



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

## **Deliverable D5.3**

# **IMOVE Second Evaluation Report, intermediate impact assessment**



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## Executive Summary

The purpose of this deliverable is to provide the intermediate evaluation results of IMOVE Living Labs by applying the impact and process assessment already defined in the early stages of the project and to update the evaluation framework according to the current progress. The document was initially foreseen to be released at month 23 but considering that two of the LLs, Gothenburg and Turin, started their full activities in the course of April 2019, the completion of the document has been shifted by one month for reporting initial outcomes.

The deliverable follows the methodology defined in the evaluation plan (D5.1) and updates the initial findings reported in D5.2. Results were collected with questionnaires or direct interviews to Living Lab partners and stakeholders.

After an introductory section, summarising the main outcomes reported in the deliverable, section 1 provides an update of the evaluation plans, revised according to the variations intervened during the course of implementation phases.

Section 2 provides the evaluation plan of Madrid, as new LL entered in the project after the Open Call process. Section 3 provides the evaluation plan for the roaming LL, defined after the completion of the design process for this specific case. These plans follow the same structure presented in D5.1 and complete the evaluation framework for all LLs.

In section 4 the intermediate impact evaluation is presented, where all KPIs are analysed, according to the progress of the pilot activities, and initial results presented.

In section 5 the process evaluation has been updated with respect to what was reported in D5.2, for both software developers and implementers: criticalities and risks were collected and analysed and necessary mitigation actions identified.

The conclusion section provides a summary of findings of recent WP5 activities and the actions to be undertaken in the next period.

## Abbreviations and Acronyms

<b>AB</b>	Advisory Board
<b>CA</b>	Consortium Agreement
<b>DDP</b>	Deliverable Development Plan
<b>DoA</b>	Description of Action
<b>EB</b>	Executive Board
<b>EC</b>	European Commission
<b>Eoi</b>	Expression of Interest
<b>ERB</b>	Ethics Review Board
<b>GA</b>	Grant Agreement
<b>IPR</b>	Intellectual Property Rights
<b>LL</b>	Living Lab
<b>LTZ</b>	Limited Traffic Zone
<b>MaaS</b>	Mobility as a Service
<b>OSS</b>	Open Source Software
<b>PC</b>	Project Coordinator
<b>P/M</b>	Person/Month
<b>PO</b>	Project Officer
<b>PT</b>	Public Transport
<b>WP</b>	Work Package

## Table of Contents

2.1	KPIs chosen for Madrid .....	11
2.2	Recommendations for data collection and validation.....	17
3.1	KPIs chosen for the Roaming Living Lab .....	19
3.2	Recommendations for data collection and validation.....	22
4.1	Update of Turin LL KPIs .....	24
4.2	Update of Greater Manchester LL KPIs .....	30
4.3	Update of Berlin LL KPIs.....	35
4.4	Update of Gothenburg LL KPIs .....	39
5.1	Process evaluation for developers .....	48
5.2	Process evaluation for implementers.....	51
5.2.1	Involvement of Living Lab stakeholders.....	51
5.2.2	Refinements or upgrade of business models .....	52
5.2.3	Political support.....	52
5.2.4	Major issues detected .....	52

## List of Tables

Table 1. Selected KPIs for Madrid Living Lab .....	11
Table 2. additional KPIs in Madrid LL recording relevant progress not directly related to IMOVE targets. ....	15
Table 3. Selected KPIs for Roaming Living Lab .....	19
Table 4. Update of the Turin KPIs .....	24
Table 5. Update of the Greater Manchester KPIs .....	31
Table 6. Update of the Berlin KPIs .....	36
Table 7. Update of the Gothenburg KPIs .....	40

## INTRODUCTION

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This deliverable reports about the ongoing evaluation process of IMOVE MaaS Living Labs.

During the last period (months 16-24), intense technical and operational activities have been carried out and the deployment of MaaS schemes has been revealed to be more complex than expected with related delays.

At the time of writing, two of the five LLs (Gothenburg and Turin) are operational, the remaining three LLs will start soon according to the maturity of technical setups.

A number of obstacles have been detected and this deliverable analyses them from quantitative (Impact evaluation) and qualitative (Process evaluation) points of view, proposing a specific action plan that will be implemented in the near future in order to overcome difficulties and ensure the successful achievement of expected impacts.

At the same time, relevant drivers have been identified and the mission of WP5 in the next period will also be to understand how these positive outcomes can be extended to other LLs and standardised for future replication initiatives.

# 1 UPDATE OF THE EVALUATION PLANS IN THE LIVING LABS

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The evaluation framework setup in the IMOVE project and reported in D5.1 is based on the following pillars:

- a) a **common evaluation methodology** based on relevant, complete, available, measurable and reliable KPIs to measure and assess socio-economic and mobility impacts of the MaaS offer;
- b) **direct measurements** provided by the Living Labs.

This common methodology has been the stable framework applied to Madrid, which joined the project at a later stage, and the Roaming LL, which is progressing according to technical developments.

Objective and subjective data have been and still are collected by the LLs under the guidance of WP5 and analysed in order to tune actions and refine the overall evaluation.

In some cases evaluation plans needed an update of the KPIs because of unavailability or non-relevance of initially defined indicators. These changes have been reported and highlighted in section 4.

This intermediate evaluation step also provides a deeper insight about drivers and barriers that are reported in related sections 4 and 5 and summarised in the conclusions; related actions will be put in place in order to ensure that expected impacts will be achieved as planned.

## **2 EVALUATION PLAN IN THE MADRID LIVING LAB**

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The Madrid Living Lab will be based on the usage of the EMT MaaS platform, combining a number of mobility services (public transport, taxi, carsharing, scootersharing) offered in a unique channel (a mobile app) for trip planning, booking and payment.

EMT, the public transport company, is the backbone of this initiative and is negotiating services with other private transport providers.

The MaaS offer should be launched in autumn 2019 and will use some of the IMOVE SW enablers as well as scalability unlockers facilitating the involvement of private actors and the deployment of some governance actions aimed at integrating policies of the Municipality in a harmonised public-private framework.

Due to the recent addition of Madrid Living Lab in the IMOVE project, this deliverable reports about the initial evaluation stages that for the other LLs were presented in D5.1.

The Madrid Living Lab was trained about the evaluation framework implemented in the IMOVE project and a set of KPIs was selected for capturing the progress that the project aims to bring in the city. The following subsection reports the selected KPIs grouped per IMOVE target (table 1) and recording additional relevant progress not directly related to IMOVE targets (table 2).

## 2.1 KPIs CHOSEN FOR MADRID

Table 1. Selected KPIs for Madrid Living Lab

Project Target	ID	Indicator name	Indicator definition	Measurement unit	Method of measurement	Target Group	Evaluation areas
<b>Target 1: At least three popular journey planners connected with existing MaaS platforms pertaining to the five Living Labs through the SW enablers</b>	51	Interoperability between MaaS and Journey Planners	Number of Journey Planners provided by or connected to the MaaS operator platform	Numeric	Data retrieved by the Living Lab actors	Private and public transport operators  ICT/ITS providers	Transport
<b>Target 4: +8% of intermodal trips generated by journey planners connected to IMOVE</b>	3	Multimodal trips	Number of trips combining different modes of transport resulting from Journey Planner responses out of total trips generated	%	Data recorded from Software platform	End-users	Transport  Environmental
<b>Target 5: +25% use of integrated ticketing for mobility services in areas covered by the LLs, of which +5% relates to tickets involving more than one mode of transport</b>	54	Integrated ticketing	Number of tickets for any urban trip (PT, taxi, car sharing, etc.) sold via the integrated ticketing channel out of the total	%	Derived by measurements	Private and public transport operators  ICT/ITS providers	Economic
<b>Target 6: Halving of total time spent to purchase intermodal travel services online by users travelling by services in the LL areas</b>	56	Purchasing user experience	Time required for buying an online ticket	Time	Derived by measurements	End-users  Private and public transport operators  ICT/ITS providers	Social

<b>Target 8: One brand awareness campaign per each of the five Living Labs, focused on a clear identification of the new mobility model empowered by the IMOVE SW enablers</b>	58	MaaS awareness	Number of dissemination actions aimed at improving the awareness of the MaaS offer	Numeric	Data retrieved by the Living Lab actors	Local Authorities	Social
<b>Target 9: a) Increase of collective transport use and car/van sharing by 10%; b) Increase of collective transport use by students and elderly people by 20%; c) Decrease of private car ownership by 5%</b>	9	Shared Mobility penetration	Number of journey segments using shared vehicle services (Car sharing, carpooling, taxi sharing) per user as % of total journey segments	%	Data recorded from Software platform	End-users Private and public transport operators	Transport Environmental
	10	Usage of collective transport services by elderly people (ONLY BUS)	Number of elderly people using collective transport services per time unit	Numeric, %	Survey	End-users Local Authorities	Transport Social
	11	Usage of collective transport services by students (ONLY BUS)	Number of students using collective transport services per time unit	Numeric, %	Survey	End-users Local Authorities	Transport Social

<b>Target 11: at least 10 MaaS involved actors per LL (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) as objective of SUMP and other mobility strategy local agendas</b>	61	Number of MaaS involved subjects	Number of legal entities (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) involved in planning, operating, monitoring, and supporting the MaaS scheme	Numeric	Data retrieved by the Living Lab actors	Local Authorities  Private and public transport operators  ICT/ITS providers	Transport Economic
<b>Target 14: at least one local agreement among all transport operators, aiming at reaching environmental targets, according to local policies</b>	62	Agreement among local operators	Commercial or technical agreements regulating MaaS operations among local subjects	Numeric	Data retrieved by the Living Lab actors	Private and public transport operators  ICT/ITS providers	Social Transport
<b>Target 16: Halving the payback period of investment for ICT booking/ticketing services and devices in LL areas</b>	70	Governance model	Impact to public-private regulations governing urban transport services	Qualitative index	Data retrieved by the Living Lab actors	Local Authorities  Private and public transport operators  ICT/ITS providers	Transport
<b>Impact on competitiveness, attractiveness and quality of transport services</b>	21	Quality of service	Perception of quality of service	Qualitative index	Survey	End-users  Private and public transport operators	Transport Social

<p><b>Promoting modal shift, transport efficiency and reduction of externalities generated by traffic</b></p>	1	Transport Modal shift	% of trips made by each transport mode	%	Survey	End-users	Transport Environmental
	5	Daily average distance	Overall distance travelled per day per user	Km	Survey/Data recorded from Software platform	End-users	Transport Environmental
	4	Total journey time	Average duration of journey from origin to destination	Time	Survey/Data recorded from Software platform	End-users	Transport Environmental
	14	Travel Costs	Total travel cost per individual/household	Euros	Data recorded from Software platform	End-users	Economic Social

Table 2. additional KPIs in Madrid LL recording relevant progress not directly related to IMOVE targets.

