



**UNLOCKING LARGE-SCALE ACCESS TO COMBINED MOBILITY
THROUGH A EUROPEAN MAAS NETWORK.**

**Deliverable D4.6
IMOVE Living Labs high-level
progress report (final)**



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Executive Summary

The present document is a high-level report of the activities performed in the IMOVE Living Labs during the IMOVE project period. The document is organized as follows:

First, an introduction section is presented, where general objectives of IMOVE are described, as well as the 3 main pillars of the project (Scalability Unlockers, Software Enablers and Data Analysis). Additionally, different concepts that will be used in the rest of the document are presented.

Chapters from 1 to 6 describe the story of each particular LL, starting from the mobility context before the start of IMOVE in each of the cities/regions participating in the project, where it is stated that they are starting from different maturity levels in terms of mobility. Also, all the preparation activities performed prior to the Living Lab execution are described, finally focusing on the expected Living Lab level of integration and barriers and enablers during preparation phase. After that, Living Lab execution activities are described, putting the focus on the users that have participated and in the pilot results achieved during testing phase. Lastly, each LL section finalises with a list of lessons learned extracted during the whole process. These lessons learned should help in the promotion of these initiatives and new ones after the end of IMOVE.

The specificity of each Living Lab and their complementarity in implementing MaaS through different schemes and approaches can be outlined as follows:

- **Turin Living Lab** has been mainly focused on the home-to-work and work-to-work mobility experience including local public transport, bike-sharing, scooter-sharing and taxi, in a 1st phase by General Motors employees (14 users) and in a 2nd phase with the Living Lab opened to general public by request (29 users). The 2nd phase was initially planned to be tested by Municipality of Torino employees, but finally it was decided to open it to the general public. The users involved in the pilot has increased in the last period due to new gamification and engagement strategies, but this increase has been lower than expected. Finally, the involvement of a car-sharing operator has not been possible. On the other hand, an e-Scooter operator (Helbiz) has been integrated in the platform. The cooperation of Public Authorities has been crucial for unlocking issues with the public transport operator active in the municipal area, it proved to be a major advantage developing MaaS as part of a set institution backed initiatives in mobility.
- **Greater Manchester Living Lab** has been focused in the Manchester Airport area with a pay as you go platform including PT, Car Club, Local Link and Taxi. The fragmented transport offer posed challenges in identifying viable strategies for the engagement of local mobility stakeholders. The pilot has been executed for 3 months, from mid-August to mid-November 2019. 58 users took part of the pilot. After the 1st testing month, with the feedback of the 8 active users, some corrective actions were performed in order to increase the activity. More communications were performed in order to engage the users and tram single journey price was reduced. The integration of different transport modes in the pilot has allowed TfGM to explore innovative solutions for future improvements in the mobility system within the region and strategies to complement public transport offer while making it more attractive.
- **Berlin Living Lab** finally started in August 2019. The Public Transport has finally not been part of the pilot despite of all the efforts to reach an agreement. A subscription model has been tested including bike, scooter and car-sharing transports. Nudging of users was done by push notifications first, lowering the price of the subscription package in second place (11 users subscribed, the subscribed users were lower than expected), and finally offering a free subscription to 20 selected users according to their mobility patterns. Finding the most effective balance in designing quotas for mobility services to be included in the subscription bundle has been challenging since providers charge in different way to the users (some providers charge by the minute, some providers charge by the kilometre, and some providers charge per ride).

- **Gothenburg Living Lab** main objective has been to enable and stimulate the establishment of various MaaS services through enabling 3rd party reselling of Public Transport tickets, with the definition of a digital reseller agreement model. Pilot 1 is a Park & Ride pilot that was executed first with a reduced number of users in order to validate the technical solution, allowing the user to buy the PT ticket together with paying for a parking spot. A second testing iteration for this pilot opened to all the users of the parking app has been already executed with a significant number of users (1079). Pilot 2 is a Combined Mobility solution for residents/tenants in new built apartments without parking spots that has been executed since April 2019 with 132 households. Pilot 3 is a B2B concept for local business trips. The preparation of pilot 3 was completed, but some organizational issues in the Gothenburg municipality (external entity testing the pilot) made impossible to start the pilot in September 2019, postponing the pilot after the finalization of IMOVE.
- **Madrid Living Lab** has evolved MaaS Madrid app during IMOVE project by integrating a multimodal planner and including firstly payment with contactless card and secondly payment by reading a QR code. Unfortunately, there were unforeseen difficulties in the development of the preproduction version, which was initially estimated to be delivered by end of September, and the subsequent delay in the final production version. Additionally, there were last minute issues regarding the General Data Protection Regulation (GDPR) and the compliance with the requirements established at the Deliverable D8.1 POPD - Requirement No. 1. Therefore, EMT has been forced to launch the piloting phase using internal resources (20 users) during a reduced period at the beginning of November 2019.
- **Roaming Living Lab** has implemented a proof of concept between Berlin and Madrid where a Berliner is able to travel to Madrid using its Urbi app and purchase a Madrid bus ticket. The risk of not having time to implement the pilot due to late start of the collaborating LLs has been correctly assessed by anticipating technical and business specific tasks. The proof of concept has been successful and reflects that MaaS roaming is a promising advance from current MaaS propositions. The business and organizational issues have been brainstormed, and it was concluded that an organism facilitating the roaming process (“IMOVE federated MaaS operators”) can be a helpful initiative in promoting the roaming after the finalization of IMOVE.

Finally, the document is closed with a Synergies & Final Conclusions section, where all the synergies between the LLs are put together, extracting very valuable conclusions and lessons learned for the near future of MaaS ecosystem. In this section, all the cities/regions that have participated in IMOVE describe how their MaaS experience will continue after the finalisation of IMOVE. Some of these joint conclusions are:

- MaaS is not built in a day, cities and regions need small scale experiments and to build on some previous experience on MaaS prior to achieve success in larger scale deployments.
- The society has not enough knowledge/awareness of MaaS, that is why a useful pathway to introduce MaaS solutions is targeting specific customer segments, while targeting the general public is far more challenging at the current maturity of the MaaS market.
- It is not perceived that technological issues are a barrier for the MaaS success, since often the business agreements, commercial proposition and marketing aspects proved to be more complex and demanding.
- Public Transport included in a MaaS proposition is a significant factor in order to increase the chances of success.
- The inclusion of the full set of Public Transport tickets in the MaaS solution will raise up the possibility of success.
- Regional legislation and control from public authorities is quite important for MaaS success.
- Gamification, incentives and marketing will help increasing adoption.

These conclusions are explained in detail in the Synergies & Final Conclusions section.

Abbreviations and Acronyms

API	Application Program Interface
B2B	Business to Business
B2C	Business to Customer
BoB	Biljett och Betal-standarder
BVG	Berliner Verkehrsbetriebe
DRE	Digital Reseller
GM	Greater Manchester
GTT	Gruppo Torinese Trasporti
KPI	Key Performance Indicator
LL	Living Lab
MAG	Manchester Airport Group
PT	Public Transport
PTO	Public Transport Operator
SDK	Software Development Kit
TfL	Transport for London
WP	Work Package

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INTRODUCTION – IMOVE CONTEXT

The overall objective of the IMOVE project is to accelerate the deployment and unlock the scalability of MaaS schemes in Europe, ultimately paving the way for a “roaming” service for MaaS users at the European level. To this end, IMOVE investigates and validates advanced solutions for improving MaaS deployment and operation and their underlying business models. Core ITS elements enabling MaaS development have been developed, including enhanced real-time collection of data about user needs, habits, preferences and tools for the (controlled) exchange of information enhancing interoperability among service components and across different MaaS initiatives.

The three major pillars of IMOVE are:

1. **Scalability Unlockers:** IMOVE has investigated and developed a set of Scalability Unlockers, i.e. measures, organisational frameworks, operational and business models enhancing the framework conditions for MaaS development and operation. This activity is highly linked to the Living Labs in order to investigate and design specific sustainable business models. **Gothenburg** and **Greater Manchester** Living Labs have been specially focused on this pillar.
2. **Software Enablers:** IMOVE has designed and implemented a software framework consisting of an integrated set of interfaces, protocols and ready-made software artefacts (Software Enablers) that ease the implementation of MaaS schemes and support the creation of a cross-border MaaS ecosystem. **Turin** and **Berlin** Living Labs have been specially focused on this pillar.
3. **Data exchange and sharing:** a crucial aspect of IMOVE has been the collection and analysis of data, in order to gain a deep and supported understanding of the actual effectiveness of actions and business models on specific and different profiles and environment, as well as the identification of technical and non-technical issues concerning data collection processing and sharing (such as data privacy, security, visibility of internal business, “fears”, trust, regulatory frameworks, etc.). **Madrid** Living Lab has been specially focused on this pillar.

The IMOVE impact has been tested at the above-mentioned 5 sites, all strongly engaged in the MaaS domain and setting specific actions on existing or new MaaS schemes. The sites were selected according to their complementarity, where success and failure factors for any specific measure and context have been investigated and evaluated.

All the LLs have progressed in their MaaS level of integration in different maturity ways, according to the figure 1 below. Living Labs presented different levels of maturity when the project was kicked-off. Some Living Labs started from level 0, where there is no integration at all, other ones from level 1, where different transport modes are integrated in the same platform at an information level.

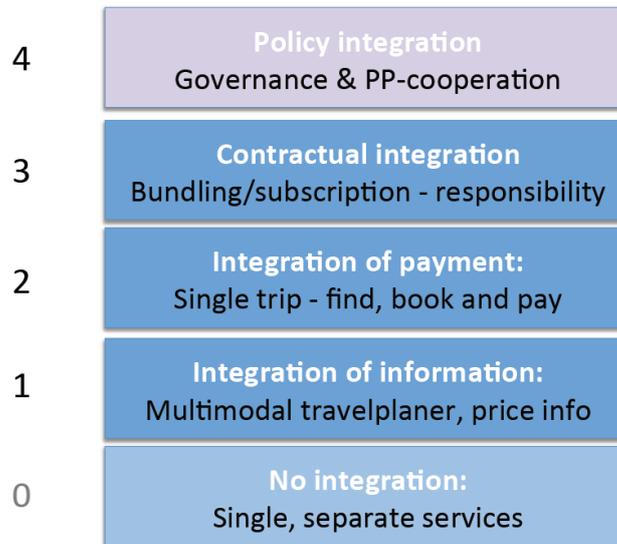


Figure 1. MaaS topology (Sochor, Arby, Sarasini, Karlsson, Holmberg)

Living Labs have progressed to levels 2 and 3, and even in some behaviours, to level 4. In the following sections, where each LL is detailed, the progress in the level of integration for each one is explained with full detail.

If the focus is placed in the technical side, the IMOVE framework provides an interoperability layer between the ICT platforms of transport service providers (MaaS operators and/or transport operators) and the backends of user mobility apps. The objective of IMOVE was not to provide a specific MaaS platform for a Living Lab. IMOVE Living Labs explored different alternatives and implemented their own specific MaaS platform. These different solutions needed a different interoperability scheme in order to connect with IMOVE Software Enablers.

In Manchester Living Lab, a company outside the IMOVE consortium has been in charge of the MaaS platform. This MaaS ICT platform has implemented all the business logics to operate the MaaS, as well as the user interface (web and/or mobile app); IMOVE is isolated from underlying service/transport operators and can only access data and services exposed by the platform. Figure 2 summarizes this approach.

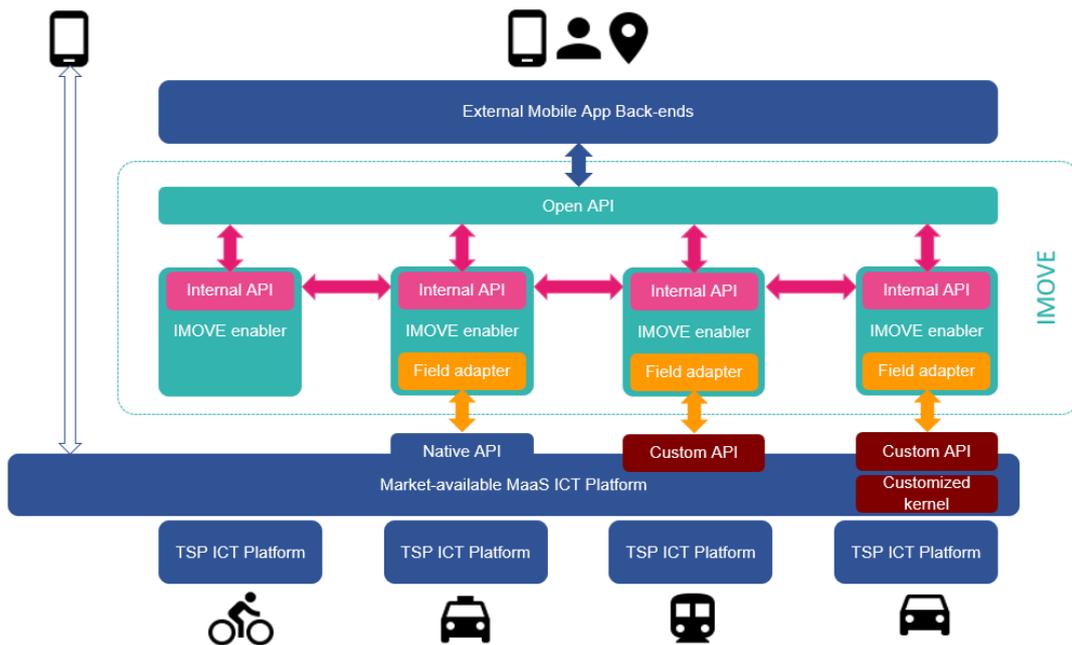


Figure 2. Interoperability Scheme 1

Madrid has adopted a similar approach, since outsourced part of the development of their technology platform to an external corporation, but EMT coordinates this initiative and integrates other own-maintained software, APIs and data sources building up the MaaS Madrid environment.

The interoperability scheme in Turin and Berlin has had a different approach. Urbi owns the MaaS ICT platform and it implements all the business logics to operate the MaaS, as well as the user interface (web and/or mobile app), and IMOVE is isolated from underlying service/transport operators; the main difference here from the integration scheme in Manchester and Madrid is that, as the MaaS platform is property of an IMOVE partner, part of the functionalities that were previously provided by IMOVE enablers are now implemented within the MaaS platform, with an “interface adaption layer” that emulates the behaviour of IMOVE internal API. In other words, if in previous case IMOVE enablers were adapted to comply with the underlying MaaS platform, in this case the platform is adapted to comply with IMOVE enablers. This approach is summarized in figure 3.

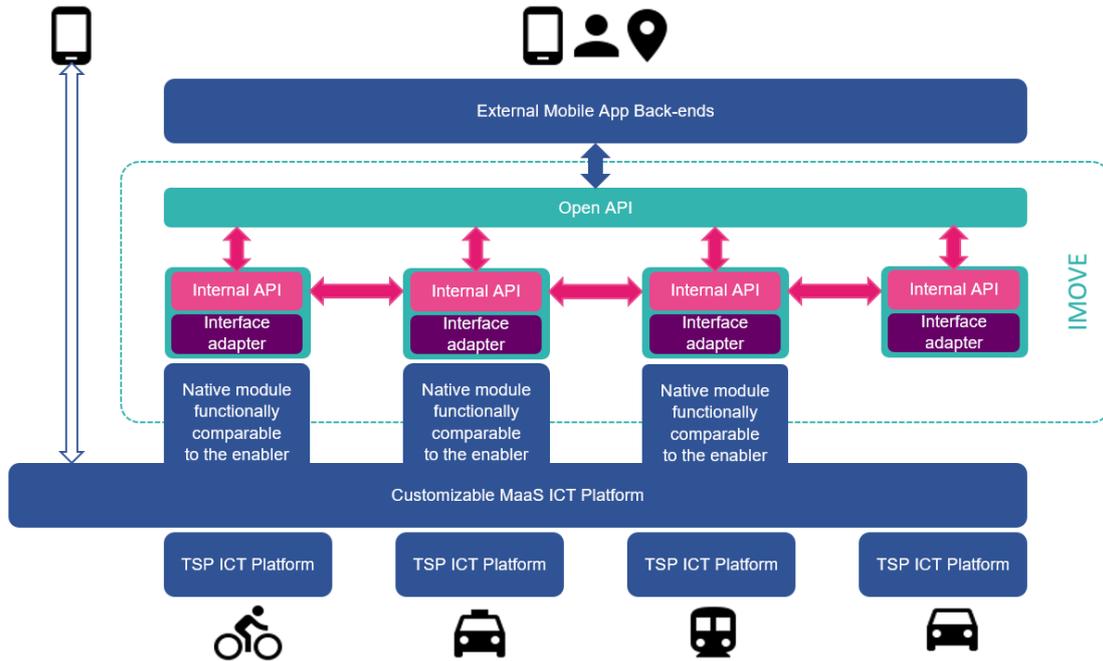


Figure 3. Interoperability Scheme 1B

The third pillar of the project is about data exchange and sharing. Data analytics has been focused prior to the pilots' execution to the analysis of the mobility data provided by the cities/regions, extracting very valuable conclusions about the users' patterns and behaviour. All these conclusions are fully detailed in the deliverables of WP3.

At the last stage of the project, Berlin and Madrid Living Labs have collaborated in order to implement a pilot about roaming, thus paving the way for this kind of services for MaaS users at the European level.

The resulting knowledge and lessons learned from IMOVE Living Labs execution will be made available and shared with any interested MaaS operator (while respecting privacy and business constraints).

1 TURIN LIVING LAB

1.1 MOBILITY CONTEXT BEFORE IMOVE

About 900.000 inhabitants live within the geographic boundaries of Turin. The residential growth of the city and its neighbouring territories during the last century led to the development of a territorial homogeneous area consisting of 32 municipalities: this area counts about 1.500.000 inhabitants. The municipalities that make up this area built a consortium (AMMT) with the Piemonte Region which main objective is to establish the public transport planning and deliver the public contributions foreseen by the law to companies managing the public transports in this area. In 2015, the AMMT consortium changed its name into AMP because it operates now for the whole regional territory. This agency performs a mobility survey on the overall area every 3 years for retrieving the level of satisfaction of citizens and assess other transport performances.

Before starting IMOVE there was already a "BIP card" (developed by the IMOVE partner 5T, with 1.400.000 users on a regional scale and about 700.000 on the territory of the Turin metropolitan area) that works on the whole territory of the Piemonte region. This card integrates different services including mobility services, services to students and also tourist services (card entrance to museums and SKYPASS for ski infrastructures). On the municipal territory it was possible to include the following services on the BIP card: subscriptions to Public Transport services, the car sharing IOGUIDO and the Bike sharing TOBIKE. In September 2016, the City of Turin (through 5T) began the development of a single mobility portal where all information about public, private and shared mobility is collected. The new portal of the city mobility is connected to the portal of the regional mobility "move in Piedmont" already developed by the 5T on behalf of Piemonte Region.

In Turin the objective is to involve in the MaaS experience as many mobility services as possible of those existing in the city, which are: (i) public transport in the 32 municipalities managed by GTT (1 metro line, 8 train lines, 92 bus lines, 4 tourist lines, train service), EXTRATO (bus lines) and TRENITALIA (train service), (ii) bike sharing (TOBIKE): 136 stations on the municipal territory with about 1.000 bikes, (iii) carsharing services, with Car2go (400 cars, free-floating service) Enjoy (400 cars free-floating service), Carcityclub (125 cars traditional service), Blucar Torino (400 electric cars, one way service), (iv) taxi services (Radi TAXI cooperative 5730 + Prontotaxi cooperative (about 1.500 taxis in all)), (v) carpooling services (Easymoove), (vi) parking services (GTT manages the parking service on surface, the principal house parking existing on the municipal territory) and (vii) ITS and Info mobility services (the City of Torino participates to the in house company 5T that manages and develops the ITS systems for the city). Target impacts for Turin are related to intermodal transports and integrated planning, booking and ticketing; these impacts will help to meet the expectations of recovering economic resources for the city, supporting local RTD activities, improving accessibility and leisure services for citizens and tourists.

1.2 PREPARATION PHASE

The ambition of the Municipality, involved in IMOVE as a partner, for the Turin Living Lab has been to foster the growth of a MaaS scheme introducing technological and regulation enablers, involving as much as mobility providers operating in the city as possible. This has been facilitated by a public-private cooperation between the Municipality and Urbi, which acts as a facilitator for commercial partnerships and as a mobility services aggregator.

The overall goal for Turin Living Lab stakeholders has been to acquire a comprehensive set of information, insights and feedbacks in order to stimulate the transport service providers interest in MaaS schemes, to foster new operators in entering the market and promote the development of further initiatives with the involvement of a larger user base.

After the initial months of the project defining potential MaaS scenarios to be tested, Turin municipality selected work-to-work and home-to-work mobility as the focus of the Living Lab. From this perspective, the City of Turin has been working on this theme over the years, acting on the behaviour of citizens moving to offices zones, and considers this is a crucial aspect for the reduction of traffic and pollution in the urban area. The administration is also interested in better understanding users' attitude towards more sustainable transport modes and how to incentivize them.

In order to set up the user group for testing the LL in a 1st phase, a public tender was launched aimed to choose a company interested in adopting the proposed solutions for its employees. The tender was closed in September 2018 and General Motors was the company awarded in the tender process. The pilot has been designed to get employees to test the potential of MaaS and to obtain data through the Urbi app about the transport choices made by users in their daily home-to-work commuting and also in their work-to-work trips, for example when they go to a client's office, to another company or to a construction site. General Motors mobility manager (a facilitator of mobility inside General Motors and a key figure to engage General Motors employees in the pilot) can have control of the monthly company billing for the work-to-work mobility costs for employees during the trial period.

On October 2018 5T, in charge of operations for the Turin LL, set up a kick-off meeting between IMOVE partners and General Motors Mobility Manager to define rules and constraints of the Living Lab.

On March 2019 a kick-off took place in General Motors in order to explain the characteristics of the experimentation to the users. After the LL launch, the IMOVE partners in Turin and General Motors scheduled meetings in order to establish privacy policies, to plan the internal communication activities and set up the roadmap to the begin of the operations. In order to invite General Motors users to join the LL, General Motors sent an invitation letter, provided a dedicated page on the company's intranet and organized a presentation meeting in both General Motors Turin offices. In the meantime, 5T shared an initial survey to be filled in by the LL users before the start of the LL and built an on-line version of the questionnaire to facilitate the answer collection.

