of transport services into a single mobility service accessible on demand. Booming demand for more personalised transport services has created a market space and momentum for MaaS. Whilst MaaS is still in its infancy, various MaaS initiatives have been launched although they have not yet been solidified in terms of interoperability. Many pilots, trials and research efforts into various scenarios and associated impacts are needed.

Currently the transport sector is mode-specifically regulated which does not always favour the implementation of MaaS. In addition, there is no harmonized way how the MaaS operator as a new actor is handled in terms of transport regulation in different EU Member States, which may hinder the emergence of new (cross-border) services. Development of the MaaS market will rely on access and openness data, open APIs (Application Programming Interface) and more flexible transport and mobility regulations.

When defining regulatory principles for a digitalized transport system, it is imperative to encourage the participation of all market players – both existing and new players - and avoid stifling innovation. IT technologies developed for MaaS should support both commercial-interest-driven and public-service types of MaaS deployment, even though the business models and interests behind them may vary. Open IT architecture and standardised sub-element features, such as payment, ticketing, authentication and security, will be enablers to maximise the development of the MaaS market. In addition to open standards, an imperative requirement is a high quality of the data being exchanged.

A fundamental principle and core motivation behind deployment of MaaS is that MaaS is a user-centric, customer-centric, market-centric proposition within a societally grounded context. MaaS to become the best value proposition for both private and business users, by helping them meet their mobility needs and solve the inconvenient parts of individual journeys, as well to improve the efficiency of the entire transport system.

While designing and establishing the MaaS ecosystem, the principles of openness and inclusivity should be fully respected, meaning that the ecosystem should be open to all service providers and inclusive for all different kind of users, including persons with reduced mobility or disabilities. In order to build attractiveness and public acceptance for MaaS services, the whole value chain should be carefully and inclusively designed to meet the high expectations related to ecological and financial sustainability.

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## FOREWORD BY JACOB BANGSGAARD, PRESIDENT OF THE MAAS ALLIANCE

### WHY DO WE NEED MOBILITY AS A SERVICE?

Mobility in the late 20<sup>th</sup> and 21<sup>st</sup> centuries has been characterized by the dominance of the use of private cars, in principle bringing people greater freedom of mobility. However, cars have also brought congested urban traffic and a heavy environmental footprint. The recent growth of personalized mobility service options is challenging the status of the private use of cars as a backbone of modern mobility. Owning a car is no longer a “must have” lifestyle choice in urban areas and, the younger generations in particular, are often more keen to have access to mobility than owning the associated commodities.

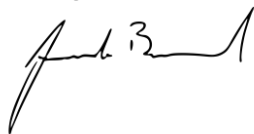
Changes in the personal mobility market present great opportunities for urban mobility players to attract new customers. Car manufacturers and automotive leasing and rental industries are increasingly positioning themselves as a provider of mobility services, e.g. by extending their traditional business with car-sharing services. Combining various transport services, e.g. car sharing, ride-hailing, bike- and scooter-sharing, car-pooling and demand-responsive transport (not to forget high-quality and real-time information about walking and cycling options and conditions) can complement classic fixed-route, timetabled public transport. For transport providers, combined mobility and Mobility as a Service schemes offer new sales channels, access to untapped customer demand, advanced user account and payment management, as well as richer data on travel demand patterns and dynamics.

Connectivity, accessibility and affordability are often cited as the main goals of transport policy, supplemented with the requirements of the minimization of the externalities, like accidents, environmental effects and congestion. Mobility as a Service holds the promise to make delivery of these targets more probable than ever before. Enhanced connectivity and digital information services are creating – for the first time ever – real-life preconditions for seamlessly multimodal transport systems, where modal shift can be realized. MaaS aims to integrate public and private modes of transport into convenient offerings and combining services, which have competed in the past. Better access and exchange of data will also simplify trip planning and comparison and improve cost transparency.

The Mobility as a Service sector is expected to grow to a business worth over one trillion euro by 2030. All over Europe, MaaS initiatives are planned or starting up and the MaaS Alliance helps these to cooperate through a shared work programme engaging service providers, transport operators, public authorities and users in order to create a vital and interoperable MaaS ecosystem to fulfil high expectations.

On behalf of the MaaS Alliance, I would like to cordially thank working group leaders and members as well external experts for their valuable contributions to this White Paper. However, the work has only begun. I hope that this White Paper inspires us to work together for the creation of a thriving MaaS ecosystem in Europe.

Looking forward to our common journey!



Jacob Bangsgaard  
President, MaaS Alliance

## BUILDING PRECONDITIONS FOR A THRIVING MAAS ECOSYSTEM

### MAAS ECOSYSTEM AND PROCESSES

The core function of MaaS ecosystem is to catalyse an open and dynamic market for the delivery of a user-centric mobility services portfolio through an unique interface. It is an ecosystem made of many different partners, sharing a common principle of delivering a door-to-door seamless mobility experience. The MaaS ecosystem needs to deliver new services to the end customers and combine various services into higher value offerings. Otherwise the MaaS revolution will not happen.

In the MaaS ecosystem, the mobile phone or application will be the remote control and command centre for personalized mobility,

replacing tickets and cash as unnecessary elements in the operations. In a mature MaaS ecosystem, some of the services could, and most probably will, be non-mobility related, aligned with the mobility patterns of users and integrated into the provision of mobility services.