Indicator name	ID	Indicator definition	Measurement unit	Method of measurement	Target Group	Evaluation areas
<b>Public Transport journey</b>	6	Number of journey segments by public transport per user as % of total journey segments	%	Data recorded from Software platform	End-users	Transport Environmental
<b>Bicycle/Foot journey</b>	7	Number of journey segments by bicycle or on foot per user as % of total journey segments	%	Data recorded from Software platform	End-users	Transport Environmental
<b>Collaboration / partnership in value chain</b>	17	Number of public and private operators (transport service providers) cooperating in the MaaS offering	Numeric	Survey	Private and public transport operators	Economic
<b>Legal and policy issues</b>	35	Potential changes in laws and regulations/policy	qualitative	Survey	Local Authorities	Environmental Economic Social
<b>Increase in PT users</b>	38	Total number of PT users (Only bus and public bike sharing system BiciMAD)	Numeric, %	Derived by measurements	Private and public transport operators  Local Authorities	Transport Social
<b>Increases in PT pass-km</b>	39	Total passenger-km by PT (Only bus and public bike sharing system BiciMAD)	Numeric, %	Derived by measurements	Private and public transport operators  Local Authorities	Transport Social
<b>Behavioural changes</b>	44	Number of persons declaring changing their mobility behaviour	Numeric	Survey	End-users  Local Authorities	Social
<b>Attitudes towards PT, sharing, etc.</b>	45	Number of persons declaring their opinion about the different modes of transport	Qualitative index	Survey	End-users  Local Authorities	Social

**D5.3 - IMOVE Second Evaluation Report, intermediate impact assessment**

**Version 2.2 – 10/04/2020**

<b>Customer segments</b>	46	Type of Customer according to age, sex or other characteristics (men/women, young/old, ...)	Numeric, %	Survey	Private and public transport operators ICT/ITS providers	Social
<b>Multimodal Integrated ticketing</b>	55	Number of tickets involving more than one mode of transport sold via the integrated ticketing channel out of the total	%	Derived by measurements	Private and public transport operators ICT/ITS providers	Economic
<b>New standard or regulations</b>	69	Impact to standards and regulations related to multimodality, integrated ticketing, etc.	Qualitative index	Data retrieved by the Living Lab actors	Private and public transport operators ICT/ITS providers	Transport

## **2.2 RECOMMENDATIONS FOR DATA COLLECTION AND VALIDATION**

The KPIs chosen by the Madrid Living Lab represent a good mix between qualitative indicators (reporting the success of MaaS uptake in the local context and the feedback from end-users) and quantitative indicators (reporting changes in mobility behaviours).

Looking at the methods of measurements of various KPIs:

- 6 KPIs will be retrieved directly by Living Lab actors and will reveal the successful conditions for MaaS uptake at both technical and operational levels
- 5 KPIs will be measured by software platforms and will report the effective usage of the MaaS offer
- 5 KPIs will be derived by measurement campaigns
- 8 KPIs will be derived by surveys administrated to end-users
- 2 KPIs will be calculated by combining surveys and data logs from the software platform

For one specific KPI – #56 ‘Purchasing user experience’ defined as ‘Time required for buying an online ticket’, the measurement procedure (taking into account that the user experience will vary from the ex-ante to the ex-post situation) will be set-up as follows:

- a) As is: to measure time occurring for the electronic purchase (if available) of (different combinations of) a multimodal trip using traditional ticketing channels
- b) To be: to measure time occurring for the electronic purchase of various transport operators of (different combinations of) a multimodal trip using MaaS selling channel

This desktop measurement procedure will be repeated a sufficient number of times in order to have stable values.

One survey will be administrated to the users of the pilot (about 400 individuals) and will be related to perceived quality of service, transport modal shift, total journey time, and daily average distance.

The main actor involved in the data collection procedures will be EMT and other transport operators will support the data collection, also thanks to the interoperability of IT systems.

## **3 EVALUATION PLANS IN THE ROAMING LIVING LAB**

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The roaming Living Lab consists in the form of interoperability among cities and MaaS operators, allowing users to seamlessly travel in a city different from the domestic one without subscribing to additional services and possibly by using the original app.

This Living Lab reveals a particular complexity for both technical and commercial points of view, however in the course of the project, progress was achieved thanks to the interests of Manchester, Berlin and Madrid that should be able to deploy at least a test service and will record the following KPIs even if for a limited set of potential users.

### 3.1 KPIs CHOSEN FOR THE ROAMING LIVING LAB

Table 3. Selected KPIs for Roaming Living Lab

Project Target	ID	Indicator name	Indicator definition	Measurement unit	Method of measurement	Target Group	Evaluation areas
<b>Target 3: +30% of trips generated by the journey planners connected with IMOVE</b>	53	Utilisation of Journey Planners	Number of travel queries submitted to Journey Planners connected to the MaaS operator	Numeric	Data recorded from Software platform	Private and public transport operators  ICT/ITS providers	Transport
<b>Target 5: +25% use of integrated ticketing for mobility services in areas covered by the LLs, of which +5% relates to tickets involving more than one mode of transport</b>	54	Integrated ticketing	Number of tickets for any urban trip (PT, taxi, car sharing, etc.) sold via the integrated ticketing channel out of the total	%	Derived by measurements	Private and public transport operators  ICT/ITS providers	Economic
<b>Target 9: a) Increase of collective transport use and car/van sharing by 10%; b) Increase of collective transport use by students and elderly people by 20%; c) Decrease of private car ownership by 5%</b>	9	Shared Mobility penetration	Number of journey segments using shared vehicle services (Car sharing, carpooling, taxi sharing) per user as % of total journey segments	%	Data recorded from Software platform	End-users  Private and public transport operators	Transport  Environmental

<b>Target 11: at least 10 MaaS involved actors per LL (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) as objective of SUMP and other mobility strategy local agendas</b>	61	Number of MaaS involved subjects	Number of legal entities (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) involved in planning, operating, monitoring, and supporting the MaaS scheme	Numeric	Data retrieved by the Living Lab actors	Local Authorities  Private and public transport operators  ICT/ITS providers	Transport, Economic
<b>Target 12: At least one data sharing process per each involved operator with another LL actor (subscriptions, profiling, common data model)</b>	50	IT interoperability	Number of data exchange processes among operators (transport providers, IT operators, etc.) in the MaaS scheme	Numeric	Data retrieved by the Living Lab actors	Private and public transport operators  ICT/ITS providers	Transport, Economic
<b>Target 14: at least one local agreement among all transport operators, aiming at reaching environmental targets, according to local policies</b>	62	Agreement among local operators	Commercial or technical agreements regulating MaaS operations among local subjects	Numeric	Data retrieved by the Living Lab actors	Private and public transport operators  ICT/ITS providers	Social, Transport
<b>Target 17: 10 novel targeted business models (2 scenarios per LL) for integrated mobility services</b>	66	New Business Models	Number of targeted business models for integrated mobility services	Numeric	Data retrieved by the Living Lab actors	Private and public transport operators  ICT/ITS providers	Economic

<b>Impact on competitiveness, attractiveness and quality of transport services</b>	21	Quality of service	Perception of quality of service	Qualitative index	Survey	End-users  Private and public transport operators	Transport, Social
<b>Promoting modal shift, transport efficiency and reduction of externalities generated by traffic</b>	1	Transport Modal shift	% of trips made by each transport mode	%	Survey	End-users	Transport, Environmental
	5	Daily average distance	Overall distance travelled per day per user	Km	Survey/Data recorded from Software platform	End-users	Transport, Environmental
	4	Total journey time	Average duration of journey from origin to destination	Time	Survey/Data recorded from Software platform	End-users	Transport, Environmental
	14	Travel Costs	Total travel cost per individual/household	Euros	Data recorded from Software platform	End-users	Economic, Social
<b>Other</b>	67	Promotion of roaming Services	Technical and commercial specification for Roaming Services among MaaS schemes	Numeric	Data retrieved by the Living Lab actors	Private and public transport operators  ICT/ITS providers	Transport
<b>Other</b>	68		Number of MaaS operators inter-connected	Numeric	Living Labs connected to roaming solution	Private and public transport operators  ICT/ITS providers	Transport

## **3.2 RECOMMENDATIONS FOR DATA COLLECTION AND VALIDATION**

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The scope of the evaluation exercise in the Roaming Living Lab will not be to collect a solid set of data, due to a presumably limited number of test users. Nevertheless, the analysis of such KPIs, altogether with a dedicated Process evaluation, will support a sound assessment of this very innovative initiative.