Finally, this 1st phase of Turin LL started in April 2019.

In a 2nd phase, the MaaS solution for home-to-work/work-to-work mobility in the Living Lab has been also opened to general public. It was announced on internet and social media on 5T LinkedIn site. This phase was launched at the beginning of October 2019 and the testers could participate by requesting it by e-mail to 5T.

From a technological point of view, the Urbi platform is interconnected with the Piedmont integrated ticketing system (BIP), which provides a set of technological solutions for public transport service operation in the regional area. Most of the effort has been spent integrating the GTT API with the Urbi app backed by IMOVE services, to allow the purchase and the validation of public transport tickets.

The Urbi app allows the users to plan a journey on the map and to view the trip options in a list sortable by time, cost and "trees saved" parameter, a sustainability index depending on transport mode choices, developed to promote modal shift and considered in the ranking of the gamification as well. This allows employees to obtain, always through the Urbi platform, mobility vouchers to be used for mobility in their leisure time. Greener vehicles are given a higher score than the less ecological ones for the calculation of the awards.

Transport modes included in the LL have been:

1. **Local public transport.** When the pilot started, the only public transport tickets integrated into the IMOVE application were single run. At the request of users and to make the platform more interesting during the Living Lab execution phase, work was done to get other ticket types, such as daily passes, available for in app purchase.
2. **Bike-sharing** – Tobike
3. **Scooter-sharing** – MiMoto
4. **Taxi** – Wetaxi

Car-sharing operators (Car2go, Enjoy and Blue Torino) have been approached but there has been no deal in order to be part of the pilot.

Helbiz (electric scooter) will be included once the service is launched in Turin.

After the selection of a transport option, the user can directly purchase the trip through the app, for example buying a public transport ticket. After that, all the tickets bought appear on the purchase list. In the app menu is also available the link to the start-up survey to be filled in by all the users.

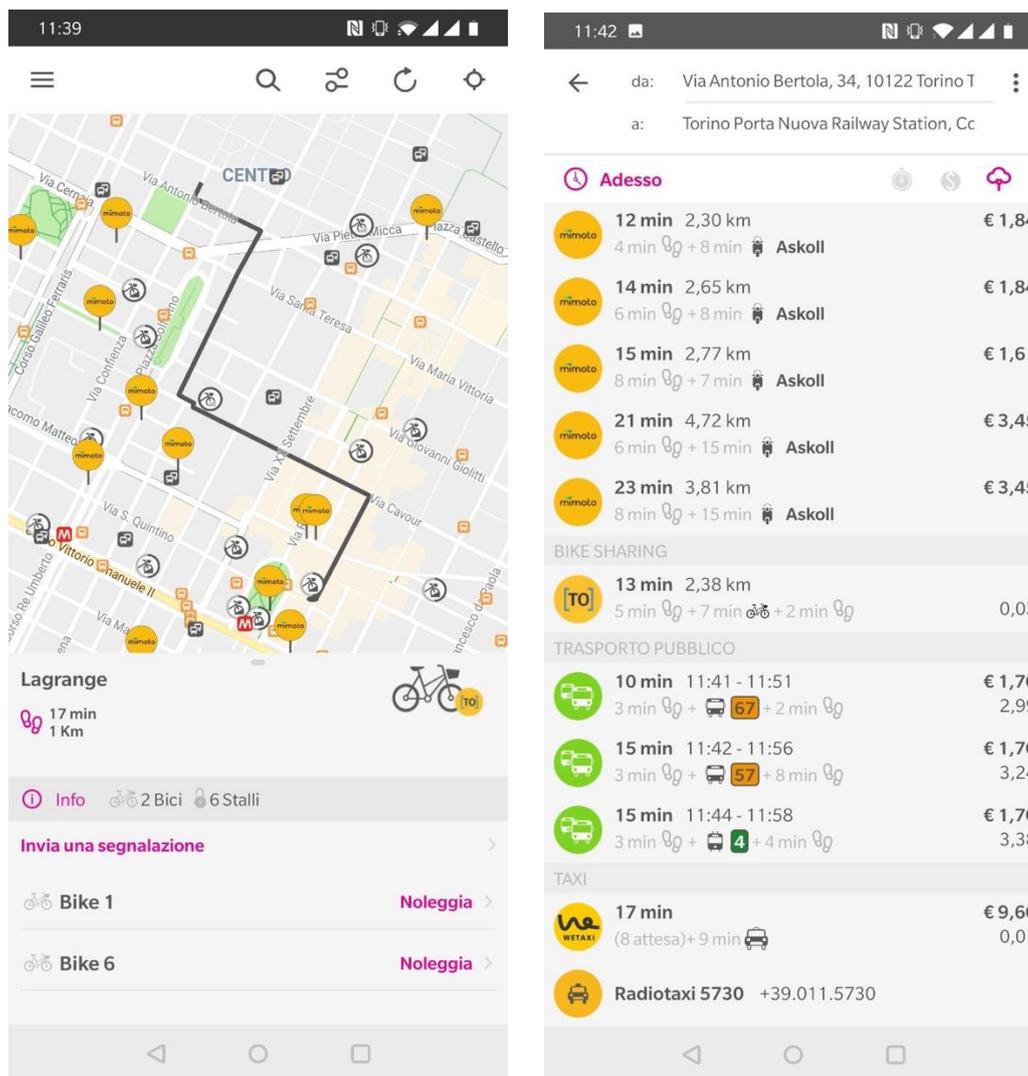


Figure 4. Turin LL app screenshots: planner and option selector

LL level of integration

In the Introduction section, the different levels of integration in the MaaS topology have been detailed. According to it, Turin LL has evolved from level of integration 1 to integration levels 2-4, as detailed below:

Turin LL
<p>Initial level of integration: 1 Urbi application integrates different transport modes and provides pricing info.</p>
<p>Expected level of integration: 2-4 In Turin LL several functionalities are deployed and include trip setting/planning/monitoring as well as payment (level 2) and incentive/gamification practices promoted by the Public Administration (level 4).</p>

Barriers and Enablers

During the preparation phase, the following barriers and enablers were identified in order to be ready to run the pilot.

Table 1. Overview of the main factors of success and barriers of Turin LL

Barriers
Commercial agreements with car-sharing providers to be part of the pilot have not been reached, it has been tried since the last stage of the preparation phase.
The limited mobility offer is having impact in the number of active participants; incentivisation schemes have been promoted.
Agreements with GTT in order to use the GTT SDK have been difficult to reach.
The developed solution is not compatible with iOS (this problem is related to the NFC standard and the impossibility of using NFC libraries on iOS). This can reduce the number of users participating in the pilot.

Enablers
Having a platform (Urbi) which is developed and operational.
Obtaining the GTT SDK for the integration of the GTT ticketing system (already available to the public) in the IMOVE app for smartphones is bringing a lot of value to the experimentation.
The active support of administrative institutions and representatives is a strength in facilitating commercial agreements and supporting dissemination activities.
The involvement of an important company (General Motors) that strongly committed in the initiative (organizational and economic, for the choice of prizes).

Issues assessment

In deliverable D4.5, the mid-term high-level progress report, some specific issues were pointed out in order to be addressed during the last period of IMOVE. In Turin LL:

Table 2. Assessment of the issues identified in D4.5 for the Turin Living Lab

Issue identified in D4.5	Assessment
Initially there is a low engagement of users in General Motors, General Motors mobility manager is aware of this and committed to increase the number of testers.	The users involved in the pilot has increased in the last period due to new gamification and engagement strategies described in section 1.3.1, but this increase has been a bit lower than expected.
Start of the 2nd phase with the City Municipality testers planned for September 2019.	The 2 nd phase was initially planned to be tested by Municipality of Torino employees, but finally it was decided to open it to the general public in order to attract as many users as possible. It was launched at the beginning of October, with a slight delay from the last plan.
Involvement of a car-sharing operator still has not been possible. The Living Lab partners are still trying to engage a car-sharing operator, but it is quite possible that success is not reached.	Finally, it has not been possible to involve a car-sharing operator. On the other hand, an e-Scooter operator (Helbiz) has been integrated in the platform.

1.3 EXECUTION & EVALUATION PHASE

1.3.1 USERS

A fundamental requirement for the companies invited to the tender was the presence of a Mobility Manager, a professional role within the company specialized in mobility. This person is in charge of coordinating the work-related transport matter for all the employees, and periodically proposes initiatives on the subject of mobility and is able to evaluate which employees can be engaged. For this reason, the selection of users was delegated to the Mobility Manager of General Motors in the 1st phase of the Living Lab.

In the **LL 1st phase with General Motors**, 14 users in total have tested the pilot. 10 of them were initial members, each one rewarded with an initial mobility budget for personal mobility worth 30 euros. A new incentive was provided during the execution phase: if the tester brought a colleague, both would be rewarded with further mobility services for a value 50 additional euros. This initiative added 4 new users to the LL.

In the **LL 2nd phase with all citizens**, 29 users have participated. Each of them was rewarded with an initial 10 euros mobility voucher worth, and to those who also answered the questionnaire were rewarded with a further bonus worth 20 additional euros.

1.3.2 RESULTS

The results of the LL have been measured through the data that has been collected from Urbi platform and have been complemented by questionnaires that have been distributed to:

- End users (employees), to investigate the advantages and the limitations they have found in using the MaaS, their feedback and willingness to change their way of mobility.

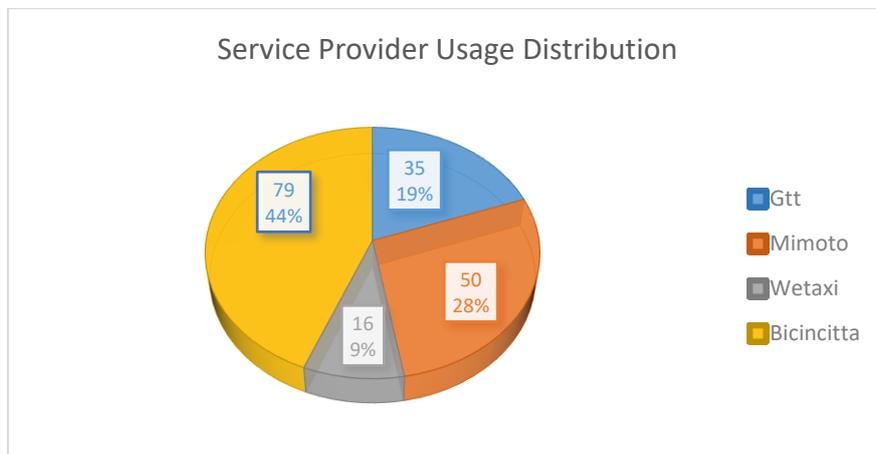
- Company / public administration managers, to understand whether the opportunities generated by the MaaS have generated convenience (e.g. having to manage a single invoice for all work-to-job journeys made by employees) and simplified work-to-work mobility.

Additionally, a focus group with General Motors employees (that already had filled the questionnaires) was done in October in order to obtain also some additional qualitative data.

Some difficulties with the MaaS solution perceived by the testers were the ticket validation process, the e-wallet and related monetary incentive usage and the usage of the bike sharing service (Tobike). Apart from these particular difficulties, the testers were happy and motivated about their participation in the pilot and would continue using a MaaS solution in the near future. During the final discussion it was agreed that the sample of users was slightly positively biased, being all interviewed persons highly interested in using efficient transport services and in experimenting new solutions; this attitude is not applicable to the overall universe of urban travellers. However, this innovative experience could be the front edge for a more general behavioural change, provided that new offers such as MaaS could provide effectiveness in the users' experience.

From the quantitative data point of view, the app allows the collection of anonymous and aggregated data on users through the Urbi platform, concerning platform usage, the mobility choices made and kilometres travelled.

13 users have been active in the LL, using the transport services as per the below distribution and transport service use per each user:



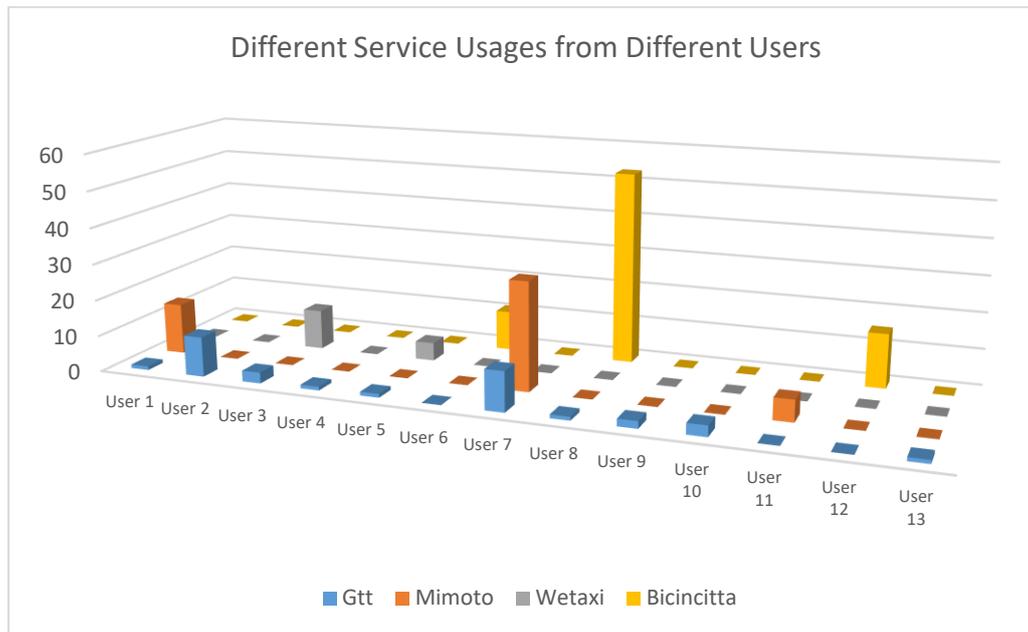


Figure 5. Turin LL – Turin LL results

Some conclusions are:

- The LL users prefer to choose Bicincitta and Mimoto services to go to their offices in the morning. The morning from 7am to 9am is the timeframe with the highest usage in general.
- The number of observations decreased significantly from 9am to 11am.
- All services are used from 11am to 5pm. Wetaxi and Mimoto trips have shorter distances than Bicincitta trips.
- From 5pm to 8pm, again, Bicincitta trips have longer distances, and Mimoto trips have longer distances than before.

1.4 LESSONS LEARNED

A very interesting list of lessons learned have been identified during the piloting phase, that will help in the evolution of the MaaS solution provided by Urbi in Turin after the finalization of IMOVE.

Table 3. Overview of the main lessons learned for the different stages of Turin Living Lab

Main Lessons Learned
Organize all activities with project management tools, managing all activities and resources makes that everything moves smoothly.
Having started activities in advance to avoid delays in the integration between GTT SDK and Urbi has facilitated the pilot smooth progress.
The absence of car sharing operators and Public Transport annual subscription makes using the application somehow less interesting. It is crucial to include the Public Transport subscriptions in the MaaS scheme for future success.
Compare qualitative and quantitative data (at the moment unfortunately there are still few data) adds a lot of value in order to understand the user's behaviour.

Access to data by the Public Authorities will allow to have a better Public Transport planning.

The cooperation of Public Authorities has been crucial for unlocking issues with the public transport operator active in the municipal area, it proved to be a major advantage developing MaaS as part of a set institution backed initiatives in mobility.

Gamification and incentives are important in order to engage users in the MaaS ecosystem.

2 GREATER MANCHESTER LIVING LAB

2.1 MOBILITY CONTEXT BEFORE IMOVE

Greater Manchester spans 1300 Square Kilometres has a population of 2.8 million people and has the largest travel-to-work area of any conurbation in the UK outside London, with seven million people living within one hour’s drive of the city centre. Additionally, more than 22 million passengers use Manchester International Airport annually. The area is also a popular destination for sports, leisure and recreation. This scale in terms of geography and demand brings both opportunity and challenges and requires an integrated, flexible and cost-effective transport system to support overall the efficient movement of goods and people across GM.

GM transport offer is very fragmented and de-regulated making the mobility environment quite difficult to manage. There is multi-modal travel in Greater Manchester through buses, trams, train, bikes and taxis but the services are highly fragmented. Multi-modal travel involves different ticketing and payment methods and users have to rely on multiple sources for journey planning and live journey updates.

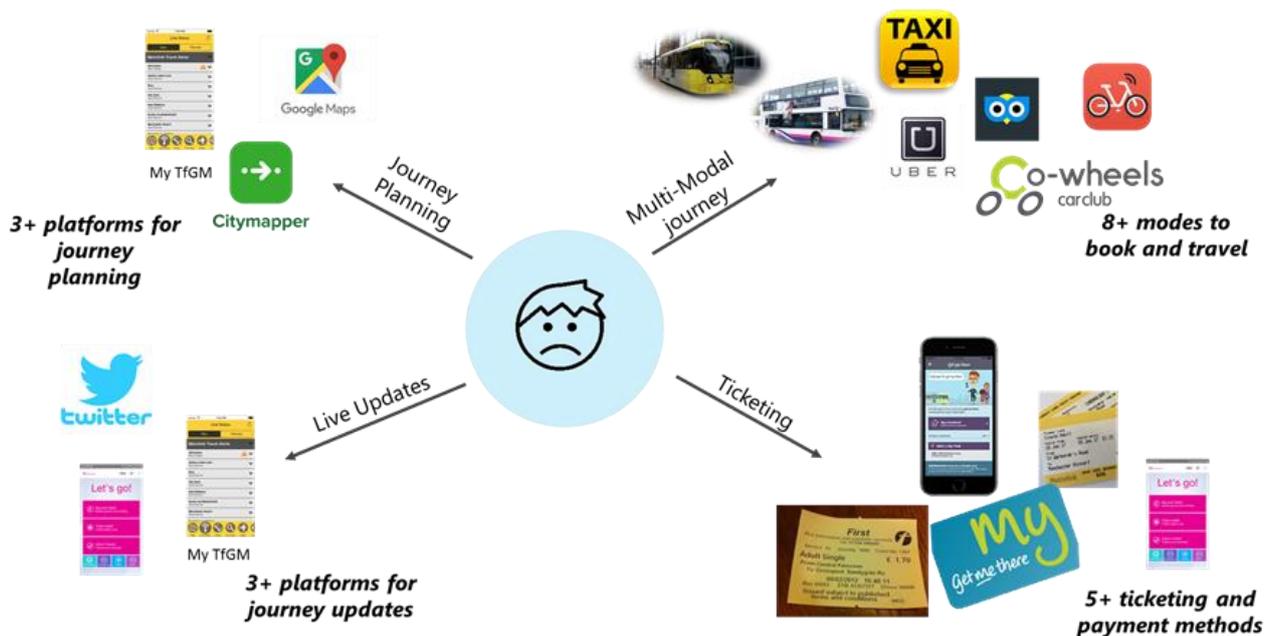


Figure 6. Multi-modal travel in Greater Manchester

The most common transport modes are light rail tram system (Metrolink), buses for key transport interchanges (Metroshuttle), bus network, taxi and private hire vehicle journeys and GM car club operator. “Get me there” (<http://www.getmethere.co.uk/>) smart card on Metrolink (light rail - tram) is available since autumn 2014 and in November 2015 a Metrolink mobile ticketing app was launched – followed by the introduction of “Get me there” for bus passengers. The intention was to deliver a one-ticket smart solution for buses and trams across Greater Manchester in 2017. “Get Me There” smart card for Metrolink was extended

from concessionary travel holders to all passengers and multimodal smart travel for joint bus and tram travel were introduced. The solution includes multiple methods of paying/topping up a smart card and also allows contactless enabled travel where passengers use their bank card to touch in and touch out instead of a smart card.

TfGM engaged key transport operators and the technology sector, through the creation of Travelspirit (<http://www.travelspirit.io/>) which was established to create an innovative and openly governed community for collaborative open source projects supporting Mobility as a Service products and services.

Unlike the other test locations, the deregulated nature of transport provision in the Greater Manchester region means that for any trial it is unlikely that all providers will be ready to buy into the concept. Briefly, these are laid out below:

Table 4. Transport modes and operators in Greater Manchester

Transport mode	Operators
Train	Trains in the GM area are operated by TransPennine Express, Virgin West Coast, Arriva Trains Wailes, CrossCountry and East Midland Trains
Tram	Metrolink is owned by TfGM and operated and maintained under contract by Keolis/Amey consortium (Keolis Amey Metrolink),
Bus	There are currently over 40 operators registered as operating in Greater Manchester
Private Hire	In addition to regulated hackney carriages, Manchester also has a large number of private hire operators, including multi-nationals such as Uber. In addition, there are car rental and car sharing schemes in operation.

In Greater Manchester, therefore, during the lifetime of the project it was expected that private hire, tram and train provision remained unchanged.

The bus provision was under review by TfGM (on behalf of the Greater Manchester Combined Authority) with a view to establishing the viability of a franchising model for bus services across Greater Manchester. Bus Operators may be less inclined to co-operate with a MaaS trial for TfGM as a result of this investigative work.

2.2 PREPARATION PHASE

MaaS represents a significant opportunity to capitalise on this early work by reviewing opportunities to deliver an enhanced customer experience that also integrates other modes into the offer whilst becoming a sustainable life-style enabler that reduces the dependency on individual private cars. IMOVE allowed the exploration of partnership agreements, technical specifications and building a supportive community of operators willing to participate in a uniform system. IMOVE allowed TfGM and wider partners to set in detail risks to delivery and subsequent mitigation to overcome these challenges, a testing of a multi-modal solution that could later be developed in full as part of TfGM current plans for a core bus rail network.

All preparation phase of the Living Lab has been very dense, especially due to the de-regulated nature of the transport in Greater Manchester region.

In the initial stages of the project, Manchester Living Lab activities focused on the business model analysis and best practices adoption to design a mobility as a service model to be put in place within the IMOVE

project frame. In Manchester IMOVE does not encompass a project partner already providing a MaaS platform, but features TfGM, a strong player in the transportation landscape interested in exploring different business models and options.

