Deliverable D2.2
Demonstration requirements and scenarios C-REL

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Executive Summary

The IP4MaaS project aims to plan and conduct demonstrations in Athens, Barcelona, Liberec, Osijek, Padua, and Warsaw testing technologies developed under the Innovation Programme 4 (IP4) of the Shift2Rail Joint Undertaking.

IP4MaaS adopts an iterative planning process that will enable two iterations of the demonstrations. The two iterations are named, respectively, C-REL (Core Release) and F-REL (Final Release). The IP4MaaS C-REL demonstrations will focus only on the Barcelona, Athens, and Padua demonstration sites.

This document provides:

- A detailed description of the methodology adopted by the IP4MaaS project for the definition of demonstration requirements and scenarios. The methodology, based on the principles of the participatory design, supports: (i) the identification of aim and objectives of each demonstration, highlighting the needs and expectations expressed by the stakeholders involved; (ii) the definition of maps representing clear pictures of current multimodal travel experiences in the demonstration site, highlighting problems and areas for potential improvement; (iii) the definition of another set of maps representing new travel experiences enabled by the integration of IP4 technologies and TSP services, and (iv) the identification of demonstration requirements and scenarios supporting the planning and execution of the IP4MaaS demonstrations.
- The results of the application of the methodology to Barcelona, Athens, and Padua that are the demonstration sites involved in IP4MaaS C-REL demonstrations.
- A preliminary analysis of the other three demonstration sites (i.e., Liberec, Osijek, and Warsaw) that will contribute to the definition of demonstration scenarios for the IP4MaaS F-REL demonstrations.
- The list of Shift2Rail IP4 functionalities that are candidates to be tested by IP4MaaS for C-REL demonstrations for each involved demonstration site.

The C-REL demonstration requirements and scenarios defined in this document will be further analysed within IP4MaaS WP4 to define a comprehensive roadmap towards each IP4MaaS C-REL demonstration. A detailed technology integration plan for C-REL demonstrations will be provided in “D4.1: Technology Integration Plan, C-REL”. Time plan, role assignments, and risks & mitigation measures will be provided in “D4.2: Demonstration Execution Plan, C-REL”.

Abbreviations and acronyms

Abbreviation / Acronym	Description
API	Application Programming Interface
CFM	Calls for Members
CMMP	Contractual Management Market Place
C-REL	Core Release
DoA	Description of Action
DS	Demonstration Scenario
F-REL	Final Release
GA	Grant Agreement
GTFS	General Transit Feed Specification
GTFS - RT	General Transit Feed Specification – Real Time
IP4	Innovation Programme 4
LBE	Location-based Experience
NeTEx	Network Timetable Exchange
OC	Open Call
PP	Pain Point
PRM	Person with Reduced Mobility
PTO	Public Transport Operator
QAC	Quality Assurance Committee
S2R JU	Shift2Rail Joint Undertaking
SIRI	Service Interface for Real-time Information
TC	Travel Companion
TE	Travel Experience
TRL	Technology Readiness Level
TSP	Transport Service Provider
UC	Use Case
W/C/MM	Walking / Cycling / Micro Mobility
WP	Work Package
WPL	Work package leader

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1. Background

The IP4MaaS project aims to advance the uptake of Mobility as a Service (MaaS) schemes by analysing and testing technologies developed under the Innovation Programme 4 (IP4) of the Shift2Rail Joint Undertaking by the complementary projects of IP4MaaS. IP4MaaS will conduct demonstrations in Athens, Barcelona, Liberec, Osijek, Padua, and Warsaw testing IP4 technologies in different contexts and will deliver a solid demonstration execution scheme that can be utilised by other projects.

IP4MaaS adopts an iterative planning process that will enable two iterations of the demonstrations. The two iterations are named, respectively, C-REL (Core Release) and F-REL (Final Release).

More specifically, the present document constitutes the Deliverable D2.2 “Demonstration requirements and scenarios C-REL” in the framework of the WP2, tasks 2.2 and 2.3 of the IP4MaaS project (S2R-OC-IP4-01-2020, GA 101015492). It identifies the C-REL version of demonstration requirements and scenarios to be utilized by the IP4MaaS project. This deliverable also contributes to WP3 and WP4 of the IP4MaaS project, providing requirements and scenarios for planning the first iteration (C-REL) of the IP4MaaS demonstrations.

2. Objective/Aim

This document has been prepared to provide IP4MaaS WP3 and WP4 with requirements and scenarios for planning the first iteration (C-REL) of the IP4MaaS demonstrations. As agreed with the complementary CFM projects MaaSIVE and ExtenSive, to make possible the overall scheduling of integration activities in the Shift2Rail IP4 ecosystems, the IP4MaaS C-REL demonstrations will focus only on the Athens, Padua, and Barcelona demonstration sites.

This document aims to provide:

- a detailed description of the methodology adopted by IP4MaaS for the definition of demonstration requirements and scenarios and the results of its application to the demonstration sites involved in IP4MaaS C-REL demonstrations;
- a preliminary analysis of the other three demonstration sites (i.e., Liberec, Osijek, and Warsaw). This analysis will contribute to the definition of demonstration scenarios for the IP4MaaS F-REL demonstrations that will be reported in D2.3 “Demonstration Scenarios and Requirements F-REL.”

This document aims to provide a first step towards the definition of a comprehensive roadmap for IP4MaaS C-REL demonstrations. The defined C-REL demonstration requirements and scenarios will be further analysed within IP4MaaS WP4 to produce a technology integration plan and an execution plan for each C-REL demonstration.

3. Introduction

IP4MaaS WP2 "Demonstration scenarios definition" aims to define requirements and scenarios for each IP4MaaS demonstration site. Figure 1 depicts tasks, activities, and deliverables included in the WP2. Task 2.1 aims to analyse (i) the technologies that are available in the S2R IP4 ecosystem to support door-to-door multimodal travel and (ii) the services currently offered by Transport Service Providers (TSPs) involved in the project, focusing on the technologies on which they are based. Task 2.1 will release D2.1 "Technology Survey," providing a first map of available assets. Task 2.2 aims to derive a set of requirements for the integration of services offered by IP4MaaS TSPs in the IP4 ecosystem by assessing the technological feasibility and investigating needs and expectations for travellers through interviews with IP4MaaS TSPs. Finally, Task 2.3 aims to analyse current travel experiences (the "AS-IS") and understand how the new technologies can improve them (the "TO-BE") with the final result of defining a set of demonstration scenarios.

A ***demonstration scenario*** is the intersection of a functionality provided by Shift2Rail IP4 solutions (technology innovation) and a given travel service provider (TSP) involved in the IP4MaaS project. Therefore, the demonstration scenarios must be defined for each IP4MaaS demonstration site considering the following aspects:

- the specific objectives of each demonstration site,
- the IP4MaaS TSP partners involved,
- the need of targeting a large number of potential users,
- the IP4 technologies to be demonstrated.

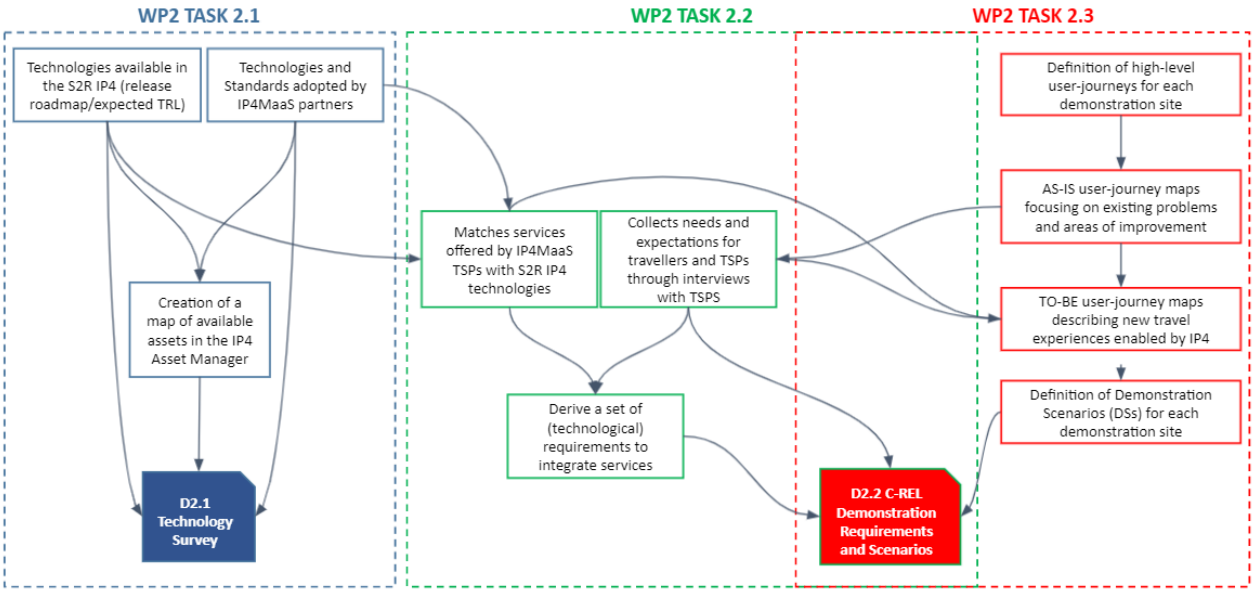


Figure 1 - Overview of WP2 activities and their dependencies.

IP4MaaS adopts an iterative planning process that will enable two iterations of the demonstrations. The two iterations are named, respectively, C-REL (Core Release) and F-REL (Final Release). The present document describes the C-REL results of Task 2.2 and Task 2.3.

As agreed with the complementary CFM projects MaaSIVE and ExtenSive, to make possible the overall scheduling of integration activities in the Shift2Rail IP4 ecosystems, the IP4MaaS C-REL demonstrations will focus only on the Athens, Padua, and Barcelona demonstration sites. A preliminary analysis on the other three IP4MaaS demonstration sites (i.e., Liberec, Osijek, and Warsaw) have been performed, but their demonstration scenarios will be finalised for F-REL demonstrations and reported in D2.3 "Demonstration Scenarios and Requirements F-REL." The reason for postponing the definition of demonstration scenarios is the need to consider new functionalities and tools that are still under development by the ExtenSive project. Moreover, given the project's timeline, it is necessary to consider that the current transportation services of the demonstration sites could change over the following months, influencing the definition of the F-REL demonstration scenarios.

The deliverables is structured as follows: Section 4 describes the 4-steps methodology adopted by IP4MaaS for the definition of demonstration requirements and scenarios. The 4-steps have been applied to the demonstration sites involved in C-REL. The results are reported in Section 5, Section 6, and Section 7 for Barcelona, Athens and Padua, respectively. The application of the first two steps of the methodology resulting in a preliminary analysis of Osijek, Warsaw, and Liberec is reported in Section 8, Section 9, and Section 10, respectively.

Finally, Section 11 provides conclusions, highlighting the Shift2Rail IP4 functionalities that are candidates to be tested by IP4MaaS for C-REL demonstrations.

4. Methodology for the definition of demonstration requirements and scenarios

To define demonstration scenarios in the six demonstration sites of IP4MaaS (Athens, Barcelona, Liberec, Osijek, Padua, Warsaw), IP4MaaS has defined a methodology, based on the principles of the participatory design [1], composed of the following four steps (depicted in Figure 2):

- **DISCOVER the project**: in this phase, the *aim and objectives of the project* are clearly defined, highlighting the needs and expectations expressed by the stakeholders involved. Moreover, knowledge of the demo site and its multimodal transportation system is acquired through the definition of *high-level user journeys* (i.e., a typology of journeys in a demonstration site, identified by a title, described by high-level information, and exemplified by specific user journeys).
- **DEFINE AS-IS scenarios:** adopting an iterative process based on templates and interviews to gather relevant information from the involved stakeholders, a set of *AS-IS user journey maps* is produced. The maps represent a clear picture of current multimodal travel experiences in the demo site, highlighting problems and areas for potential improvement.
- **DESIGN TO-BE scenarios**: a workshop is organized to devise new mobility scenarios and for the participatory design of *TO-BE user journey maps,* which represent new travel experiences enabled by the integration of IP4 technologies and TSP services.
- **DELIVER demonstration scenarios and requirements**: in this phase, the *demonstration requirements and scenarios* are defined as the input to IP4MaaS WP4 and WP5, dealing with the planning and execution of the IP4MaaS demonstrations. A set of demonstration scenarios is defined for each demonstration site by selecting from the TO-BE user journey maps specific travel experiences enabled by IP4 solutions.