There are not specific recommendations for this LL, being a subsidiary service of the city-based LL, therefore alleviating their consideration concerning data collection, validation and evaluation.

## **4 INTERMEDIATE IMPACT EVALUATION**

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At the time of writing the present deliverable, the Living Labs are working towards implementing technical solutions and deploying services for users. Two of them (Gothenburg and Turin) started with pilot execution with end-users but the data collection of the selected KPIs has not completed for a sound number of records and a comprehensive picture will be provided in the next deliverable (D5.4) altogether with final evaluation results.

In the Gothenburg Living Lab an initial evaluation summary based on feedback from a survey administrated to users of pilot 2 is reported and will be updated as soon as more responses will be collected.

The present section reports useful considerations related to a review of initially selected KPIs and some updates in consideration of the advancements and the lessons learnt during recent months.

## 4.1 UPDATE OF TURIN LL KPIS

The city of Turin approached the MaaS experimentation with an ambitious plan, by involving other public authorities (the Piemonte Region), innovation agencies (Torino Wireless), Mobility Managers of private companies (General Motors) and transport operators. Twinning initiatives are in place with other EU projects (Interreg Solez and H2020 SUMP-UP) with an extended team working in parallel on all initiatives.

After setting up technical and operational environments, the Living Lab started with employees of General Motors in April 2019 and will continue in the next months. Employees of the Municipality will soon be involved in taking part in the initiative and profiting from the same MaaS scheme. Data collection is in progress and updates are reported in the following table. More details about actions of the Living Lab are reported in the deliverables of WP4.

**Table 4. Update of the Turin KPIs**

Project Target	Indicator name	Indicator definition	Baseline (as reported in D5.2)	Remarks
<b>Target 1: At least three popular journey planners connected with existing MaaS platforms pertaining to the five Living Labs through the SW enablers</b>	Interoperability between MaaS and Journey Planners	Number of Journey Planners provided by or connected to the MaaS operator platform	0	Due to the fact that the Living Lab will be restricted to closed groups (General Motors and Municipality of Turin employees) the only journey planner will be the one provided by the MaaS mobile app. Nevertheless, in the next period a link with the journey planner from 5T will be considered, in order to strengthen the entry channel. This feature would be in place once the IMOVE app will be opened to all citizens.

<p><b>Target 2: At least five non-travel-planner mobile apps will be connected to each MaaS platform in each Living Lab through the SW enablers</b></p>	<p>Interoperability between MaaS and other apps</p>	<p>Number of generic mobile apps connected to the MaaS operator platform</p>	<p>0</p>	<p>During the course of the project, it has been considered to avoid in-app redirection for a better user experience. Therefore all features from other transport service providers are provided in transparent mode to the user that will only access the MaaS app. The meaning of the indicator does not change and connection is provided in B2B mode. At present 3 services are connected thanks to MaaS app</p>
<p><b>Target 3: +30% of trips generated by the journey planners connected with IMOVE</b></p>	<p>Utilisation of Journey Planners</p>	<p>Number of travel queries submitted to Journey Planners connected to the MaaS operator</p>	<p>No MaaS operator yet. As reference it is possible to consider the Muoversi a Torino multi-modal travel planner (<a href="https://www.muoversiatorino.it">https://www.muoversiatorino.it</a>) provided by 5T that records about 200.000 queries/year</p>	<p>Being that the MaaS app launched with the Living Lab, the baseline will be assumed at the initial period of the trial (first month) and from this, value will be calculated regarding the increase for catching the interest of end-user in journey planning as entry point for using the MaaS</p>
<p><b>Target 4: +8% of intermodal trips generated by journey planners connected to IMOVE</b></p>	<p>Multimodal trips</p>	<p>Number of trips combining different modes of transport resulting from Journey Planner responses out of total trips generated</p>	<p>The data about intermodal trips is not available at the moment; a further investigation will be made for producing this data before the beginning of the MaaS pilot.</p>	<p>Variations calculated within the user groups</p>

<p><b>Target 5: +25% use of integrated ticketing for mobility services in areas covered by the LLs, of which +5% relates to tickets involving more than one mode of transport</b></p>	<p>Integrated ticketing</p>	<p>Number of tickets for any urban trip (PT, taxi, car sharing, etc.) sold via the integrated ticketing channel out of the total</p>	<p>Due to recent changes in tariff model, this data is not available at the moment; a further investigation will be made for producing this date before the beginning of the MaaS pilot.</p>	<p>Variations calculated within the user groups</p>
<p><b>Target 6: Halving of total time spent to purchase intermodal travel services online by users travelling by services in the LL areas</b></p>	<p>Purchasing user experience</p>	<p>Time required for buying an online ticket</p>	<p>Purchasing procedures are still with vending machines or at kiosks but in the next months a mobile app selling integrated ticketing will be provided. Therefore, it can be assumed that the purchasing time will be in the range of few minutes, but this data will be further assessed once the mobile app will be available</p>	<p>A dedicated user group is going to be set up for measuring this indicator</p>
<p><b>Target 8: One brand awareness campaign per each of the five Living Labs, focused on a clear identification of the new mobility model empowered by the IMOVE SW enablers</b></p>	<p>MaaS awareness</p>	<p>Number of dissemination actions aimed at improving the awareness of the MaaS offer</p>	<p>Two main campaigns related to integrated ticketing.</p>	<p>The Turin Living Lab is being disseminated in several events and IMOVE is twinning with two other EU projects: SUMP-UP and Solez. Dedicated campaigns are promoted by the Municipality and the Region</p>

<p><b>Target 11: at least 10 MaaS involved actors per LL (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) as objective of SUMP and other mobility strategy local agendas</b></p>	<p>Number of MaaS involved subjects</p>	<p>Number of legal entities (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) involved in planning, operating, monitoring, and supporting the MaaS scheme</p>	<p>0</p>	<p>Apart from direct LL stakeholders (3 transport service providers, one big company involved in direct pilot), involved LL actors are other public authorities (Piemonte region for future regional MaaS extension), Innovation/research subjects (Torino Wireless, leading the H2020 SUMP-UP project), and other cities (within Interreg Solez project).</p>
<p><b>Target 12: At least one data sharing process per each involved operator with another LL actor (subscriptions, profiling, common data model)</b></p>	<p>IT interoperability</p>	<p>Number of data exchange processes among operators (transport providers, IT operators, etc.) in the MaaS scheme</p>	<p>1 (5T and GTT)</p>	<p>No remarkable issues detected in measuring this indicator: data exchange processes are in place for ticket or service booking, purchase and validation, for unlocking vehicles, opening gates.</p>
<p><b>Target 14: at least one local agreement among all transport operators, aiming at reaching environmental targets, according to local policies</b></p>	<p>Agreement among local operators</p>	<p>Commercial or technical agreements regulating MaaS operations among local subjects</p>	<p>0</p>	<p>The LL leading group is working on this agreement, involving all stakeholders. The political representatives are committed in reaching wide cooperation.</p>

<p><b>Target 15: at least 3 ancillary services per LL, complementing transport provision included in existing MaaS in LL areas (parcel delivery, long distance trip booking, mobility management and/or loyalty programs and other facilities linked to urban travels)</b></p>	<p>Ancillary Services</p>	<p>Number of additional services (parcel delivery, long distance trip booking, mobility management and/or loyalty programs and other facilities linked to urban travels) offered besides the MaaS scheme</p>	<p>0</p>	<p>At present there is no significant progress about this indicator because of the little penetration reached so far in terms of users that slowed the process of twinning with other initiatives. The strategy for increasing cooperation will be revised and related actions deployed in the next period.</p>
<p><b>Target 17: 10 novel targeted business models (2 scenarios per LL) for integrated mobility services</b></p>	<p>New business models</p>	<p>Number of targeted business models for integrated mobility services</p>	<p>1 (Formula ticketing integrating train and bus)</p>	<p>Business model development is in progress and will be reported with the support of WP1</p>

<p><b>Impact on competitiveness, attractiveness and quality of transport services</b></p>	<p>Quality of service</p>	<p>Perception of quality of service</p>	<p>Survey administrated on 2013 by the regional agency of mobility<sup>1</sup></p> <p>PT:</p> <ul style="list-style-type: none"> <li>• Easiness in purchasing tickets: 89.8%</li> <li>• Safety of PT: 83.4%</li> <li>• Enforcement efficacy: 68%</li> <li>• Park &amp; Ride facilities: 56.6%</li> <li>• Convenience of ticketing: 68.1%</li> </ul> <p>Car:</p> <ul style="list-style-type: none"> <li>• Trip comfort: 95.2%</li> <li>• Privacy on-board: 93.7%</li> <li>• Transport of people and goods: 93.8%</li> <li>• Road maintenance: 62.5%</li> <li>• Easiness in parking: 62%</li> <li>• Economic convenience: 56.6%</li> </ul> <p>Bicycle:</p> <ul style="list-style-type: none"> <li>• Economic convenience: 98%</li> <li>• Environmental compatibility: 97%</li> <li>• Trip comfort: 93.2%</li> <li>• Bike lanes maintenance: 63.5%</li> <li>• Safe crossings: 60.4%</li> </ul> <p>Secure parking: 61.5%</p>	<p>A dedicated survey has been administrated before the LL execution and will be done after its termination, to collect these indicators</p>
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<sup>1</sup> <http://mtm.torino.it>

<b>Promoting modal shift, efficiency and reduction of externalities generated by traffic</b>	Transport Modal shift	% of trips made by each transport mode	Data retrieved from EMTA reports on 2015: <ul style="list-style-type: none"> <li>• Motorised modes: 39.8%</li> <li>• PT: 24.3%</li> </ul> Soft modes (cycling, walking): 36.7%	Data of the sample involved in the experimentation will be retrieved using both surveys and the IT platform
	Daily average distance	Overall distance travelled per day per user	Distance and journey time are not available in aggregated mode. For this reason, it has been considered to use the number of average daily trips: 2,11 trips. 1,40 of them are motorised (source regional agency of mobility).	
	Total journey time	Average duration of journey from origin to destination		
	Travel Costs	Total travel cost per individual/household	This data is not available in aggregated mode and will be further investigated in next project period	

## 4.2 UPDATE OF GREATER MANCHESTER LL KPIs

In the earlier period of the project the Manchester Living Lab experienced some difficulties in selecting a MaaS provider, also because of some peculiar characteristics of the Public Transport schemes and tariffs that in the UK are different than from the rest of Europe. After the selection of the Mobbileo platform, the operational actions started and related impact indicators were consolidated as reported in the following table.