The organized workshops provided an opportunity for TfGM to understand perspectives on data sharing, data ownership and operational challenges from the standpoints of transport authorities, operators and technology providers. The initial discussions reviewed potential business models for MaaS, the different stakeholders that make up the MaaS ecosystem and what role do they play. These workshops undertaken in Manchester during the first year of the project showed that Operators across all modes were sceptical about the benefits MaaS could bring to their individual businesses, making them less inclined to engage in trials. Moving forward, a better prospect has to be presented to Operators, demonstrating how MaaS offers:

- Greater visibility of demand data and ability to better match supply and demand.
- Increased patronage.
- Cost savings in operations and maintenance.
- Optimisation of services.
- Confidence in innovation.
- Potential revenue through a farebox/transaction levy/cut or fee.

The MaaS Business Model has specific interdependent elements which together comprise the overall ecosystem. These elements are:

- (1) **The MaaS User:** with their expenses for mobility and the value they derive from using the service.
- (2) Greater Manchester's **delivery entity for MaaS:** how TfGM envisions MaaS being delivered in Greater Manchester.
- (3) **Operators and Multi-modal Delivery:** service concessions and incentives to support MaaS.
- (4) **3rd Party Revenue:** further income that can be raised to contribute to ongoing MaaS costs.

These 4 elements working together create an effective and cohesive MaaS solution which is operationally and commercially successful for all participating entities.

After this first period focused on the business perspective, TfGM focused on the platform selection, looking for a provider that shared the same interest in exploring the exploitation of MaaS in the UK environment, which presents different characteristics in terms of PT when compared with other European cities. After exploring a selection of promising solutions and business models, TfGM decided to partner with Mobbileo, a service technology platform provider with its headquarters in the UK. Mobbileo owns a B2B platform that provides trip planning, booking and payment worldwide and wants to expand into B2C, providing MaaS solutions at a regional level.

The platform selection was based on the following parameters:

1. User experience and User interface that is user friendly and easy to use.
2. Availability of multimodal integration in the platform.
3. Availability of multimodal journey planner with preference setting to promote sustainable travel and mass transit.
4. Availability of mobility wallet and payment systems within the platform.
5. Ability to white label the solution to meet project requirements.
6. Provision of customer support team to provide customer support to participants for the duration of the trial.
7. Provision of customer services team to accommodate booking and management of local link services.
8. Accreditation to necessary data protection and payment protection regulations.

9. Potential costs of using the platform and support services along with timescales required to deliver the requirements.
10. Existing integrations of services in the platform reducing time for new commercial agreements.
11. Ability to test “Pay As You Go” pricing for buses and tram.

18 Different stakeholders have been approached during the preparation of the Living Lab including different transport modes. Some approaches have been successful and some other not. The Greater Manchester MaaS solution in IMOVE finally includes the transport modes described in the below figure:

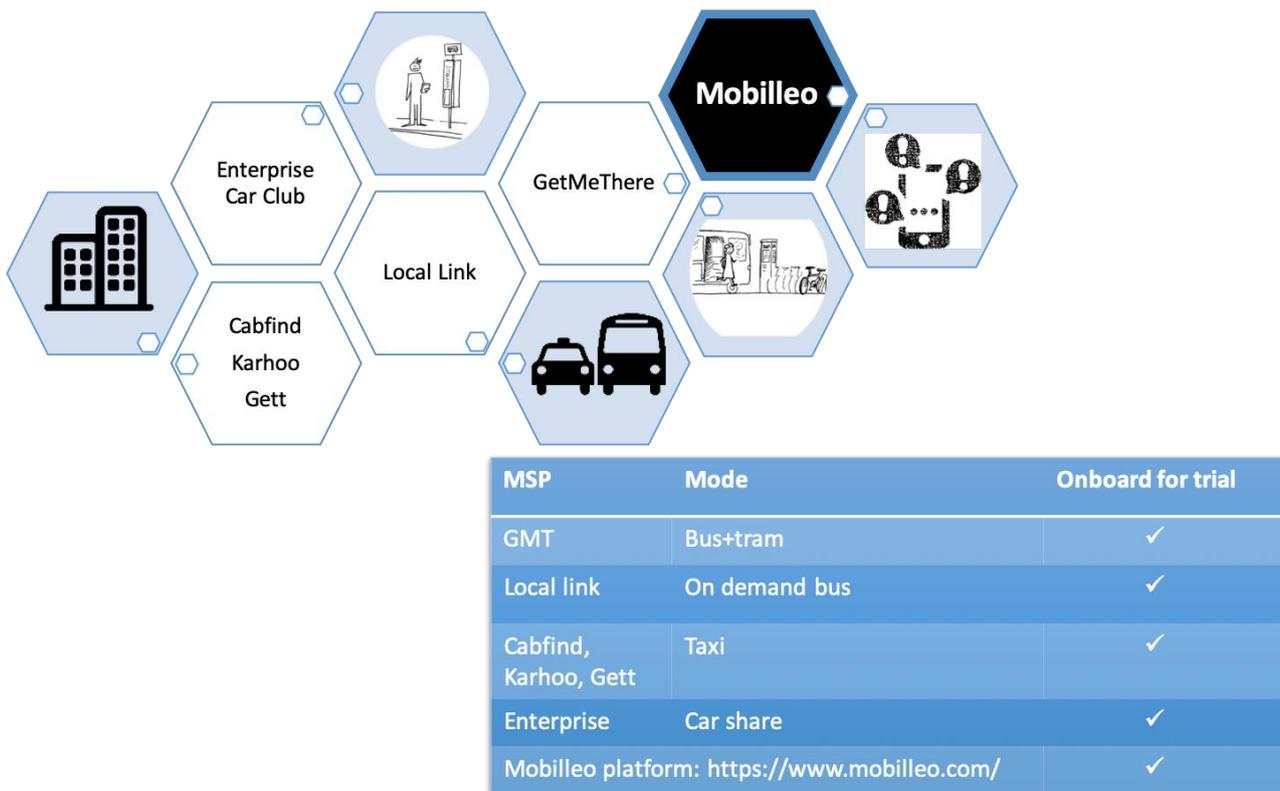


Figure 7. Greater Manchester LL solution

The Living Lab has been based on and around Manchester Airport, the biggest airport outside of London.

All the modes in the pilot have been “Pay As You Go”, users pay for how much they use the service.

Currently there is no flat fare mechanism in Greater Manchester for buses and tram, but variable pricing based on journey distance and journey timing. Initially, for bus and tram there was a flat fare for each journey made priced £2.80 for tram and £2.10 for bus. The flat fare is only for the IMOVE pilot. Each user was provided with a “Get me there” card. This allowed pilot testers to use all the buses and trams within Greater Manchester for the duration of the pilot. They were used to tap in and out on buses and tram. The retail price of the “Any Bus Any Tram” product is £125, and TfGM pre-bought these for the participants before the start of the pilot. Legally TfGM is not allowed to resell any existing product and make a profit hence the cap of £125.

Local Link, which is a TfGM run community service, was free to use but the booking was made using the Mobbileo platform.

The MaaS platform can be accessed both in desktop and in mobile app versions. Some screenshots of the solution for IMOVE pilot are shown below.

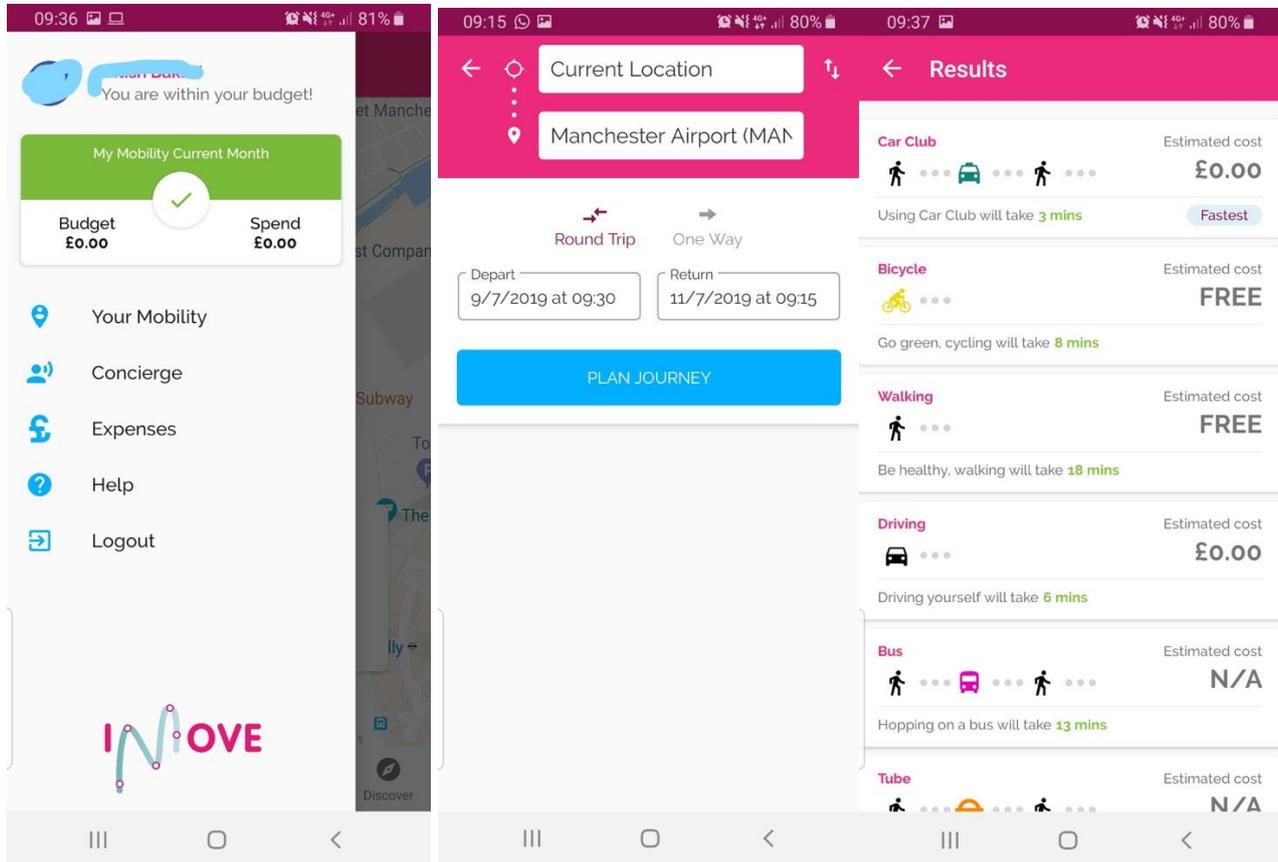


Figure 8. GM LL mobile APP screenshots

LL level of integration

In the Introduction section, the different levels of integration in the MaaS topology have been detailed. According to it, Greater Manchester LL has evolved from level of integration 0 to integration level 2:

Greater Manchester LL	
Initial level of integration: 0	At the beginning of IMOVE the existing services in Greater Manchester are not integrated into a single solution.
Expected level of integration: 2-3	During the LL Manchester reached Level 2, integrating booking & payments options in the MaaS solution, with ambitions to progress this through Level 3 in the mid-term after the project ends.

Barriers and Enablers

During the preparation phase, the following barriers and enablers were identified in order to be ready to run the GM pilot.

Table 5. Barriers and enablers of Greater Manchester Living Lab

Barriers
The Living Lab started without a MaaS platform available in the city.
Due to the nature of the transport services in Greater Manchester, a lot of services cannot be seamlessly integrated to offer all required MaaS services such as planning, booking, payment and ticketing. For a comprehensive MaaS solution to be successful it is essential that there is high number of services across different operators available to integrated.
Given a MaaS scheme touches so many different operational teams not only within the local authority but also outside the organisation, it is important to ensure each and every stakeholder is aware and supports the initiative.
Enablers
Enthusiasm to explore new solutions.
Early and continuous engagement with various stakeholders in the organisation has been useful to ensure quick decision making and easy approval processes.
Having a platform that has already been tested and implemented in the market. It provides confidence that even though some changes may be required, the overall implementation would be smooth.
Engagement with external stakeholders for support and contribution for a successful pilot was essential.

Issues assessment

In deliverable D4.5, the mid-term high-level progress report some specific issues were pointed out in order to be addressed during the last period of IMOVE. In Greater Manchester LL:

Table 6. Assessment of the issues identified in D4.5 for the Greater Manchester Living Lab

Issue identified in D4.5	Assessment
Manchester Living Lab has invested a huge amount of time in the preparation phase, engaging the local mobility stakeholders and finding the most adequate mobility platform for the Manchester MaaS solution. The pilot is almost prepared and will start on August. No additional delays are expected.	Finally, the pilot started by mid-August as it was expected in D4.5.
It is important that a significant number of users signs up for the pilot. If the number of users is lower than expected some engagement strategies will be implemented to cope with this issue. Even some reduction on the price of the offer can be a mitigation measure if needed.	58 users took part of the pilot. After the 1 st testing month, with the feedback of the 8 active users, some corrective actions were performed in order to increase the activity. More communications were performed in order to engage the users and tram single journey price was reduced.

2.3 EXECUTION & EVALUATION PHASE

2.3.1 USERS

TfGM worked closely with Manchester Airport Group (MAG) and Atkins to recruit participants for the pilot. The trial audience were the employees of these organisations. Through MAG marketing and communications team, the information about the pilot was published on the weekly newsletter to all employees, “Big Conversation” as well as the internal intranet website. A flyer was also created to be distributed amongst the employees of MAG and business based in the airport village.

Finally, 62 people signed up for the pilot, with 62 questionnaires answered. 4 of them withdrawn, so the final number of users has been 58.

IMOVE
Research Participation Opportunity

What Will You Get?

- Single app for all transport modes
- Personalised Journey Planning
- Travel Across Multiple Transport Models
- Seamless & Intergrated Travel Experience
- Single Mobility Wallet and Smartcard

You Can Apply If You:

- Use a Smartphone
- Use Public Transport or a Car to commute
- Work at Manchester Airport and live in Greater Manchester
- Willing to participate between 12th August to 8th September

Why Join Us?

- 4 weeks of discounted travel during the study
- Test the convenient way to plan and book your journeys
- A minimum of £20 high street shopping vouchers and other prizes sponsored by Enterprise Car Club & Manchester Airport Group
- Help us solve some of the transport challenges in Greater Manchester

We would like you to use our custom-built app for all your travel needs and share feedback throughout

Want to participate? Fill in a short online survey
<http://bit.ly/imovesurvey>

innovation@tfgm.com

enterprise | Transport for Greater Manchester | fcd | IMOVE

Figure 9. GM LL – User recruitment flyer

2.3.2 RESULTS

Greater Manchester LL started the execution in August 20th of 2019 and has had a duration of 3 months.

A preliminary questionnaire was responded by the participants, and at the end of the first month of trial execution a survey was provided to the users in order to get feedback for pilot improvement.

The pre-trial questionnaire was sent to 62 users. 33 interviews were performed.

This questionnaire was focused in the mobility patterns of the users before the pilot execution and their willingness to use more sustainable transport modes in order to better understand their travel behaviour.

The after 1-month survey was sent to 29 users with 8 responses.

After this feedback, the corrective actions that were implemented in the pilot are specified below:

- **Changed pricing:** the pricing for tram was updated to make a single journey £1.70 from £2.10. This closely reflected the normal retail pricing and ensuring a return trip on tram costed £3.40 which earlier costed £4.20.
- **Improved the offering:** updates were made to the journey planner of the IMOVE app to ensure it provide more optimised results and seamless integration with car club and car hire services.
- **More communications:** additional communications were performed in order to engage the users.

Trip purchases in the pilot

Greater Manchester pilot has been based in the trips to and from the Manchester Airport. The number of trip purchases in the pilot has been progressively increasing during the course of the pilot. In total, 103 bookings have been done by 11 different users.

The overall summary of the booked trips in these 3 months is reflected in the below figures:

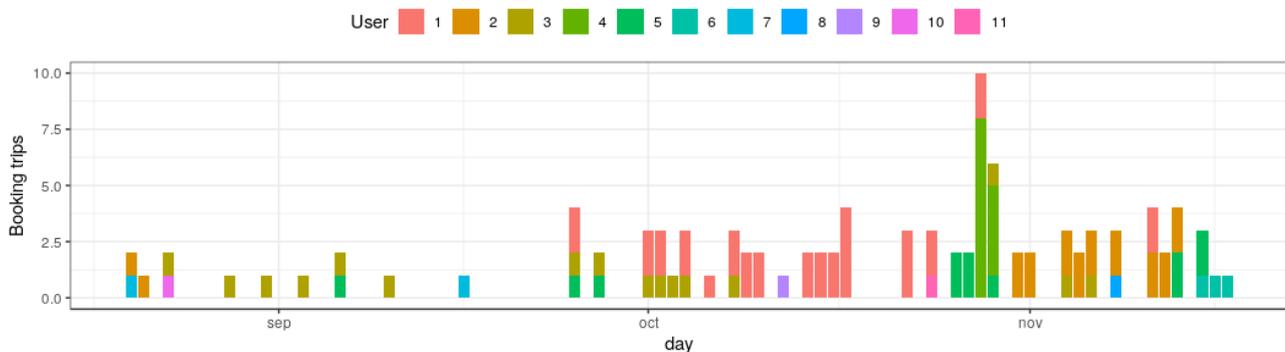


Figure 10. GM LL – Use of the MaaS application

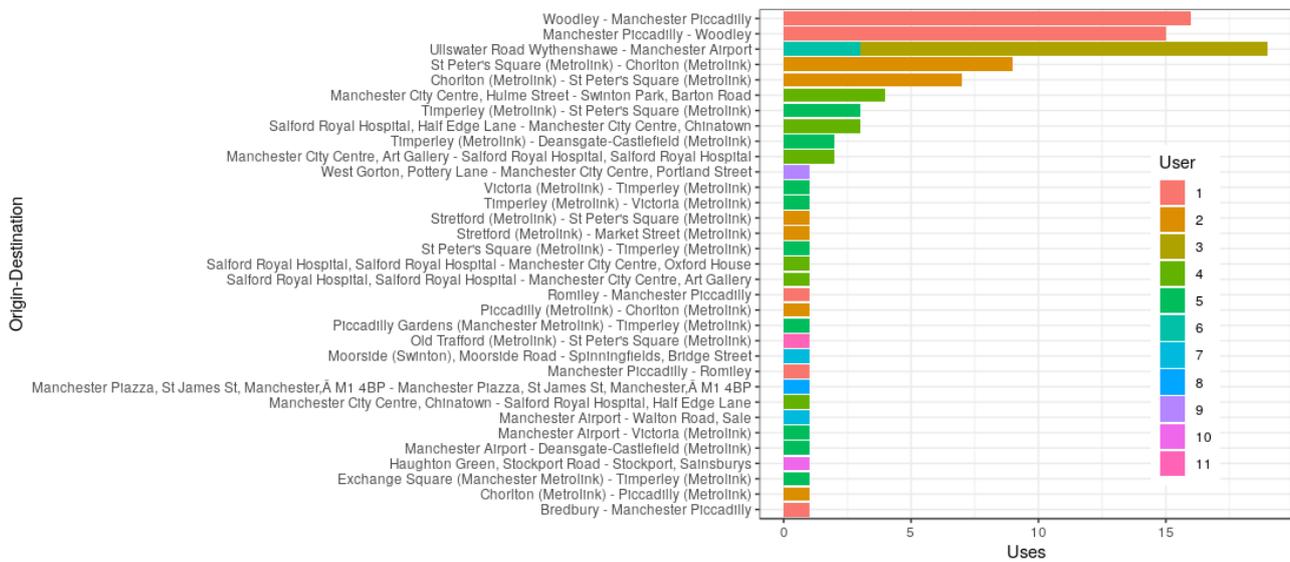


Figure 11. GM LL – Origin-Destination and number of uses of this route

Wythenshawe, one of the most active areas, is a Manchester neighbourhood next to the Manchester Airport.

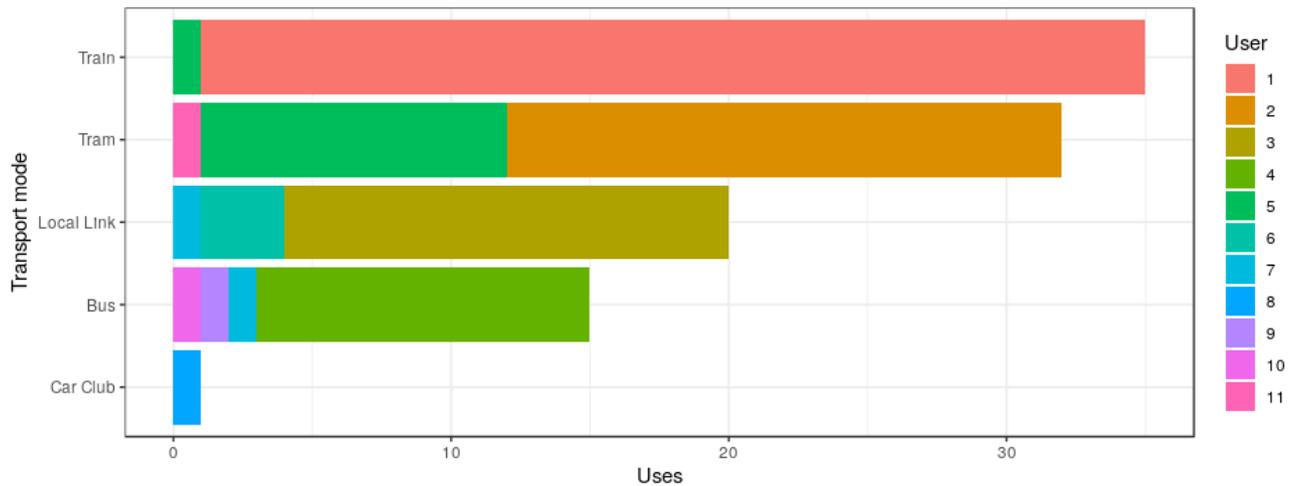


Figure 12. GM LL – Uses per booking type

Local link is basically demanded after midnight where mainly PT are not active.