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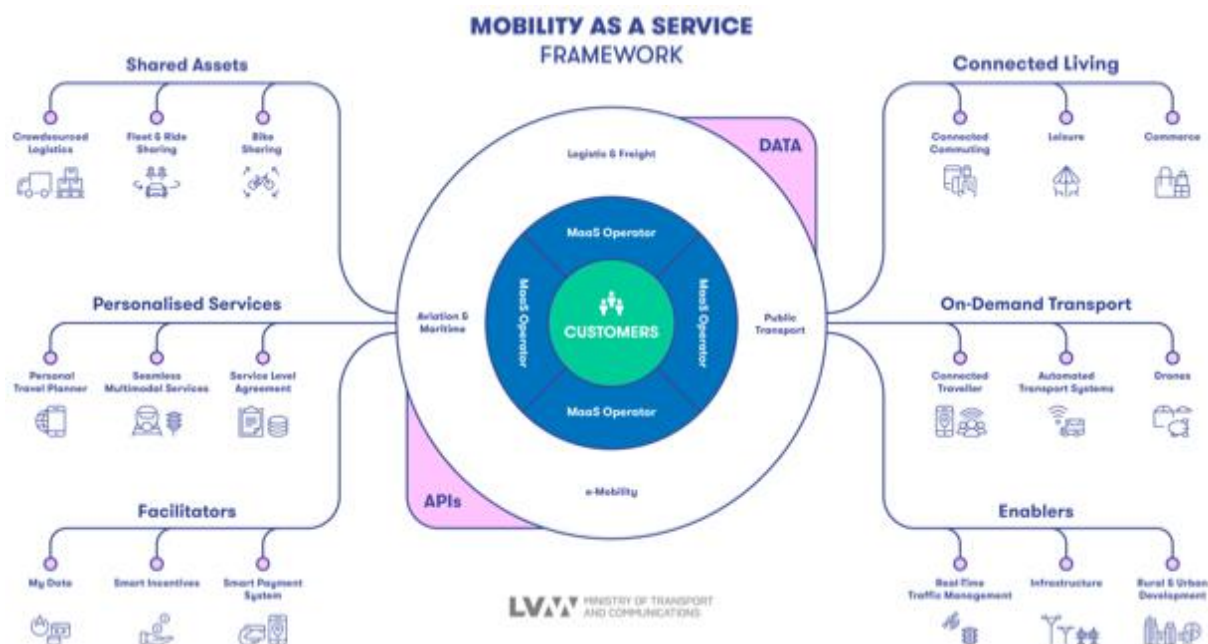


Figure 1: Mobility as a Service framework (Finnish Ministry of Transport & Communications, 2016)

Generally speaking, a MaaS scheme should comprise the following basic processes:



Figure 2: Processes in a MaaS offering

## The MaaS Operator: Emergence of a New Mobility Player

Since the role of ‘MaaS operator’ does not yet exist in the conventional transport value chain, it might be worth briefly describing its most common functions and responsibilities.

Human and business related	Process-related	Technological
<ul style="list-style-type: none"> <li>• Liaising with other mobility operators and integrators with clearly defined contractual obligations</li> <li>• Transparent and fair treatment of transport service providers when aggregating their services based primarily on end-user preferences</li> <li>• Understanding that a successful MaaS operation may result in improved operations and revenues for all mobility operators</li> </ul>	<ul style="list-style-type: none"> <li>• Collaborate with stakeholders to ensure payment &amp; ticketing integration, define parameters such as fare policies and discounts</li> <li>• Sharing real-time information with stakeholders related to service status and issues to ensure continuity of customer service</li> <li>• Adhering to MaaS customer service norms</li> </ul>	<ul style="list-style-type: none"> <li>• Implement an IT system to set up services, publish data, set up tariffs, interface with third party modules and to integrate different public and private transport service providers</li> <li>• Promote interoperable interfaces in the ecosystem (for transport service providers and other service providers)</li> <li>• Share anonymized data with the city, and other mobility stakeholders as well as with other integrators</li> </ul>

Figure 3: Responsibilities of a MaaS operator

Although the allocation of responsibilities in the case of non-compliance of the service promise or incidents is a topic of further discussions with the actors in the value chain, already some very general principles can be gleaned regarding liability and insurance schemes:

- The scope of liabilities for the transport service provider remains basically the same within the context of MaaS as it is in non-MaaS operations. The liabilities resulting from aggregation of transport service providers in general remains with the MaaS operator (for example one leg of the trip is cancelled and therefore the whole trip is cancelled, the MaaS operator may be liable for the entire trip).
- While each of the transport service providers will need to continue to maintain liability insurance, the MaaS operator might be served by the introduction of mobility insurance for users. Such insurance would cover end users regardless of the mode of mobility used in the context of MaaS, closing all coverage gaps that may exist.
- Insurance would provide an added incentive to users as they and their families would be well covered in case of any incident while travelling. Insurance can also be used to compensate end users when the service levels are not adhered to.
- In order to provide maximal flexibility for the user, the insurance scheme could possibly also cover some of the liability of the end user in case they decide to cancel or change their journey at the last minute, after booking and payment has been made.



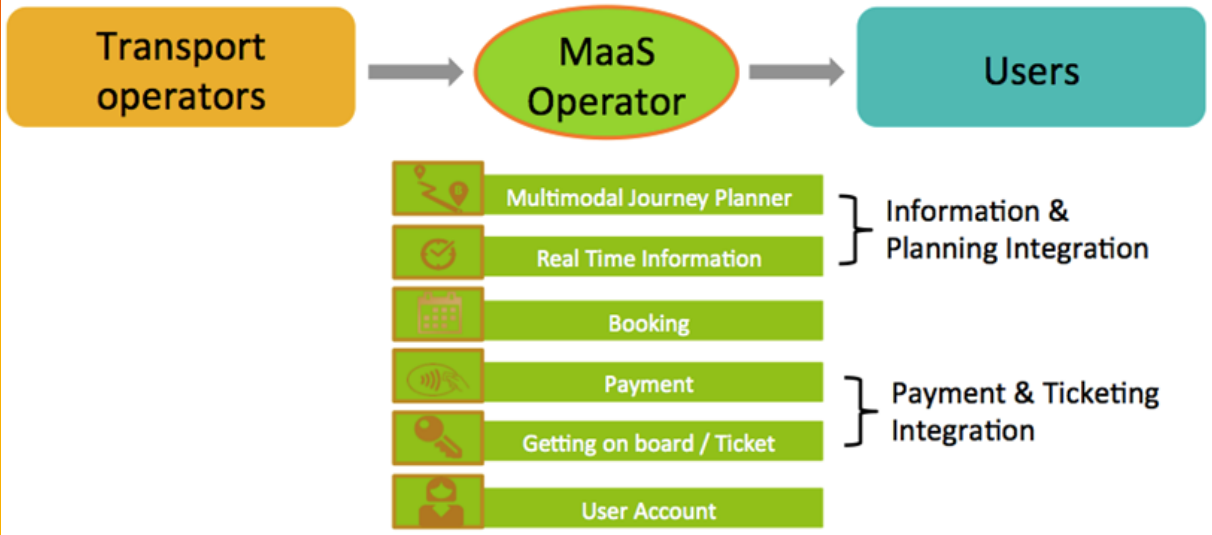


Figure 4: Functions of a MaaS operator (UCL MaaS Lab, 2015)