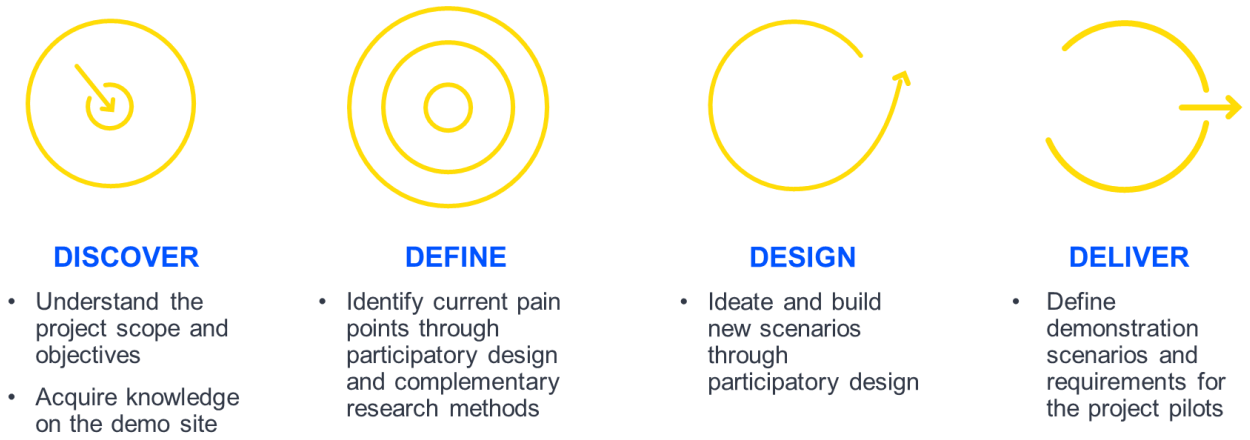


Figure 2 - The methodology for the definition of demonstration scenarios

To enable the application of the aforementioned methodology, the demonstration site leaders have been involved in coordinating the dialogue with the involved TSPs and for the collection of contributions. The *High-level User Journeys* and the *AS-IS User Journey Maps* have been defined through two different templates, respectively described in Section 8.1 and Section 8.2. The *TO-BE User Journey Maps* and the related *Demonstration Scenarios* have been identified through the TO-BE workshop, organised as described in Section 8.3. The demonstration scenarios defined in this document will be further discussed in the following months within WP4 to address potential integration issues and to define the execution plan.

4.1. High-level User Journey Template

As described above, the goal of the first step of the methodology is to identify relevant high-level user journeys that describe typologies of journeys performed by a large pool of users in the demonstration site.
The high-level user journeys have been identified considering the description of the demonstration site in the DoA, the specific objectives mentioned and the constraints (TSPs involved, transportation modes available, etc.).

The description of each high-level user journey is complemented by selecting user journeys, i.e., specific itineraries bounded to specific origins and destinations that are characterized in more detail and guide the following steps of the methodology.

Additional criteria for the selection of the High-level User Journeys are:

- Each IP4MaaS TSP involved in the demo site does not need to be involved in all the high-level user journeys of the demonstration site, but all the TSPs involved in IP4MaaS should be present in at least one high-level user journey.
- At least two specific user journeys (different origin and/or destination) are requested for each high-level user journey. It is advisable to select two user journeys that are not too similar and can be covered using different multimodal transportation alternatives.

The following template has been used to facilitate the collection of information from TSPs for the identification of high-level user journeys and related user journeys.

High-level user journey - Template

Description

- **Title***:* brief title identifying the high-level user journey.
- **Description of the typology of journeys considered**: characteristics describing the journeys that can be associated with the high-level user journey.

- **TSPs involved (IP4MaaS partners/supporting partners)***:* list of the IP4MaaS TSPs (partners/supporting partners) involved in the high-level user journey and description of the offered transportation services.
- **Addressed demonstration site objectives***:* objectives of the demonstration site specified in the IP4MaaS DoW and addressable considering the high-level user journey.
- **Expected target users**: description of the potential target users involved in the high-level user journey.

User Journey

- **Itinerary:** origin and destination of the journey.
- **Most common travel solutions:** description of the most common travel solutions currently adopted by users for the itinerary considering both private vehicles and services offered by all the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).
- **Travel solutions supported by IP4MaaS:** description of the different travel solutions available considering private vehicles and services offered by the TSPs involved in IP4MaaS. It is requested to:
  - Specify for each leg the transportation mode and the TSP that provides the service.
  - Use "W/C/MM" to represent leg covered through Walking/Cycling/usage of Micro-Mobility.
- **Discussion of alternatives:** selection of two travel solutions to focus on considering the areas of potential improvement due to current limitations and pain points.

A blank "High-level User Journey Template" used to perform this step of the methodology is provided in Annex I (Section 13). To better guide this activity and to clarify the requested information, IP4MaaS WP2 provided to the demonstration site leaders: (i) the template initialised considering information from the DoW for the specific demonstration site, and (ii) an example of a filled template related to a demonstration site (i.e., Milan) not included in the IP4MaaS project.

The information collected through this template has been analysed by IP4MaaS WP2 to select the most representative travel solutions to be further analysed in the next step of the methodology.

4.2. AS-IS User Journey Maps Template

The second step of the methodology deals with the definition of AS-IS User Journey Maps, gathering information about the current travel experiences encountered by a user performing the selected travel solutions in the demonstration site. In particular, the objective is related to the identification of the current pain points and areas of potential improvement. Moreover, this step has been structured to contribute also to Task 2.2, collecting needs and expectations for both TSPs and travellers. For C-REL the focus is on the collection of needs and expectations from the TSPs.

The template is structured in the following four sections and each section was requested to be filled for each selected travel solution:

- **Planning**: description of tools/apps for journey planning and booking/buying of tickets and services offered during the travel (e.g., navigation, notification of disruptions) that are currently available for the travel solution.
- **Travel**: description of each leg of the travel solution in terms of current travel experiences (e.g., ticket validation, navigation at the interchange). If multiple transfer points are available for a travel solution, please select a specific itinerary defining starting and ending point of each leg.
- **Current Pain Points**: description of current pain points of the travel solution for both TSPs and travellers related to journey planning, booking/buying of tickets, services offered during the travel, ticket validation and inspection.
- **Target users' needs**: description of specific needs and expectations driven by specific characteristics (i.e., gender, living environment, age, income, professional status, impairment/disability) of travellers performing the travel solution.

Information collected through the template is then validated and discussed during the TO-BE workshop and contributes to WP3 Task 3.2 to collect needs driven by the specific characteristics of the travellers.

AS-IS User Journey Map - Template

The template must be filled for each selected travel solution.

Section 1: Planning

Journey planning

- Specify the tools available (app/website) provided by the TSPs or Transport Authority.
- Specify for each tool if it allows door-to-door journey planning.
- Specify for each tool whether it includes solutions provided by different TSPs.
- Specify for each tool if it provides available times of departure/arrival for each leg of the travel solution computed (scheduled timetables). Specify also if real-time updates are available (delays/cancellations).

Booking and Buying

Considering both tickets for a single trip and subscription, reply to the following questions:

- What tickets can I buy beforehand online? Specify the website/app to buy each ticket.
- Are integrated tickets available? (Mobility packages, MaaS solutions, etc.). If yes, describe what is available.
- Are tickets refundable? If yes, specify how.
- Are there ancillary services that can be booked in advance? (e.g. services for PRM in a station, Wi-Fi/Meal on board,...).
- In which format are the tickets issued by the website/app? (e.g. QR Code, Barcode, numbers sequence).

Services offered during the travel

- Specify for each tool mentioned above if it provides live notifications on disruptions affecting the planned travel (e.g. delays, cancellations).
- Specify for each tool mentioned above if it provides a live navigation/positioning service to help the user during the travel (e.g. notifying when it's time to board or get off of a means of transport).
- Specify for each tool mentioned above if it supports the re-planning and/or re-accommodation after a disruption.

Section 2: Travel

Origin Starting point

Leg *n (Once for each leg)*

- Starting point.
- Ending point.
- Means of transport and TSP.
- Is a separate ticket (not purchasable during the planning) needed? If yes, how to buy it?
- Specify the ticket validation process.
- Specify the ticket inspection process.
- How is the user notified about disruptions affecting this leg?
- What is the average waiting time before the following leg?
- Is there a service of indoor navigation available at the starting/ending point?

Destination Ending Point

Section 3: Current Pain Points

Considering the selected travel solution, it is requested to describe the current pain points and areas of potential improvement related to:

- Journey Planning (e.g., no integrated journey planning involving multiple TSPs, no door-to-door, no timetables for the planned journey, no real-time updates).
- Booking/Buying (e.g., paper-based tickets, no integrated tickets/mobility packages available, no refundability, no additional services available).
- Services offered during the travel (e.g., live navigation not available, notifications of disruption not available, no re-planning, no re-accommodation).
- Ticket validation (e.g. difficulties in finding validation machine, demagnetized ticket/card, multiple validations required, etc.).
- Ticket inspection (e.g. demagnetized card/ticket, multiple inspection mechanism, etc.).
- Other services.

Section 4: Target Users' Needs

This section must be filled with specific needs and/or expectations related to this travel solution, if any, driven by specific characteristics of the travellers. The collected information will be used within Task 3.2 in WP3 to appropriately design the USI (User Satisfaction Index) surveys.

- Needs driven by gender (male, female, other). E.g., Women need security services out of peak hours.
- Needs driven by living environment (rural, suburban urban, abroad/tourist). E.g., translated information for foreign tourists.
- Needs driven by age range (18-24, 25-65, >65). E.g., Reserved seats for people >65.
- Needs driven by income (low, medium, high). E.g., Special discount fares for people with a low income.
- Needs driven by professional status (non-paid work, student, unemployed employed, retired, keeping house/house maker). E.g., Special fares for students/unemployed/retired people.
- Needs driven by travelling with accompanying person (travelling alone, with school-age children 5-16 years, preschool-age children under 5 years old, older relative, disabled person). E.g., Special seats and/or discounted tickets for people travelling with children under 5 y/o.
- Needs driven by impairment/disability (a person on a wheelchair, person with reduced mobility, visual impaired, hearing impaired, other [specify]). E.g., Audible information for visually impaired people, visible information for hearing impaired people.
- Needs driven by being not familiar with technology. E.g., Tutorial videos to get familiar with the travel app.

A blank "AS-IS User Journey Maps Template" used to perform this step of the methodology is provided in Annex II (Section 14). To better guide this activity and to clarify the requested information, IP4MaaS WP2 provided to the demonstration site leaders: (i) the template initialised with information extracted from the defined high-level user journeys, and (ii) an example of a filled template related to a demonstration site (i.e., Milan) not included in the IP4MaaS project.

The information collected through this template have been analysed by IP4MaaS WP2 to produce:

- **AS-IS User Journey Maps** providing a graphical representation of the current travel solutions in the demonstration site, highlighting pain points and areas for potential improvement identified through the template;
- **User Needs Tables** providing a list of TSP/Traveller needs linked to the identified pain points. For each need, an IP4 enabler (i.e., IP4 tools or functionality) is specified.