The summary of the trips performed, specifying the transport mode, average time, distance and cost is detailed in the following table:

Table 7. Greater Manchester LL – Summary of trips

Mode	Trips	Average time (min)	Average distance (km)	Average cost (£)
Train	35	23	10.6	2.15
Tram	32	45	5.7	2.53
Local Link	20	Unknow	2.3	Unknow
Bus	15	43	5.8	2.10
Car Club	1	120	Unknow	15.11

2.4 LESSONS LEARNED

A very interesting list of lessons learned has been identified during the piloting phase, that will help in the evolution of the MaaS solution in Greater Manchester area after the finalization of IMOVE, reaching higher levels of integration in the MaaS topology described in the introduction section.

Table 8. Overview of the main lessons learned for the different stages of GM Living Lab

Main Lessons Learned
Have a clear user group and target market identified and build a solution around the user needs will increase the possibilities of success.
With a fragmented transport market and a number of private transport operators in the market bringing different operators to join the MaaS platform is challenging and they need a clear incentive to participate.
Availability of digital provision of different services is essential for successful MaaS implementation but a lot of operator don't have digital platforms available and ready to integrate with MaaS platform.
Stronger national-scale mandates for integration or tighter regulation of the mobility market will be needed for a successful MaaS in the region.
The integration of different transport modes in the pilot has allowed TfGM to better manage the mobility system within the region and make public travel more attractive.

3 BERLIN LIVING LAB

3.1 MOBILITY CONTEXT BEFORE IMOVE

At around 3.4 million, the population of Berlin for 2012 was roughly at the same level as in 1991. The number of households in Berlin, however, reveals a rise. Above all, the number of single-person households has increased, by 34 % in the last 15 years. On average, each Berliner makes three journeys per day, and in the process spends about 70 minutes in traffic. An interesting figure is that the proportion of journeys on foot in Berlin is almost as high as that of journeys covered by car.

Berlin possesses an outstanding local public transportation network. The network of regional trains, S-Bahn (city train), U-Bahn (subway), trams and buses has a total length of around 1,900 km – roughly equivalent to the distance between Berlin and Moscow. Passengers can get on or off at over 3,100 stations and stops. Many U-Bahn and S-Bahn stations – as well as those for regional and mainline trains – have been equipped for disabled access in recent years, with elevators, ramps, escalators and facilities for the sight-impaired. Each year, 937 million passengers use the U-Bahn, buses and trams operated by Berliner Verkehrsbetriebe (BVG) and 395 million the S-Bahn. Although a modest downward trend can be detected in the last ten years, traffic continues to produce around a quarter of climate-relevant CO₂ emissions in Berlin.

Berlin has a lot of mobility services available. Public Transport (BVG), free-floating car-sharing (Multicity, Car2go, DriveNow), stationary car-sharing (Cambio, Flinkster), bike-sharing (Call a Bike, Next Bike), scooter-sharing (Mio, Coup Berlin) and Taxi (Public Taxi, Free Now, Uber).

Urbi, before IMOVE start, already integrated mobility services in a single app that allows users to search, book and use most of these mobility services (public transport, car, scooter and bike sharing as well as taxis and ride sharing), however, did not provide a complete MaaS scheme with a single subscription and users had to pay each single provider. Urbi had more than 150.000 downloads, and user community was growing fast. Urbi subscription prices were offered at a lower rate than printed versions and lots of promotional activity were undertaken to promote take-up. In particular on some specific target, such as students and young people, making special offers to get their engagements.

3.2 PREPARATION PHASE

In Berlin Living Lab, Urbi has a fundamental role: the platform on which the various services are integrated on, offering, to the market, a practical and tangible MaaS. Consequently, the ambition has been to serve the users with the most complete and holistic offer, at the best price possible, considering also the potential high price-sensitivity of the common customer.

The ambition is to leverage on the learnings developed during previous stages in order to optimize the platform according to the needs of the common user, as also to increase the number of providers and to adjust pricing. The possibility to automatize Urbi offering and partnership is envisioned by proposing a standardized agreement to the various Partner Companies that would like to cooperate in the successful development of an innovative MaaS in Berlin. Being that there are several parties involved, the business model has been articulated on two different levels:

- The first one is focusing on the return that needs to be guaranteed to the operators.
- The second one is guaranteeing a long-term financial stability for Urbi.

Based on the agreements that Berlin LL has been developing with the providers, Urbi operates on a commission-based scheme, or by potentially applying a mark-up.

Berlin has developed partnerships with local mobility providers while waiting for the contract with the public transport agency to unlock. There have been multiple conversations with at least 8 different providers (Emmy, Coup, Miles, Car2go, Nextbike, Mytaxi, Clevershuttle, VBB) which required extensive explanation, business negotiations and bureaucratic procedures to get to the point where the integration could finally happen. This activity resulted in hundreds of emails and phone calls, contract signing and dozens of in-person meetings.

Finally, Berlin LL has managed to pull on board only **Nextbike (bike-sharing)** and **Miles (car-sharing)**.

The agreements and access to APIs with different providers during the preparation phase are detailed as below:

Table 9. Berlin Operators Agreements and APIs

Mode	Operator	Official agreement	Proposed integration solution
Public Transport	BVG	No	Full API access
Bike	NextBike	Yes	Full API access, Purchase of vouchers, to be assigned to users
Car sharing	Miles	Yes	Full API access, Purchase of vouchers, to be assigned to users
Scooter sharing	Emmy	To be signed	Full API access, Purchase of vouchers, to be assigned to users
Taxi	?	No	Full API access

Berlin LL is based on a subscription model. The definition of a suitable subscription package to be presented to the users was discussed, opting finally for the one described below:

Table 10. Subscription details in Berlin

Mode	Operator	Amount	Unit
Cost	Urbi	20	Eur
Bike	NextBike	30 (for each ride)	Minutes
Car sharing	Miles	25	Kilometres
Scooter sharing	Emmy	30	Minutes

Here below some screenshots where the Urbi app for Berlin Living Lab are shown.

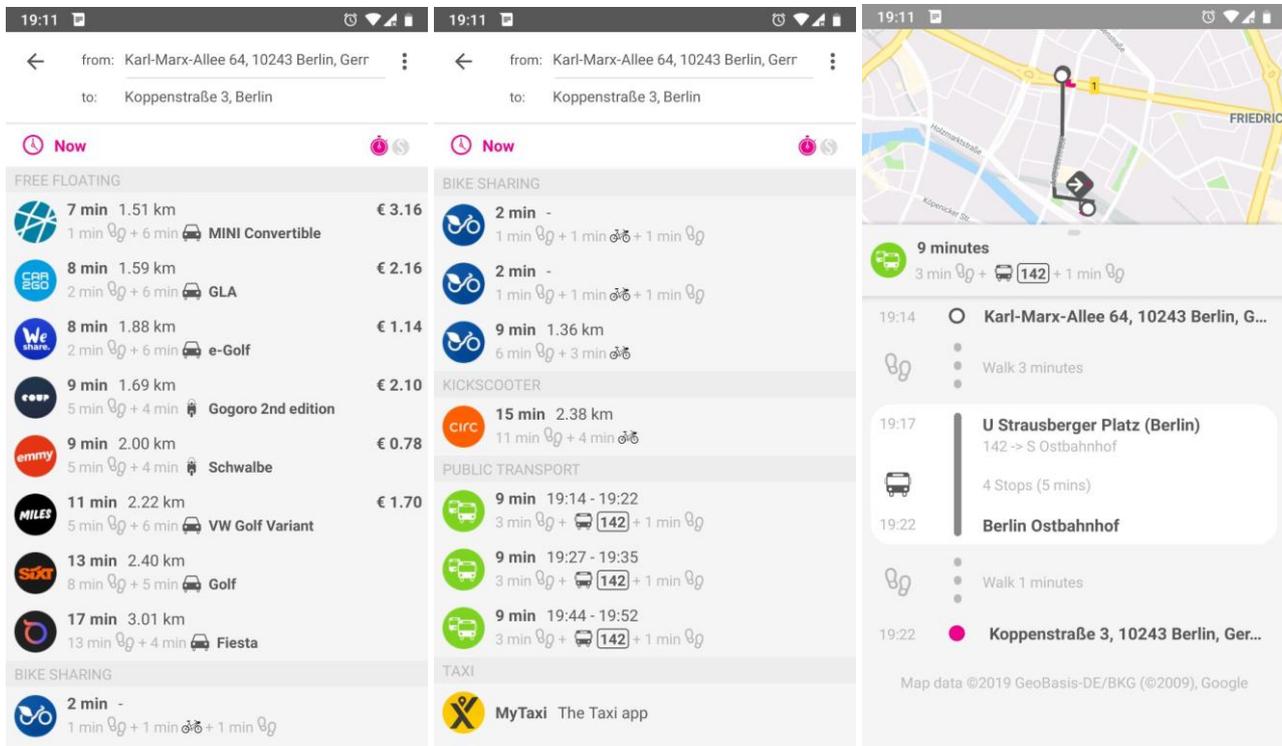


Figure 13. Berlin LL Journey planning

LL level of integration

According to the MaaS topology described in the Introduction section, Berlin LL has evolved from level of integration 1 (Urbi was already a mobility aggregator at the beginning of IMOVE) to integration level 3.

Berlin LL
Initial level of integration: 1 Urbi application initially integrated different transport modes and provides pricing info.
Expected level of integration: 3 Berlin LL has tested a subscription model with the MaaS users of Urbi application.

Barriers & Enablers

During the preparation phase, the following barriers and enablers were identified in order to be ready to run the pilots.

Table 11. Barriers and enablers of Berlin Living Lab

Barriers
The lack of engagement or loss of interest of mobility operators external to the Consortium with regards to the project. Not knowing if/when an issue is going to be resolved creates a waterfall effect of delays and saturated backlogs.
Waiting for agreements with taxi service providers and PT authority delayed the preparation phase and the execution start.

Enablers
Commitment of vehicle-sharing transport operators even if the pilot starts without the Public Transport.
The pilot defined and tested a subscription model and evaluated how the users perceive it.
Timely access to API able to provide the necessary requirements for successful integrations.
Signed contracts which allow proper use of external resources.

Issues assessment

In deliverable D4.5, the mid-term high-level progress report some specific issues were pointed out in order to be addressed during the last period of IMOVE. In Berlin LL:

Table 12. Assessment of the issues identified in D4.5 for the Berlin Living Lab

Issue identified in D4.5	Assessment
From the technical perspective, everything is prepared to start the pilot, even the Public Transport integration has been implemented. The green light from Public Transport Authority has still not arrived and the possibilities are becoming smaller as the time goes by. This issue has to be assessed implementing innovative engagement strategies.	The pilot started without additional delays from the ones reported in D4.5. The Public Transport has finally not been part of the pilot despite of all the efforts to reach an agreement. A subscription model has been tested including bike, scooter and car-sharing transports. Nudging of users was done by push notifications first, lowering the price of the subscription package in second place (11 users subscribed, the subscribed users were lower than expected), and finally offering a free subscription to 20 selected users according to their mobility patterns.

3.3 EXECUTION & EVALUATION PHASE

3.3.1 USERS

User recruitment in Berlin was accomplished through the use of targeted push notifications and in-app advertising. Users were selected on the ground of their mobility habits. One key driving factor for selection was the past use of the services included in the mobility subscription (Miles and Nextbike).

Those users received the target push notification as a nudge, displayed in figure below.

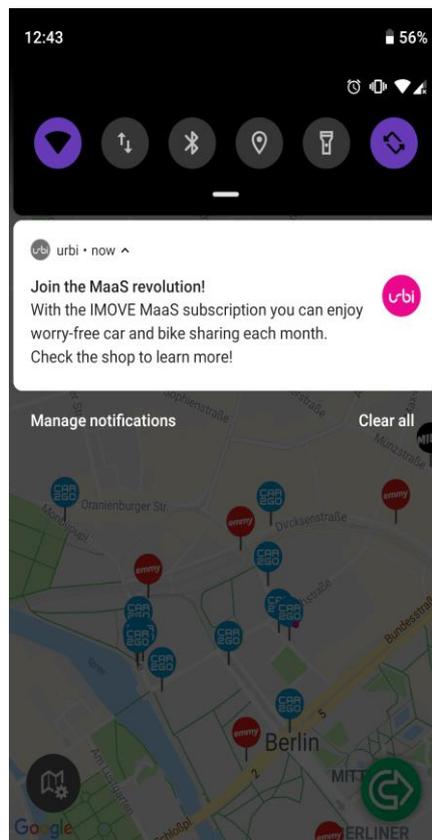


Figure 14. Berlin LL – Nudging push notification

Any user saw at least once the advertising modal dialog at their first app access in Berlin. At any rate, the ability to purchase the subscription was always available in the app regardless of the targeted notification or dismissal of the in-app dialog. Once the user selected to purchase the subscription, it was presented with an instructive screen, explaining the advantages of the subscription and eventually allowing to enter personal and payment info to complete the purchase.

This approach did not have the results hoped for, and it was understood that one of the causes has to be looked for in the lack of a public transport offer. Due to the low engagement results, the price was reduced to a heavily subsidized level in order to promote the subscription even further, as well as assigned it for free to a number of selected users.

The next table shows a schema of the user recruitment action performed.

Table 13. Berlin LL – User recruitment schema

Date	Action	Audience	Results
16-08-19	Push notification	2196 users in Berlin	+8% sessions
16-08-19	Introduction of modal dialog	All users in Berlin	not measurable
02-09-19	2nd push notification	2209 users in Berlin	+3% sessions
25-09-19	Lower price	All users	+11 subscriptions
30-09-19	Assigned to selected users	20 selected users in Berlin	+20 subscribers

Finally, the pilot has been executed with 31 users.

3.3.2 RESULTS

The Living Lab results can be analysed from a quantitative perspective, by looking at the data generated on Urbi databases, or from a qualitative perspective, thanks to surveys sent to the users of the pilot.

A user survey when subscribing to the pilot has been performed. The preliminary results of the survey are shown in the table below. Being mandatory, the survey completion rate is equal to the number of activated subscriptions.

Table 14. Berlin LL – Survey results

Question	Answer	% of replies
Gender	Male	66%
	Female	33%
	Non-Binary/3rd gender	
Age range	20 or younger	16%
	21-30	28%
	31-40	31%
	41-50	20%
	51+	5%
Car ownership	Yes	39%
	No	61%
Commuting	Commute	45%
	Business	44%
	Leisure	11%
	Other	

The results from quantitative data perspective are described below, starting on August 1st and finalising on November 25th. These results include the bookings performed by the users participating in the pilot with the subscription model.

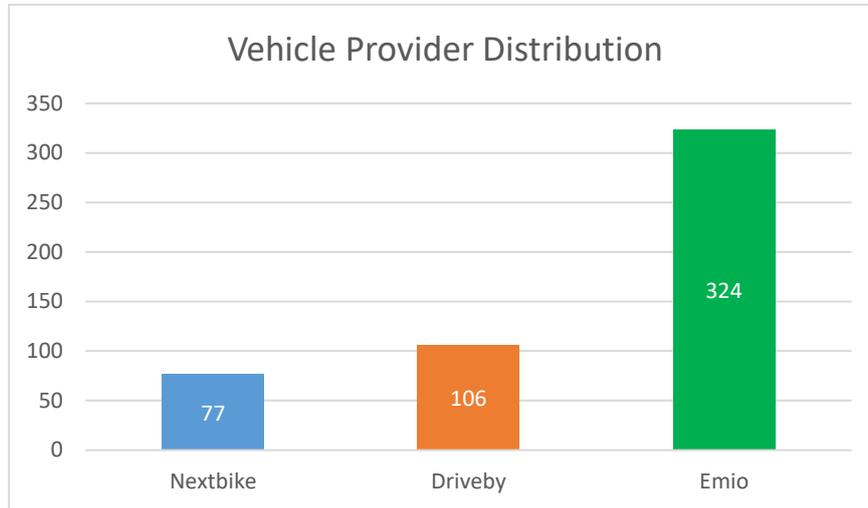


Figure 15. Berlin LL – Transport modes use

The most used transport service is scooter-sharing with 324 uses, car-sharing is used 106 times and lastly bike-sharing with 77 uses.

3.4 LESSONS LEARNED

Berlin LL has allowed to identify an interesting list of lessons learned, especially related to transport modes and subscription solution.

Table 15. Overview of the main lessons learned for the different stages of Berlin Living Lab

Main Lessons Learned
To avoid potential delays during the Living Lab implementation, it would be advisable to carefully assess the concrete engagement of the mobility operators which the pilot relies on.
There is a challenge in the integration with different transport operators, since each transport operator had its unique set of information variables required for their own sign up process and the merging of them is a challenge in a MaaS service.
A good subscription model is a challenge as providers charge in different way to the users (some providers charge by the minute, some providers charge by the kilometre, and some providers charge per ride).
The absence of public transport made the subscription way less interesting to the users.

4 GOTHENBURG LIVING LAB

4.1 MOBILITY CONTEXT BEFORE IMOVE

Gothenburg had a previous experience in MaaS provided by the UbiGo trial during 2013-2014. In this trial the service was distributed to users through an app covering all transport modes included in the offer, but with service specific ticketing functions, since, at that time, there were no ticketing APIs available.

Since the ending of the UbiGo-pilot in Gothenburg in 2014, an extensive work has been carried out both in the research arena and in the industry itself (Public transport, mobility providers, entrepreneurs). The general perception of MaaS have shifted from somewhat sceptic, to a positive belief that MaaS can help achieve public goals of sustainable transport.

Through the stimulus and support from public bodies as Swedish Energy Agency, Swedish Innovation agency and Swedish Transport administration, several activities were launched during 2016 and 2017 to stimulate the creation of a Swedish MaaS ecosystem. All these activities provided funding and support, not only to the PTO, but also to possible service providers and entrepreneurs in the MaaS ecosystem.

In Sweden, there are some commercial start-ups aiming for the role of the MaaS operator, but interest is gaining also from the traditional transport industry such as public transport operators, car manufacturers and the event industry.

Västtrafik is a fully owned subsidiary of the region of Västra Götaland. Västtrafik is responsible for public transport in western Sweden (including the city of Göteborg). Every day, over 450.000 customers choose to travel with buses, trains, trams, boats, cars and special vehicles. In Västra Götaland region there are approximately 1,050 000 journeys made using ordinary public transport each day.

Västtrafik envisages that with public transport as the backbone in combination with different types of vehicles and solutions could customise travel to suit customers circumstances and find easier ways to combine different modes of transport to help people to travel more sustainably.

Västtrafik launched in 2015 the digital tickets, so that single tickets and period tickets could be purchased by an app (togo) at consumers smartphone, today there are among 500.000 active users. The objective is that service providers could have access to digital tickets, integrating these tickets in their mobility offer portfolio.

The Living Lab in Gothenburg is planned to take a distinct approach for enabling MaaS services to be established and financially viable in the Gothenburg region. It is called “the Scandinavian approach to MaaS”, meaning that public transport enables entrepreneurs and companies to start MaaS services, including public transport in their service offering. Public transport here takes the role as producer of public transport services, provider of the possibility to include PT (through digital tickets), and also promoter towards entrepreneurs and companies of this opportunity, for them to become 3rd party resellers of digital tickets.

4.2 PREPARATION PHASE

During the execution of IMOVE, Västtrafik needed to understand if a tender for a combined mobility provider is necessary. IMOVE gave support to understand the framework of such tender. IMOVE allowed to investigate a structured process to follow and evaluate the effects of the service when it comes to user involvement, behavioural change and societal effects as a result of the service.

A vital part for Västtrafik is the development of new business agreements and business models supporting these new sales channels. These new MaaS services should lead to more sustainable transport in the Västra Götaland region, sustainable in the sense of environmental, social and economic perspective.

IMOVE has facilitated running different kind of pilots with technical, commercial and customer aspects to be able to take steps and gathering knowledge so that at the end of the project a fully operational technical and business infrastructure is in place for the MaaS ecosystem. Västtrafik has been the responsible for creating the technical and business enablers for this, by developing technical APIs for 3rd parties to include tickets and information in their services (apps), and also contractual artefacts such as business agreements templates and contract models.

The technical solution for the integration is based on the National Swedish Ticketing Standard called BoB (*Biljett och Beta*). The BoB-standard was developed approximately during the period from 2015 to 2017. The industry agreed upon standards of API interfaces and ticket specifications within and between different constituent parts of all ticketing and payment systems. The goal was both to achieve interoperability between companies and counties as well as to prevent locking into supplier-specific solutions. The standards provide opportunities for both established and new players to access the market, being them service suppliers as well as equipment/system suppliers.

The objective of Gothenburg LL is to test pilots containing proposals for how Västtrafik should work with digital resellers. A Digital Reseller (DRE) is an independent operator that is given access to Västtrafik’s range/tickets and provides them to the customer on their own responsibility and on their own account. A DRE is not a service for which Västtrafik pays and is therefore not one that needs procurement. With sales to a DRE, Västtrafik is not able to set the DRE’s end-customer pricing, neither maximum nor minimum prices.

In order to achieve this, 3 pilots have been planned in the frame of IMOVE project:

- **Pilot 1** - Göteborgs Stads Parkering AB here called P-bolaget enables motorists to buy a public transport ticket together with parking fee.
- **Pilot 2** - Mobility service for those who are new residents of Riksbyggen’s Viva at Guldheden in Gothenburg.
- **Pilot 3** - Service aimed at business travellers for local business trips.



Pilot 1 – Park & Ride for Motorists



Pilot 2 - Accommodation



Pilot 3 - Local business trips



Figure 16. Gothenburg LL pilots

4.2.1 PILOT 1 – PARK & RIDE

Pilot 1 initial limited technical test was carried out in spring 2018. A first version of the BoB API’s was implemented as part of the Pilot with “P-bolaget” during the first half of 2018. P-bolaget is the public parking

company in the city of Gothenburg and has a well-established smartphone app for users to conveniently perform check-in and check-out in parking. A special version of the mobile application was provided for a limited number of piloted users in order to run the pilot. In the pilot, the following main functions were implemented:

- P-bolaget is able to offer and sell Västtrafik's tickets in P-bolaget's user app (limited assortment). P-bolaget charges the end-user by Credit Card.
- P-bolaget requests the tickets from Västtrafik's backend, and the ticket is delivered to P-bolaget over the BoB-API's.
- The ticket is presented visually in the P-bolaget mobile application and Västtrafik's Ticket Control could validate the ticket automatically in the validation equipment.