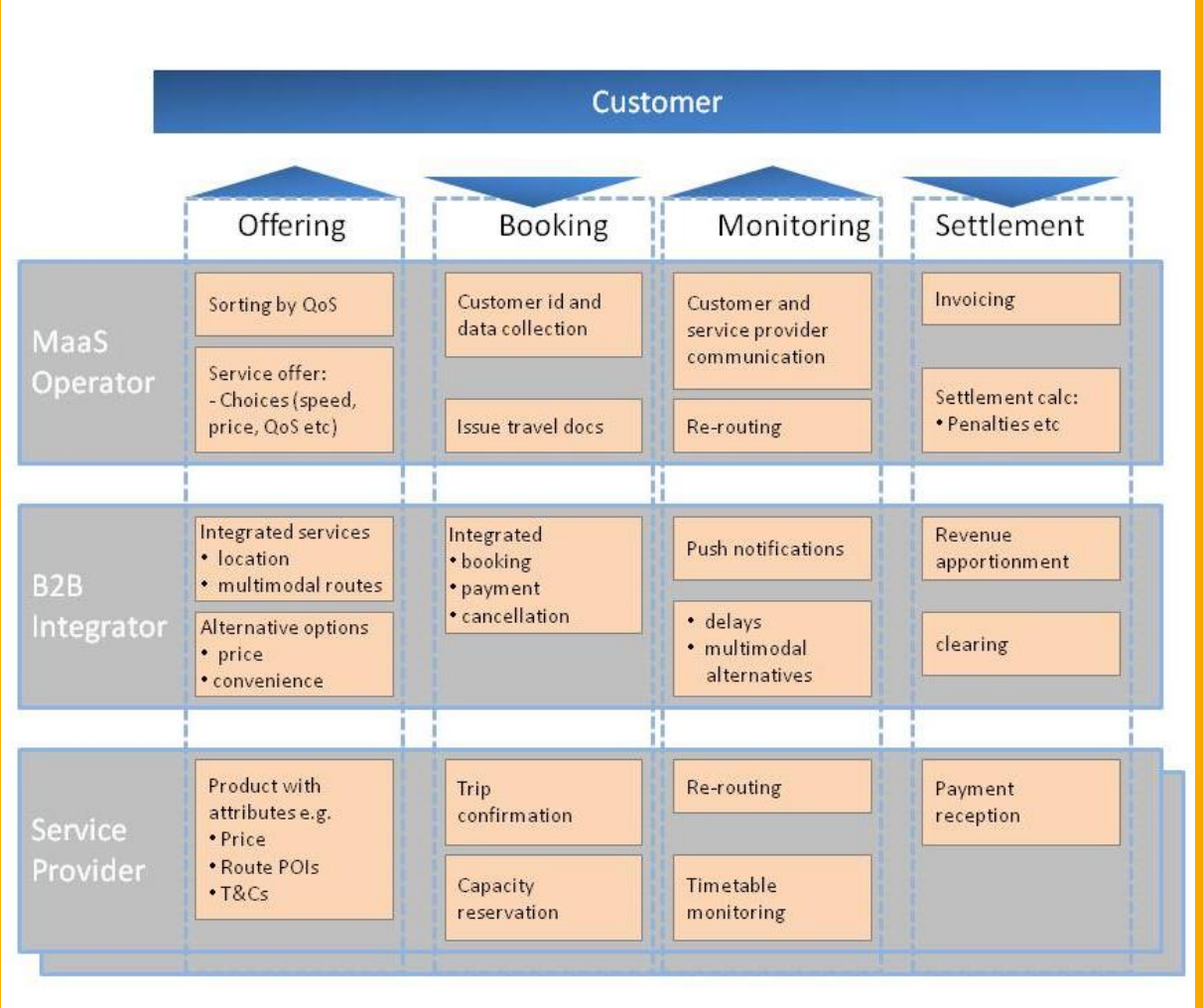


Figure 5: MaaS value chain participants and key processes (University of Tampere, 2016)

## PRECONDITIONS FOR THE MAAS ECOSYSTEM

Figure 4 extracts the main requirements and preconditions for the MaaS ecosystem. It is important to note that these requirements represent the best understanding of the problem domain at this stage, but additional requirements may emerge in the future.

***What should be properly delivered from the very beginning, is the quality of the service provided, even if within a reduced scope.***

It is advisable not to try and address all issues from the very beginning, but rather start deploying demonstrations and expand stepwise. What should be properly delivered from the very beginning, however, is the quality of the service provided, even if within a reduced scope. Failing this, by for instance providing a non-reliable trip planner or a non-user-friendly interface, user acceptance will also deteriorate and it will be virtually impossible to recapture.