4.3. TO-BE User Journey Maps - Workshop

The third step of the methodology for the definition of the demonstration scenarios concerns the execution of the TO-BE workshops. Starting from the *AS-IS User Journey Maps* and the *User Needs Table* produced by the previous step, the first version of *TO-BE User Journey Maps* has been produced for each demonstration site before the workshop by IP4MaaS WP2. The *TO-BE User Journey Maps* provide a first description of new travel experiences enabled by IP4 solutions. Each travel experience represents a potential use case for the IP4MaaS demonstrations. These TO-BE maps are preliminary versions defined to stimulate the discussion during the workshop with the involved stakeholders. These maps were analysed, changed, and finalized during the workshop.

Each workshop has been organised by Task 2.3 leader (Cefriel) as a 2-hour telco with all the partners involved in the demonstration site. The agenda of each workshop was the following:

- (30') collaborative session to revise and finalise the AS-IS User Journey Maps using a MIRO Board[1]. The workshop organizer (Cefriel) described the maps and asked the stakeholders to replied to the following questions by writing the response on a post-it and moving it on the map:
  - *Do you agree with the proposed AS-IS Maps?*
  - *Do you want to update/add/remove any specific pain point (PP)?*
- (30') collaborative session to revise and finalise the User Needs Table using a MIRO Board. The workshop organizer (Cefriel) and WP2 leader (PoliMi) described the table with a special focus on the integration of TSP services in the IP4 ecosystem. The stakeholders were asked to reply to the following question by writing the response on a post-it:
  - *Do you want to update/add/remove any TSP/Traveller need?*
- (60') collaborative session for the participatory design of TO-BE User Journey Maps through a MIRO Board. Starting from a first draft of the maps showing the new enabled travel experiences, the participants were asked to collaborate in finalising/changing the maps and to communicate their expectations. The stakeholders were asked to reply to the following question by writing the response on a post-it:
  - *Do you agree with the proposed TO-BE Maps? Do you want to update/add/remove any travel experience (TE)?*
  - *Do you foresee any potential issue concerning the implementation of the travel experiences defined in the TO-BE Maps?*

After the workshops, a final version of AS-IS User Journey Maps, User Needs Tables, and TO-BE User Journey Maps were produced. It is important to note that the TO-BE maps produced by WP2 define the first set of demonstration scenarios that will be further discussed in the following months within WP4 to address potential issues and determine the final execution plan.

[1] www.miro.com

4.4. Demonstration Scenarios and Requirements

The produced TO-BE User Journey Maps have enabled the definition of demonstration scenarios and their requirements for each demonstration site. Each demonstration scenario have been defined by selecting from the TO-BE User Journey Maps a specific travel experience enabled by IP4 solutions, and it has been described as follows:

- **Demonstration scenario ID**: using the form "DS-X-n", where X is the first letter of the demonstration site and n is a sequential number. For example, "DS-B-1" represents the first demonstration scenario of the Barcelona demonstration site;
- **TSP**: TSP involved in the demonstration scenario;
- **IP4 Solution**: IP4 tools or functionalities enabling the demonstration scenario;
- **Demonstration Requirements**: technical requirements that must be fulfilled to enable the demonstration scenario. These requirements have been determined considering the requirements for the integration of TSP services in IP4 solutions provided by the COHESIVE project (summarized in Table 1).

Table 1 - Requirements for the integration of TSP services in IP4 solutions

IP4 Solution	Requirements for the integration of TSP services
Journey Planner / Offer Builder	GTFS files for Public Transport; Service Areas (multi-polygon GeoJSON) and basic mode of transport (car, bike) for Shared mobility; Journey planner web-service (API); Web-service providing fares (API);
Booking	Web-service allowing booking (API)
Issuing	Web-service allowing to issue tickets (API) as QR-code, images, PDF or URL link
Ancillary services	Web-service (API) allowing to: (i) List available services; (ii) Book available services (optional); (iii) Issue available services.
Mobility Packages	Use Shift2Rail operators portal to configure products (must be in NeTEx format) and to build mobility packages.
Validation and Inspection	Means to validate/inspect tickets (i.e., hardware validators or validation apps) to be provided by the TSPs.
Trip Tracking	Web-service (API) providing real time information in TRIAS or GTFS-RT (Only Trip Updates, neither Vehicle position nor Service Alerts) or SIRI-SX
Calculation of alternatives	Integration of IP4 Journey Planner solution

IP4 Solution	Requirements for the integration of TSP services
Location-based Experiences (LBE)	To build location-based experience using IP4 LBE editor
Navigation	Integration of IP4 Journey Planner solution
Traveller's feedback	-
Trip Sharing	Integration of IP4 Journey Planner solution
Group Travelling	Web-service allowing to issue group tickets (API)
Travel Arrangement	Integration of IP4 Journey Planner solution
Travel companion Web-Portal	Integration of IP4 Journey Planner, Booking, Issuing solutions
Guest User	-
Preferences and Profiles	-
Best price optimization	Best price web-service
Commuter detection	Provision of user trips data over a long period
Travel Companion for Kids	Integration of IP4 Journey Planner solution
Asset Manager	Data or web-services to be integrated
CMMP	Products described in the NeTEx format
Business Analytics	Provision of transport data
Trip Tracking CEP configuration	Integration of IP4 Trip Tracking solution
LBE Editor	-
Inspection with fraud control	Integration of IP4 Issuing solution, QR code (UIC or VDV), validation of licence fee.

The requirements defined for each demonstration scenario will be evaluated considering the survey of services offered by IP4MaaS TSPs carried out in Task 2.1 (and described in D2.1 “technology Survey”) within the activities of the Integration Committee (WP4).

5. Barcelona

The demonstration site of Barcelona covers both the urban and suburban areas of Barcelona. In particular, the focus is on travels having as origin or destination the residential areas of Barcelona (e.g., Canet or Arenys) and the medium-sized cities in the metropolitan area of Barcelona such as Matarò, Sabadell, Terrassa, Sant Cugat. The main objective of the demonstrator is to incentivise multi-modal travel and shared modes of transport targeting: (i) users travelling from the same starting point to different destinations in Barcelona, and (ii) users travelling from different starting points to the same destination in the suburban/rural area of Barcelona. On one hand, people going to the same destination in Barcelona could benefit in the first mile of shared rides together with other passengers having a similar starting point and going to different destinations in Barcelona. On the other hand, people working in the same area outside Barcelona could reach through public transport a shared transfer point in Barcelona and benefit from shared rides to reach their destination.

The PTO and TSP involved in the IP4MaaS Barcelona demonstration site are:

- **TMB** (*Transports Metropolitans de Barcelona*) is the main public transport operator operating the metro and several bus lines in the urban metropolitan area of Barcelona.
- **BusUp** is a company providing bus ride-sharing services and on-demand services for commuting in large metropolitan areas. BusUp provides corporates located in suburban/rural areas, usually lacking a suitable public transport offer, with a sustainable and economic means of transport for their employees.
- **SocialCar**: a car-sharing and car renting company operating in Spain. SocialCar allows also private users to share their vehicles as car-sharing vehicles.

The additional IP4MaaS partners involved in the Barcelona demonstration site are SPARSITY (demonstration site leader) and MOSAIC.

5.1. High-level User Journeys

For the IP4MaaS Barcelona demonstration site, two high-level user journeys are defined. This section describes the main information for each high-level user journey extracted to support the following steps of the methodology. The complete *High-level User Journeys Template* for Barcelona is reported in Annex III (Section 15.1).

1st High-level User Journey

- **Title**: **Travelling from a suburban area to the UPC campus in Barcelona**
- ***Description of the typology of journeys considered:*** Passengers travelling from the suburban area (mostly residential) nearby Barcelona to the Universitat Politècnica de Catalunya (UPC). Potential origin can be medium-sized cities (e.g., Matarò, Sabadell, Terrassa, Sant Cugat) or residential areas (e.g., Canet or Arenys).
- ***Expected target users***: commuters (workers, students), participants to conferences/meetings/events hold by UPC.

- ***Selected user journeys***:
  - *Origin*: Sabadell Central station, *Destination*: Les Corts (UPC Campus)
  - *Origin:* Mataró Station, *Destination*: Les Corts (UPC Campus)

2nd High-level User Journeys

- **Title**: **Travelling from Barcelona to suburban industrial areas for work**
- ***Description of the typology of journeys considered:*** Passengers travelling from Barcelona to a suburban area that has an industry or a scientific park. Potential origin can be anywhere in Barcelona and the destination a location that gathers business activity such an industry, a scientific park or an airport located at the surroundings of Barcelona.
- ***Expected target users***: commuters (workers)
- ***Selected user journeys***:
  - *Origin*: Barcelona Area, *Destination*: Martorell (e.g., Seat's premises, Solvay chemistry facilities and factory)
  - *Origin:* Barcelona Area, *Destination*: Sant Cugat del Vallès (Can Sant Joan, Business Area)

For each user journey selected, all the available travel solutions, enabled by PTOs and TSPs involved in IP4MaaS to complete the origin/destination itinerary considered, were identified and discussed (cf. Annex III – Section 15.1). Table 2 reports for each user journey two travel solutions selected by the involved stakeholders considering the areas of potential improvement due to current limitations and pain points.

Table 2 - Barcelona: High-level user journeys and selected travel solutions

High-level User Journeys	User journeys	Travel Solutions
Travelling from a suburban area to the UPC campus in Barcelona *TSP involved*: TMB, BUSUP, Social Car *Expected target users*: commuters (workers, students), participants to conferences/meetings/events hold by UPC.	**Origin**: Sabadell Central station **Destination**: Les Corts (UPC Campus)	Private Car/ Car Sharing (Social Car) → Metro (TMB) → W/C/MM *Transfer Points*: Any Metro station or Sants Estació or Plaça d'Espanya
		W/C/MM → DRT (BusUp) → Metro (TMB) → W/C/MM *Transfer Points*: Sant Andreu Arenal or Sants-Sants Estació
	Origin: Mataró Station **Destination:** Les Corts (UPC Campus)	Private Car/ Car Sharing (Social Car) → Metro (TMB) → W/C/MM *Transfer Points*: Sants or El Clot Aragó
		Private Car/ Car Sharing (Social Car) → Metro (TMB) → DRT (BusUp) → W/C/MM *Transfer Points*: 1. Sagrada Família 2.Mallorca - Marina

High-level User Journeys	User journeys	Travel Solutions
Travelling from Barcelona to suburban industrial areas for work *TSP involved*: TMB, BUSUP, Social Car *Expected target users*: commuters (workers)	**Origin**: Barcelona Area **Destination**: Martorell (and Seat's premises, Solvay chemistry facilities and factory)	W/C/MM → Metro (TMB) → Private Car/ Car Sharing (Social Car) *Transfer Points*: Any Metro station
		W/C/MM → Metro (TMB) → DRT (BusUp) → W/C/MM *Transfer Points*: 1.Sant Andreu Arenal 2. Sants-Sants Estació
	Origin: Barcelona Area **Destination**: Sant Cugat del Vallès (Can Sant Joan, Business Area)	W/MM/C → Bus (TMB) → DRT (BusUp) → W/MM/C *Transfer Points*: Calabria 16, Entença 68, Entença 19, Entença 320, Pg. Sant Juan Bosco 6
		W/MM/C → Metro (TMB) → DRT (BusUp) → W/MM/C *Transfer Points*: Lepant 278, Gran Via de les Corts 814, Bac de Roda 192, Av. Meridiana 274, Av. Meridiana 375, Av. Meridiana/Av. Mossèn Clapés

Considering the travel solutions reported in Table 2, a further selection (orange boxes in the table) is performed to support the discussion and definition of detailed AS-IS and TO-BE maps for each high-level user journey. The criterion for the selection is to pick travel solutions that can be representative of the travel experiences of all the others. For Barcelona, the involved stakeholders selected the following travel solutions to ensure the coverage of all the TSPs involved in IP4MaaS and to analyse the combination of public transport and other transport modes: (i) a travel solution involving SocialCar and the metro service offered by TMB (1st high-level user journey), and (ii) a travel solution involving a bus service offered by TMB and a second bus leg provided by BusUp (2nd high-level user journey).