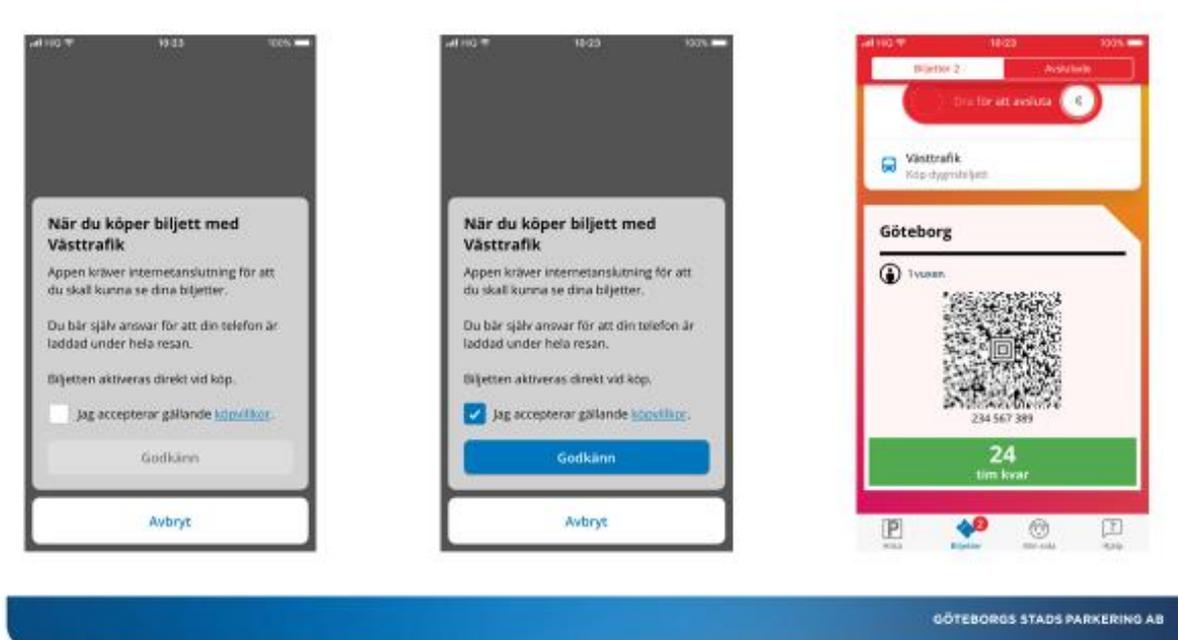


Figure 17. Gothenburg LL - P-bolaget's user APP integration with PT and QR code ticket

The target group for the pilot was defined as motorists who parks several times a week and who rarely or never travels with public transport and with Västtrafik. The group was offered a "version" of the P-bolaget app where they could buy both parking tickets and tickets to Västtrafik. The Västtrafik ticket could only be purchased if the customer had an active parking. The Västtrafik tickets that were available in the app were 24-hour tickets and single tickets in Gothenburg (valid for 90 min).

The pilot was extended from May 2019 to be part of the parking company's standard app, which has around 700,000 active users. Furthermore, this resulted in a trial where public transport was part of the parking app together with additional features as showing the closest bike rental or the closest Public transport stop. The test was to understand the appeal of combining Car Parking tickets and Public Transport tickets in the same app and purchase experience, and to assess if that could make motorists to use Public Transport more often than today.

4.2.2 PILOT 2 - HOUSEHOLDS

The 2nd pilot is a concept that delivers **Combined Mobility solutions for residents/tenants**. 132 new apartments have been built (Riksbyggen’s Viva Tenant Association at Guldheden in Gothenburg) and instead of building parking spaces, the contractor promised to provide a Combined Mobility solution, including local carpool and bike pool, mobility management and a community solution. Concept owner is a company called EC2B, but the integration to Västtrafik’s API was done by a company named SmartResenär.

The EC2B app makes it easier for those living in the building to choose the means of transport for each journey they make and the range available during testing has comprised public transport (Västtrafik), bike sharing via GoRide and car sharing via Sunfleet. EC2B owns the app as well as the customer concept, while SmartResenär is the technical integrator.

Some screenshots from the EC2B app are shown below:

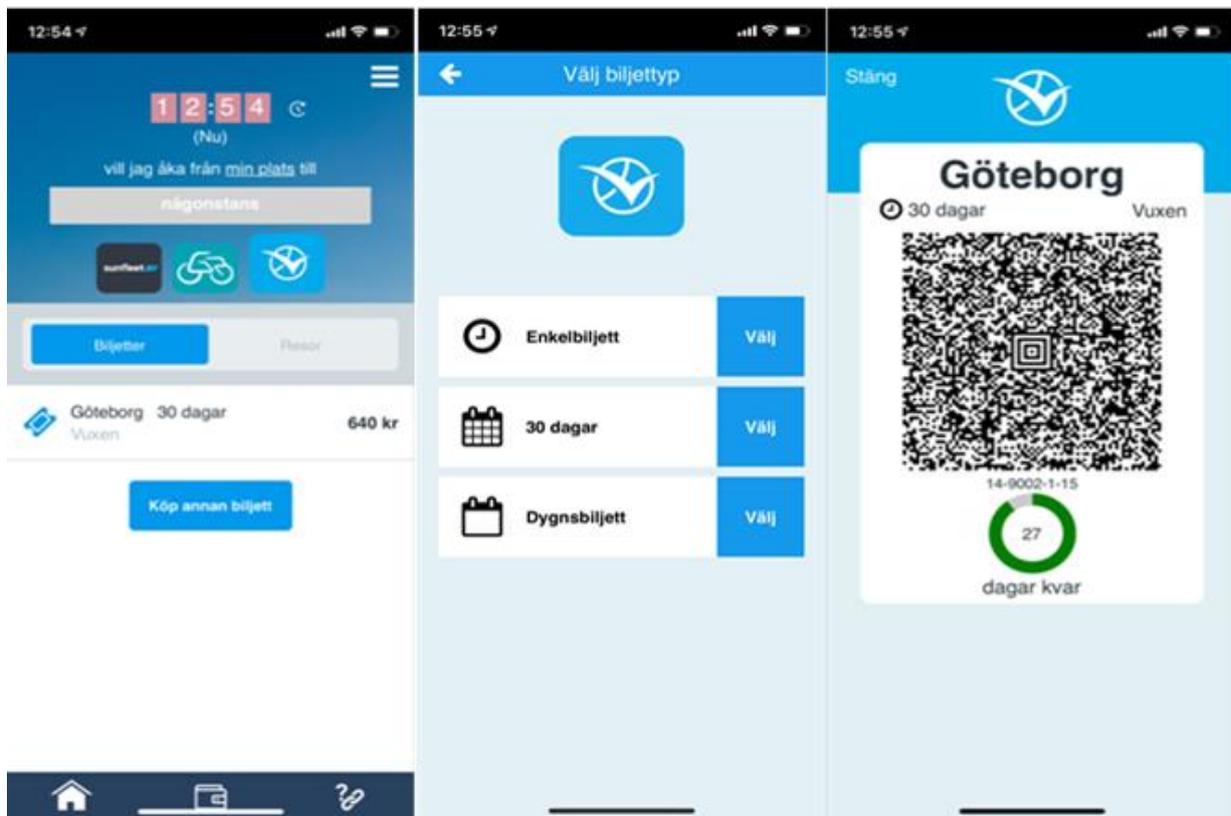


Figure 18. Gothenburg LL - EC2B pilot screenshots

An integration with Västtrafik’s product and ticketing API was completed successfully, and it is based on the Swedish national ticket standard, just in the same manner as in pilot 1. This means that the tickets that EC2B delivers to the customer can be validated on Västtrafik’s readers on buses, trams, trains and boats in the whole region.

The first household moved into the building in late February 2019 and in May 2019 all 132 households had already moved in and they were all part of the pilot.

4.2.3 PILOT 3 – LOCAL BUSINESS TRIPS

Pilot 3 is a solution for business travels with product name “Spacetime” and it is provided by the company SmartResenär. The technical integration is completed, and the pilot was scheduled to start running by part of the city of Gothenburg in September 2019. (finally, it has been delayed due to internal organizational issues of the testing organization, the City of Gothenburg, that is not a member of the IMOVE consortium). The test is regarding local business trips and it is designed to find out if a MaaS concept with carpool, bikes and public transport tickets in the same app will make these trips easier and more appreciated by the relevant customer segment.

200 employees at City of Gothenburg were contacted to get access and start using the app. Interviews have been conducted with a small number of participants/customers and they have been followed up.

It is based on the same integration with Västtrafik via SmartResenär (as Pilot 2). The service primarily involves booking and administrating a company’s internal carpool, with the additional option of purchasing other transport services, such as digital public transport tickets.

During the last project phase, the mobile application development has been completed, including carpool, bikes and public transport tickets.

Here below some screenshots of the developed application are shown.

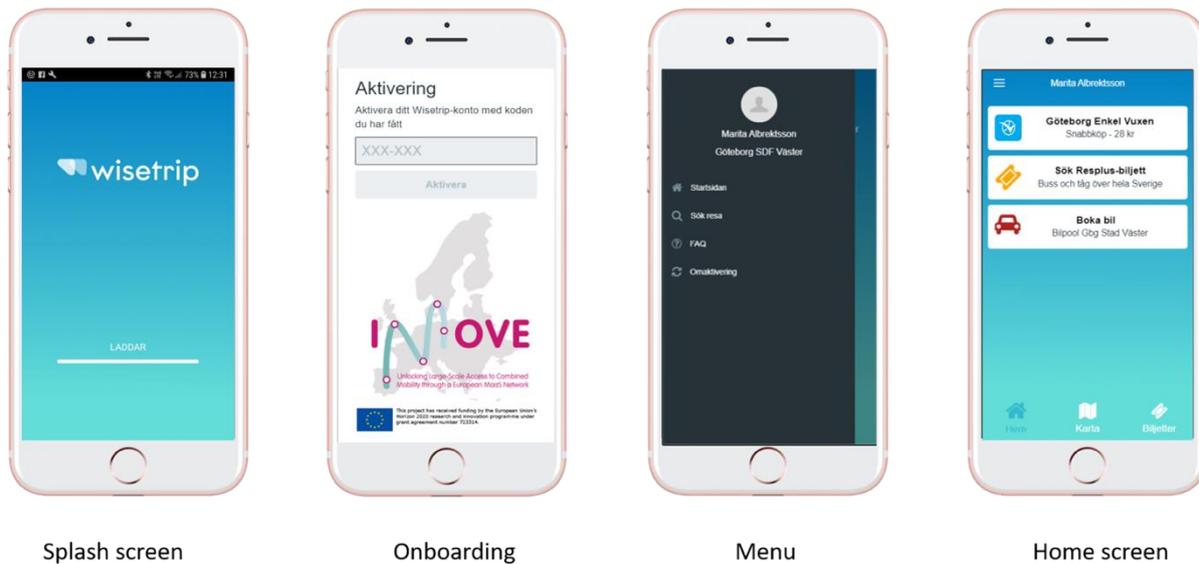


Figure 19. Gothenburg LL – Pilot 3 onboarding screens

LL level of integration

According to the MaaS topology described in the Introduction section, Gothenburg LL has evolved from level of integration 0 to integration levels 2-3/4.

Gothenburg LL
<p>Initial level of integration: 0 At the beginning of IMOVE 3rd parties in some cases were able to sell tickets valid at Västtrafik, but not as digital tickets.</p>
<p>Expected level of integration: 2-3/4 Services both in level 2 and level 3/4 have been created, however, they are run by commercial or public 3rd party service providers.</p>

Barriers and Enablers

During the preparation phase, the following barriers and enablers were identified in order to be ready to run the pilots.

Table 16. Barriers and enablers of Gothenburg LL

Barriers
Complex business models can delay the evolution of the pilots
BoB is a new standard, high initial cost for the 3 rd party supplier
Immature organisation regarding MaaS (lack of processes)
In pilot 3, dependency on external entities (Gothenburg municipality) resulted in a weakened guidance in organisation and vague prioritisation
Enablers
The execution of different pilots allowed to explore different solutions from different perspectives
Involvement of Västtrafik in the pilots acting as transport provider eases the process
Close cooperation with WP1 allowed exploration of different sustainable business models
Usage of the national standard BoB architecture and API
Regular meetings between MaaS provider, MaaS integrator and Public Transport facilitated the collaboration between several companies

Issues assessment

In deliverable D4.5, the mid-term high-level progress report some specific issues were pointed out in order to be addressed during the last period of IMOVE. In Gothenburg LL:

Table 17. Assessment of the issues identified in D4.5 for the Gothenburg Living Lab

Issue identified in D4.5	Assessment
Pilot 1 “Park & Ride” is executing its 2 nd iteration opened to all the users of the parking app without significant issues.	The pilot has been completed successfully.
Pilot 2, a Combined Mobility solution for residents/tenants in new built apartments, is active since April 2019. It will be important to deal with users’ feedback properly.	The users’ feedback was gathered successfully as described in section 4.3.2.3.
Pilot 3 execution start is planned for September 2019. A close monitoring of this pilot has been established in order to possibly smooth out the remaining preparation activities.	The preparation of pilot 3 was completed, but some organizational issues in the Gothenburg municipality (external entity testing the pilot) made impossible to start the pilot in September 2019, postponing the pilot after the finalization of IMOVE.

4.3 EXECUTION & EVALUATION PHASE

4.3.1 USERS

4.3.1.1 PILOT 1 – PARK & RIDE

In the first phase, a group of 550 people defined as "mainly motorists/new customers for public transport" was contacted via mail to be offered the opportunity to participate in the pilot. Mail dispatches were made in three rounds distributed to 100 customers in first mailings, 200 customers in other mailings and 250 customers in third mailings. The plan was to choose, based on the interest of the respondents, a pilot group of 50 people, the selection would be carried out on the basis of demography and geography. But when only 50 persons reported their interest in participating and testing the service, no selection was needed. Finally, 35 persons downloaded the App.

The final strategy was to open up the possibility to buy PT tickets within the mobility app provided by the Parking Company for all parking customers, to see if motorists parking their vehicle will benefit from easily be able to buy PT-ticket for further transport with the same price as in Västtrafik's own channel.

The mobile app usage statistics reported **1079 users** have purchased the PT ticket with their smartphone at least one time.

4.3.1.2 PILOT 2 – HOUSEHOLDS

132 household have had the opportunity to use the MaaS EC2B. An introduction package has been specifically delivered for each wave of occupancy including instructions for downloading and details to login and get onboarded in the pilot.

4.3.1.3 PILOT 3 – LOCAL BUSINESS TRIPS

There are approximately **200 users** that work at the organisation and are targeted to be engaged to the pilot.

4.3.2 RESULTS

4.3.2.1 BUSINESS MODELS

The prominent part of the business models analysis in the Gothenburg Living Lab throughout the project resulted in the development of a proposed digital reseller model (DRE model). The DRE model means the way in which Västtrafik makes its ticket range available to digital resellers. This includes which strategic principles and guidelines Västtrafik should work to, which operators Västtrafik wishes to sign reseller agreements with and what kind of criteria need to be established in order to become a DRE.

DRE model – General principles

Västtrafik’s DRE model must take various conditions into account and ensure that Västtrafik acts in accordance with prevailing legislation. The general principles for the model are:

- Simple and with low barriers (technical and commercial requirements)
- Fair and transparent
- Encourage DREs that drive behavioural change towards more sustainable travel

There are many ways to categorise and evaluate potential DREs. One way considered important for Västtrafik is to examine the aims and driving forces of the potential resellers. On the basis of this reasoning, Västtrafik envisages three distinct segments:

- **Allow the customer to buy their ticket from an external provider:** Västtrafik stimulates the market for new solutions/collaborations and allows other systems to sell Västtrafik tickets, individually or combined with other services.
- **Promote combined mobility:** Västtrafik aims at supporting the uptake of combined mobility, getting customers to satisfy their mobility needs using multiple modes of transport, including public transport, and possibly shared resources in terms of vehicles and services.
- **Enable the customer to buy tickets seamlessly for all public transport:** Other public and/or commercial public transport companies can sell Västtrafik tickets and vice versa.

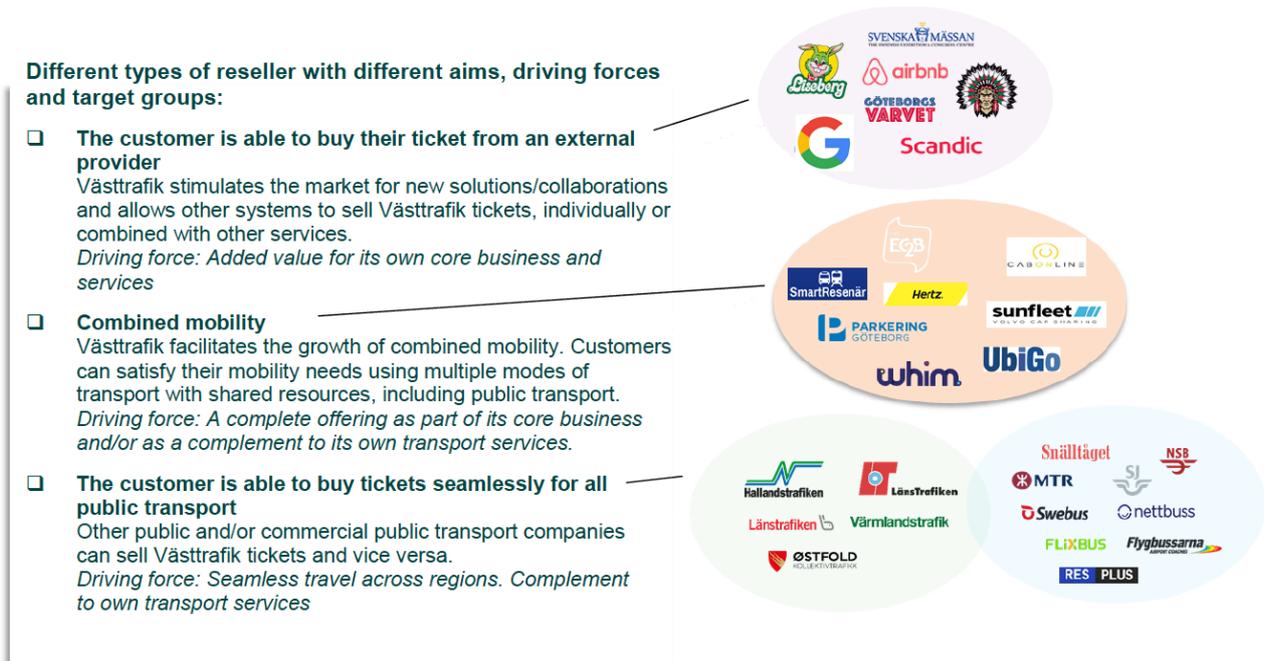


Figure 20. Gothenburg LL - Different types of reseller

A result of the joint work with the pilots around business models is that Västtrafik can see two different paths going forward beyond the project:

1. A path for a **Digital Resellers** marketplace with basic requirements and same conditions for everyone selling Public Transport tickets as a 3rd party reseller.

2. Another path with **Mobility Partners**, which are contracted by Västtrafik through regular concession contract procurements. These help Västtrafik to deepen its cooperation and enable it, together with external partners, to test and stimulate new mobility solutions that make a difference and provide development towards sustainable travel.

4.3.2.2 PILOT 1 – PARK & RIDE

After a successful technical pilot with a limited number of customers, it was possible from May 2019 for all parking customers to buy public transport tickets in the app Parking Gothenburg. The results of the execution of the pilot in the period from May 1st to September 2nd are described in this section.

No of unique customers: 1079

- **One-time customers:** 654. 800 tickets have been bought by this type of customers.
- **Recurrent customers:** 425. 1973 tickets have been bought by this type of customers.

In the below figure the number of PT tickets for each different month from May to September is detailed. Customers have bought most of the Public Transport tickets in July. This is interesting as the use of the Parking app generally is lower in July.

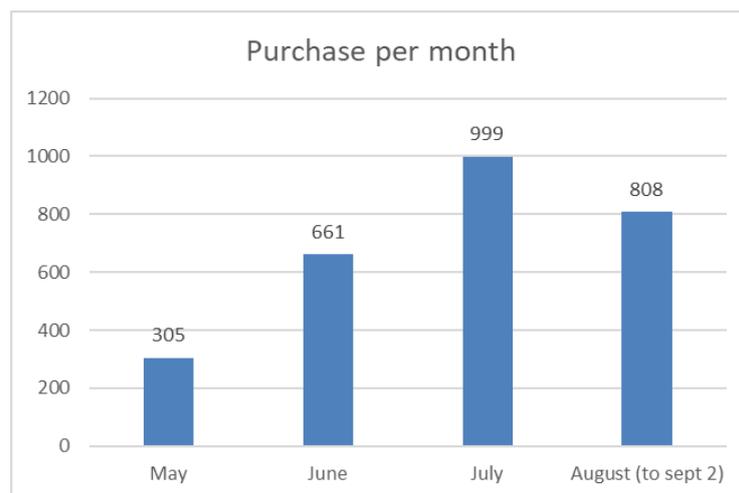


Figure 21. Gothenburg LL Pilot 1 – PT tickets sold per month

Buying behaviour of the users: 19% of all customers have bought two or more tickets at the same time, this proportion is higher than sales of several tickets in Västtrafik's app To Go, and customers mainly buy single tickets for zone Gothenburg.

Qualitative analysis for pilot 1 Park and Ride

All 1079 unique customers have been invited via e-mail to participate in a web-based survey study. 105 customers have participated. Half of the participants in this survey live or study in the city of Gothenburg, and the 67% are over 50 years old. For a better understanding of the use of the service, three groups have been separated and compared in the results of the survey responses. Gaining a better understanding about infrequent travelers and combination travelers is most interesting in this study, as these are target groups to be encouraged to travel by public transport.