Single market	User perspectives	Legal and regulation	Technology & standards
The ecosystem should be open for varied service providers to establish their business <ul style="list-style-type: none"> <li>• no exclusivity to any operator,</li> <li>• no vendor or operator lock-ins</li> </ul>	MaaS is a user-centric, customer-centric, market-centric proposition within a societally grounded context	The optimal legal environment for MaaS enables cooperation and sharing	MaaS relies on interoperability of IT systems and openness of interfaces
MaaS development requires open APIs	MaaS should be the best value proposition for users	Legislation designed for conventional transport systems (transport modes provided and consumed separately) can unintentionally work against multimodal service provision and MaaS	The ecosystem, especially its IT systems, need to provide flexibility and adaptability to new types of user and customer requirements
Appropriate data management is a priority	MaaS should be the best value proposition for innovators, industry, enterprises and government leaders	Clear environmental policy targets may be beneficial to MaaS	It is not possible to define a complete IT architecture and system preconditions for MaaS at this stage
Regulatory framework to provide legal certainty to public and private stakeholders	Need to explicitly define certain MaaS service user rights, e.g. in the form of “Bills of Rights”	Regulatory measures to facilitate openness and exchange of data are needed	The viable solutions will only emerge via pilots and trials
Regulatory framework needed to ensure technical rules are widely applied		Public sector activities like taxation and procurements may have significant impact	A high quality and reliability of the data being exchanged is an imperative requirement for successful MaaS

**Figure 6: Preconditions for successful MaaS deployment as identified by the MaaS Alliance working groups**

## *SINGLE MARKET APPROACH NEEDED TO BOOST INVESTMENTS*

In a digital economy, the ownership and access to data determines the market dominance. In order to build real multi-player, multi-option market platforms, the service providers should provide each other access to essential information in a computer-readable format, including routes, timetables, stops, prices and accessibility information. Further on, ticketing and payment system interfaces should be accessible for other service providers. The establishment of an open ecosystem can be encouraged by public procurement rules, requiring interoperability of ticketing and payment systems with other similar systems.

Better access to travel planning data is, however, not sufficient. In order to make

seamless multi-modal transport a reality, it is imperative that third parties can establish a secure real-time data-connection to the vehicles in their fleets. Without the ability of mobility operators (apart from the manufacturers) to know what is going on with vehicles at any given point in time, MaaS will fail to materialize as the necessary preconditions for a fair and competitive marketplace will simply not exist.

A compatibility framework is needed to enable a single market, to ease deployment for MaaS investors and operators, and to guarantee a minimum set of rights for customers. A European “single market” for Mobility as a Service should be based inter alia on the following building blocks:

### Single Market for MaaS

- An open market for MaaS operators and service providers to establish their business
- Fair market conditions
- A right of access to MaaS marketplaces for transport operators & mobility service providers
- Open but secure and safe APIs
- Real-time secure access to in-vehicle data for mobility operators
- Clearly defined & secured ownership of data
- Possibilities to create scaling services
- Entitlement for all citizens to MaaS services that meet their accessibility needs
- Seamless roaming for MaaS service customers travelling anywhere in Europe and/or globally
- The ability to offer one-way cross border travel solutions
- A framework for European/global compatibility and interoperability

**Figure 7: Building blocks of MaaS single market**

One of the obstacles for the development of the MaaS ecosystem could be the regulatory uncertainties, creating additional risks for investors and dissuading them from investing in evolving markets. A complex regulatory framework with multiple national and international regulatory layers might hinder the development of new services and cause additional risks for investments. The

aspiration to harmonize the regulation at EU level, as in a European single market area, is well justified from this perspective. For the development of a MaaS ecosystem and scalability of services it is pivotal that future regulatory initiatives both in the EU and at national level acknowledge the integrated and multimodal characteristics of MaaS services.