5.2. AS-IS User Journey Maps

Considering the travel solutions selected from the high-level user journeys template, the involved stakeholders filled the AS-IS user journey maps template describing the current travel experience for a traveller and focusing on current pain points and areas of potential improvement.
In the following paragraphs, we summarise the main information collected through the template. The current paint points identified for the analysed travel solutions are reported in Figure 3. The produced AS-IS User Journey Maps have been checked and validated by the involved stakeholders.

A user can plan a travel solution with TMB app[2] covering a door-to-door journey involving TMB services and some other TSPs. The app provides the available times of departure/arrival, delays or cancellations for the services of TMB. It is possible to obtain personalized notifications if subscribed to the app. The app allows the user to buy a ticket for TMB, however, while ticket buses are fully digital, tickets for the metro needs to be collected at the metro stations[3]. Once the purchase process is completed online, the traveller receives a collection code (voucher) via the website or app screen.
The AMB Mobilitat website/app[4] is also made available for travellers by the Barcelona transport authority and it integrates a higher number of TSPs. The planner includes information from different TSPs of the Barcelona Metropolitan area such as TMB, RENFE, FGC and it covers the following modes: train, metro, bus, tram and bikes. It provides available times of departure/arrival but not delays or cancellations. The app redirects you to the site of the TSPs and then you can buy a ticket if online ticketing is available.

Social Car[5] provides a service to people that want to share their car and/or to people that want to rent a car. The app provides info regarding the availability of the car at a specific location i.e. train station, airport, etc. The app of Social Car allows the user to register and reserve a car. An apparatus placed at the car and facilitated by the mobile app allows access without key also to private shared cars.

BusUp offers services to companies and the app[6] is only available to registered and confirmed users. The company provides a web interface for travellers to register and being confirmed by the company which has a contract with BusUP. BusUp app covers only the routes provided by BusUp's operators, the app shows the routes available for each user and their stops. The user needs to book his seat for BusUP, in some cases, the payment is handled by the company, in other cases, a payment process is performed. QR code and Ultrasonic technology are used in BusUP for ticket validation and/or inspection. BusUP includes notification of disruption and tracking of the vehicle with real-time updates.

[2] https://www.tmb.cat/en/barcelona/applications-downloads/tmb-go
[3] https://www.tmb.cat/en/barcelona-fares-metro-bus/single-and-integrated/purchase-tickets-online
[4] https://www.amb.cat/s/web/mobilitat/mobilitat.html
[5] https://www.socialcar.com/en/how-it-works
[6] https://play.google.com/store/apps/details?id=com.busup.BusUp and

Figure 3 - Barcelona: AS-IS User Journey Maps

5.3. User Needs Table

Considering the pain points highlighted in the AS-IS User Journey Maps, Table 3 defines a set of user needs that can be addressed through IP4 enablers. For each user need the set of current pain points (and related identifiers in the AS-IS Maps) and the involved TSPs are reported.

Table 3 - Barcelona: User Needs Table

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Planner integrating services from different TSPs	TMB, BusUp and SocialCar	SocialCar doesn't provide journey planning (PPA1). A user can not plan a door-to-door journey involving TMB services and services provided by BusUp (PPB1) and Social Car (PPA2). The BusUp app is available only to users working at registered companies, so empty seats cannot be offered to users performing similar travel solutions (PPB2).	Journey Planner / Offer Builder
Plan journeys and notify colleagues/friends of the possibility to share a portion of the trip to reduce the number of private vehicles.	SocialCar	Not possible to share a ride using the SocialCar app (PPA6). No car can be available (PPA4). Difficulties to park (PPA8).	Trip sharing
Definition of Mobility Packages incentivizing the usage of PT and sharing mobility/rides services	TMB, BusUp and SocialCar	Different tickets/subscriptions for TMB public transport services, BusUP rides and/or SocialCar services (PPA5, PPB5)	Mobility Packages / CMMP
Booking/Issuing of car sharing/shared bus rides with the purchase of a PT ticket. Booking/Issuing integrated with journey planning.	TMB, BusUp and SocialCar	Purchase of tickets/subscriptions for TMB public transport services not integrated with booking for BusUP rides and/or SocialCar services (PPA3, PPB3) and with journey planning (PPB4). Different validation mechanisms due to different entitlement (PPB9).	Booking / Issuing

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Issuing of online tickets that can be validated/inspected through an application	TMB	Even if buying a ticket online, a user needs to collect a paper-based ticket to enter the Metro in Barcelona (PPA9, PPA11)	Validation / Inspection
Trip tracking on planned journeys with live notifications	TMB, BusUP	No real-time updates about delays and cancellations on the planned journey. Currently only planned maintenance is reported online, live announcements only at the stations (PPA7, PPB6).	Trip Tracking
Find alternatives in case of disruption on how to reach the starting point of the following leg	TMB, BusUP	In case of disruption, it may be difficult to find an alternative solution combining PT and BusUp (PPB7)	Calculation of alternatives
Navigation during the trip, especially in the interchanges between legs	TMB, BusUP, Social Car	The traveller may have difficulties in finding information on the arrival time of the next leg and/or intermediate stops for a leg (PPA10, PPB8)	Navigation

5.4. TO-BE User Journey Maps

As a result of the TO-BE workshop, the TO-BE User Journey Maps in Figure 4 were defined identifying the possible use cases for the Barcelona demonstration site.

Figure 4 - Barcelona: TO-BE User Journey Maps

The following list summarises the discussion on foreseen issues that emerged during the TO-BE workshop:

- Regarding the implementation of integrated booking/issuing, it may require development activities from the TMB side that cannot be performed within the project.
- Some data and web services (e.g., ticketing web service) are not handled directly by TMB. It needs to be further discussed and accorded how to access it.
- A new way of integrated ticketing for PT will be soon introduced in Barcelona. NFC technology (card or smartphone) will be probably operative for TMB in the next months.
- BusUp core business is related to corporate commuting with specific contracts with companies. It is not possible due to legislation in Spain to sell tickets to customer B2C (need for an entity and private contracts with companies). For the IP4MaaS pilot, BusUp is open to the possibility to allow also external users but the legislation must be considered. To be checked if the IP4MaaS consortium can act as a company.
- TMB QR-based digital tickets are valid only on buses. For the metro, the QR-code is used to collect the tickets from the vending machines. No digital ticket can be validated and inspected on the metro currently (no physical infrastructure available).
- Several questions have been raised by TSPs on the definition of mobility packages. In particular, the need of involving several actors in each company to authorise the sale of a package and on the mechanism to split costs and revenues between the TSPs.
- Some real-time disruptions are not registered by TSPs in their systems so they cannot be provided to the IP4 ecosystem and communicated to the user.

5.5. Demonstration Scenarios and Requirements

The use cases included in the TO-BE User Journey Maps enable the definition of demonstration scenarios for Barcelona by considering the selected IP4 solutions and the involved TSPs. Demonstration scenarios considering the IP4 functionalities *Guest User* and *Preferences/Profiles* are added to the table since they are associated with the usage of other functionalities (e.g., journey planning) through the Travel Companion. Table 4 also reports for each demonstration scenario the related technical requirements.

Table 4 - Barcelona: Demonstration Scenarios and Requirements

Demonstration Scenario	TSP	IP4 Solution	Demonstration Requirements
DS-B-1	TMB	Journey Planner / Offer Builder	GTFS files for TMB Journey planner web-service for TMB (API); Web-service providing fares for TMB (API).
DS-B-2	BusUp	Journey Planner / Offer Builder	GTFS files for BusUp services; Journey planner web-service (API) for BusUp; Web-service providing fares (API) for BusUp.
DS-B-3	SocialCar	Journey Planner / Offer Builder	Service Areas (multi-polygon GeoJSON) and basic mode of transport (car) for Social Car; Web-service providing fares (API) for Social Car. [Optional] Journey planner web-service (API) for SocialCar.
DS-B-4	TMB	Trip sharing	Integration of IP4 Journey Planner solution.
DS-B-5	BusUp	Trip sharing	Integration of IP4 Journey Planner solution.
DS-B-6	SocialCar	Trip sharing	Integration of IP4 Journey Planner solution.
DS-B-7	TMB	CMMP	Description of TMB products (e.g., daily/monthly subscriptions) in NeTEx format.
DS-B-8	BusUp	CMMP	Description of BusUp products in NeTEx format.
DS-B-9	SocialCar	CMMP	Description of SocialCar products in NeTEx format.
DS-B-10	TMB	Mobility Packages	Mobility packages defined through the CMMP.
DS-B-11	BusUp	Mobility Packages	Mobility packages defined through the CMMP.
DS-B-12	SocialCar	Mobility Packages	Mobility packages defined through the CMMP.
DS-B-13	TMB	Booking / Issuing	Booking is not needed for TMB. Web-service allowing to issue tickets (API) as QR-code, images, PDF or URL link.
DS-B-14	BusUp	Booking / Issuing	Web-service allowing booking (API) for BusUp. Web-service allowing to issue BusUp tickets (API) as QR-code, images, PDF or URL link.

Demonstration Scenario	TSP	IP4 Solution	Demonstration Requirements
DS-B-15	SocialCar	Booking / Issuing	Web-service allowing booking (API) for SocialCar. Web-service allowing to issue SocialCar entitlement to access the car (API).
DS-B-16	TMB	Validation / Inspection	Means to validate/inspect tickets (i.e., hardware validators or validation apps) to be provided by TMB.
DS-B-17	BusUp	Validation / Inspection	Means to validate/inspect tickets (i.e., hardware validators or validation apps) to be provided by BusUp.
DS-B-18	TMB	Trip Tracking	Web-service (API) for TMB providing real-time information in TRIAS or GTFS-RT (Only Trip Updates, neither Vehicle position nor Service Alerts) or SIRI-SX
DS-B-19	BusUp	Trip Tracking	Web-service (API) for BusUp providing real-time information in TRIAS or GTFS-RT (Only Trip Updates, neither Vehicle position nor Service Alerts) or SIRI-SX
DS-B-20	TMB	Calculation of alternatives	Integration of IP4 Journey Planner solution.
DS-B-21	BusUp	Calculation of alternatives	Integration of IP4 Journey Planner solution.
DS-B-22	Social Car	Calculation of alternatives	Integration of IP4 Journey Planner solution.
DS-B-23	TMB	Navigation	Integration of IP4 Journey Planner solution.
DS-B-24	BusUp	Navigation	Integration of IP4 Journey Planner solution.
DS-B-25	Social Car	Navigation	Integration of IP4 Journey Planner solution.
DS-B-26	TMB	Traveller's feedback	-
DS-B-27	BusUp	Traveller's feedback	-
DS-B-29	TMB	Guest User	-
DS-B-30	BusUp	Guest User	-
DS-B-31	Social Car	Guest User	-
DS-B-32	TMB	Preferences and Profiles	-

Demonstration Scenario	TSP	IP4 Solution	Demonstration Requirements
DS-B-33	BusUp	Preferences and Profiles	-
DS-B-34	Social Car	Preferences and Profiles	-

6. Athens

The demo site is located within the Athens agglomeration and focuses on main terminal positions of the metro and suburban rail where multiple modes are available. Although multiple transport modes are operating in the area, serving everyday travellers in the agglomeration, there is limited connectivity at the level of the networks and the services to support both tourists and commuters. The main objective of this demonstration scenario is to enhance multimodality by providing integrated services, including all the different TSPs, through a single application that can be used by tourists and commuters. The services should cover (i) trips from central Athens to metro stations outside the city centre for day-to-day work commuters, (ii) trips from touristic hubs such as Port Pireaus or El. Venizelos airport to any other station for tourists, and (iii) trips from rural areas to any other central metro station to cover commercial points for shopping or leisure commuters.