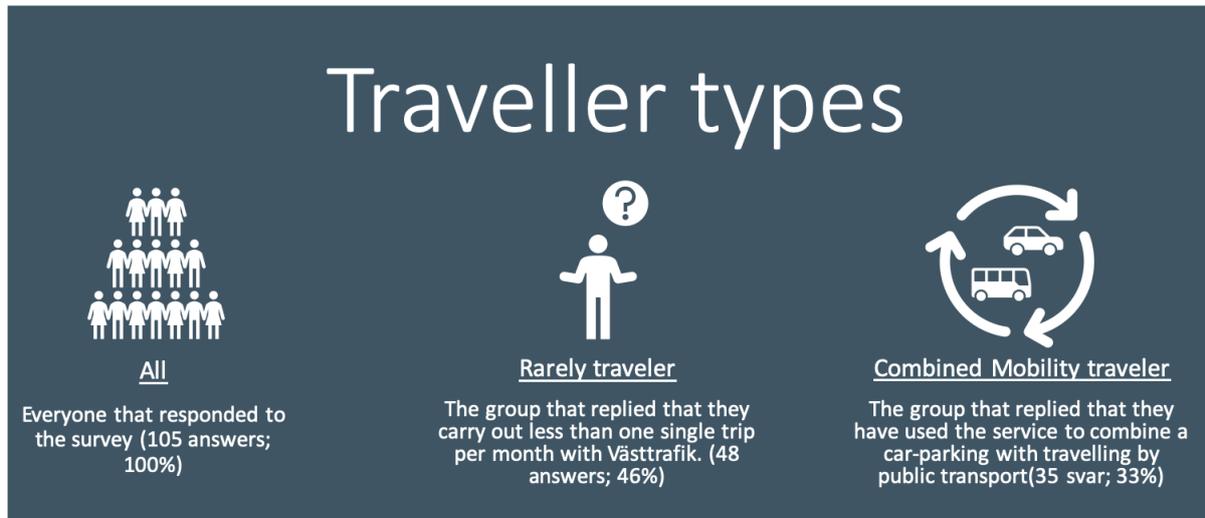


Figure 22. Gothenburg LL Pilot 1 – Traveller types

Conclusions of the survey:

- Since the MaaS feature to buy public transport tickets in the Parking app is so new and unique, it was difficult to determine before launch how the function would be used.
- Since its introduction in May, there has been continued interest in buying PT-tickets in the app Parking Gothenburg. It is worth mentioning that there was no specific marketing for the function, and it seems that the customers have found the function themselves.
- Based on data analysis, it is reasonable to assume that some tourists use the feature (possibly explaining the raise in purchases in July). This was not confirmed in the survey. It is possible that fewer tourists have participated in the survey, and that more Gothenburg citizens have participated in submitting comments on a service they are accustomed to use regularly.
- The survey shows that most of the customers think it is a positive development to have access to PT-tickets in the Parking Gothenburg app for various reasons such as the well-designed user experience, easy billing to companies, and the seamless way to make the PT ticket purchase when already accessing the app to pay for the parking.
- A small number of customers are dissatisfied with the feature, it appears that they have bought tickets by mistake or they do not want too many features in the same app.

This first evaluation shows that this MaaS functionality has a value for different target groups. The feature makes it easier for motorists to travel by public transport more often and contributes to a simplified and combined mobility.

4.3.2.3 PILOT 2 - HOUSEHOLDS

The block of apartments includes a dedicated bicycle infrastructure consisting in a large-scale garage with a ramp and an elevator, as well as charging facilities and a room with repair stands and tools.

The tenants also have exclusive access to the EC2B app. The app enables the tenants to book and pay for a pool of shared vehicles operated by GoRide. This vehicle pool, situated in the bicycle garage, includes six electric bicycles, two electric cargo bicycles and a three-wheeled electric moped. Moreover, the tenants can buy tickets for regional public transport (operated by Västtrafik) through the app – two bus stops and a tram stop are within walking distance. Via deep linking, they can also book and pay for Sunfleet, the largest car

sharing service in Sweden – four electric cars are parked outside Viva, and a few other cars of different models are parked within walking distance. Apart from booking and payment functionalities, the app provides additional features such as the payment history, the offer of occasional discounts for public transport and furthermore it can be used to access information and customer support. The figure below shows Public Transport tickets sold in pilot 2.

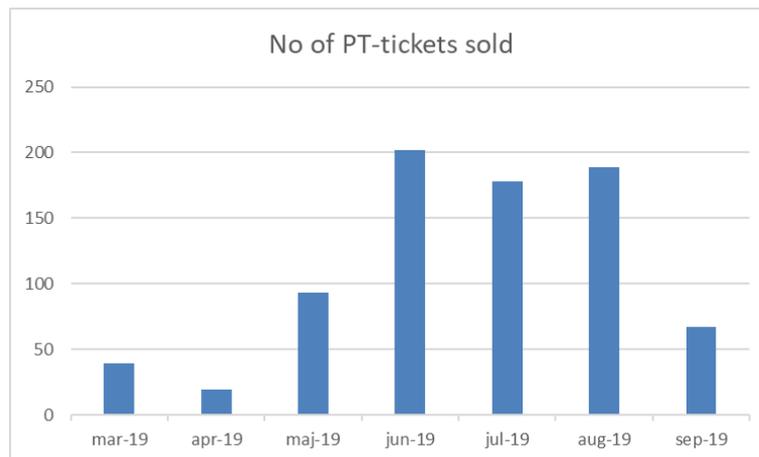


Figure 23. Gothenburg LL Pilot 2 – PT tickets sold per month

The use of the included transport services increased progressively throughout spring, especially of shared cars and e-bikes. In May, the three-wheeled e-moped was introduced, and EC2B began a 20 percent discount on single public transport tickets. These actions caused a spike in usage of these services.

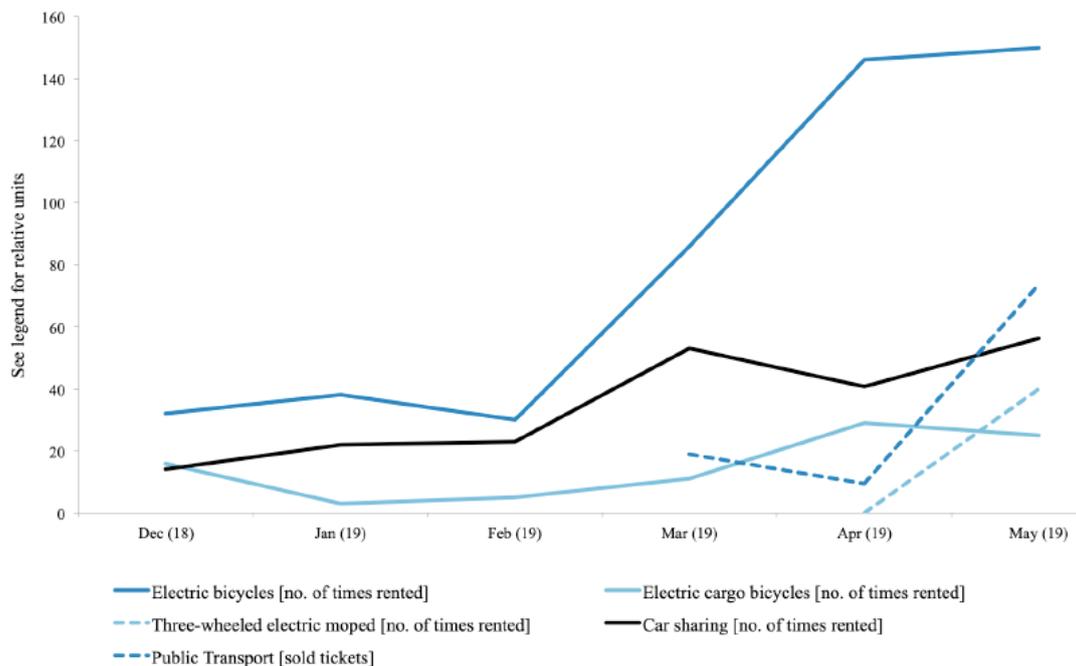


Figure 24. Gothenburg LL Pilot 2 – User of transport services

In summary, many of the interviewed car-owning households at Viva are using their cars to a lesser degree compared to how they travelled prior to moving there. The central location of the apartment complex, the longer distance to parking for private cars and the access to public transport seem to be important factors for

this shift, alongside an individual motivation to change. Still, the access to EC2B appears to play a role as well as it gives them access to a range of viable alternative modes and a smooth way to trial them. For the non-car-owning households, EC2B's included transport services reduce travel time and hassle, and provide a sense of independence.

4.4 LESSONS LEARNED

A very interesting list of lessons learned have been identified during the piloting phase, that will help in the evolution of the MaaS solution focused in the 3rd party PT ticket resell in Gothenburg area after the finalization of IMOVE.

Table 18. Overview of the main lessons learned of Gothenburg LL

Main Lessons Learned
The technical part is not the issue. The pilot projects have confirmed that technical integration with Västtrafik using the BoB national standard works, which enables third-party suppliers to sell Västtrafik tickets that can also be machine-validated using Västtrafik's ticket inspection equipment. Each new digital reseller needs to implement technological development in order to integrate with Västtrafik and have access to public transport tickets.
The type of range, prices, time settings in different apps and the rendering of tickets are some of the issues that have been dealt with through the pilot projects. Most of the lessons from the pilot projects have been incorporated into Västtrafik's technical solution, influenced Västtrafik's processes, amended Västtrafik's documentation and affected the proposed agreement and reseller model. Much of this concerns the details, which real-world testing has clearly identified, and which are significant for the overall result.
Two customer groups, rarely travellers and combined mobility travellers, are even more positive to the development and the first evaluation shows that MaaS has a value for different target groups. The feature makes it easier for motorists to travel by public transport and contributes to simplified combined mobility.
The results from this study have shown that with a proper planning and with the right incentives, it is possible to change behaviour and get people into public transport.
Achieving a sustainable and profitable business model for all the involved stakeholders is a major challenge.
It has also become clear that there are specific business rules for Västtrafik that do not technically comply with the ticket description under BoB and must be handled through an agreement. Digital Resellers may bring about a change in Västtrafik's relationship with customers and provide new ways of securing customer relationships.
The administration of sales channels, product range and invoicing currently requires manual work, which entails the need for finance staff and an increased need for administrative and accounting control.
Entering into a strong Digital Reseller relationship requires both the commercial and technical conditions to be well considered.

Looking into the future, it will probably take several years in order to know whether the work with DREs and the stimulation of Mobility Partners can prove to be a successful route towards Västtrafik's objectives in terms of more passengers and increased sustainable travel in society.

5 MADRID LIVING LAB

5.1 MOBILITY CONTEXT BEFORE IMOVE

Madrid city is an area with 604,45 km² and 3.2 million inhabitants. EMT (Empresa Municipal de Transportes) is integrated in the “Consortio Regional de Transportes” (Regional transport authority, CRTM) which coordinates, as the transport authority, the transport offer in Madrid City and surroundings. Since 1985 the CRTM is responsible for providing and managing all public passenger transport services, which principal functions are planning public transport infrastructures, managing an integrated fare system, planning services and controlling the financial management.

In Madrid city there are more than 40 different public transport operators (both public and private ones) providing the railway, underground, tram and bus services in Madrid Region. The integrated ticketing scheme includes two modalities of payment:

- The **Transport Pass** (monthly or annual) which includes all means of public transport within certain areas of influence in which the Region is divided.
- The **Multi Card**, which is a rechargeable card with a duration of ten years, which serves to contain the non-personal titles of the fare system of the public transport service (single tickets for specific means of transport, ten trips ticket, etc).

Certain mobility services are also integrated with the Transport Pass card, such as the city bike sharing service. And also, two station-based carsharing companies, Bluemove and Respiro. The whole public transport network in Madrid has an annual demand of 1,600 million passengers.

The project "MaaS Madrid" proposes a mobile application, offered by EMT Madrid (therefore, offered by the public sector), where the user can find all the operators and mobility service providers in a single tool. It provides a combined information of public transport with others means of transport. The initiative is part of the measure number 21 of the Air Quality Plan of the City of Madrid, which is about supporting shared mobility and multimodality initiatives. It offers, beyond the benefit to citizens, to the city and to the operators, development options and public-private collaboration opportunities for a new model of urban mobility based on mobility as a service.

The first phase of the application completed in Spring 2018 is an aggregator of mobility services with georeferenced information. The added value in this first phase is to be able to know all the mobility services available for the user. And therefore, helping citizens to start being conscious that using a car may not be needed anymore. Besides public transport information, it includes also the taxi and the public bike sharing system, and also the information from the shared mobility companies that operate in Madrid.

Within this phase EMT incorporated APIs of mobility operators (19 so far: 2 carsharing companies, 6 moto sharing companies, 5 e-scooter sharing companies, Madrid e-bike sharing system-BiciMAD, urban bus, subway, regional trains and light rail) by negotiating and signing previously confidentiality agreements. This integration steered by a public operator has no precedent in Spain nor in Europe.

EMT won the open call process opened by IMOVE consortium and is part of the project since November 2018. The second phase of MaaS Madrid is part of IMOVE and means the gradual incorporation of different features such as calculation and comparison of routes, travel planning, personalization of options or booking, payment of trips and ticketing.

5.2 PREPARATION PHASE

The second phase of the MaaS Madrid solution is currently ongoing and it is scheduled to offer a new version of the app. Within this phase, EMT gradually includes more features that are tested in Madrid LL in the frame of IMOVE, such as the calculation and comparison of routes (multimodal planner), more customized options, incentives program, and the Booking, Payment and Ticketing functionalities. To develop this second phase of “MaaS Madrid”, EMT launched a tender (not subjected to IMOVE project) in October 10th, 2018 published with the title "Development of a mobile application that integrates the different mobility services of the city of Madrid to facilitate its use" (procedure 18/106/3) with the initial deadline for presentation of offers on November 8th and additional extension after November 15th. On November 22nd, the technical proposals were open, and evaluation was carried out. EMT awarded the tender to the company IECISA on April 10th, 2019. The contract was signed on May 27th, 2019, for 4 years.

The multimodal planner is the first step. By selecting the origin and destination of their journeys in the MaaS Madrid App, users can visualize the range of options according to their preferences (the fastest, the cheapest, the least polluting trip, etc.) and complete all the necessary reservation processes, directly or through the provider's app. The multimodal planner testing has been part of IMOVE and has been developed for the fastest and cheapest criteria.

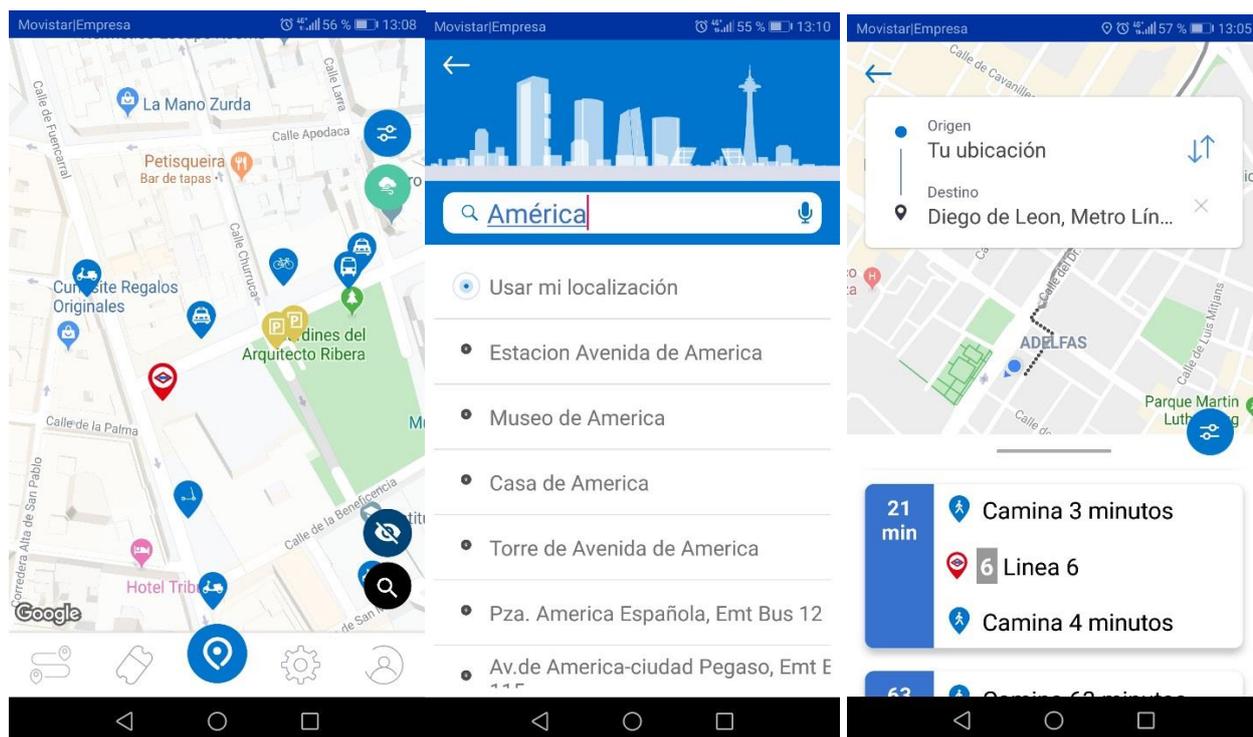


Figure 25. Madrid LL - Journey planner of MaaS Madrid

The complete app provides an easy system in which users can register once and use any of the services they are allowed to, as all people could use public transportation, but you need to fulfill certain requirements to drive a car, for example. The user decides whether to transfer data or not. If accepted by the user, the App can get data always anonymously or by tracking (if registered). Therefore, incentives can apply for users.

The technological solution involves many challenges related to the business model, commercial agreements, selection of criteria, etc. MaaS Madrid has already integrated a platform for managing the identity of the user,

a payment platform (EMTing) that allows postpaid with the best price for the user and the modeling tools to analyze the data.

Regarding the payment module (EMTPay) to be used in IMOVE Madrid Living Lab, it is being developed in three phases:

- 1st phase: payment with contactless card (EMV) + NFC
- 2nd phase: payment by reading a QR code (to be used at the IMOVE roaming pilot)
- 3rd phase: postpaid functionality (“pay as you go”)

The first two phases are completed and have been tested in the frame of IMOVE. The third phase (“pay as you go”) will be deployed once the full functionality of MaaS Madrid is completed.

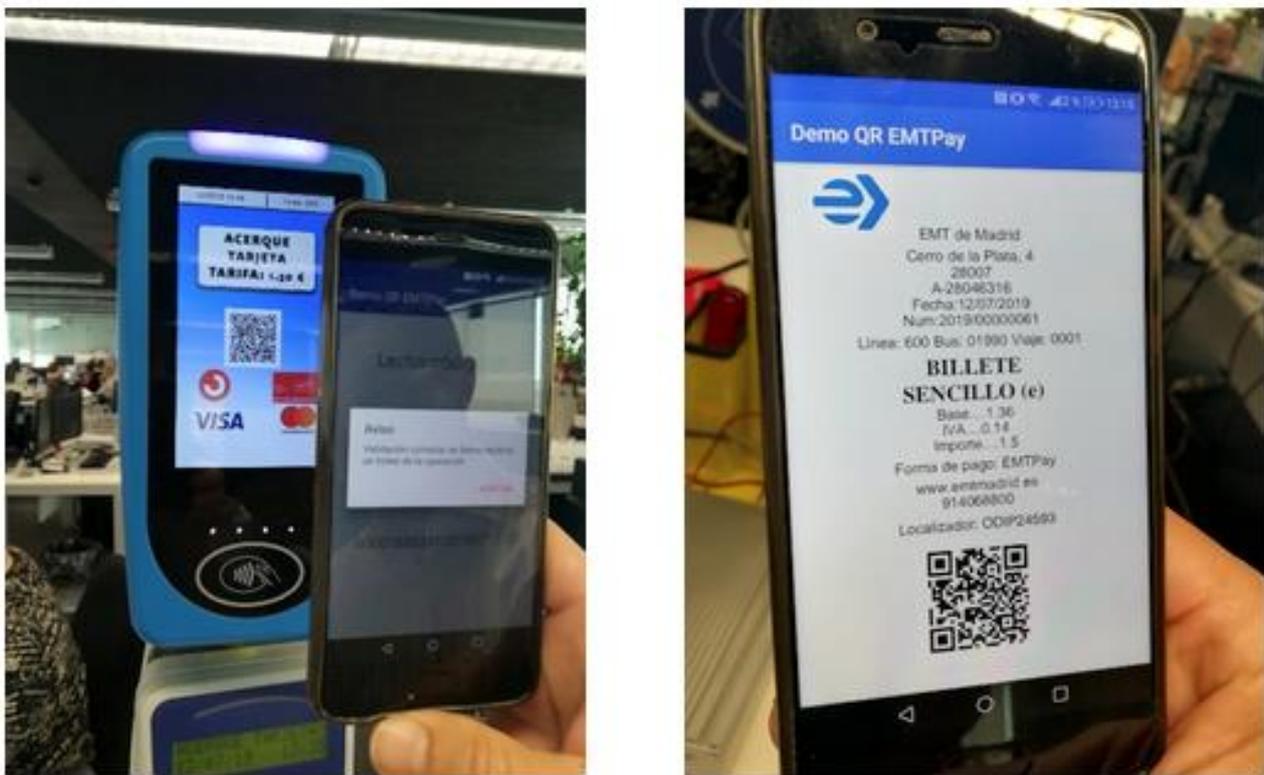


Figure 26. Madrid LL - QR payment functionality at EMT buses

In the context of Madrid LL, EMT has shared a lot of data of the city that has been very valuable in order to analyse users’ patterns and behaviour in the frame of WP3.

LL level of integration

According to the MaaS topology described in the Introduction section, Madrid LL has evolved from level of integration 1 to integration level 2.

Madrid LL

Initial level of integration: 1

Today, MaaS Madrid is a solution aggregating information of several transport providers.

Expected level of integration: 2

Booking, Payment and Ticketing functionalities have been included and tested in MaaS Madrid in the frame of IMOVE.

Barriers and Enablers

During the preparation phase, the following barriers and enablers were identified in order to be ready to run the pilots.