### USER PERSPECTIVES

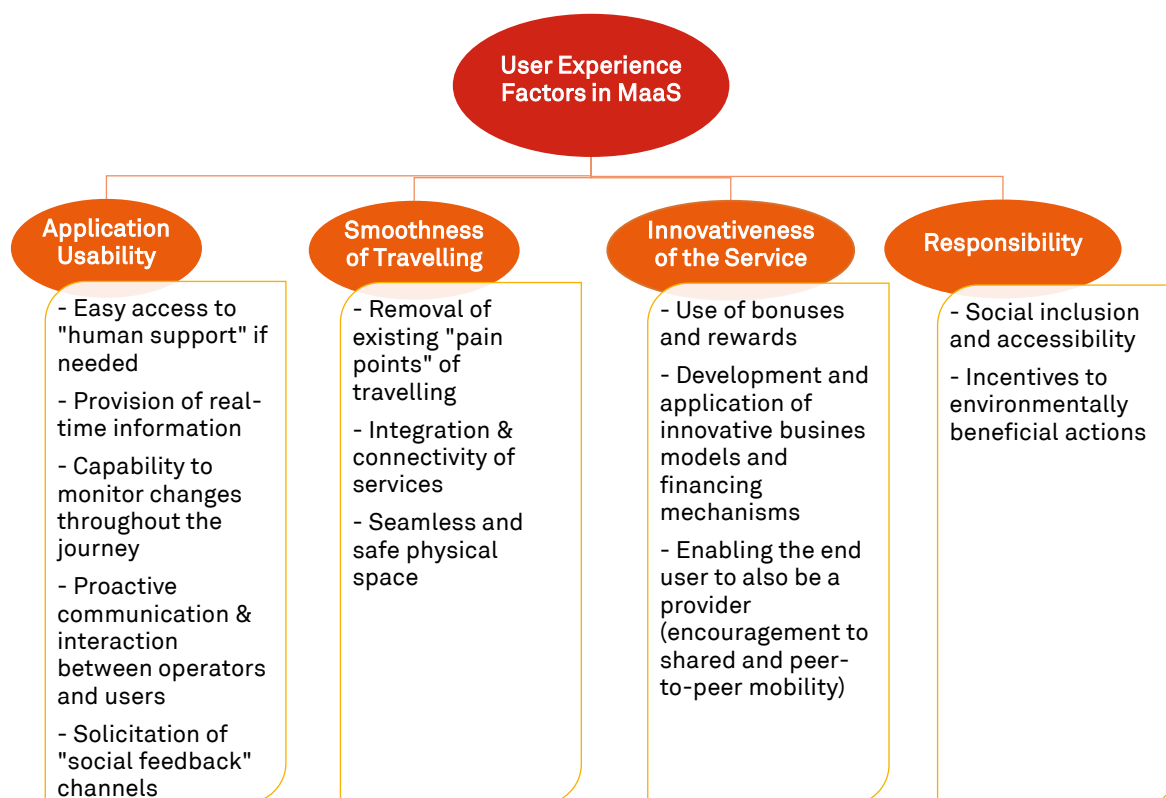


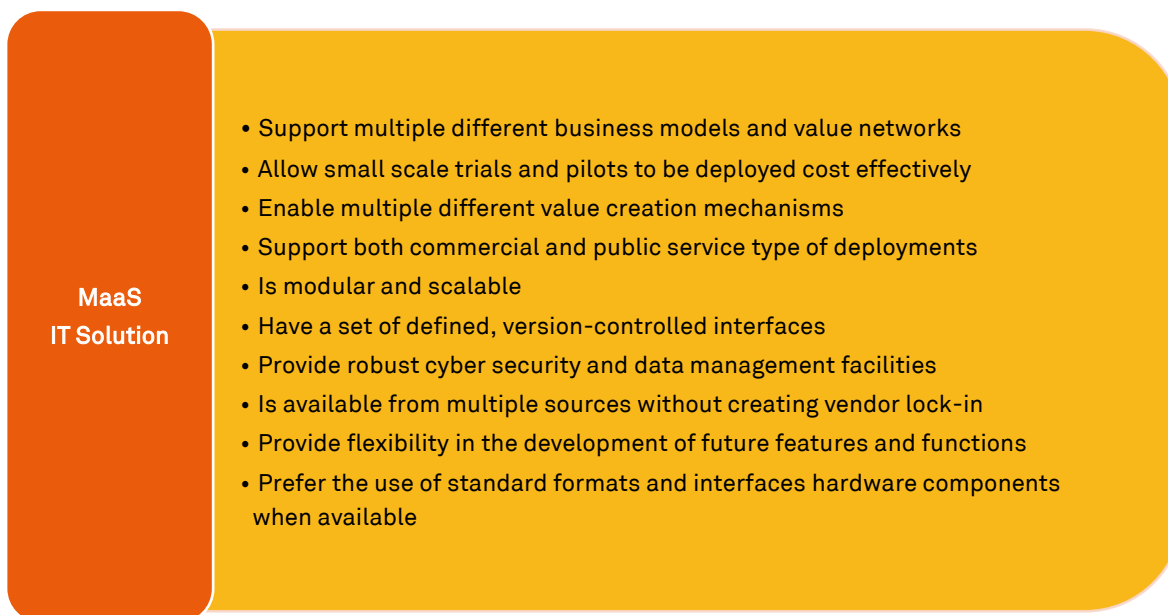
Figure 8: Key user experience factors in MaaS

***Mobility is an enabler, the end goal being access and meeting the needs and aspirations of the user.***

End users are the focus of the ‘service’ in MaaS, and all other elements are enablers (i.e. technology, policy, business models, land use and physical design, and legislation). In fact, even “mobility” is an enabler, the end goal being “access” or meeting the needs and aspirations of the user.

Although current travel behaviour and mobility patterns can provide insight for MaaS product and system design, one must keep in mind that current behaviour is not necessarily the same as possible and/or self-desired behaviour, i.e. analysing historic behaviour is not enough when designing MaaS packages. MaaS has the potential to change the choice set.

***MaaS has the potential to change the choice set.***



**Figure 9: Requirements for MaaS IT Solution**

In terms of technology, the critical points for MaaS are interoperability, roaming and harmonized standards. Fostering interoperability is a common responsibility for all parties. An essential prerequisite for the effective deployment of a MaaS ecosystem is an open middle-layer platform to connect the transportation service providers with the MaaS operator. This B2B platform, established with common rules, common (standardised) interfaces/APIs and consistent governance, enabling multiple business models, removes the need for each stakeholder to address technical and organizational obstacles individually. The B2B platform can be managed or operated by an entity (B2B integrator) distinct from

both transportation service operators and MaaS operators (see page 8). Furthermore, the platform manages the business processes related to the collection of data from the various service providers, including trip information, routing, and transactions, takes care of the various B2B clearing processes, and makes relevant data available to MaaS operators in the form of APIs, thus avoiding generating redundancy for such processes when interfacing with multiple MaaS operators.

***Fostering interoperability is a common responsibility for all parties.***

## ENABLING REGULATORY FRAMEWORK

The boom of digital services has changed the way services are consumed and provided, restructuring business models of the sector and questioning the appropriateness of the existing regulation. Transport regulation is based on historic and conventional conceptions, assumptions and categories and may have to be adjusted. Regulation, for instance, has remained transport-mode specific throughout these times, which might hinder the development of MaaS.

As a result of the involvement of IT-based services, the boundaries *between and within* the various transport services are changing and blurring, giving rise to a new multimodal reality. Greater intermodal competition and convergence is easily foreseen. But not only are the boundaries of transport modes blurred, also the functions of the different actors, e.g. the role of the users and the providers, are evolving. This will also challenge a prevailing rough division and definition of “public” and “private” transportation.

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The competitiveness and attractiveness of MaaS services relies heavily on availability of high-quality data. The first step towards a digital transport system is harmonization of data, supported by appropriate regulation and standards. Similarly important is to enforce safe and secure real-time access to data, as well as ensure clarity regarding liabilities of parties with principal control over the data. In addition to open standards, an imperative requirement is a high quality of data, be it a transit schedule or a booking confirmation for a shared car. Reliable data, serving as a basis for advanced and up-to-date travel information services, is one of the main prerequisites to MaaS uptake, creating more predictable travel chains and inducing people leave their cars at home.