The PTO and TSP involved in the IP4MaaS Athens demonstration site are:

- **OASA**: is the responsible authority for planning, coordinating, and financing the public transport system in the Athens metropolitan area, covering buses, trams, trolleys and metro (3 lines).
- **MIRAKLIO**: is the public transport operator responsible for the buses operating within the Municipality of Heraklion, Attica.
- **BRAINBOX**: is a company offering bike and car-sharing services.
- **TAXIWAY**: is a company providing taxi services.

The additional IP4MaaS partners involved in the Athens demonstration site are CERTH and AETHON.

6.1. High-level User Journeys

For the IP4MaaS Athens demonstration site, the following high-level user journeys are defined in detail. This section describes the main information for each high-level user journey extracted to support the following steps of the methodology. The complete *High-level User Journeys Template* for Athens is reported in Annex III (Section 15.2).

1st High-level User Journey

- **Title**: **Travelling to and from the Northern sector of Athens for work/education (and recreation)**
- ***Description of the typology of journeys considered:*** Passengers travelling from Central Athens to the Northern part of the capital (or vice versa), specifically from and to the Municipality of Iraklio to reach the place of their employment, education, and recreation. For the first case, the potential origin can be the Metro Station of Keramikos, or any other metro station nearby, while, for the second one, the opposite route is chosen, from the Municipality of Iraklio to the centre of the city.
- ***Expected target users***:
    - Commuters, moving around the Athens agglomeration for work, education and/or

leisure purposes.

- ***Selected User journeys***
  - *Origin:* Keramikos station. *Destination:* Manpower employment organization school (OAED) at the Municipality of Iraklio
  - *Origin*: Municipality of Iraklio. *Destination*: Stavros Niarchos Foundation Cultural Center (SNFCC)

2nd High-level User Journey

- **Title**: **Travelling to Kerameikos district (touristic area)**
- ***Description of the typology of journeys considered:*** Passengers, in this case, are tourists arriving or departing to and from a central tourist district in Athens (e.g., Keramikos, Syntagma, Kolonaki, Petralona). Potential transportation hubs that may be considered as origin and destinations include the Port of Piraeus, the El. Venizelos National airport, the railway station St. Larisis. The passenger is not intended to make further trips within the central district as they are considered to hold and carry at least one piece of luggage.
- ***Expected target users***:
  - Passengers arriving and departing from a central district of Athens for touristic purposes.
- ***Selected User journeys***
  - *Origin:* Port of Piraeus. *Destination:* Keramikos metro station and access to accommodation in the Keramikos district.
  - *Origin:* Port of Piraeus. *Destination:* Syggrou-Fix metro station and access to accommodation in the Koukaki district.
  - *Origin:* Keramikos metro station, egress from accommodation in the Keramikos district. *Destination:* El. Venizelos Airport

3rd High-level User Journey

- **Title**: **Travelling to a metro station located in a rural area of Attica**
- ***Description of the typology of journeys considered:*** Passengers travelling from and from the centre of the city of Athens to a metro station located to a (semi) rural area, for different activities, such as work and shopping/leisure.
- ***Expected target users***:
  - Commuters, moving in the Athens agglomeration for work, shopping and/or leisure purposes.
- ***Selected User journeys***
  - *Origin:* Keramikos Metro station. *Destination:* "The Mall Athens"
  - *Origin:* Palaio Faliro (Ag. Alexandrou Sq). *Destination:* N. Heraklion (Central Square near Metro Station Line 1)

For each user journey selected, all the available travel solutions enabled by PTOs and TSPs involved in IP4MaaS to complete the origin/destination itinerary considered, were identified and discussed

(cf. Annex III - Section 15.2). Table 5 reports, for each user journey, the two travel solutions selected by the involved stakeholders considering the areas of potential improvement due to current limitations and pain points.

Table 5 - Athens: High-level user journeys and selected travel solutions

High-level User Journeys	User journeys	Travel Solutions
Travelling to and from the Northern sector of Athens for work/education (and recreation) *TSP involved*: OASA, MIRAKLIO, Taxiway, Brainbox *Expected target users*: Commuters (work, education, leisure)	**Origin**: Keramikos station **Destination**: OAED School (Iraklio)	Taxi (Taxiway) → Metro (OASA) → Local PT service (MIRAKLIO) *Transfer Points:* 1. Keramikos Metro st. 2. Monastiraki metro st. 3. Iraklio metro st.
		Taxi (Taxiway) → Bus (OASA) → Metro (OASA) → Local PT service (MIRAKLIO) *Transfer Points:* 1. Asomaton bus st. 2. Omonoia bus st. (change to metro) 3. Iraklio
	Origin: Municipality of Iraklio (Neo Iraklio) **Destination**: Stavros Niarchos Foundation Cultural Center (SNFCC)	Taxi (Taxiway) → Metro (OASA) → Bus (OASA) → C/Electric Car (shared=Brainbox) *Transfer Points:* 1. Iraklio metro st. 2. Faliro metro st. 3. Faliro bus st. 4. Peisistratus bus st.
		Local PT service (MIRAKLIO) → Metro (OASA) → Bus (OASA) → Taxi (Taxiway) *Transfer Points:* 1. Iraklio metro st. 2. Attiki metro st. 3. Suggrou fix metro st. 4. Onasio bus st.
Travelling to Kerameikos district (touristic area) *TSP involved*: OASA, MIRAKLIO, Taxiway, Brainbox, Welcome pickups *Expected target users*: Tourists	**Origin**: Port of Piraeus **Destination**: Keramikos metro station	W → Metro (OASA) → Taxi (Taxiway) *Transfer Points: -*
		W → Bus (OASA) → Metro (OASA) → Taxi (Taxiway) *Transfer Points:* 1. Nikaia metro station
	Origin: Port of Piraeus **Destination**: Syggrou-Fix metro station	W → Metro (OASA) → Taxi (Taxiway) *Transfer Points:* 1. Petralona
		Taxi (Taxiway) → Metro (OASA) → Metro (OASA) → Taxi (Taxiway) *Transfer Points:* 1. Nikaia 2. Syntagma 3. Syggrou-fix
	Origin: Keramikos Metro station **Destination**: El. Venizelos Airport	W/C(shared=Brainbox) → Metro (OASA) → Bus (OASA) → W *Transfer Points:* 1. Syntagma bus station
		Taxi (Taxiway) → Bus (OASA) → W *Transfer Points:* 1. Syntagma bus station

High-level User Journeys	User journeys	Travel Solutions
Travelling to a metro station located in a rural area of Attica *TSP involved*: OASA, Taxiway, Brainbox *Expected target users*: Commuters (work/leisure)	**Origin**: Keramikos Metro station **Destination**: The Mall Athens	W → Metro (OASA) → W/C/Electric car (shared=Brainbox) *Transfer Points:* 1. Omonoia metro st. 2. Neratziotisa metro st.
		W/C/Electric car (shared=Brainbox) → Metro (OASA) → Bus (OASA) → W/C/Electric car (shared=Brainbox) *Transfer Points:* 1.Keramikos metro st. 2.Evangelismos metro st. 3.Ethniko idryma ereynon bus st. 4.OTE bus st.
	Origin: Palaio Faliro (Ag. Alexandrou Sq) **Destination**: N. Heraklion (Central Square near Metro Station Line 1)	W/C(shared=Brainbox) → Metro (OASA) → Taxi (Taxiway) → W/C (shared=Brainbox) *Transfer Points:* 1. Tram Stop or Taxi 2. Faliro Metro St.
		W/C(shared=Brainbox) → Bus (OASA) → Metro (OASA) → Taxi (Taxiway) *Transfer Points*: 1. Tram Stop or Taxi 2. Faliro Metro St.

Considering the travel solutions reported in Table 1, a further selection (orange boxes in the table) is performed to support the discussion and definition of detailed AS-IS and TO-BE maps for each high-level user journey. The criterion for the selection is to pick travel solutions that can be representative of the travel experiences of all the others.
For Athens, the following travel solutions are selected:

- A travel solution involving Taxiway, the metro service offered by OASA and the local PT service managed by MIRAKLIO (1st high-level user journey);
- A travel solution involving bike/car sharing services offered by Brainbox paired with both a bus and a metro leg covered by OASA (2nd high-level user journey);
- A travel solution with two different metro legs, both covered by OASA, and the option of using Brainbox car or bike-sharing services to cover the last mile (3rd high-level user journey).

6.2. AS-IS User Journey Maps

Considering the travel solutions selected from the high-level user journeys template, the involved stakeholders completed the AS-IS user journey maps template. The collected information is summarised in this section and the current paint points identified are reported in Figure 5 and Figure 6. The produced AS-IS User Journey Maps have been checked and validated by the involved stakeholders.

OASA telematics website or app allows the user to plan a journey using metros and trams starting and ending at two different stations, hence not covering the door-to-door part. The app also provides information about the exact time of the vehicle's (bus) arrival at the bus stop and the vehicle's position on the network. Alternatively, through Google Transit, a user can plan a journey using all means of Public Transport and including potential walking parts.
OASA only supports digital tickets through physical contactless smartcard: the ATH.ENA Card, which can also be ordered online and delivered home. The digital tickets can be purchased at stations or online; the loading of the tickets on the Athena card can be done at the stations, at automatic vending machines, or through the Athena card mobile application. The validation of the ticket is only carried out using NFC technology, thus currently only available for holders of the ATHENA card.

Taxiway offers a dispatching services app and website through which the users can plan the trip, book it, and request additional services (e.g., child seats, a vehicle for PRM). The app also provides the estimated time of arrival of the taxi at the starting point as well as the expected time of arrival at the customer's destination. Any disruption in the service is also pushed to the customer through this platform.

Brainbox includes different apps that offer car or bike-sharing services. Through these apps, the user can pre-book a car or bike and start the rental process. The rental is possible only for registered users for legal liability reasons. The app provides navigation to reach the desired bike or car and the user is also notified, during the rental/travel, for the current duration of the usage of the service and the active cost of the rental. The usage is paid through the e-wallet of the mobile application; the e-wallet is topped up by the user whenever he/she considers it appropriate through debit/credit card.

MIRAKLIO's planning service is currently under development. The Public Transport service does not require tickets.