Table 19. Barriers and enablers of Madrid Living Lab

Barriers
The agreement with MaaS Madrid platform provider has been recently signed, the pilot has been ready for execution in the last period of IMOVE.
Delays due to time necessary for each partner to adapt other partners requirements.
Lack of standardization in transport services APIs.
Enablers
Great diversity of transport modes are included in MaaS Madrid solution, both from public and private sectors. Previous phase aggregating APIs: analysis of external APIs and building of an operative database with most of them as a starting point to identify adaptation needs.
There is a core group of local stakeholders (city council, transport services) supporting the project. EMT Madrid, coordinator of the transport offer in Madrid, leads the Living Lab, making very easy to have the PT in the pilot and attracting other transport providers to it.
Development of interoperability among platforms from a European project draws a model that pushes a lot of partners to work in the same direction.
A lot of data has been made available for analysis before trial execution, allowing to identify common patterns in order to enhance the offer to the users.

Issues assessment

In deliverable D4.5, the mid-term high-level progress report some specific issues were pointed out in order to be addressed during the last period of IMOVE. In Madrid LL:

Table 20. Assessment of the issues identified in D4.5 for the Madrid Living Lab

Issue identified in D4.5	Assessment
Some delays in the development of the platform (comparison of routes and travel planning) are being experienced, being the new target date to start the pilot execution September 2019. Close monitoring of these activities has to be performed in order to avoid additional delays.	The pilot start experienced some delays from the plan provided in D4.5. Unfortunately, there were unforeseen difficulties in the development of the preproduction version, which was initially estimated to be delivered by end of September, and the subsequent delay in the final production version.
User recruitment has to be completed in order to ensure that a significant number of users takes part in the pilot.	There were last minute issues regarding the General Data Protection Regulation (GDPR) and the compliance with the requirements established at the Deliverable D8.1 POPD - Requirement No. 1. Therefore, EMT has been forced to launch the piloting phase using internal resources (20 users) during a reduced period at the beginning of November 2019.

5.3 EXECUTION & EVALUATION PHASE

5.3.1 USERS

The testing has been organized in four steps:

1. Pre-trial survey, getting feedback from 20 employees.
2. Testing of the App, getting records from **20 users** (17 Android users and 3 iOS users).
3. Post-trial survey, getting feedback from 10 users.
4. Additionally, a sample of 10 users has been selected to have an interview.

5.3.2 RESULTS

The Madrid LL testing period has been a 5-day pilot executed by EMT employees. Some results from this 5-day pilot execution are displayed in the below figures:

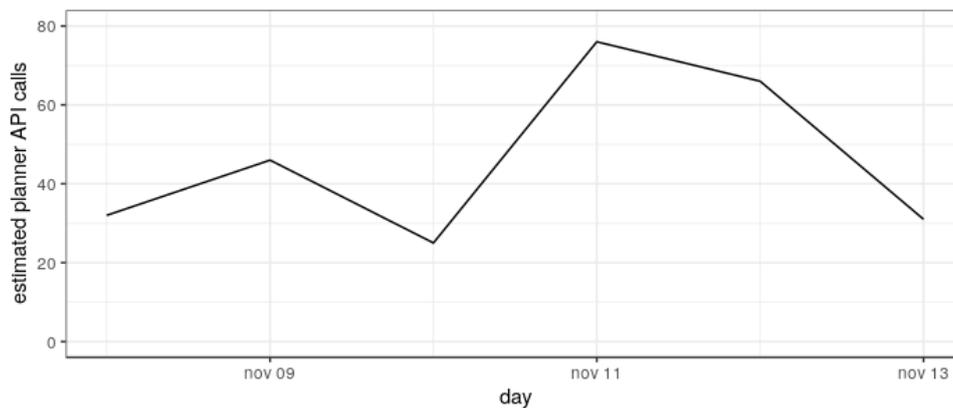


Figure 27. Madrid LL – Calls to the journey planner API

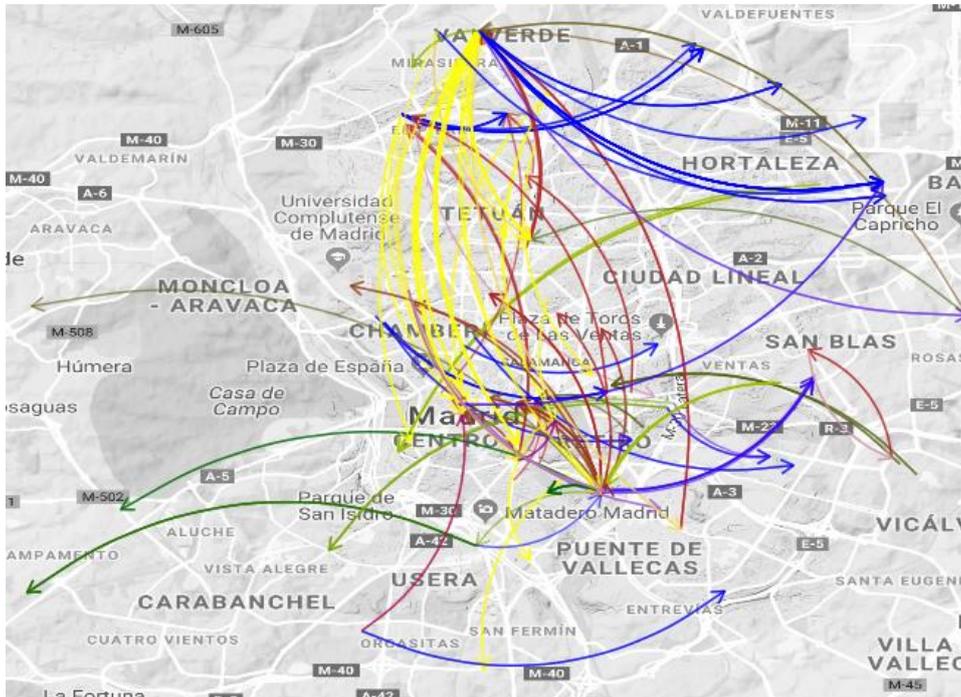


Figure 28. Madrid LL – Routes consulted in the pilot

The post-trial questionnaire, which have been also confirmed by the results of the more in detail interviews to 10 users, reflect that in general, the users perceive MaaS Madrid application intuitive, but some icons can be improved in order to provide more clarity about their meaning. The detailed information about the transport modes (e.g. next bus waiting times, ride-sharing provider specific info, etc.) can be improved as it has not been positively evaluated by all the testers. The testers generally understand the benefits of using MaaS Madrid application, where searching for the nearest transport modes and the possibility to plan a multi-modal trip have been appreciated mostly. All the testers are willing to use MaaS Madrid once it is opened to general public. All testers have expressed their specific comments in order to improve MaaS Madrid. Apart from some cosmetic issues, a common message is to give more importance to Public Transport when proposing different routes to the user.

5.4 LESSONS LEARNED

A very interesting list of lessons learned have been identified during the piloting phase, that will help in the evolution of the MaaS Madrid solution after the finalization of IMOVE.

Table 21. Overview of the main lessons learned for the different stages of Madrid Living Lab

Main Lessons Learned
Interoperability is needed, but the technical integration is not the principal issue in order to develop MaaS.
An important barrier is the development of proper business models to sustain the app operation. Most of cities and regions are facing the same barriers.
User feedback about market, preferences and user experience of the app is crucial in order to develop the future MaaS solution.

There is still some reluctance of transport service providers to join a MaaS platform.

The barriers found allowed to establish a position about the regulatory or support needs from other administrations and for private partners.

6 ROAMING LIVING LAB

6.1 MOBILITY CONTEXT BEFORE IMOVE

Roaming LL pays attention to cooperation and technical interoperability between different MaaS schemes, a new concept in the MaaS ecosystem. Due to the novelty of the concept (no existing solution available), some key tasks had to be addressed along the project, leveraging on progress made in the other project research areas:

- Technical standards of relevance to enable cross-MaaS roaming through European cities and regions.
- Deal with all the complexities for the services the user may want to access in the different regions using his/her single local MaaS provider, without the need to search for and use a new tool (i.e. an app or on-line service).
- Detect, analyse and deal with non-technical barriers.

6.2 PREPARATION PHASE

The development of Roaming LL has mostly happened in the last period of IMOVE, as a high level of maturity in the local LLs has been necessary in order to progress in the roaming solution.

The roaming scenario involves different MaaS providers, federated in IMOVE:

- the MaaS-operator the traveller is customer of, usually in his home town (from now the Visiting MaaS), providing a mobile app to get access to the services;
- one of the MaaS operators active in the area where the user is travelling to (from now the Visited MaaS), offering a selection of transport modes and mobility options.



Figure 29. IMOVE roaming high level diagram

The Roaming process can be investigated from 2 different perspectives, the business/organizational one, where the organizational relationships between the local MaaS providers have been analysed in order to

pave the way for future business agreements in roaming. The second one is the technical standpoint, where IMOVE identified the components to be part of the process along with the relevant workflows and designed a specific software enabler (Roaming Manager) as a central point used by the MaaS providers in order to implement the roaming.

6.2.1.1 BUSINESS/ORGANIZATIONAL CONSIDERATIONS

In order to understand the business needs and organization considerations that should be taken into account in a MaaS roaming scenario, a questionnaire has been requested to the 3 Living Labs initially interested in Roaming.

With this feedback, some conclusions have been extracted in order to pave the way for a roaming solution in the last stages of the project, with the clear intention to give continuity to the concept after the project finalization.

General topics

Reasons to use roaming as visited city/region:

- Tourists are a very attractive and well-identified market niche, both for leisure and for business.
- Tourist feel lost when they are travelling abroad and need a tool in order to facilitate their mobility.
- PT transport offer is usually difficult to understand for a foreigner.
- Possibility to tap into the audience of users which are not yet users of the platform.

Reasons to use roaming as visiting city/region:

- User loyalty. The users will be able to travel without the need of installing another app.
- Seamless customer experience.
- Analysing user behaviour when travelling outside the core region.

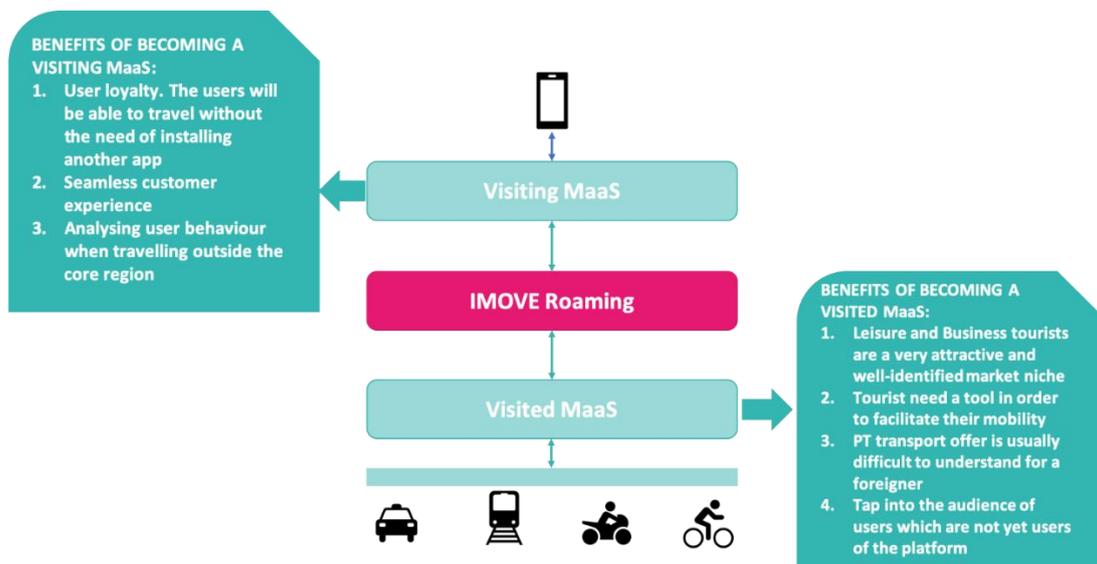


Figure 30. Roaming benefits for MaaS operators

The preconditions as a visiting MaaS for supporting own registered customers in another country are:

- A minimum amount of transport offer with full integration in order to share agreements.
- Establish responsibilities, assuring that service offer.

- Different agreements to be settled: commercial, revenue sharing, data sharing, etc.

The business relationships foreseen are:

- Rules for sharing of users and mutual tracking should be in place (possibly through an “IMOVE federated MaaS operators”).
- Public entity agreements will be based on equality, transparency and quality criteria.
- Agreements for payment settlement.

Roaming contract

Considerations about the roaming contract:

- Being part of the “IMOVE federated MaaS operators” will make MaaS operators roaming contract (when you are a visited MaaS) available to other cities taking part in the same agreement and willing to act as visiting MaaS. The existence of the “IMOVE federated MaaS operators” is perceived positively in order to accelerate the adoption of MaaS roaming.
- It is clearly perceived that a yearly agreement duration with possibility to renew is the preferred option for the interviewed MaaS providers.
- ONE TO ALL contract would be easier in order to take up and would give more options to the users. But probably ONE-TO-ONE contracts deals would be needed in the future.

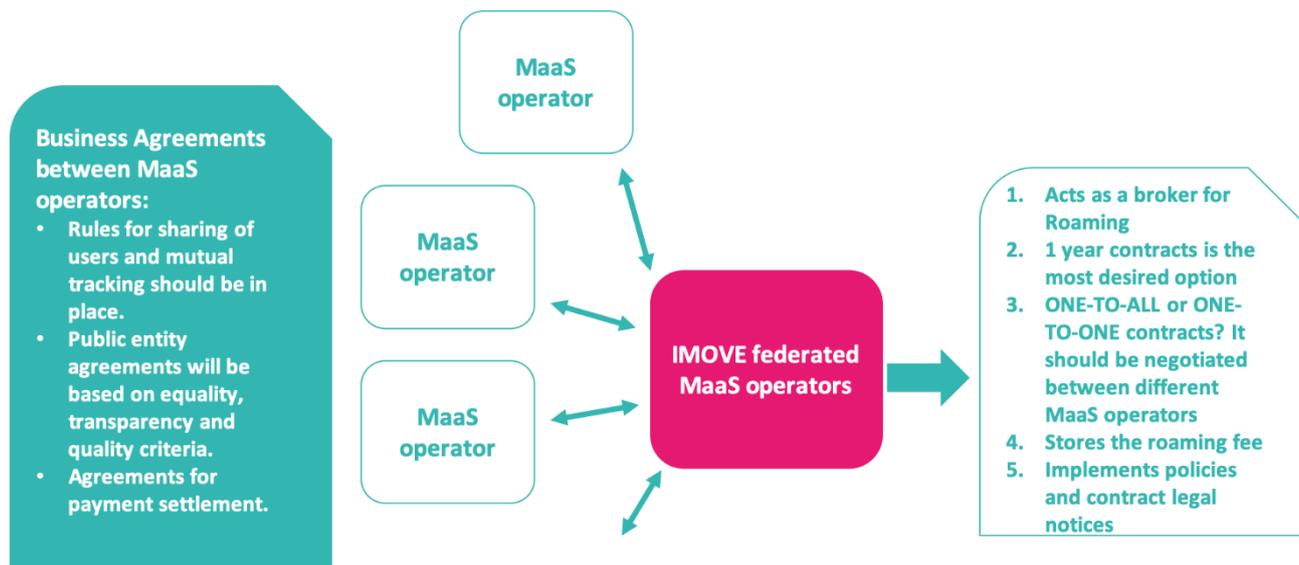


Figure 31. Roaming contract considerations

PAYMENTS / FEES

Considerations about payments and fees:

- In general, it is well perceived that a subscription model with monthly invoicing would be beneficial in the roaming scenario.
- In the current vision, price should not be different for local or foreign users. Visited MaaS should receive 100% of the price.
- No clear vision on which amount the roaming fee should be, and even if there should be one. Ideally the fee should be the same for all the transport services.

- The future scenario is that the user pays to the MaaS operator and then the MaaS operator settles the accounts with individual operators.
- A lot of transport providers need specific registration and it is clearly a barrier not only for roaming, but generally for MaaS penetration. The model should move on to reach a single MaaS registry accepted by all operators and, in case of roaming, being part of the “IMOVE federated MaaS operators” should facilitate this, as any user coming from there should be trusted both by Visited MaaS and by the transport operators participating in the MaaS solution.

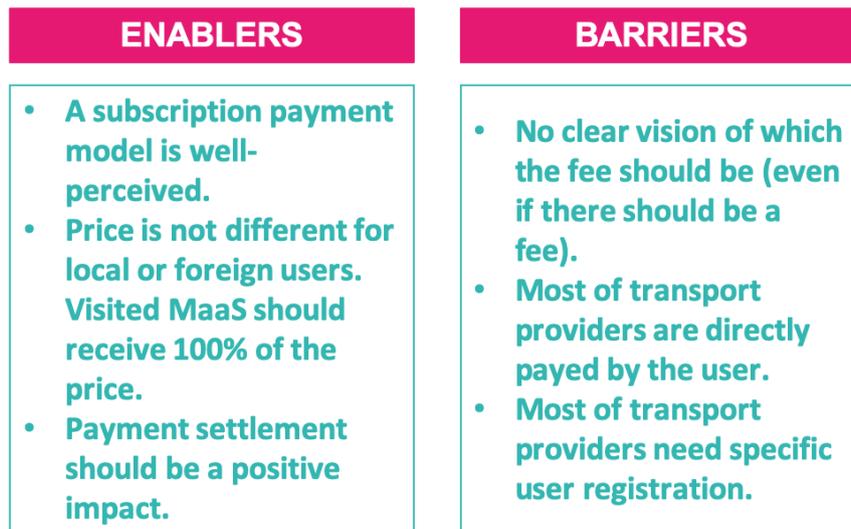


Figure 32. Roaming Enablers and Barriers

6.2.1.2 TECHNICAL CONSIDERATIONS

The roaming workflow starts with the traveller abroad looking for mobility services in the mobile application regularly used to access mobility options supplied by his own MaaS operator in the city he lives. The app backend through IMOVE identifies that there are services, in the specific location, that other operators, federated with IMOVE, have agreed to offer to customers of the visiting MaaS provider. The connection to these transport services is mediated by the IMOVE Roaming Manager Software Enabler.

The below figure summarizes from a general perspective how the Visiting MaaS App and the Visited MaaS App would ideally implement the roaming through Roaming Manager Software Enabler.

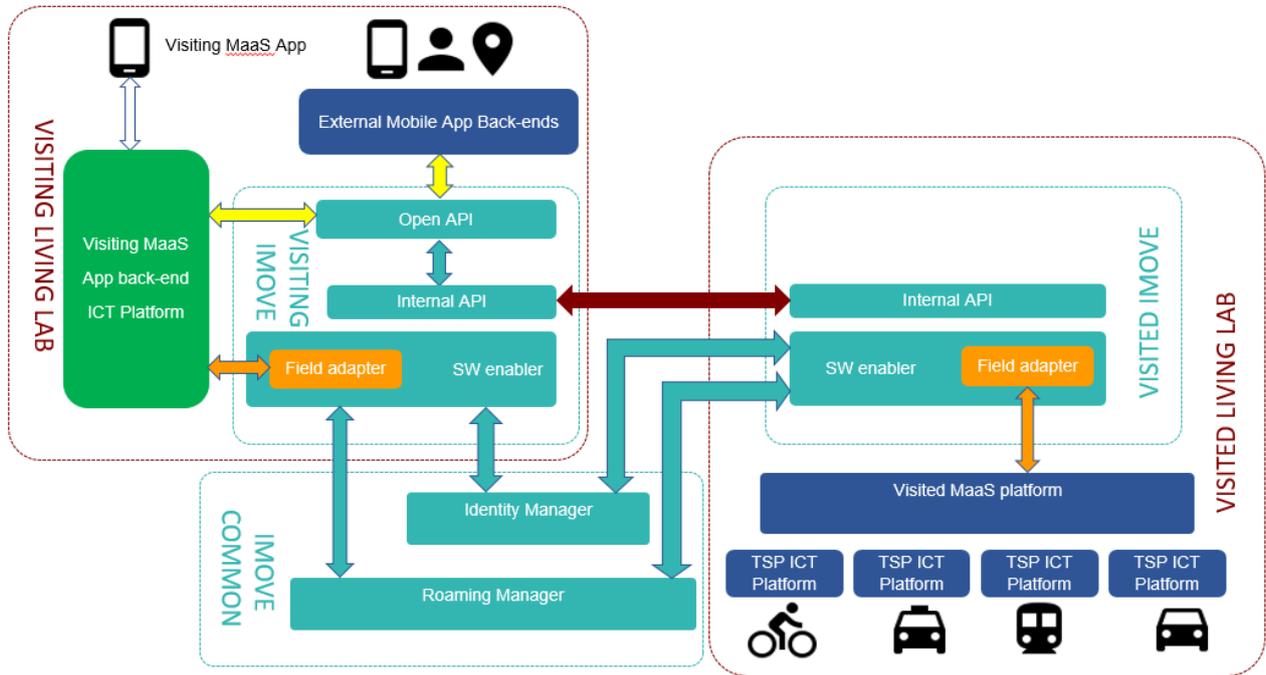


Figure 33. Roaming technical integration

Finally, IMOVE demonstrated the Roaming solution between Berlin and Madrid Living Labs. The detailed integration between Madrid and Berlin is shown below, including the Software Enablers necessary for the roaming success:

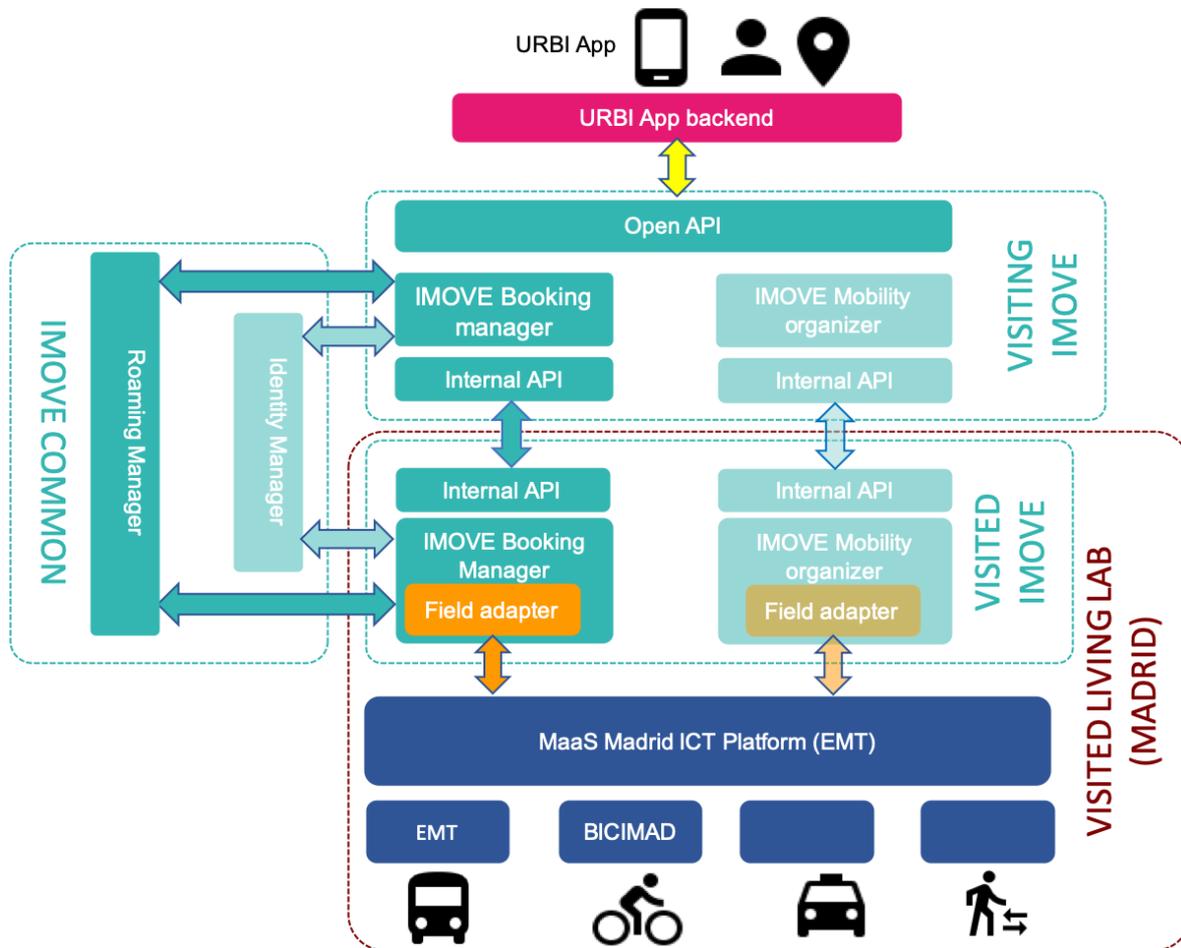


Figure 34. Roaming IMOVE-Berlin-Madrid technical integration

In the end, Urbi solution for Berliners includes the transport services made available for roaming by Madrid. Then, when a “Urbi Berliner” travels to Madrid and opens her/his Urbi app, a notification is provided that roaming is available, and transport modes are offered when the user looks for a journey in Madrid.