Table 5. Update of the Greater Manchester KPIs

Project Target	Indicator name	Indicator definition	Baseline (as reported in D5.2)	Remarks
<b>Target 1: At least three popular journey planners connected with existing MaaS platforms pertaining to the five Living Labs through the SW enablers</b>	Interoperability between MaaS and Journey Planners	Number of Journey Planners provided by or connected to the MaaS operator platform	Transport for Greater Manchester has a web-based journey planner: <a href="https://my.tfgm.com/#/planner/">https://my.tfgm.com/#/planner/</a>	Since there will be only the Mobbileo journey planner built into the app, no other journey planners will be targeted during the pilot execution.
<b>Target 2: At least five non-travel-planner mobile apps will be connected to each MaaS platform in each Living Lab through the SW enablers</b>	Interoperability between MaaS and other apps	Number of generic mobile apps connected to the MaaS operator platform	Currently 0. However, there are many connected to the existing journey planners and related apps that are run by private companies and data is not available.	During the course of the project, it has been considered to avoid in-app redirection for a better user experience. Therefore all features from other transport service providers are provided in transparent mode to the user that will only access the MaaS app. The meaning of the indicator does not change and connection is provided in B2B mode. At present 4 functionalities (related to transport services of (Local Link, Bus, Tram, Train, Uber and Enterprise) are connected thanks to MaaS app
<b>Target 3: +30% of trips generated by the journey planners connected with IMOVE</b>	Utilisation of Journey Planners	Number of travel queries submitted to Journey Planners connected to the MaaS operator	The Living Lab is currently awaiting feedback from Information Service department relating to this data.	The current version of the MaaS Mobbileo platform does not keep track of the number of queries, apart those resulting in trip booking. Therefore this KPI will not be measured in Manchester.

<p><b>Target 4: +8% of intermodal trips generated by journey planners connected to IMOVE</b></p>	<p>Multimodal trips</p>	<p>Number of trips combining different modes of transport resulting from Journey Planner responses out of total trips generated</p>	<p>Estimation not currently available. An additional investigation will be done in next months for the collection of this data.</p>	<p>Data for multimodal trips of the recruited users will be compared to the baseline provided by Greater Manchester, considering the representativeness of the sample</p>
<p><b>Target 5: +25% use of integrated ticketing for mobility services in areas covered by the LLs, of which +5% relates to tickets involving more than one mode of transport</b></p>	<p>Integrated ticketing</p>	<p>Number of tickets for any urban trip (PT, taxi, car sharing, etc.) sold via the integrated ticketing channel out of the total</p>	<p>This data will be released by the Ticketing and Fares department in a future period, once MaaS operations will be started.</p>	<p>Data for integrated ticketing of the recruited users will be compared to the baseline provided by Greater Manchester, considering the representativeness of the sample</p>
<p><b>Target 6: Halving of total time spent to purchase intermodal travel services online by users travelling by services in the LL areas</b></p>	<p>Purchasing user experience</p>	<p>Time required for buying an online ticket</p>	<p>A dedicated user group will be set in the next period for estimating the current purchasing time that will be release in the next deliverable.</p>	<p>This data cannot be captured in Manchester, therefore this KPI will not be measured.</p>
<p><b>Target 8: One brand awareness campaign per each of the five Living Lab, focused on a clear identification of the new mobility model empowered by the IMOVE SW enablers</b></p>	<p>MaaS awareness</p>	<p>Number of dissemination actions aimed at improving the awareness of the MaaS offer</p>	<p>1: promotion of ITSO smartcard which is used for multi-modal products.  ITSO is the national smart ticketing standard (except London). <a href="https://www.itso.org.uk/">https://www.itso.org.uk/</a></p>	<p>A dedicated campaign will be carried out for recruitment and dissemination purposes</p>

<p><b>Target 9:</b>  <b>a) Increase of collective transport use and car/van sharing by 10%;</b>  <b>b) Increase of collective transport use by students and elderly people by 20%;</b>  <b>c) Decrease of private car ownership by 5%</b></p>	<p>Shared Mobility penetration</p>	<p>Number of journey segments using shared vehicle services (Car sharing, carpooling, taxi sharing) per user as % of total journey segments</p>	<p>Negligible.</p>	<p>Collective and shared transport services are part of the MaaS offer and this indicator will be measured accordingly.</p>
<p><b>Target 11: at least 10 MaaS involved actors per LL (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) as objective of SUMP and other mobility strategy local agendas</b></p>	<p>Number of MaaS involved subjects</p>	<p>Number of legal entities (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) involved in planning, operating, monitoring, and supporting the MaaS scheme</p>	<p>Although TfGM has operated one "MaaS Trial" this was not actual MaaS but simulated, therefore 0.</p>	<p>Actors have been involved in the Living Lab and related roles will be specified in the course of the next period.</p>

<b>Target 12: At least one data sharing process per each involved operator with another LL actor (subscriptions, profiling, common data model)</b>	IT interoperability	Number of data exchange processes among operators (transport providers, IT operators, etc.) in the MaaS scheme	0	No remarkable issues detected in measuring this indicator: data exchange processes are in place for ticket or service booking, purchase and validation, for unlocking vehicles, opening gates.
<b>Target 19: Technical specifications and related roadmap for roaming services (one per LL) involving other cities and areas outside LLs, as a result of LL local workshops</b>	Promotion of roaming Services	Technical and commercial specification for Roaming Services among MaaS schemes	There is no existing specification for roaming.	Technical specifications are being elaborated by WP2 and will be released in the next period
<b>Promoting modal shift, transport efficiency and reduction of externalities generated by traffic</b>	Perceived accessibility	Perceived accessibility to transport services	This data is currently not available: a specific focus group will be set-up for defining a suitable metric for evaluating a qualitative indicator and retrieving measurements.	This data will be elaborated by the LL and reported in the next period
<b>Impact to standards and regulations</b>	New standard or regulations	Impact to standards and regulations related to multimodality, integrated ticketing, etc.	Anti-Competition Law - block ticketing exemption	A qualitative index will be elaborated by the LL and estimates reported after related data collection
<b>Impact on competitiveness, attractiveness and quality of transport services</b>	Quality of service	Perception of quality of service	Not initially selected. Baseline to be collected yet.	This data will be detected via a survey administered to users.

	Perceived quality of service	Increase in customer satisfaction with travel	Not initially selected. Baseline to be collected yet.	These <b>new KPIs</b> have been introduced for capturing the feedback of users about the new mobility offer and will be detected with surveys administrated before and after the pilot execution.
	Perceived quality of service	Change in perception towards Public transport modes		
<b>Other</b>		Increase in patronage of Public Transport modes		This <b>new KPI</b> has been introduced for capturing the user adoption and will be measured during the pilot execution

### 4.3 UPDATE OF BERLIN LL KPIs

The Berlin Living Lab suffered from the fact that the public transport company has revealed to be not as reactive as initially envisaged and a commercial partnership was not realised. Lacking support from this relevant transport service, the Living Lab was however able to make agreements with 3 transport service providers (and one more is under negotiation). The pilot, although slowed while waiting for PT company feedback, will start soon and related data collection will begin accordingly.