Figure 5 - Athens: AS-IS User Journey Map A

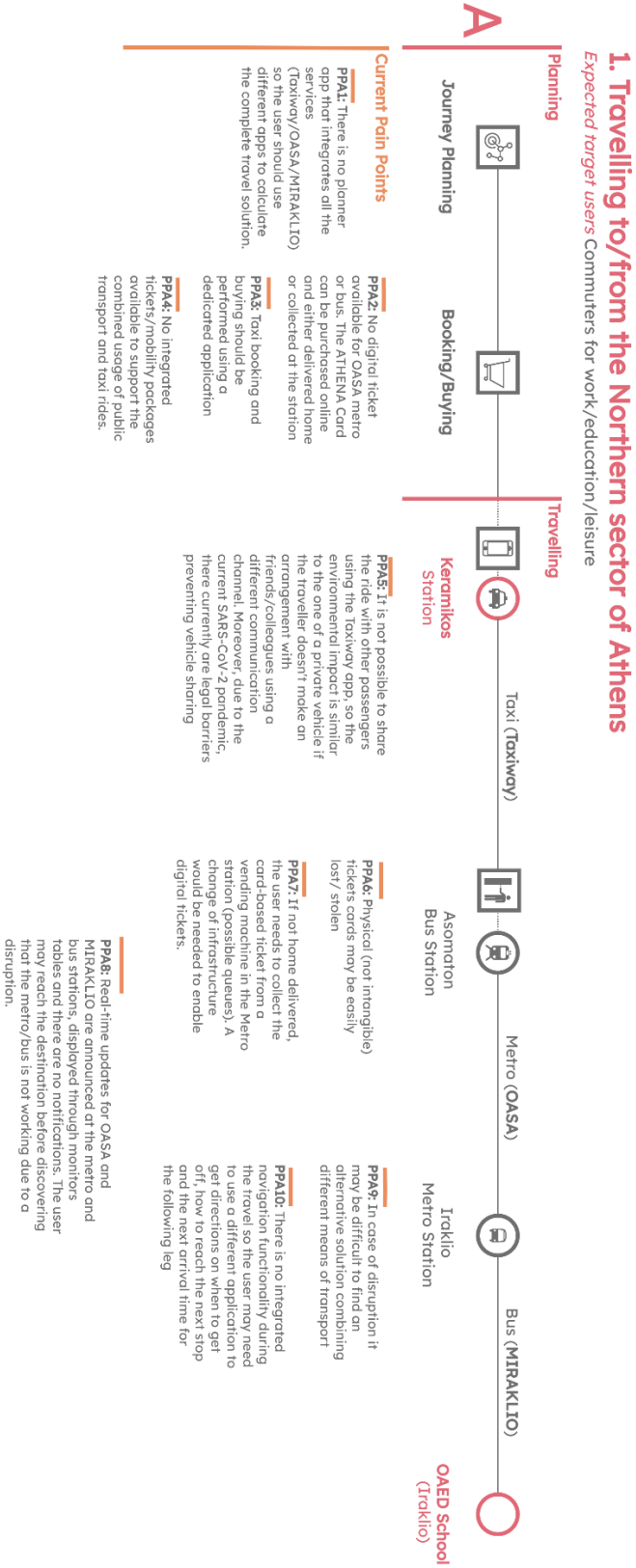
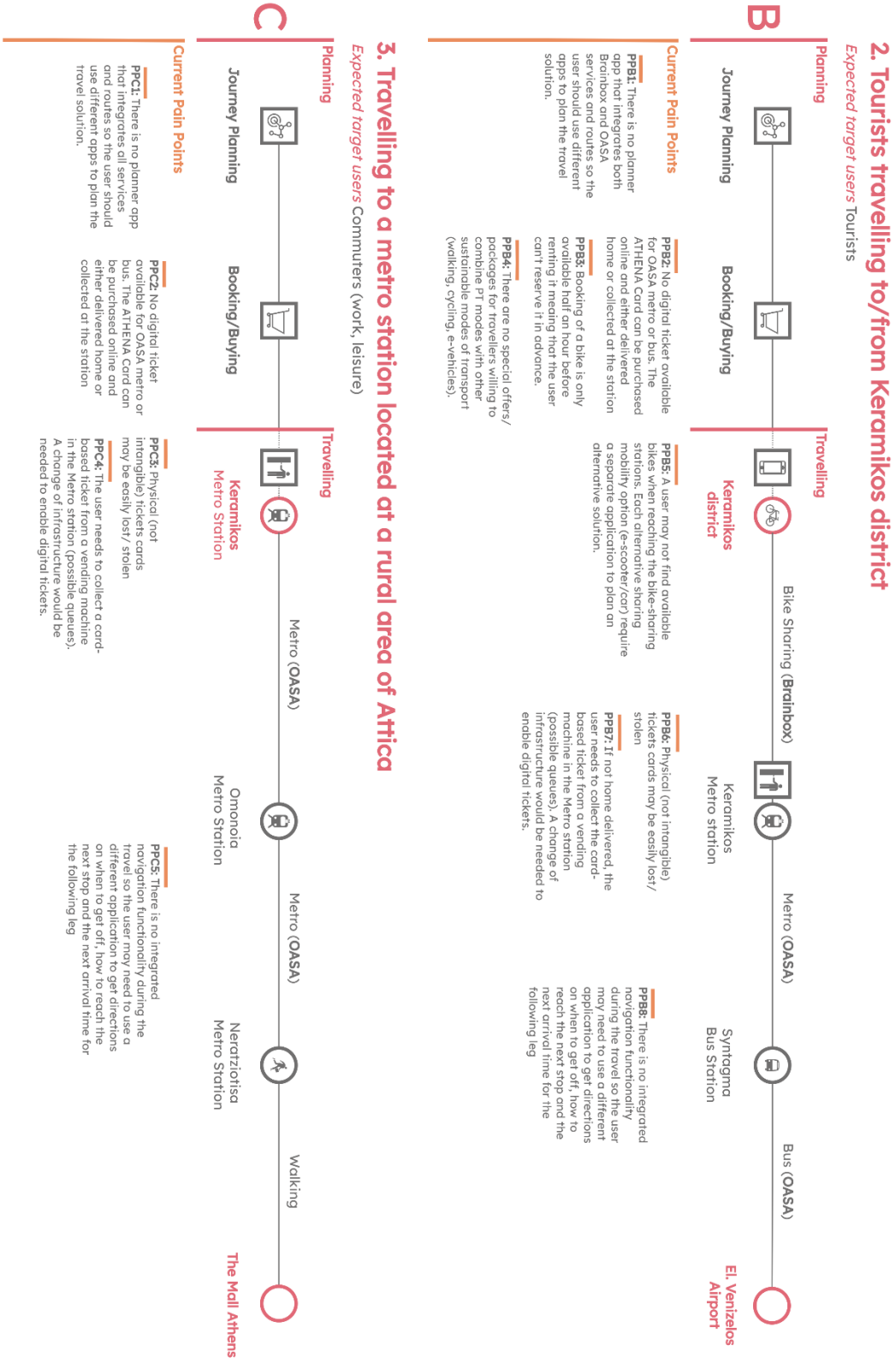


Figure 6 - Athens: AS-IS User Journey Maps B and C



6.3. User Needs Table

Considering the pain points highlighted in the AS-IS User Journey Maps, Table 6 defines a set of user needs that can be addressed through IP4 enablers. For each user need, the set of current pain points (and related identifiers in the AS-IS Maps) and the involved TSPs are reported.

Table 6 - Athens: User Needs Table

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Planner integrating services from different TSPs	OASA, Brainbox, Taxiway, Miraklio	A user needs to access different platforms to plan a journey involving different means/TSPs (PPA1, PPB1, PPC1)	Journey Planner / Offer Builder
Live notifications with real-time updates	OASA, Taxiway, Miraklio	The user may reach the destination before discovering that the metro/bus is not working due to a disruption (PPA8)	Trip Tracking
Find alternatives on the go in case of disruptions. (Replanning services)	OASA, Taxiway, MIRAKLIO	In case of disruption, it may be difficult to find an alternative solution combining different means of transport (PPA9)	Calculation of alternatives
Online digital tickets issuing and management	OASA, Brainbox, Taxiway	The user needs to buy the ATHENA Card at the station or wait for it to be delivered home (PPA2, PPB2, PPC2). A physical card might be stolen or lost (PPA6, PPB6, PPC3), even if with a personalized ATHENA Card the value is restored. A change of infrastructure would be needed to enable QR-code based digital tickets (PPA7, PPB7, PPC4). For Taxiway and Brainbox, the user needs to use a dedicated app to book a ride. (PPA3, PPB3).	Booking / Issuing
Plan journeys and notify colleagues/friends of the possibility to share a portion of the trip to reduce the number of private vehicles.	Taxiway, Brainbox	Not possible to share a ride using the Taxiway or Brainbox app (PPA5). No car or bike can be available (PPB5).	Trip sharing

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Navigation during the trip	OASA, MIRAKLIO	The traveller may not know when to get off the mean of transport and what's the next arrival time for the following leg (PPA10, PPB8, PPC5)	Navigation
Mobility packages that integrate all TSPs	OASA, Brainbox, Taxiway, Miraklio	There are no integrated tickets/mobility packages available to support the combined usage of public transport and taxi/bike/car rides. (PPA4, PPB4)	Mobility Packages / CMMP

6.4. TO-BE User Journey Maps

As a result of the TO-BE workshop, the TO-BE User Journey Maps in Figure 7 and Figure 8 were defined identifying the possible use cases for the Athens demonstration site.

Figure 7 - Athens: TO-BE User Journey Map A

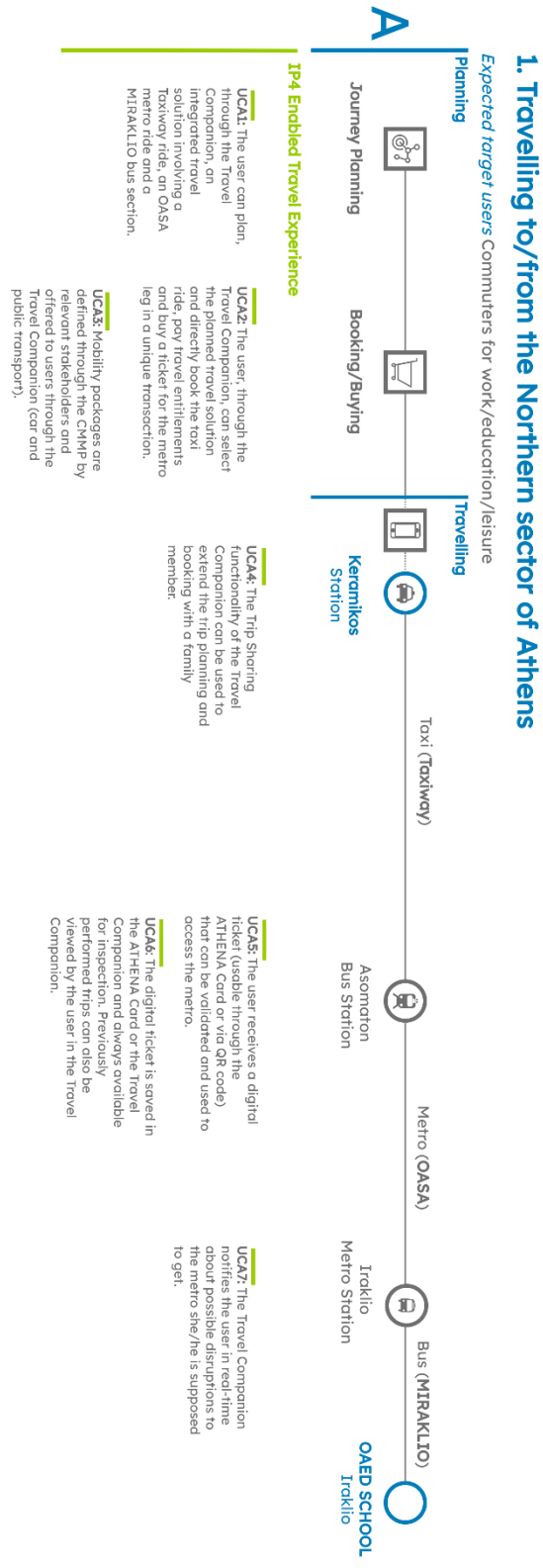
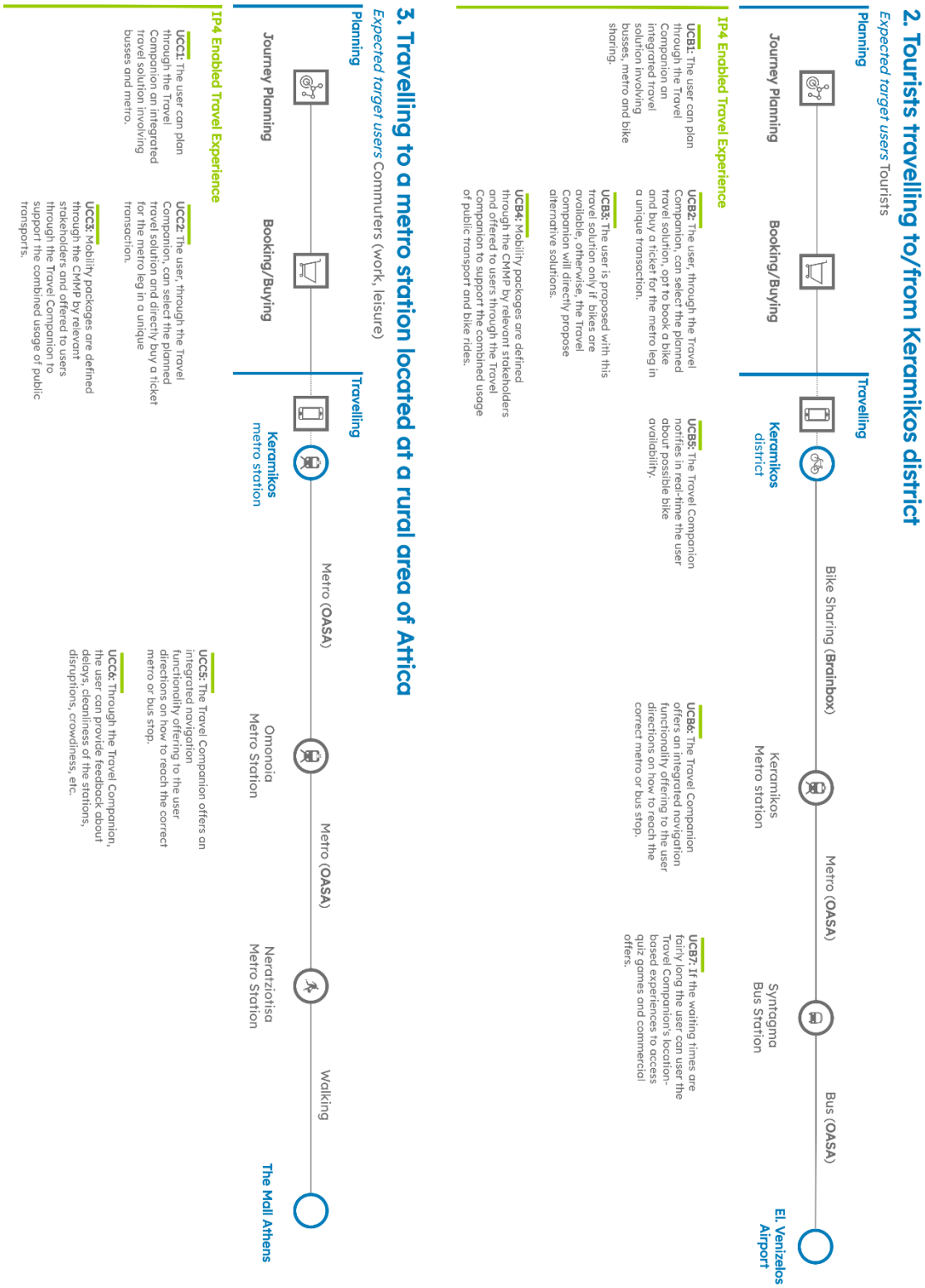