The MaaS Alliance and UK Transport Systems Catapult commissioned a survey in spring 2017 to generate data on the critical regulatory enablers and barriers for the development and full deployment of MaaS. Based on the analyses of the survey results, the regulations governing the public sector budget allocation, the transport sectors regulation (e.g. taxi regulation, PSI directive, ITS directive), the information society (including data protection and privacy regulation) and consumer rights were considered to be the most significant. Also, other public sector activities, like taxation and public procurement procedures may have a significant impact when developing MaaS. One of the major challenges is the differing views and interpretations of current legislation, creating regulatory uncertainties for market actors. This seems to be a common phenomenon of the digital age, when newly developed services do not conveniently fit into the current regulatory framework. It is worth noting, that the expected policy targets on emissions are likely to have a positive effect on the MaaS market developments.

The discussion, however, moves beyond exchange of data between various platforms. The ability to access in-vehicle data in real-time has become increasingly relevant for the entire value chain in the era of the “connected car”. With the ascendance of shared mobility services, it is vital that the mobility operator has the ability to assess the status of the asset used (be it a vehicle, train, or bicycle) in order to utilize it as efficiently as possible.

The regulation of privacy and data security should be put in place to secure public confidence. Once general principles for data

economy, e.g. those governing data protection and privacy, are agreed upon at the EU level, their application to the transport sector should not cause controversy. The steep rise in the collection and processing of personal mobility-related data has already been seen and consumers are getting increasingly cautious, waiting for the regulators to intervene. Users must have the assurance that they have full control over how and for what purposes their data are being used.

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The first known regulatory effort to boost the establishment of preconditions for MaaS services and the openness of data has taken place in Finland where the Act on Transport Services (also known as Transport Code) was adopted in April 2017. The data provisions will enter into force on 1 January 2018 and all the other provisions on 1 July 2018.

The Code introduces significant changes to transport markets that have so far been strictly regulated and steered by public measures. It promotes customer-oriented, market-based transport services on the basis of sound competition.

Its aim is to enable the introduction of new technologies, digitalisation and new business concepts in the transport sector. This, in turn, will promote provision of transport services that better meet user needs.

The Code brings together and renews passenger and goods transport provisions. It obliges passenger transport service providers to give access to essential data related to mobility services and contains provisions on the interoperability of ticketing and payment systems, thus resulting in transport services as widely accessible as possible for everyone and also facilitating combining services efficiently.

Transport service procurements and other public involvement are a significant item of expenditure in central and local government budgets. Major cost savings can be achieved when services can be offered, combined and used in a more versatile and efficient manner.

## *NEW ROLES FOR PUBLIC ADMINISTRATIONS*

A particularly important role in the development of a fully open and sustainable MaaS ecosystem needs to be assumed by the public administration, both at a local and national level. They should remove initial development barriers and jump-start the development of MaaS. Some public authorities are already moving beyond their traditional role as infrastructure providers by enabling and promoting mobility services of new entry-level players. The new digitally-powered mobility requires leadership that

works with the global picture in mind, helping to move from a standalone vision to an interoperable and interconnected picture. Therefore, the public authorities may need to adopt new open working methods, and also include those who are keen to enter the market into the stakeholders' dialogue. Also the voice of users of the transport system, i.e. the customers, namely citizens and tourists and the users of logistics should be well taken into account.

### **Recommendations for public administration to encourage MaaS:**

- Avoid enabling bottlenecks and monopolies and the development of closed systems
- Ensure access to the mobility market for all operators, regardless of size
- Work with open but secure architectures and standard interfaces
- Support the cooperation among the various members of the MaaS ecosystem for the exchange of data, including both established actors and newcomers
- Take advantage of the opportunities offered by MaaS to improve the operations of transportation services to meet policy goals
- Provide some of the initial investments necessary to jump-start the ecosystem, taking into account the equity, sustainability, and economic and job creation - benefits that MaaS deployment may bring
- Collaborate with the private industry to develop innovative business models



## KEY FUNDAMENTALS OF THE MAAS ECOSYSTEM AND STEPS FORWARD

Regarding their significance for the establishment of a dynamic MaaS ecosystem, as well as the attractiveness of MaaS services and the acceptance from a public policy perspective, the following fundamentals should be addressed at all levels when developing MaaS services.

### 1. MAAS - OPEN AND INCLUSIVE ECOSYSTEM

When catalysing and establishing a MaaS ecosystem, the principles of openness and inclusivity should be fully respected, meaning that the ecosystem should be open to all service providers and should be inclusive for all users, including persons with reduced mobility or disabilities. Ideally, the value creation in the ecosystem should be based on the open pro-market approach instead of exclusive bilateral agreements. No exclusivity should be granted to any operator, regardless of the size of the operator or transportation provider in order to encourage fair competition. This principle should go into both directions, meaning that access to transport providers' APIs should be the same for all MaaS operators (no exclusive deals).

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***Ideally, the value creation in the ecosystem should be based on the open pro-market approach instead of exclusive bilateral agreements.***

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In order to promote an open ecosystem, transportation service providers should apply similar pricing schemes for all MaaS operators. All market participants should be enabled to engage in the ecosystems and promote their offerings. Smaller organizations, including start-ups, often enter the market with new ideas and

Ensuring and fostering the implementation of these fundamental principles will be one of the main tasks of the MaaS Alliance, in strong and seamless co-operation with the relevant stakeholders. Some of the most critical steps and actions requiring immediate response are addressed below.

creativity that should be encouraged. Lowering entry barriers will facilitate the entry of players with innovative solutions. Vendor or operator lock-ins should be avoided, otherwise the disruption in traditional value chains will be hindered.

At the EU level, the roaming of services between and across cities and member states should be clearly taken into account while developing related transport regulation. The European Commission and Member States should analyse the gaps in the internal market that hinder cross-border services and address present day barriers to one-way cross-border transport operations (for example, car rental and the impossibility to bring back a car to another Member State than the Member State of rental), which are enshrined in various pieces of European legislation.