Issues assessment

In deliverable D4.5, the mid-term high-level progress report some specific issues were pointed out in order to be addressed during the last period of IMOVE. In the Roaming Living Lab:

Table 22. Assessment of the issues identified in D4.5 for the Roaming Living Lab

Issues identified in D4.5	Assessment
<p>Roaming Living Lab task depends on the progress of the involved pilots. Berlin, Madrid and Manchester are the 3 Living Labs cooperating in roaming activities, but these LLs have not started their execution phase yet. Business and technical tasks in preparation of roaming are proceeding in line with the planning. Synchronization between involved partners and relevant sites is recognized as a key factor for the set-up of a roaming test, a crucial output of IMOVE.</p>	<p>The risk of not having time to implement the pilot due to late start of the collaborating LLs has been timely prevented by anticipating technical and business specific tasks. The proof of concept has been successful and reflects that MaaS roaming is a promising advance from current MaaS propositions.</p>

6.3 EXECUTION PHASE

In order to test the proof of concept and as the Berlin LL is based in a subscription scheme, the users under the subscription are given some credit in order to be spent in Public Transport outside Berlin. Then when the user travels to Madrid, the visited LL, the roaming manager notifies that this area is covered by IMOVE-affiliated services. Then the user of Berlin Urbi app is able to purchase an EMT ticket by scanning the QR code on the bus. Then, the credit of the user is adjusted by charging the amount of the purchased ticket. The below screenshots show how the Berlin Urbi app displays the Madrid transport services when the user travels and how the PT ticket is purchased via QR code reading.

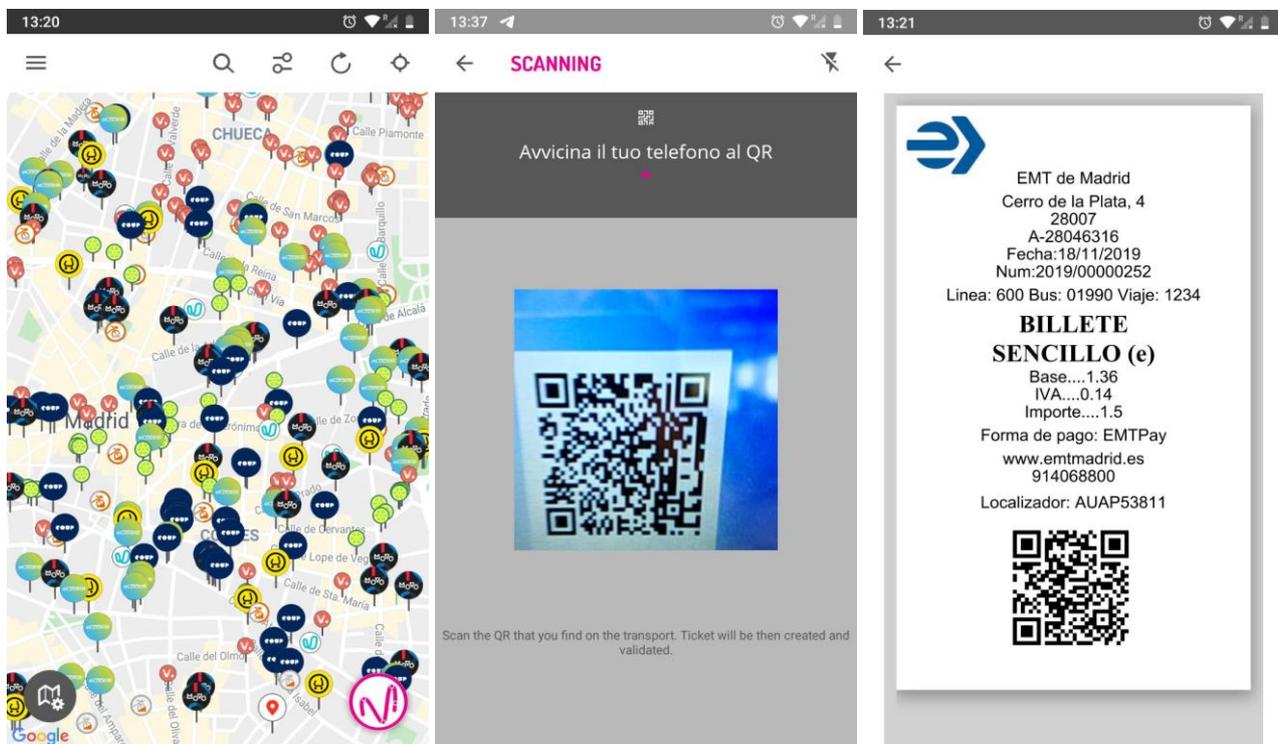


Figure 35. Roaming LL – Berlin Urbi app screens when visiting Madrid

This proof of concept considers what is in-between the business/organizational considerations and the technical part described previously in order to build the IMOVE scenario that is demonstrated. The below table describes the storyboard for the tested solution.

Table 23. Roaming storyboard

Storyboard	User Interface	Workflow	Considerations
Urbi Berliner opens the Urbi app in Madrid	Urbi app opened	Call to roaming manager with the actual location to assess if another MaaS operator is available.	
MaaS Madrid available	Popup explaining roaming availability		
User looks for mobility options in Madrid	Map on app.		Urbi user will see the Madrid services available for Roaming in Madrid.
User asks for a route	Route displayed		Availability to purchase a PT ticket is offered.
User decides to buy a PT ticket	User activates the ticketing and QR scan screen is displayed.		The QR code already contains the price of the single ticket.
User scans the QR	Ticket is delivered to user	Booking manager performs the purchase – Call to Roaming manager to register the transaction.	
User is billed	Subscription quota is updated	Roaming manager calls back the Tariffs manager.	Actual quota limits in principle depends on agreements between operators, in the case of the pilot free tickets are provided.
Settlement between MaaS operators	(no user action, offline).		At given times (e.g. monthly), depending on agreements between the MaaS couples, MaaS operators settle amounts for registered transactions. Madrid gets the 100% of the price of the ticket.

The IMOVE Roaming Manager is the central point that takes the user location and based on the stored roaming contracts along with the MaaS boundary info, it provides the available MaaS solution nearby the location of the user. Then, when a Berliner using the Urbi app when located in Madrid, the Roaming Manager will reply to the Urbi app backend that some services available in the Spanish capital for Roaming can be offered to the user.

The Roaming Manager holds the Roaming Contracts. Roaming Contracts reflect the type and level of service agreed between the different MaaS operators. The contract describes which services are available for the roaming operators couple, which service level can be exchanged between the MaaS operators.

In the context of IMOVE, there is an informal agreement between Berlin and Madrid. It allows selling the transport tickets for free, as this is a proof of concept and at present time not a long-lasting a commercial agreement,

A subscription which accounts for public transport quota expressed in tickets count but with a euro-equivalent, so that different booking managers can "claim their prices" and roaming/user tariff managers will know how to charge the subscription accordingly. For example, Berlin subscription with 5 tickets (2.80 x 5 = 14 euro). Assuming Madrid ticket price is 1.50 euro, that should allow to purchase 9 tickets.

6.4 LESSONS LEARNED

The lessons learned extracted of the Roaming LL should serve to go ahead with this initiative after the finalisation of IMOVE project. The fundamental pillars have been put in place in order to continue working on this concept.

Table 24. Overview of the main lessons learned for the different stages of Roaming Living Lab

Main Lessons Learned
MaaS is still not consolidated in the cities participating in the Roaming pilot, some time will be needed in order to consolidate the MaaS offer and then to progress on Roaming
The proof of concept that has been executed in the frame of the project has been successful and reflects that MaaS roaming is a promising advance from current MaaS propositions
Cities are interested in Roaming. They are willing to explore on this after the finalization of the project.
The business and organizational issues have been brainstormed, an organism facilitating the roaming process ("IMOVE federated MaaS operators") will help in promoting the roaming after the finalization of IMOVE.

SYNERGIES & FINAL CONCLUSIONS

The present document illustrates the final conclusions extracted from the preparation and execution of the 6 different Living Labs that have been part of IMOVE. The value of testing a MaaS scheme in 5 different cities/regions having all of them their particularities from societal, technological and political perspectives allows to detect synergies and extract common conclusions about how to proceed in order to promote the MaaS ecosystem.

Living Labs have experimented with different approaches. From the **users segmentation** perspective, Turin, Manchester and Gothenburg have executed pilots targeting specific customer segments (employers in case of Turin, people involved in the airport ecosystem in Manchester, private car users / motorists living in the outskirts and households in Gothenburg) while Berlin and Madrid are delivering the pilot with a more general proposition open to a wider range of customer segments. It is perceived that the society has not enough knowledge and awareness of MaaS, that is why a useful pathway to introduce MaaS solutions is targeting specific customer segments, while targeting the general public is far more challenging at the current maturity of the MaaS market.

It is clearly perceived that cities and regions need small scale experiments and to build on some **previous experience** on MaaS prior to achieve success in larger scale deployments. In this case, Gothenburg has run several MaaS initiatives previous to IMOVE project. This is the reason for having a significant higher number of users participating in the pilots in Gothenburg Living Lab than in the other pilots. Also, Turin has been working on the MaaS concept before IMOVE and is willing to proceed in the support and development of innovative and sustainable mobility initiatives beyond project end, as well. IMOVE pilots executed in the different cities resulted in notable steps towards MaaS uptake and acceptance, being them forerunners and valuable sources of insights and real-world experience for subsequent initiatives.

When developing the MaaS platform and integrating also the platforms with IMOVE Software Enablers there are several **technical challenges** to be addressed in order to reach success. Each transport provider currently has to leverage on its own IT system, possibly exposing its specific API and so integration of different operators requires a certain degree of effort. Furthermore, the customer registration process dictates further integration challenges, since each transport operator had its unique set of information variables required for their own sign up process and the merging of them is not so straightforward in a MaaS service. Berlin LL has also experienced challenges integrating the unique ticketing and payment standards of different transportation service providers into a single subscription, but although these integrations sometimes require time and effort, it is not perceived that technological issues are a barrier for the MaaS success, since often the business agreements, commercial proposition and marketing aspects proved to be more complex and demanding. Additionally, the promotion of open data has already enabled MaaS and further extension to open and standardized access will correspondingly drive MaaS forward, enabling easier third-party ticket resales. In Turin, collaboration with Turin's public transport operator, which was initially uncertain, has been resolved by political pressure from high-level municipal authorities, illustrating a remarkable advantage in developing MaaS as part of existing institutional channels. IMOVE pilot has been the first time the public transport company has sold tickets outside their own vendor network.

MaaS solutions include different transport modes. After piloting in IMOVE, it can be stated that having **Public Transport included in a MaaS proposition** is a significant factor in order to increase the chances of success. As example, we can take Berlin LL, where PT was expected to be part of the solution, but despite the technical integration was completed, the green light from the relevant company (external to the IMOVE consortium) to allow ticketing reselling finally never arrived due to changes in their commercial strategy and the development of a commercial initiative on their own.. This issue delayed the start of the pilot and influenced the number of users interested in testing it. This is even more important when the pilot is not customer-segmented. MaaS without public transport can have better odds to succeed if it is designed as a

very specific solution for a very specific segment of customers. Without the cooperation with public transport authorities and operators, the conclusion is that small independent MaaS initiatives are unlikely to diffuse beyond a niche following.

Insisting on the availability of Public Transport in the MaaS solutions, Turin has allowed the purchase of single and daily tickets in the MaaS experience. It is important to remark that the inclusion of the **full set of Public Transport tickets** in the MaaS solution will raise up the possibility of success, as users would not find interesting a partial offer but are instead looking for more comprehensive and eventually customized “packages”, without implying a more constraining commitment than the current one requested to access to the public transport. Eventually a subscription should be an option and not a mandatory request, and the advantages should be as clear as the constraints. The packages or bundles do not need to be closed but could also be determined from the actual use as in the case of the capping offered by TfL Oyster card and payment by Credit Card.

Regional legislation and control from public authorities is quite important for MaaS success. For example, Madrid and Gothenburg are efficient in driving MaaS forward, a no emission zone in Madrid and incentives to procure MaaS in new apartment housing in Gothenburg, are leading reasons for the possibility of driving successful MaaS pilots in these cities. In Manchester, where the lack of formal barriers on public transport could be perceived as a benefit for the introduction of MaaS, advances in regulation in order to require a certain digital maturity and accessibility of the transport providers would help to encourage MaaS initiatives uptake. MaaS offers a potential alternative to re-regulation of the transport system, to the extent it can be transformed from a fragmented disarray into a coherent, well-functioning system.

There is a general lack of knowledge in smart mobility, fears of the consequences of MaaS to the traditional business models, and a certain degree of need for ownership. Through productive discussions, reiteration of the **business model** and adaptation Gothenburg, Turin, Madrid, Berlin and Manchester all have been able to further improve the acceptance from the existing mobility ecosystem. Transport providers perceive that they can reach new customer segments and can help on a shift to more sustainable travel patterns. In Greater Manchester region, TfGM has framed MaaS as an opportunity for existing service providers to gain access to new customers and increase their business.

At the actual maturity level of MaaS solutions, it is interesting to include **gamification** and provide **incentives** to users in order to engage them in being part of the MaaS ecosystem. With gamification techniques and incentives, IMOVE Living Labs have been able to increase the number of users that have been part of the pilots.

After the recapitulation of synergies between all the Living Labs, conclusions and lessons learned, it is important to understand what will happen in the near future.

How will the cities/regions involved in IMOVE will continue their MaaS experience after the finalization of IMOVE?

The future of MaaS in **Turin** and in **Piedmont Region** will start through two new projects:

1. Turin municipality: The project will start at the beginning of 2020 and it is centered around “buoni mobilità” (mobility vouchers).

The leader of the project is the Municipality of Turin and 5T (IMOVE partners) is the coordinator. The aim of the project is to select around 100 users and to offer them such coupons to be used every day through a specific digital MaaS platform. The only condition required is the demolition of the own car.

2. Piedmont Region: the project called “BIPforMaaS” started in July 2019 and will end in 2022.

The leader’s project is the Piedmont Region and 5T (IMOVE partner) is the coordinator and the manager. The main purpose of the project is to create conditions enabling a new MaaS platform through activities of

governance, benchmarking and business model analysis, stakeholder engagement (+ working tables), testing of customized MaaS IT infrastructures.

In detail the aims are:

- to allow the improvement of the quality of BIP (“Biglietto integrato Piemonte”, the unified ticketing system at regional level) services for customers, simplifying and innovating the methods of access to the services of Regional PT with the use of the smartphone;
- to evolve the BIP system on mobile through smartphone apps for all regional PT services;
- to create and consolidate a new integrated PT tariff system, based on pay-per-use and best-fare logic.

The infrastructure will natively integrate all the regional PT services (BIP system) and it will be interoperable with the largest number of additional transport services in order to improve the adoption and usage at the regional level.

In **Greater Manchester**, the pilot has been a valuable first experience about MaaS in an area with a very fragmented transport offer. It allowed to extract very valuable conclusions in order to continue with MaaS initiatives:

- Building on the learnings and results from IMOVE, TfGM will continue to develop and test the MaaS offering for Greater Manchester.
- TfGM have bid for funding from Department for Transport (DfT) for Future Mobility Zones and if successful the main focus of the delivery would be implementing and trialing MaaS for Greater Manchester.
- IMOVE has provided the framework to engage with multiple stakeholders in the GM mobility ecosystem and the results and findings from the pilot would help to support those discussions.
- The Software Enablers from IMOVE helped feed into the technical development of GM MaaS solution.
- The business model work in IMOVE has helped TfGM understand the commercial MaaS ecosystem and the roles of different stakeholders involved. The learnings from it would help develop the commercial case for MaaS in GM.

In **Berlin** it has been noticed that the presence of PT is crucial for the success of a MaaS opened to all citizens. Urbi MaaS app in Berlin is a consolidated solution, the results of IMOVE pilot bring some lessons learned in better understanding of the customer demand in terms of transport modes, getting feedbacks about the digital strategies adopted for user engagement, and the appeal of different commercial and marketing propositions.

In **Gothenburg** pilots have been successful, as the management of Västtrafik has decided to continue the MaaS experiences by a two-way model in order to stimulate the MaaS market with the goal to increase sustainable travel in the region of Västra Götaland:

- The first type is the “Digital Reseller” model, to allow further sales channels with preset criteria, a defined range and specific pricing schemes. The conditions are the same for all the interested third parties and all those who meet the criteria have the right to become a digital reseller and a reseller agreement is drawn up.
- The second model is based on “Mobility Partners”, providing mobility services to be contracted by Västtrafik through regular concession contract procurements. The purpose is to stimulate the development of MaaS that lead to increased sustainable travel.

In **Madrid**, EMT will continue in the evolution of MaaS Madrid with the aim to open it to all Madrid citizens, including as much as transport modes as possible and completing the pay as you go functionality for multimodal trips.

Roaming is still a very innovative concept where and during IMOVE the first steps have been taken to assess the interest in and the viability of such a scenario and the organizational, operational and technical challenges to be considered and progressively addressed to move it to a prototypal stage. The definition of “IMOVE federated operators” as the cooperating counterparts in the roaming process and the distinction between the roles of visiting (for digital access to mobility options when abroad) and visited (for actual transportation services supply) proved to be valuable tools to help interested parties, Living Labs in the project and MaaS operators on the market, in understanding the potential of this solution, and how its further evolution can benefit their business.

As a final consideration about the envisioned future for MaaS initiatives throughout Europe, a scenario where public authorities (at different levels) support and regulate the implantation of MaaS is highly important for successful and consolidated implementations, in the frame of properly designed legal mandates. Another approach, conceivable as a short-term alternative, may consist in a bottom-up evolution, where regional or local operators support existing and propose new MaaS initiatives starting from smaller scale experimentations involving multiple agreements with transportation service providers.

REFERENCES

- [1] Freixanet, Josep. “D4.1 Handbook for LL coordination and Business Cases implementation”, *IMOVE project deliverable*, released 28/09/2017.
- [2] Freixanet, Josep, “D4.2 IMOVE Living Labs scoping document”, *IMOVE project deliverable*, released 14/12/2017.
- [3] Freixanet, Josep, “D4.3 IMOVE Living Labs expansion document”, *IMOVE project deliverable*, released 28/12/2018.
- [4] Freixanet, Josep, “D4.4 IMOVE-D4.4-IMOVE Living Labs high-level progress report (initial)”, *IMOVE project deliverable*, released 31/10/2018.
- [5] Freixanet, Josep, “D4.5 IMOVE-D4.4-IMOVE Living Labs high-level progress report (mid-term)”, *IMOVE project deliverable*, released 25/07/2019.
- [6] Estivo, Giuseppe, “D4.7 IMOVE Living Labs progress report – 1st iteration”, *IMOVE project deliverable*, released 31/10/2018.
- [7] Bakshi, Nitish, “D4.8 IMOVE Living Labs progress report – 2nd iteration”, *IMOVE project deliverable*, released 23/7/2019.
- [8] Alesso, Corrado, “D4.9 IMOVE Living Labs progress report – 3rd iteration”, *IMOVE project deliverable*, released 17/12/2019.
- [9] Sarasini, Steven, “D1.4 Regulatory frameworks for sustainable business model innovation and sustainable travel behaviour”, *IMOVE project deliverable*, released 30/11/2019