Figure 8 - Athens: TO-BE User Journey Maps B and C



The following list summarises the discussion on foreseen issues that emerged during the TO-BE workshop:

- Mobility packages should be elaborated before configuration by considering various business objectives and using data analysis (neutral data analytics tool by CERTH)
- The absence of an existing digital ticket solution according to the project specifications for some services is a key issue in integrating various travel entitlements of the TSPs. In fact, the migration from smart card-based ticketing of OASA to QR code or relevant digital solution may be costly and not feasible due to existing contractual restrictions (i.e. the existing Athena card system runs under a multi-year, active PPP contract). A potential solution could be to maintain the Athena card and integrate it with the TC solution especially at mobile application level. With this approach, the digital tickets could be bought through the TC and then loaded on Athena card through NFC protocol.
- QR code is not a feasible solution for bikes since the current system works vice-versa, having the user scan a QR code placed on the bike to unlock the bike and start the rental process.
- The bike sharing payment model is based on topping up an e-wallet. Depending on the actual bike usage the application deducts value from the e-wallet.
- Bike sharing use is only possible for registered end users. This is because of the liability of the user for damages/theft/vandalism of the bikes.
- Regarding journey planning for bikes, information regarding live availability and battery level should be provided. It should also be noted that bikes are only bookable for up to one hour before the renting begins.
- The current legal framework does not allow taxi sharing if not from the same family due to the COVID-19 pandemic.
- Some real-time disruptions are not registered. Overall real-time disruption notifications, especially for OASA, is currently not feasible.

6.5. Demonstration Scenarios and Requirements

The use cases included in the TO-BE User Journey Maps enable the definition of demonstration scenarios for Athens by considering the selected IP4 solutions and the involved TSPs. Demonstration scenarios considering the IP4 functionalities *Guest User* and *Preferences/Profiles* are added to the table since they are associated with the usage of other functionalities (e.g., journey planning) through the Travel Companion. Table 7 reports for each demonstration scenario the related technical requirements.

Table 7 - Athens: Demonstration Scenarios and Requirements

Demonstration Scenario	TSP	IP4 Solution	Demonstration Requirements
DS-A-1	OASA	Journey Planner / Offer Builder	GTFS files for OASA services; Journey planner web-service (API) for OASA; Web-service providing fares (API) for OASA.
DS-A-2	MIRAKLIO	Journey Planner / Offer Builder	GTFS files for MIRAKLIO services; Journey planner web-service (API) for MIRAKLIO;
DS-A-3	BrainBox	Journey Planner / Offer Builder	Service Areas (multi-polygon GeoJSON) and basic mode of transport (bike) for BrainBox; Web service for real time location, battery level and availability of bikes [Under development]
DS-A-4	Taxiway	Journey Planner / Offer Builder	Service Areas (multi-polygon GeoJSON) and basic mode of transport (car) for Taxiway; Web-service providing estimation of fares (API) for Taxiway.
DS-A-5	OASA	Booking / Issuing	Web-service allowing to issue OASA tickets (API) as QR-code, images, PDF or URL link.
DS-A-6	Taxiway	Booking / Issuing	Web-service allowing to book a taxi (API).
DS-A-7	Brainbox	Booking / Issuing	Web-service allowing to reserve a shared vehicle (for one hour) (API).
DS-A-8	Taxiway	Trip sharing	Integration of IP4 Journey Planner solution.
DS-A-9	BrainBox	Trip sharing	Integration of IP4 Journey Planner solution.
DS-A-10	OASA	CMMP	Description of OASA products (e.g., daily/monthly subscriptions) in NeTEx format.
DS-A-11	Brainbox	CMMP	Description of Brainbox products in NeTEx format.
DS-A-12	Taxiway	CMMP	Description of Brainbox products in NeTEx format.
DS-A-13	OASA	Mobility packages	Mobility packages defined through the CMMP.
DS-A-14	Brainbox	Mobility packages	Mobility packages defined through the CMMP.
DS-A-15	Taxiway	Mobility packages	Mobility packages defined through the CMMP.
DS-A-16	OASA	Navigation	Integration of IP4 Journey Planner solution.

Demonstration Scenario	TSP	IP4 Solution	Demonstration Requirements
DS-A-17	MIRAKLIO	Navigation	Integration of IP4 Journey Planner solution.
DS-A-18	MIRAKLIO	Trip Tracking	Web-service (API) for MIRAKLIO providing real-time information in TRIAS or GTFS-RT (Trip Updates, neither Vehicle position nor Service Alerts) or SIRI-SX
DS-A-19	Taxiway	Trip Tracking	Web-service (API) for Taxiway providing real-time information about the vehicle's current position.
DS-A-20	Brainbox	Validation & Inspection	Means to validate issued travel entitlements
DS-A-21	OASA	Calculation of Alternatives	Integration of IP4 Journey Planner solution.
DS-A-22	MIRAKLIO	Calculation of Alternatives	Integration of IP4 Journey Planner solution.
DS-A-23	Taxiway	Calculation of Alternatives	Integration of IP4 Journey Planner solution.
DS-A-24	Brainbox	Calculation of Alternatives	Integration of IP4 Journey Planner solution.
DS-A-25	OASA	Location based experiences	Availability location-based experience created using LBE editor
DS-A-26	MIRAKLIO	Location based experiences	Availability location-based experience created using LBE editor
DS-A-27	Taxiway	Location based experiences	Availability location-based experience created using LBE editor
DS-A-28	OASA	LBE Editor	-
DS-A-29	MIRAKLIO	LBE Editor	-
DS-A-30	Taxiway	LBE Editor	-
DS-A-31	MIRAKLIO	Guest User	-
DS-A-32	Taxiway	Guest User	-
DS-A-33	Brainbox	Guest User	-
DS-A-34	OASA	Guest User	-
DS-A-35	OASA	Preferences and Profiles	-
DS-A-36	MIRAKLIO	Preferences and Profiles	-
DS-A-37	Taxiway	Preferences and Profiles	-
DS-A-38	Brainbox	Preferences and Profiles	-
DS-A-39	OASA	Traveller's feedback	-
DS-A-40	MIRAKLIO	Traveller's feedback	-

7. Padua

This demo site is located within the geographical area surrounding Padua, focusing on rural and suburban areas, and targeting workers and students in their daily commuters. The main objective of this demonstration scenario is to improve mobility planning while offering to the customers different multimodal services by enhancing the management services of the FSI Group. These multimodal services need to be made available to customers by assimilating all mobility options within the Padua area into mobility packages centred around the specific requirements of the citizens, with the final goal of connecting urban and rural areas through multimodal mobility services.

FST (Demonstration Site Leader), a technology company fully owned by FSI Group, is involved in the IP4MaaS Padua demonstration site to foster the integration of the following operators:

- ***Trenitalia***: national train operator
- ***BusItalia Veneto***: bus operator in the Veneto region

The additional IP4MaaS partners involved in the Padua demonstration site are Cefriel, POLIMI and FIT.

7.1. High-level User Journeys

For the IP4MaaS Padua demonstration site, two high-level user journeys are defined. This section describes the main information for each high-level user journey extracted to support the following steps of the methodology. The complete *High-level User Journeys Template* for Padua is reported in Annex III (Section 15.3).

For the Padua demonstration site, the selection of the high-level user journeys has been carried out with the following additional criteria:

- itineraries offering multimodal travel solutions with at least one leg to be made with train (as the backbone of multimodal trips);
- itineraries with sufficient service offer on a daily schedule so that it is possible to arrange a complete travel solution with reasonable travel time;
- itineraries suitable for the target users, be they workers or students (e.g., arrival at Venice University Campus by 9 AM, etc.).

1st High-level User Journey

- **Title**: **Travelling to Venice University (Ca' Foscari)**
- ***Description of the typology of journeys considered:*** Travelling from a town in the rural area surrounding Padua to the University of Venice (Ca' Foscari) Campus.
- ***Expected target users***: Commuters (workers, students)
- ***Selected User Journeys***

- *Origin:* Montegalda. *Destination:* Venice Ca' Foscari University Campus.
- *Origin:* Torri di Quartesolo. *Destination:* Venice Ca' Foscari University Campus.

2nd High-level User Journey

- **Title**: **Travelling home from Arcella to the Padua rural area**
- ***Description of the typology of journeys considered:*** Commuters working within the sub-urban area of Padua (Arcella) and travelling back home in a small town in the rural area.
- ***Expected target users***: Commuters (workers, students)
- ***Selected User Journeys***
  - *Origin:* Arcella, *Destination:* Trebaseleghe.
  - *Origin:* Arcella, *Destination:* Camposampiero.

For each user journey selected, all the available travel solutions enabled by PTOs and TSPs involved in IP4MaaS to complete the origin/destination itinerary considered, were identified and discussed (cf. Annex III - Section 15.3). Table 8 reports, for each user journey, the two travel solutions selected by the involved stakeholders considering the areas of potential improvement due to current limitations and pain points.