Table 6. Update of the Berlin KPIs

Project Target	Indicator name	Indicator definition	Baseline (as reported in D5.2)	Remarks
<b>Target 1: At least three popular journey planners connected with existing MaaS platforms pertaining to the five Living Labs through the SW enablers</b>	Interoperability between MaaS and Journey Planners	Number of Journey Planners provided by or connected to the MaaS operator platform	1 (Urbi)	As acknowledged at the early stages of the project, there was not the possibility to engage other journey planners that either are competitors of the MaaS offer provided by URBI or are not willing to have collaboration because of different industrial strategies (e.g. Citymapper, after some experimentations in London, is considering to use the journey planner service as entry portal for measuring transport gaps and building collective transport offers). Therefore only one journey planner, the one provided by URBI, will be included for this indicator
<b>Target 2: At least five non-travel-planner mobile apps will be connected to each MaaS platform in each Living Lab through the SW enablers</b>	Interoperability between MaaS and other apps	Number of generic mobile apps connected to the MaaS operator platform	4 mobility apps: <ul style="list-style-type: none"> <li>• Driveby carsharing</li> <li>• Emmy scootersharing</li> <li>• Nextbike bikesharing</li> </ul> - VBB ticket selling	During the course of the project, it has been considered to avoid in-app redirection for a better user experience. Therefore all features from other transport service providers are provided in transparent mode to the user that will only access the MaaS app. The meaning of the indicator does not change and connection is provided in B2B mode. At present 3 services (Miles, Emmy, Nextbike) are connected thanks to MaaS app and other commercial contacts are in progress

<p><b>Target 3: +30% of trips generated by the journey planners connected with IMOVE</b></p>	<p>Utilisation of Journey Planners</p>	<p>Number of travel queries submitted to Journey Planners connected to the MaaS operator</p>	<p>Queries:</p> <ul style="list-style-type: none"> <li>Day: 2.600</li> <li>Month: 65.200</li> </ul> <p>Year: 783.000</p>	<p>The pilot did not start yet. This data will be monitored within the URBI platform and no remarkable issues have been identified in collecting this data</p>
<p><b>Target 4: +8% of intermodal trips generated by journey planners connected to IMOVE</b></p>	<p>Multimodal trips</p>	<p>Number of trips combining different modes of transport resulting from Journey Planner responses out of total trips generated</p>	<p>25% of the total outlined above.</p>	<p>Variations calculated within the user groups</p>
<p><b>Target 5: +25% use of integrated ticketing for mobility services in areas covered by the LLs, of which +5% relates to tickets involving more than one mode of transport</b></p>	<p>Integrated ticketing</p>	<p>Number of tickets for any urban trip (PT, taxi, car sharing, etc.) sold via the integrated ticketing channel out of the total</p>	<p>This data is not available at the moment; a further investigation will be made for producing this data before the beginning of the MaaS pilot</p>	<p>Variations calculated within the user groups</p>
<p><b>Target 6: Halving of total time spent to purchase intermodal travel services online by users travelling by services in the LL areas</b></p>	<p>Purchasing user experience</p>	<p>Time required for buying an online ticket</p>	<p>4 minutes</p>	<p>A dedicated user group is going to be set up for measuring this indicator</p>

<p><b>Target 9:</b>  <b>a) Increase of collective transport use and car/van sharing by 10%;</b>  <b>b) Increase of collective transport use by students and elderly people by 20%;</b>  <b>c) Decrease of private car ownership by 5%</b></p>	<p>Shared mobility penetration</p>	<p>Number of journey segments using shared vehicle services (Car sharing, carpooling, taxi sharing) per user as % of total journey segments</p>	<p>This data is not available at the moment; a further investigation will be made for producing this data before the beginning of the MaaS pilot</p>	<p>This data will be detected via a survey administrated to users.</p>
<p><b>Target 11: at least 10 MaaS involved actors per LL (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) as objective of SUMP and other mobility strategy local agendas</b></p>	<p>Number of MaaS involved subjects</p>	<p>Number of legal entities (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) involved in planning, operating, monitoring, and supporting the MaaS scheme</p>	<p>0</p>	<p>Actors have been involved in the Living Lab and related roles will be specified in the course of the next period.</p>
<p><b>Target 12: At least one data sharing process per each involved operator with another LL actor (subscriptions, profiling, common data model)</b></p>	<p>IT interoperability</p>	<p>Number of data exchange processes among operators (transport providers, IT operators, etc.) in the MaaS scheme</p>	<p>7</p>	<p>No remarkable issues detected in measuring this indicator: data exchange processes are in place for ticket or service booking, purchase and validation, for unlocking vehicles, opening gates.</p>

<b>Target 16: Halving the payback period of investment for ICT booking/ticketing services and devices in LL areas</b>	Financial improvements	Payback period of IT investment cost	Data not available at the moment, this indicator will be investigated in the next period	No remarkable issues detected in measuring this indicator: financial data will be assessed in URBI in order to derive this indicator.
<b>Promoting modal shift, transport efficiency and reduction of externalities generated by traffic</b>	Total journey time	Average duration of journey from origin to destination	Data not available at the moment, this indicator will be investigated in the next period	No remarkable issues detected in measuring this indicator: data will be collected for the URBI platform

## 4.4 UPDATE OF GOTHENBURG LL KPIS

The Living Lab is in an advanced stage in all 3 implemented pilots that provide:

1. Integrated parking and PT ticketing services with mobile app.
2. Mobility services (PT and shared mobility) provided via mobile app to tenants in newly built apartments without parking facilities.
3. Multimodal and integrated ticketing solution for business trips provided via mobile app.

All pilots are running and data collection via the different MaaS providers is in progress and will be reported in the next period.

Details about indicators are reported in the following table.

Table 7. Update of the Gothenburg KPIs

Project Target	Indicator name	Indicator definition	Baseline (as reported in D5.2)	Remarks
<b>Target 3: +30% of trips generated by the journey planners connected with IMOVE</b>	Utilisation of Journey Planners	Number of travel queries submitted to Journey Planners connected to the MaaS operator	0	Data for this KPI will be collected via pilots 2 and 3 in Gothenburg. Data will be available from two MaaS operators, EC2B and Smartresenär. Data is not yet available, but should be available at the completion of the first round of pilots.
<b>Target 6: Halving of total time spent to purchase intermodal travel services online by users travelling by services in the LL areas</b>	Purchasing user experience	General user experience	Not applicable.	With respect to what was reported in D5.2, <b>this KPI has been replaced with qualitative data</b> on the general user experience (e.g. ease of use, time required to purchase tickets, simplicity, etc.) that will be collected with a survey administrated to users
<b>Target 7: -5% of operating costs for collective transports connected by MaaS proprietary platforms in LL areas</b>	Operating costs for MaaS operators	MaaS provider's net profit margin, i.e. a ratio of the total revenue minus costs divided by the total revenue  Estimation of the service's future profitability after the pilot ends.	This KPI will not be measured as getting data may be difficult. Instead, process evaluation surveys will be done (see related procedures)	After initial investigation, Living Lab actors concluded that it is not possible nor relevant to measure OPEX in terms initially defined in D5.2. WP1 will perform slightly different analyses and <b>the indicator has therefore been changed as indicated in the related definition</b> , capturing profitability rather than cost reduction

<p><b>Target 9:</b></p> <p>a) Increase of collective transport use and car/van sharing by 10%;</p> <p>b) Increase of collective transport use by students and elderly people by 20%;</p> <p>c) Decrease of private car ownership by 5%</p>	<p>Shared mobility penetration</p>	<p>Total number, share and combination of modes of trips per individual and month, including work trips but excluding vacation trips per mode of transport</p>	<p>The shared mobility % is not currently available.</p>	<p>This <b>KPI has slightly been modified</b> in its definition with respect to D5.2.</p>
<p><b>Target 11: at least 10 MaaS involved actors per LL (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) as objective of SUMP and other mobility strategy local agendas</b></p>	<p>Number of MaaS involved subjects</p>	<p>Number of legal entities (transport providers, ITS companies, research entities and other involved service providers included in all the MaaS local schemes) involved in planning, operating, monitoring, and supporting the MaaS scheme</p>	<p>Hundreds of actors have been involved in previous and ongoing MaaS-related activities. In 2016 Västtrafik opened a Request for Information on MaaS, which engaged hundreds of companies and other stakeholders. There are numerous other projects that engage or have engaged actors from both the public and private sectors, such as the Go:Smart project which trialled the world's first combined mobility service.</p>	<p>The Living lab already involved a number of different operators in its 3 pilots, ranging from parking operators, to real estate and MaaS operators.</p>
<p><b>Target 12: At least one data sharing process per each involved operator with another LL actor (subscriptions, profiling, common data model)</b></p>	<p>IT interoperability</p>	<p>Number of data exchange processes among operators (transport providers, IT operators, etc.) in the MaaS scheme</p>	<p>The main ticketing/data exchange service in LLGOT is "BoB", which is an open API that is deployed in the existing ToGo app (VT) and all digital ticketing solutions. See: <a href="http://Bob.samtrafiken.se">Bob.samtrafiken.se</a>.</p>	<p>No remarkable issues detected in measuring this indicator: data exchange processes are in place for ticket or service booking, purchase and validation, for unlocking vehicles, opening gates.</p>

<p><b>Target 15: at least 3 ancillary services per LL, complementing transport provision included in existing MaaS in LL areas (parcel delivery, long distance trip booking, mobility management and/or loyalty programs and other facilities linked to urban travels)</b></p>	<p>Ancillary Services</p>	<p>Number of additional services (parcel delivery, long distance trip booking, mobility management and/or loyalty programs and other facilities linked to urban travels) offered besides the MaaS scheme</p>	<p>P-bolaget - purchase of parking tickets in connection with public transport tickets.</p>	<p>Some complementary services are already offered in pilot 2 (e.g. shared laundry for tenants) in the same MaaS app. The LL is exploring how to complement mobility offers with other ancillary services and this will be reported in the next period.</p>
<p><b>Target 17: 10 novel targeted business models (2 scenarios per LL) for integrated mobility services</b></p>	<p>New business models</p>	<p>Number of targeted business models for integrated mobility services</p>	<p>0</p>	<p>Business model development is in progress and will be reported with the support of WP1</p>
<p><b>Target 19: Technical specifications and related roadmap for roaming services (one per LL) involving other cities and areas outside LLs, as a result of LL local workshops</b></p>	<p>Promotion of roaming Services</p>	<p>Technical and commercial specification for Roaming Services among MaaS schemes</p>	<p>0</p>	<p>Differently to what was planned at the beginning of the project, Gothenburg will not be part of the Roaming Living Lab. <b>This KPI will be discarded.</b></p>