For the success of the MaaS ecosystem, it is key to find win-win business models and cooperative opportunities between various stakeholders, to ensure the roaming and scalability of businesses and ultimately to tackle the differences in regulation policies, leadership, responsibilities and specificities between and among players. These are the main responsibilities of the MaaS Alliance in the near future.

## 2. THE MaaS USER SHOULD BE “BETTER OFF”

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***MaaS is a service promise. Even more precisely, it is an access promise.***

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MaaS is a service promise. Even more precisely, it is an access promise. In a mobility context, a service promise means that users always get a door-to-door solution from A to B or at least the best solution possible for them to travel from A to B. The attractiveness of MaaS is based on the freedom and variety it offers to the user. MaaS should be the best value proposition for users, helping them meet their basic access needs and solving the inconveniences of the journey, like congestion, safety and security risks, inconsistent costs, etc. The best value proposition is not limited to what is the quickest or most cost-efficient solution. Depending on the user’s priorities it can also be the safest, healthiest, most environmentally-friendly, most aesthetically

appealing or providing the best working-while-commuting facilities.

There is wide recognition that the creation of a MaaS ecosystem could benefit from harmonization and deregulation activities across modes and across sectors beyond transport. An area that quickly needs a closer look is the need to establish a common understanding for MaaS user rights, e.g. in the form of “Bills of Rights”, ideally recognised at the EU level. The European Commission is expected to publish its proposal for passenger rights in multimodal travel chains in 2018. This proposal is identified as one of the more significant legislative dossiers, possibly majorly affecting the development of MaaS services. Therefore the MaaS Alliance will be proactive in the discussion with the European Commission and other policymakers regarding the preparation of the proposal, ensuring that it reflects the foreseen developments.

## 3. ADDED VALUE BUILDS ON INTEROPERABILITY AND ROAMING

Access to data and ticketing and payment interfaces are among the most critical components for the development of a vital MaaS ecosystem providing end users with freedom of choice. Service providers should grant each other access to essential information in a computer-readable format, including routes, timetables, stops, prices and accessibility information. Ticket and payment system interfaces should also be opened for other service providers.

Public procurements also play an extremely significant role in case full interoperability of ticketing and payment system with other similar systems should be required. The European Commission, Member States and regional authorities should foster the opening of public transport APIs and

ticketing systems throughout Europe. Also joint research initiatives, e.g. through the Horizon 2020 programme, would be highly valuable for the establishment and growth of a more interoperable ecosystem.

To catalyse the improved interoperability, the MaaS Alliance should investigate the current state-of-the-art regarding relevant standards and define a roadmap on what new requirements are needed to support MaaS development. Liaisons with organisations developing standards would be needed, in order to develop or extend current standards for data formats for transport, and interfaces/APIs for key business processes, such as booking, payment, etc. Also research and commercial projects being developed by partners of the

MaaS Alliance should be encouraged to take interoperability into account.

The rapid development of 5G and blockchain technologies might provide new opportunities for MaaS. Although the technical enablers in terms of coverage of mobile networks and capacity of 3G/4G networks provides are assessed to serve as a sufficient platform for current MaaS services, 5G will however will bring many new possibilities for MaaS enabling the provision of more advanced location-based services as well as data-intensive solutions.<sup>1</sup>

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<sup>1</sup> MaaSIFIE webinar 30.5.2017:  
[http://www.vtt.fi/sites/maasifie/PublishingImages/results/MAASiFiE\\_webinar\\_final.pdf](http://www.vtt.fi/sites/maasifie/PublishingImages/results/MAASiFiE_webinar_final.pdf)

Also the benefits and use cases of blockchain-based systems would be well worth studying in a MaaS context. The blockchain technology might be particularly helpful for MaaS as regards 1) the issues of trust in payment and transaction procedures, and 2) the question of “who owns the customer”, which can be a challenge when the new entity of a MaaS operator gets introduced between the customer and the transport service provider. The blockchain technology might help to overcome the issue of every MaaS operator needing to make individual contracts and connecting with every other actor in the ecosystem, thus easing the roaming and scalability of services.

#### **Next steps to ensure the creation of an interoperable and roamable MaaS ecosystem**

- Define a framework for open, standard based system architecture and create a roadmap for its implementation
- Define technical requirements to support agreed upon principles for “single market”, “roaming & clearing”, “interoperability” etc.
- Follow technology development and standardisation in technologies and system solutions related to the MaaS system architectures and implementation and participate in standardisation work and system development where the MaaS architecture has special requirements
- Ensure MaaS visibility in existing groups so that they can support MaaS solutions (for example MaaS payment use cases are defined and recognized in payment forums)
- Support MaaS use cases and solutions in selected forums
- Advocate to eliminate institutional barriers and legal limitations in the MaaS roll-out
- Consider the need to establish a special task force for members’ joint research initiatives

#### **4. MAAS PROVIDING TOOLS FOR LOW-CARBON TRANSPORT AND MOBILITY**

In order to address the significant sustainability expectations, the MaaS ecosystem should always be based on the extensive use of mass transit and/or shared mobility services. Providing a competitive alternative option to the use of the personal car, MaaS attracts new users from the

former users of private cars to use combined public transport services, thus also streaming new customers to public transport operators. Identifying the optimal pricing deals and building a trustworthy win-win partnership between MaaS operators and public transport providers is one of the

challenges which will require some work in the near future, but will eventually generate great opportunities for both parties.

***Actors in the MaaS ecosystem will have to jointly ensure that the ecosystem is actually able to diminish the ecological footprint of personal mobility compared to conventional transport systems.***

Acknowledging that the decarbonisation of the transport system is one of the main priorities of the European policymakers is crucial for attractiveness and public

acceptance of MaaS. Actors in the MaaS ecosystem will have to jointly ensure that the ecosystem is actually able to diminish the ecological footprint of personal mobility compared to conventional transport systems. This should be taken into account in all MaaS pilots and projects. Clearly some impact assessment studies are needed, summarizing the results from different pilot projects. This should also occur on a theoretical level, to demonstrate the beneficial environmental impacts of MaaS implementation. The MaaS Alliance should facilitate this work and ensure wide communication of the results.