<p><b>Impact on competitiveness, attractiveness and quality of transport services</b></p>	<p>Quality of service</p>	<p>Perception of quality of service</p>	<p>Gothenburg LL plans to conduct surveys with end users in conjunction with pilots #1, #2 and #3 (see D4.2 for references about pilots). These will gauge user perceptions of quality, satisfaction, accessibility etc. before, during and after the pilot phase in order to examine the impact of each pilot. User surveys have previously been performed in conjunction with the Go:Smart/UbiGo field operational test. The results demonstrated, among other things, a high level of satisfaction and high perceptions of quality as a result of the MaaS service. A further study by Inter Metra in 2017 examined user readiness to adopt MaaS across Sweden. [4][5][6][7]</p>	<p>This data will be detected via a survey administrated to users.</p>
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<p><b>Promoting modal shift, transport efficiency and reduction of externalities generated by traffic</b></p>	<p>Transport Modal shift</p>	<p>% of trips made by each transport mode</p>	<p>Modal split:</p> <p>For the Gothenburg region:</p> <ul style="list-style-type: none"> <li>• Walk: 15%</li> <li>• Bicycle: 8%</li> <li>• Public transport: 23%</li> <li>• Car: 53%</li> <li>• Other: 1%</li> </ul> <p>For Gothenburg city area:</p> <ul style="list-style-type: none"> <li>• Walk: 18%</li> <li>• Bicycle: 10%</li> <li>• Public transport: 34%</li> <li>• Car: 36%</li> </ul> <p>Other: 1%</p>	<p>This data will be captured from the MaaS apps</p>
	<p>Perceived accessibility</p>	<p>Perceived accessibility to transport services</p>	<p>This type of data is not measured in national or regional surveys. Perceived accessibility was examined using questionnaires as part of the Go:Smart/UbiGo pilot in 2012-14, showing that MaaS has positive impacts on perceptions of accessibility. [4][5][6][7]</p>	<p>This data will be detected via a survey administrated to users.</p>

	Total journey time	Average duration of journey from origin to destination	<p>For the Gothenburg region, mean average travel times are:</p> <ul style="list-style-type: none"> <li>• Walk: 16mins</li> <li>• Bicycle: 19mins</li> <li>• Public transport: 42mins</li> <li>• Car: 25mins.</li> </ul> <p>For the Gothenburg region, mean average travel distances are:</p> <ul style="list-style-type: none"> <li>• Walk: 1.3km</li> <li>• Bicycle: 4.1km</li> <li>• Public transport: 17km</li> </ul> <p>Car: 17km</p>	This data will be detected via a survey administrated to users.
<b>Impact to standards and regulations</b>	New standard or regulations	Impact to standards and regulations related to multimodality, integrated ticketing, etc.	Bob.samtrafiken.se - in operation via p-bolaget and other MaaS pilots. The BoB API is also applied in the existing ToGo app (VT) and all digital ticketing solutions	The Living Lab will provide evidence of the action undertaken by the public authority for regulating the MaaS and related multimodal mobility service thanks to the lessons learnt after the IMOVE trials
	Governance model	Impact to public-private regulations governing urban transport services		The Living Lab will provide evidences of the action undertaken by the public authority for identifying a governance model thanks to the lessons learnt after the IMOVE trials

In addition to this analytic reporting, the LL has collected initial feedback via a survey administrated to users in pilot 2 (tenants living in newly built apartments without parking facilities and using the MaaS app for mobility services). Data collection is still in progress but an initial evaluation summary is hereafter reported.

**Introduction:** In order to understand who lives at the accommodation (named BRF Viva) as well as their expectations and first impressions of the transport services (public transport, bicycle pool, car pool and combined mobility app), 19 people from 17 households were interviewed at the end of March until the beginning of May 2019. The interviewees were recruited primarily from those who moved in during March (stage two, about 35 households), partly through an information meeting on the transport services and partly through mail. The interviews were recorded, transcribed and qualitatively analyzed. In the future, the plan is to carry out follow-up interviews with the same selection during June in order to better understand how transport services are used, and to compare the interview results with sales statistics and with insights from consultations done by the supplier, Trivector.

**Selection:** By age and size, the 17 households interviewed could be categorized as follows: a family of small children (with a child); ten couples (three in retirement age or just below, two middle-aged and five young people, one of whom is expecting a child); and six single households (one pensioner, two middle-aged and three younger). Before the move, nine of the households owned a car, and one household had a private car collective. Three of the interviewees lacked a valid driving license.

**Tenant BRF Viva:** Some of the interviewees had bought their apartment in haste, were not involved in the purchase or rented secondarily. Most had, however, actively applied to BRF Viva because of the location, architecture and planning, as well as being fascinated and attracted by the concept and overall idea. The majority of the interviewees highlighted the environmental profile and shared solutions such as the bicycle garage, the orangery, the laundry room, the guest rooms and the transport services as extremely positive. Overall, they were extremely satisfied with Riksbbyggen (building developer), tenant BRF Viva and their apartments, although not everything works perfectly yet (for example, many burglaries and cold in the bathrooms). However, the idea of more interaction with neighbours was not particularly appealing to everyone.

**Parking and car holdings:** Everyone except one household was aware, when buying and / or influenced, that there would be no accommodation parking. Those who didn't own a car didn't see it as a problem. Of those who owned a car, two of them got rid of their cars in connection with the move, while the other seven arranged with parking facilities nearby, at relatives, at work, at other properties or free parking in the area. Those who used their car relatively little were not disturbed by this, but would like to have liked a 10-minute parking at BRF Viva to be able to unload food. Those who were traveling by car (two), or would like a car shuttle (one) felt that the lack of parking was impractical and unfair. Several of the car owners considered getting rid of the car in the future, if the transport services worked well enough. The most common and decisive arguments against this were transport to and from jobs located in 'hard-to-get-to area' and summer cottages.

**Changed Travel Patterns:** Some planned to change their travel patterns with the move, and several described that this had also become the case. Primarily, the interviewees who owned the car had reduced their car driving in favour of public transport, cycling and walking. The public transport access was generally described as very good and the central location was said to make it easier to walk and cycle. For some, it also seemed to help that the car was now parked further away from the accommodation. Furthermore, the vehicle pools contributed to the conversion, see below. Another related change that many mentioned was that they had started ordering home delivery of food items more often since their move.

**Vehicle pools:** Of the households interviewed, seven had tested the bicycle pool and six

car pools, while many were planning to test them shortly. Some saw no need for the pools at the moment: they had their own car and bike and/or did not cycle. Regardless of whether the interviewees saw any personal benefit from the bicycle pool and the car pool or not, however, they were absolutely positive to them. The pools were seen as a central part of the house's environmental profile. Those who did not benefit from them now saw that they might have it in the future, or felt that they could bid for the possible costs that the pools bring. The traditional electric bicycles had so far been used to combat the hills from the city centre to home, to shop in the neighbourhood and to cycle to and from destinations a little further away from home. Everyone did not dare to use the bicycles - they look scary to use and are theft-prone. However, those who had tested them for big actions and excursions with children and grandchildren were very satisfied. The electric cars that are parked at BRF Viva have so far been used to pick up and leave people and to shop, while larger cars and vans parked in the district (associated car pool) had been used for excursions and during the move. In addition to the services for some being a bit complicated to use the first time, the interviewees were very satisfied. If they would change something they would make it possible to extend the rental period for the bikes gradually (i.e. without cycling home) and add free-flowing rental cars to the range.

EC2B MaaS app: most had downloaded at least one of Sunfleets (carpool), GoRides (bike pool) and EC2B (accommodation) apps at the interviews, and many used the ToGo app by Västtrafik previously. The majority therefore had the opportunity to book bicycles and cars and buy public transport tickets in several alternative ways. Some had chosen to do everything via the EC2B app because they thought it was practical with everything in one place (a thought that appealed to many - they therefore wanted to integrate other house functions such as booking the laundry room), while some chose the EC2B app because they thought it was simple and smooth (one meant, for example, that it was faster to buy a ticket in the EC2B app, compared to the ToGo). Many, however, had opted out of the EC2B app more or less actively. The reasons mentioned were: they were used to other apps; that the trip planner did not work; that the app was not user-friendly / aesthetically pleasing; that functions were missing; that they did not trust the EC2B app because it was under development; and that they planned their travels elsewhere and then just wanted the closest route of booking / purchase. Overall, the registration process for EC2B and the vehicle pools was also perceived as cumbersome for many, which among other things, contributed to misconceptions and uncertainty about the relationship between actors and regarding which app would / could be used for what.

**Interim conclusion:** The interview results indicate that the vehicle pools contribute to the overall concept and the environmental profile that the interviewees experience and appreciate with BRF Viva. For many of the interviewees, the pools also, so far, seem to facilitate both boring (e.g. commuting and everyday shopping) and fun (e.g. visits and excursions) trips. Hence, access to the pools can hopefully facilitate the possibilities of living without a car on BRF Viva, albeit not for everyone. The idea of gathering all the information in one place was liked by many, but at present the EC2B app lacks some important features (e.g. travel planner) and offers nothing that the other apps do not. Thus, the reasons for choosing EC2B are right now, especially for those who have already downloaded and are used to other apps. The interviewees' comments indicate that the EC2B's competitive advantages (and thus the possibilities of influencing the residents' travel behaviour) would be greater if the EC2B e.g. offered a well-functioning multimodal travel planner, gathered all the smart features of the house, or brought prices / offers that the households could not get directly from GoRide, Sunfleet and Västtrafik. It also seems important that the EC2B prevents suspicions that their app does not offer all the functionality that the individual apps do (e.g. selection of specific bikes).

## 5 INTERMEDIATE PROCESS EVALUATION

As outlined in D5.1, the process evaluation is aimed to gain insights into drivers (factors of success) and barriers (impeding progress) during the implementation and validation of the IMOVE Living Labs, in order to point out which approaches and methods have been successful in terms of reaching the initial strategic and specific objectives.

In this deliverable, the intermediate process evaluation has been carried out, by administrating questionnaires to both developers (the IMOVE partners in charge of developing the software enablers, the technical solutions and adding improved features to Living Lab MaaS platforms) and implementers (the Living Labs subjects in charge of organizational, operational and commercial activities for implementing the MaaS offers). The following subsections report the main outcomes of this process, updating what was reported at month 14 (D5.2).

### 5.1 PROCESS EVALUATION FOR DEVELOPERS

This subchapter is dedicated to the evaluation process in the context of the work conducted and the work in progress within WP2 (Software Enablers) which mostly deals with software development. To this purpose, a questionnaire has been recreated and circulated to all the technical partners involved in the Software Enablers development process, similarly as in the first stage of the evaluation process. The aforementioned were again invited to answer a total number of fourteen questions, regarding the development related lifecycle. The answers were analysed and the results are included in the current document with respect to the IMOVE development efforts.

Similarly to the first round, the questionnaire was again designed to directly access the IMOVE functionalities and the development peculiarities of the project (integration efforts, large-scale development, challenging and heterogeneous operating environments, etc.) with an overall aim to indicate to what extent the development of the software enablers is, and ensure on IMOVE's development phase as it is coming to its end. The developers were asked the following:

- Experienced deviations from the initially planned work.
- Requirements change and impact.
- Delays in development or integration and the reasons.
- Issues on the development, and mitigation measures.
- Criticisms of the development process for the components.
- Views on the development of the components
- Unexpected difficulties in the deployment
- Software failures (freezes or crashes) identification and resolution
- If the software components manage to perform their intended tasks and if not how do they differ from the planning phase
- Observation of issues related to performance
- Adoption of proper security and privacy mechanisms to make the use of data GDPR compliant
- Current stage of the components development
- Changes regarding the initially planned adopted technologies for development

The overall goal is to further evaluate technical partners' productivity regarding the software development process, before the verification of the project results, to improve effectiveness and efficiency on time, by mitigating risks and ensuring quality. The results of the analysis based on the questionnaire circulated will be communicated to the consortium again through this deliverable, and relevant recommendations will be delivered to the developers so as to achieve products and services with the best quality guarantee.

The second phase of the questionnaire takes into account mostly technical-related details and in general quality related aspects with respect to the procedures utilized and focuses on the result oriented point of

view, thus, ensuring productivity of technical partners along IMOVE software development and the finest quality of the final results.

The recipients of this technical evaluation are the following:

- IMOVE developers who will keep in touch with their managers and the WP2 leader so as to finalize the development process according to the pre-scheduled plan and tackle any difficulties without drifting from the initial design.
- IMOVE managers who are responsible for keeping up to date this assessment in order to finalize the development process on time and deliver the development products in the finest quality with respect to the development efforts of the relevant organizations.
- WP5 leader (FIT) who is responsible for the evaluation plan and the impact assessment activities and to communicate the evaluation results to the consortium.
- The project officer, who needs to be informed of the findings and the overall development process adopted, any difficulties faced and the risk mitigation strategies.

The IMOVE project's development phase is soon coming to its end. Organizations involved in the development process are:

- **Softeco**: responsible for the design and development of the **B2B API (Open API) enabler**, the **Notification Manager** and the **Incentive and Gamification manager**
- **Mosaic**: responsible for the design and development of the **Preference Manager** and **Mobility Tracker**
- **URBI**: responsible for the design and development of the **Identity Manager**, the **User Tariffs Manager** and the **Preferences Manager**
- **CVUT**: responsible for the design and development of the **Mobility Organizer** and **Price Manager**
- **ICCS**: responsible for the design and development of the **Roaming Manager**.

All partners will work together for the integration of all software enablers with the whole IMOVE platform which ensure the interconnection of multiple MaaS operators towards the realization of inter-roaming and cross-border roaming services.

Starting with the evaluation analysis, it was noted that the development plan has been adjusted to better fit the Living Lab plans. In principle, no great deviation has been experienced yet and the second iteration required very little additional work. Some slight deviations from the original plans though, appeared in the development of the Preference Manager and the Mobility tracker, due to different delays at project level and also due the lack of information from the sites about the users profile (information that they could provide). Mobility Organizer and Price Manager enablers are already implemented and have been deployed in the Greater Manchester area. Taking into account that the development of the Roaming Manager is still in its infancy, the ongoing discussions between partners concerning the roaming use case may cause in future minor deviations.

During the last months and after recent iterations, the initial requirements have mainly remained the same, taking into account that no additional requirements from the Living Labs have still completely arrived. Effort has been needed only for regular maintenance and for searching and collecting various localized data sources. However, requirements are expected to evolve further because of the new details and feedback emerging from the Living Labs; in particular regarding the ongoing discussions concerning roaming. This is expected to have some impact on development with all the effects expected to be properly managed. In any case any changes are going to be reflected in Deliverable D2.5, and the latter will indicate the impact to be experienced in the design of roaming.

A slight delay in development is experienced in the Roaming Manager case as a result: since IMOVE partners have not yet completed the specifications of the Roaming Business Model, the development has been postponed. However, this will not pose any significant impact in the development activities of the overall project, since the development of most of the other IMOVE components (other software enablers) can proceed more or less independently. Other deviations on the development are mainly due the lack of information from the sites, because integration of local data from the sites (currently still missing) and part of the enablers' customization depend on the Living Lab plans. Some enablers have already been deployed

with the development finishing fast enough, as said, with ambition not to cause any delays in LL-related plans, although their deployment was slightly delayed due slower response times of local LL partners. With no known issues and no actual development going on certain enablers are being used in production for Turin LL, for Greater Manchester, and soon for Berlin LL.

Any issues faced were mostly of technical nature (and quite low level) such as how to make the IMOVE model and URBI model coexist, since URBI takes care of two Living Labs. The solution to this class of problem was to isolate the two components and link them together via the equivalent of a foreign key. Potential issues stem from the limited availability of data about local transport providers. Manchester LL is quite complicated in this respect (many commercial providers with no centralized open data sources). To mitigate any missing data sources or data types, heuristic approximations, interpolation and machine learning were employed. The results are satisfactory. For the mobility tracker but also the preference manager, an issue detected is the lack of data from real users on the sites, so to tackle it, synthetic data by simulation processes were generated and used for the technical validation of both enablers. Any other issues arouse, between the enablers and with local technology providers at the LLs have been addressed through phone meetings and technical documentation exchange and "hands-on" sessions. No issues have been detected yet regarding the development of the Roaming Manager.

All partners responded negatively when asked if they have any further criticisms of the development process for their components as no further issues are foreseen and the development process went smoothly until now.

No big changes on the expected capabilities are foreseen for the majority of the components at the current stage. Most of the work after the initial implementation revolved around having the enabler implementation fit the documentation and requirements outlined beforehand which is perfectly physiological in any software project. On a good note, the initial draft was for the most part good enough, and only adjustments were needed although **the deployment process would be easier if developers received explicit requirements from the LL partners and/or description of how our SW enablers will be used in the Living Labs**. The collaboration and the interaction between IMOVE partners (technical partners, LL partners) are essential for facilitating the final design and the development of the Roaming Manager. The final specification of the Roaming LL use cases will define the concrete technical requirements of the Roaming Manager.

For most of the software components no further unexpected difficulties in the deployment other than the previously described were identified. Some enablers are highly dependent on the external data. They depend on other enablers and by using simulated data any deployment difficulties can be faced because of the integration with other components. The Roaming Manager has not yet been deployed. However, some relevant software components (frameworks, libraries, dependencies, etc.) have been tested in a virtual development machine with no difficulties experienced yet.

Regarding software failures (freezes or crashes), most of the partners have not yet detected or identified any in the current tests, but when they did, the resolution was performed through logging and debugging. There was a case of some technical difficulties with the deployment of one of the SW enablers as a Docker container on older hardware. This was solved by replacing Tensorflow with Theano as a backend for machine learning tasks.

Most of the partners responded positively that their component(s) manage to perform its intended task well. The enablers have a proper performance for the expected functionalities and the components adhere to the pre-specified requirements. Compatibility issues might be faced though from the usage of certain software components from other Living Labs other than the already deployed. Issue was experienced with the Roaming Manager, since the design of whom has not yet been finalized, and yet, developers cannot address whether or not the software component will perform its intended task, but we are confident that it will.

All components perform the tasks they were designed for, without any difference, excluding the cases where the full set of functionalities have not been implemented yet or the development has not yet been finalized. In these cases, the aim is to fulfill all the expected requirements that remain.

At the time being, no performance issues have been reported, identified or detected for the current implementations. In fact pleasantly and surprisingly the SW enablers had a relatively low usage of system resources and the response times are fast enough too. This is expected given the relative low usage of such

components. But since some of the components are in development phase, this remains to be seen in the near future.

GDPR is not a relevant matter to some implementations of SW enablers, since they do not store or expose any personal, protected or non-public data. In principle, in other cases, guidelines have been established by the Ethics Review Board (ERB). Proper authentication and authorization mechanisms have been adopted, along with transport level security for over the Internet data transfers. Data exchanging and processing is considered to be secure and GDPR compliant. In some cases, data used is simulated only so no privacy matters have been reported. When dealing with real data, privacy and security measures will be implemented according the Data Management plan. The needed authentication, security and privacy mechanisms will be developed in accordance to the security specifications proposed in WP2 making the use of data and information GDPR compliant.