### 5. NEW BUSINESS MODELS FOR A NEW BUSINESS

It is important to acknowledge that the success or failure of MaaS relies on existing factors. For instance, the quality of public infrastructure and physical assets will always remain pivotal to successful MaaS offerings. Public authorities can now use the services of new enterprises and new

platforms, replacing partly costly investments required to update the transport infrastructure, facilities and operation systems.

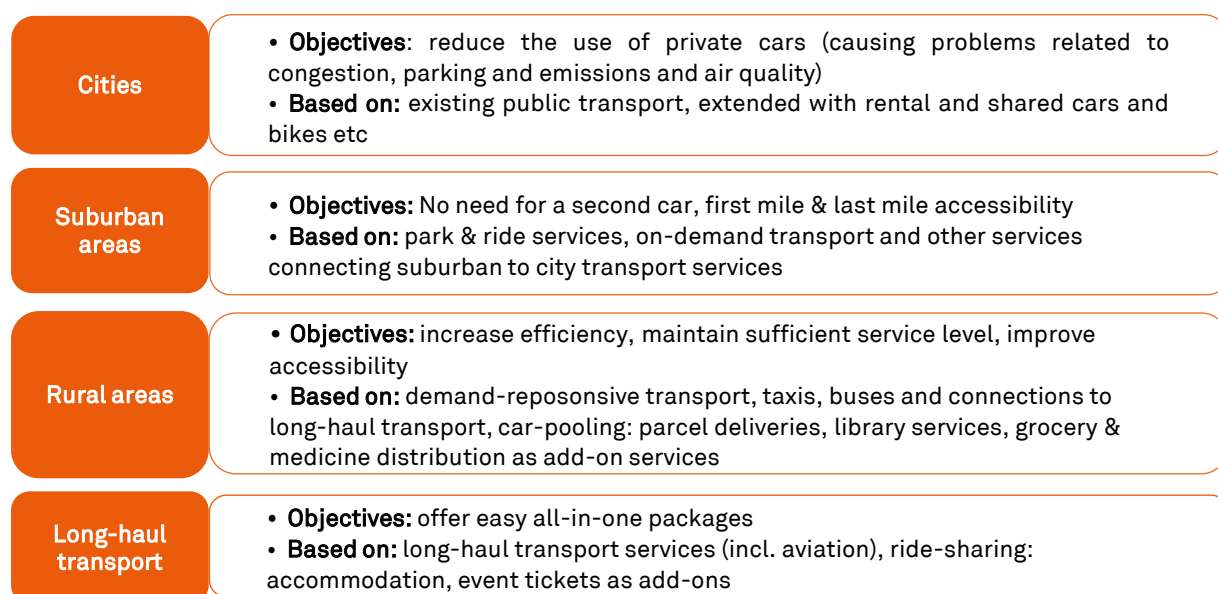


Figure 10: Potential of MaaS in different geographical scope<sup>2</sup>

<sup>2</sup> Modified from MaaSifE presentation, 31.5.2017:  
[http://www.vtt.fi/sites/maasifE/PublishingImages/results/MAASiFiE\\_webinar\\_final.pdf](http://www.vtt.fi/sites/maasifE/PublishingImages/results/MAASiFiE_webinar_final.pdf)

While the focus of the development on new MaaS services has mostly been on the provision of personalized urban transport services for individual consumers, some significant potential is also seen in the optimization of publicly funded mobility services, where the conventional systems in many cases include inefficiencies in terms of use of capacity and public funds. In certain cases, a city or a municipality can act as a MaaS operator for its own services to lower or optimize the cost of the services it by law needs to provide to the citizens. Furthermore, there is certainly potential for MaaS deployment also in corporate mobility and logistics sectors, which still needs to be explored.

Mobility as a Service is driving the modal shift from privately owned and operated cars to the use of shared resources and public transportation. Consequently, extremely underutilized privately owned cars can be replaced by various forms of mobility services that all have higher asset utilization as well as lower environmental footprint. Improved attractiveness of public transport systems should also ease the financial burden of the local public transport operators and authorities and thus reduce the need of subsidies. Due to ecological and capacity advantages, the traditional modes

of public transport, like bus, tram and metro/underground, should remain as the backbone of MaaS in urban areas. Also advanced shared mobility solutions should also be encouraged and prioritized over private cars. The vitality and diversity of the MaaS market will thus heavily rely on the willingness of transport operators to participate.

To unlock the full potential of MaaS, further experiments and studies are still needed in order to identify the most suitable business models for MaaS deployment and to create an attractive value proposition for users, preconditions for profitable involvement for MaaS operators and transport service providers, and the right incentives for all stakeholders. The MaaS Alliance will continue its work in this regard. It is the statutory task of the MaaS Alliance to facilitate a dialogue among its members and stakeholders and build together prosperous preconditions for varied MaaS provisions. It is also the task of the Alliance to encourage and catalyse various pilot projects. The European Commission and regional authorities are invited to foster MaaS development by funding research on varied MaaS pilots in various European cities to demonstrate their added-value to citizens, the society, and the environment.

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***It is the statutory task of the MaaS Alliance to facilitate a dialogue among its members and stakeholders and build together prosperous conditions for varied MaaS provisions.***

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## ACKNOWLEDGMENTS

The MaaS Alliance set up four working groups to address the good practices, gaps, barriers and opportunities related to emerging MaaS schemes. This White Paper summarizes the first results from the working groups and gives recommendations for the next steps to be taken to foster the development of a MaaS ecosystem in Europe.

The following persons contributed to the work of the working groups. The White Paper was then compiled and edited by Ms Piia Karjalainen (MaaS Alliance).

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The guidelines and recommendations presented in this document are those of the authors and members of the working groups and do not necessarily reflect the views of the organizations they represent or of other members of the MaaS Alliance.