As for the current development status, Mobility Organizer and Price Manager are implemented and deployed in the Greater Manchester area. They should be ready for integration in the LL. The development of Identity Manager, User Tariffs Manager and Preferences Manager is considered to be completed. This doesn't exclude that changes will be performed as required while with the finalization of the development for Berlin LL. B2B API (Open API) enabler, Notification Manager and the Incentive and Gamification manager are already deployed in a test environment, and deployment in the Living Labs is expected to be straightforward. The Preference Manager is delayed and the Mobility Tracker is implemented partially. The development of the Roaming Manager is in its infancy and the design of the component has not yet been finalized. The ongoing discussions between partners (technical partners and partners from LL that will support the Roaming use case) will form the final technical specifications of the component.

All technologies envisioned for development have been kept updated to their latest version throughout the project. No technological changes have been introduced since the first evaluation iteration. Implementation and deployment technologies, are mainly based in AWS infrastructure, Docker and Python which have been decided from the early beginning of the development. PostgreSQL and Django will most probably constitute the main tools for building the Roaming Manager. However, this will be reassessed during the whole development phase, based on the project progress.

## 5.2 PROCESS EVALUATION FOR IMPLEMENTERS

For the purposes of assessing the work carried out by Living Labs (mainly in WP4, with the support of WP1 for business modelling) a new process evaluation questionnaire (after the first one reported in D5.2) has been administrated to Living Lab.

The main outcomes are hereafter reported, highlighting progresses with respect to the previous iteration.

### 5.2.1 INVOLVEMENT OF LIVING LAB STAKEHOLDERS

The involvement (meaning active commitment) of Living Lab stakeholders is judged from poor to good with the exception of Gothenburg where this is considered very positive like in the previous iteration. In the case of Berlin, a strong difficulty has been reported in the interaction with PT company because they decided to activate their own MaaS program and are reluctant even to initiate a dialogue with IMOVE (despite some attempts made on both technical and commercial channels). The support of IMOVE for stimulating the engagement process is considered just sufficient, despite support undertaken during call conferences. A dedicated action plan from WP5, taking advantage from the Gothenburg experience will therefore be proposed to other LLs, in order to improve stakeholder collaboration. With regards to specific activities carried out with local stakeholders, Gothenburg, Turin and Manchester mention workshops and other fruitful contacts for raising the interest and assessing pros and cons. In Gothenburg private stakeholders share the proposed value proposition concepts and all of them are proactively working by profiting from the technical (Open APIs for ticketing) and commercial (agreement between Västtrafik and other operators and among operators themselves) collaborations; the results are very positive with a **stimulating ecosystem** at present resulting in the three operating MaaS pilots. In Turin the driving force is mostly the public authority, with the strong political commitment of the Municipality that was able to involve also the Region with a more ambitious program of extending the MaaS outside the metropolitan area, by involving other public and private transport operators.

## 5.2.2 REFINEMENTS OR UPGRADE OF BUSINESS MODELS

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The LL experimentations are allowing MaaS operators to assess in real field their business assumptions.

In Berlin the offer will start with the pay-per-use model but it will be evaluated if the subscription model is attractive for the users. Data collected will also be beneficial in assessing the users' behaviour and understanding if dynamic fares can be sustainable as well.

Turin chose to focus on starting with the support of Mobility Management practices, activating the offer in the controlled environments of home-to-work and work-to-work daily trips. Further evaluations will be done once more data will be available.

Gothenburg, as mentioned above, activated **multi-lateral collaboration** with different models and the active support of RISE is a key factor, well recognised by operators.

Manchester is still in an exploratory phase for business modelling, and the experimentation should help the local authority in understanding the most suitable engagement model.

Further actions in WP1 will be undertaken in the next period, for supporting this process in all LLs, including Madrid that, as new entry, is focused on the driving role of the public transport company EMT.

## 5.2.3 POLITICAL SUPPORT

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**Political support can be a relevant driver** when a spontaneous collaboration environment (as seen for Gothenburg in the previous subparagraph) is not ready yet.

The city of Turin had strong political support from both mayor and mobility deputy mayor that intervened in solving reluctances of the PT company and demonstrating strong public commitment to private operators, in order to guarantee long-term strategies and stimulate investments. This action raised the interest of the Region too, as reported below.

Gothenburg and Manchester shown a half-hearted, still existing, political support. On the contrary Berlin did not experience any support, nor awareness and this has been considered a barrier towards possible agreement with the PT company.

## 5.2.4 MAJOR ISSUES DETECTED

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There have been some issues reported in the implementation of the LLs and these mainly concern PT and in one cases (in Berlin) taxi.

In some cases it was somehow difficult to clearly discriminate between commercial and technical issues that are linked and reciprocally impacting: the design of commercial (and legal) agreements has been slowed by sometimes excessive precautions required by transport operators for technical aspects such as ticket re-selling and security of transactions and reveal an attitude not fully enthusiastic in joining the program from the public transport side. The reported reasons consist in low receptiveness to the MaaS innovation and the fear to lose market shares due to increased competition brought by the aggregation of transport offers.

In terms of political or governance issues, Gothenburg reported that Västtrafik cannot freely choose partners to commercialise MaaS-services without undergoing a procurement process and this challenge could emerge when scaling from pilot to launch stage and could reasonably apply also to other sites.

In addition, in the case of Manchester, bus devolution and bus franchising had a direct impact on integration of bus services into the system.

These aspects will be further studied from the **governance** point of view. Next actions in WP5 will consider how to provide support to LLs in order to deal start building a suitable governance model.

Another issue is the **low user adoption** that has been reported by Gothenburg but also experienced in Turin looking at the initial data captured after few week of piloting. The public seems not to be so eager to adopt IMOVE solution and move away from traditional mobility schemes and in the case of Gothenburg marketing campaigns (such as trial campaigns, advisory services and direct dialogues with individuals) are in place for

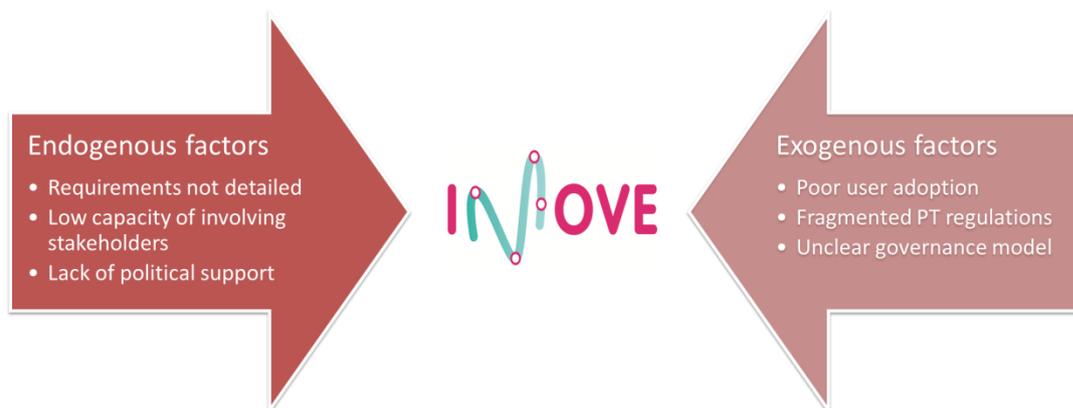
convincing users of the quality of MaaS scheme. However the initial feeling is that additional drivers, other than dissemination campaigns, are needed for stimulating the scale-up of this kind of services.

## CONCLUSIONS AND NEXT STEPS

The intermediate evaluation presented in this deliverable shows a number of **barriers** that can be summarised in the following findings:

- **The operational deployment of MaaS schemes is very complex for a number of interrelated reasons**, combining technical, legal, political, organisational and economic aspects. The IMOVE consortium underestimated to some extent this complexity and this led to a slower implementation classifiable as **endogenous factor**.
- **The external dependencies** mainly identified in agreements with transport operators and user adoptions **are affecting the impacts achieved so far**. Despite encouraging experiences deployed before IMOVE project, the receptiveness to this innovative model is still to be fully achieved from both provider and consumer sides. This is an **exogenous factor**.

The abovementioned factors have been described in the previous sections and are represented in the following figure:



Besides these barriers there are also positive aspects that can be raised to the rank of **drivers**, provided that the project will be able to systematise, replicate, scale-up and exploit them.

These drivers, already mentioned, refers to the capacity especially experienced in the more advanced Living Lab in Gothenburg and Turin to create cooperation, identify reciprocal advantages and get strategic support and are summarised as follows and represented in the next figure:

- A proactive and **stimulating ecosystem** in the Living Lab composition
- The **multi-lateral collaborative approach** among stakeholders
- An explicit **Political support**, according to well-identified urban strategies



This intermediate evaluation suggests therefore to activate a cross-WP action plan at project level for taking advantage from drivers and dealing with barriers, in order to overcome existing limitations and progress in a swifter and more effective implementation of planned activities.

The decision to activate the action plan will be proposed to the consortium and consequently a dedicated operational structure will be allocated to detail tasks and define internal milestones and related means of verification. An initial outline of the acts is the following:

Objective	Task	Assignee
<b>Deploy successful MaaS platforms in the remaining LLs</b>	To reassess and align requirements from LL with technical developments	WP2 supported by WP4
<b>Raise the interest of stakeholders</b>	To export in all LLs good practices and successful business models identified so far	WP1 supported by WP5
<b>Increase user adoption</b>	To identify corrective measures for increasing the number of MaaS users	WP4 supported by WP6 and WP3
<b>Create conditions for replication</b>	To identify a set of relevant measures and create a transferability package	WP5 supported by WP6

The next deliverable D5.4 will report about results of this plan, final evaluation and impact achieved by the project.

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