Table 8 - Padua: High-level user journeys and selected travel solutions

High-level User Journeys	User journeys	Travel Solutions
Travelling to Venice University (Ca' Foscari) *TSP involved*: Trenitalia, Busitalia Veneto *Expected target users*: commuters (workers, students)	**Origin**: Montegalda **Destination**: Venice Ca' Foscari University Campus	Bus (BusItalia) → Train (Trenitalia) → Walking *Transfer Points*: 1. Padua central station 2. Venice St. Lucia
		Private car/Ridesharing → Train (Trenitalia) → Walking *Transfer Points*: 1. Padua central station 2. Venice St. Lucia
	Origin: Torri di Quartesolo **Destination**: Venice Ca' Foscari University Campus	Bus (BusItalia) → Train (Trenitalia) → Walking *Transfer Points*: 1. Padua central station 2. Venice St. Lucia
		Private car/Ridesharing → Train (Trenitalia) → Walking *Transfer Points*: 1. Padua central station 2. Venice St. Lucia

High-level User Journeys	User journeys	Travel Solutions
Travelling home from Arcella to Padua rural area *TSP involved*: Trenitalia, Busitalia Veneto *Expected target users*: commuters (workers)	**Origin**: Arcella **Destination**: Trebaseleghe	Train (Trenitalia) → Train (Trenitalia) → Walking *Transfer Points*: 1. Castelfranco Veneto
		Bus (BusItalia) → Train (Trenitalia) → Walking *Transfer Points*: 1. Piombino Dese
	Origin: Arcella **Destination**: Camposampiero	Walking → Train (Trenitalia) → Walking *Transfer Points*: 1. Padua Central station 2. Camposampiero station

Considering the travel solutions reported in Table 8, a further selection (orange boxes in the table) is performed to support the discussion and definition of detailed AS-IS maps for each high-level user journey. The criterion for the selection is to pick travel solutions that can be representative of the travel experiences of all the others. For Padua, the involved stakeholders selected the following travel solutions to ensure the coverage of all the TSPs involved in IP4MaaS considering both the rural and suburban area around Padua: (i) a travel solution involving a bus leg by BusItalia and a train service offered by Trenitalia to reach Venice (1st high-level user journey), and (ii) a similar travel solution with bus and train from the suburban area of Padua (2nd high-level user journey).

7.2. AS-IS User Journey Maps

Considering the travel solutions selected from the high-level user journeys template, the involved stakeholders completed the AS-IS user journey maps template. The collected information is summarised in this section and the current paint points identified are reported in Figure 9. The produced AS-IS User Journey Maps have been checked and validated by the involved stakeholders.

A user can plan a travel solution by train using the Trenitalia website[7] or app, the journey planning offers only train options by Trenitalia from station to station and it is not door-to-door. The

[7] https://www.trenitalia.com/

BusItalia Veneto website/app[8] can be used to plan a travel solution by bus, it offers only bus options by BusItalia and it doesn't cover the first and last mile. The Nugo website/app[9] integrates several TSPs including Trenitalia and BusItalia and offers a door-to-door journey planning service.

The Trenitalia app\website provides info about delays (if more than 15 minutes) and real-time updates if notifications are enabled on a train service, the BusItalia app/website does not. Nugo app provides train trip monitoring for Trenitalia solutions.

Live navigation information (current/next stops) is currently available only on legs provided by Trenitalia.

Digital train tickets are purchasable online from the Trenitalia website\app, digital bus tickets from the BusItalia Veneto app (not from the website) and the DropTicket[10] website/app. Different transport modes tickets are displayed on Nugo website\app (one for each TSP involved in the planned travel solution), and some travel solutions can be purchased on Nugo app. Digital tickets are composed of a QR Code and sequence number for Trenitalia and BusItalia Veneto, and they do not need to be validated. BusItalia single tickets have a time validity, they can be purchased and validated before onboarding.
Monthly passes can be purchased online but they need to be validated in the train station using the physical machine.

It is not possible to book ancillary services in advance, purchasing meal service is only available onboard for Trenitalia.

Trenitalia and BusItalia website\app don't provide integrated tickets\mobility packages. Integrated tickets (bus by BusItalia and train by Trenitalia) are available only on specific extra-urban lines for Chioggia Sottomarina and Cortina d'Ampezzo and can be purchased on the Trenitalia website[11] (FrecciaLink service[12]).

The Trenitalia platform allows the user to change the travel solution before departure time. If the train or bus service is cancelled, single tickets can be refunded/re-accommodated, but the process is manual and the user needs to go/write to Trenitalia or BusItalia Veneto stations\info point (under the normal commercial condition of a single operator).

[8] https://www.mycicero.it/BUSITALIAVENETO-PD/TPWebPortal/
[9] https://www.nugo.com/nugoweb/
[10] https://www.dropticket.it/
[11] (In Italian) https://www.fsbusitalia.it/content/fsbusitalia/it/turismo/programma-il-tuo-viaggio-2021/chioggia-sottomarina-link.html and https://www.trenitalia.com/it/treni_regionali/veneto/cortina-link.html
[12] FrecciaLink service offers integrated travel solution with train and bus, mainly for touristic destinations and during the summer season. (In Italian) https://www.trenitalia.com/it/le_frecce/servizio_freccialink.html

Figure 9 - Padua: AS-IS User Journey Maps

7.3. User Needs Table

Considering the pain points highlighted in the AS-IS User Journey Maps, Table 9 defines a set of user needs that can be addressed through IP4 enablers. For each user-need, the set of current pain points (and related identifiers in the AS-IS Maps) and the involved TSPs are reported.

Table 9 - Padua: User Needs Table

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Multimodal door-to-door journey planning integrating bus and train legs to/from the suburban area around Padua.	Trenitalia, BusItalia	A user needs to access different platforms to plan a journey involving different means/TSPs (PPA1, PPB1)	Journey Planner / Offer Builder
Plan journeys and notify colleagues/friends about them	Trenitalia, BusItalia	Incentivize the use of PT to reduce the number of private vehicles (PPB2)	Trip sharing
Definition of Mobility Packages incentivizing the usage of PT	Trenitalia, BusItalia	Different tickets/subscriptions for BusItalia and Trenitalia (PPA4, PPB4). No integrated solution to reach/leave rural/suburban areas. No incentives (e.g. parking) to promote PT (PPB4).	Mobility Packages / CMMP
Booking/issuing of integrated tickets Trenitalia and BusItalia.	Trenitalia, BusItalia	Purchase of tickets/subscriptions for Trenitalia not integrated with booking for BusItalia (PPA2, PPB3). Different entitlement in different applications (PPA7, PPB8).	Booking / Issuing
Book and purchase ancillary services (e.g. meal on board) in advance.	Trenitalia	It is possible to buy ancillary services only directly on the train (PPA3)	Ancillary Services

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Trip tracking on planned journeys with live notifications	Trenitalia, BusItalia	A user would like to have real-time updates about delays and cancellations on the planned journey (PPA5, PPB5)	Trip Tracking
Find alternatives in case of disruption.	Trenitalia, BusItalia	In case of disruption it may be difficult to find an alternative solution combining Trenitalia and BusItalia (PPA6, PPB6)	Calculation of Alternatives
Navigation during the trip	Trenitalia, BusItalia	The traveller may not know when to get off and the arrival time for the next leg (PPB7)	Navigation

7.4. TO-BE User Journey Maps

As a result of the TO-BE workshop, the TO-BE User Journey Maps in Figure 10 were defined identifying the possible use cases for the Padua demonstration site.

The following list summarises the discussion on foreseen issues that emerged during the TO-BE workshop:

- GTFS files are not available for Trenitalia, but equivalent information can be retrieved using the PICO platform of Trenitalia.
- Ticketing for BusItalia is handled by a third party. Only the integrated tickets for Chioggia Sottomarina and Cortina d'Ampezzo (FrecciaLink service) can be purchased through Trenitalia. It needs to be further discussed and accorded how to access it.
- Trip tracking is available on the website www.viaggiatreno.it only for trains. Access to APIs is not provided by the PICO platform of Trenitalia and should be requested. BusItalia does not provide real-time information for its services.
- Ancillary services cannot be currently booked in advance, no web service is available through the PICO platform of Trenitalia.

Figure 10 - Padua: TO-BE User Journey Maps

7.5. Demonstration Scenarios and Requirements

The use cases included in the TO-BE User Journey Maps enable the definition of demonstration scenarios for Padua by considering the selected IP4 solutions and the involved TSPs. Demonstration scenarios considering the IP4 functionalities *Guest User* and *Preferences/Profiles* are added to the table since they are associated with the usage of other functionalities (e.g., journey planning) through the Travel Companion. Table 10 reports for each demonstration scenario the related technical requirements.

Table 10 - Padua: Demonstration Scenarios and Requirements

Demonstration Scenario	TSP	IP4 Solution	Demonstration Requirements
DS-P-1	Trenitalia	Journey Planner / Offer Builder	GTFS files for Trenitalia services; Journey planner web-service (API) for Trenitalia; Web-service providing fares (API) for Trenitalia.
DS-P-2	Busitalia	Journey Planner / Offer Builder	GTFS files for Busitalia services; Journey planner web-service (API) for Busitalia; Web-service providing fares (API) for Busitalia.
DS-P-3	Trenitalia	Trip sharing	Integration of IP4 Journey Planner solution.
DS-P-4	Busitalia	Trip sharing	Integration of IP4 Journey Planner solution.
DS-P-5	Trenitalia	Group Travelling	Web-service allowing to issue group tickets (API)
DS-P-6	Busitalia	Group Travelling	Web-service allowing to issue group tickets (API)
DS-P-7	Trenitalia	CMMP	Description of Trenitalia products (e.g., daily/monthly subscriptions) in NeTEx format.
DS-P-8	Busitalia	CMMP	Description of Busitalia products (e.g., daily/monthly subscriptions) in NeTEx format.
DS-P-9	Trenitalia	Mobility packages	Mobility packages defined through the CMMP.
DS-P-10	Busitalia	Mobility packages	Mobility packages defined through the CMMP.

Demonstration Scenario	TSP	IP4 Solution	Demonstration Requirements
DS-P-11	Trenitalia	Booking / Issuing	Web-service allowing booking (API) for Trenitalia. Web-service allowing to issue Trenitalia tickets (API) as QR-code, images, PDF or URL link.
DS-P-12	Busitalia	Booking / Issuing	Booking is not needed for Busitalia. Web-service allowing to issue Busitalia tickets (API) as QR-code, images, PDF or URL link.
DS-P-13	Trenitalia	Ancillary Services	Web-service (API) for Trenitalia allowing to: (i) List available services; (ii) Book available services (optional); (iii) Issue available services.
DS-P-14	Trenitalia	Trip Tracking	Web-service (API) for Trenitalia providing real-time information in TRIAS or GTFS-RT (Only Trip Updates, neither Vehicle position nor Service Alerts) or SIRI-SX
DS-P-15	Busitalia	Trip Tracking	Web-service (API) for BusItalia providing real-time information in TRIAS or GTFS-RT (Only Trip Updates, neither Vehicle position nor Service Alerts) or SIRI-SX
DS-P-16	Trenitalia	Calculation of alternatives	Integration of IP4 Journey Planner solution.
DS-P-17	Busitalia	Calculation of alternatives	Integration of IP4 Journey Planner solution.
DS-P-18	Trenitalia	Navigation	Integration of IP4 Journey Planner solution.
DS-P-19	Busitalia	Navigation	Integration of IP4 Journey Planner solution.
DS-P-20	Trenitalia	Traveller's feedback	-
DS-P-21	Busitalia	Traveller's feedback	-
DS-P-22	Trenitalia	Guest User	-
DS-P-23	Busitalia	Guest User	-
DS-P-24	Trenitalia	Preferences and Profiles	-
DS-P-25	Busitalia	Preferences and Profiles	-

8. Osijek

The demonstration site of Osijek mainly targets people living in the rural area in the Osijek-Baranja County in Croatia. Commuters, and especially students, travelling daily to the city of Osijek are the main target group for the demonstration site. The main objective of the demonstration site is to test the added value of the IP4 solution in connecting current PT services and new services currently in implementation (e-car sharing and bike & e-bike sharing schemes) to offer a seamless multimodal experience to travellers.

The PTO involved in the IP4MaaS Osijek demonstration site is **GPP Osijek.** GPP Osijek currently operates in the City of Osijek wider administrative area (City of Osijek, Čepin, Antunovac and Erdut) providing transport services with its 12 Bus and 2 tram lines. GPP Osijek also manages e-bike sharing (station-based), car sharing (station-based) and e-scooter sharing systems (free floating). HZ Putnicki Prijevoz (HŽPP), the national rail operator, is not directly involved in the project but offered support to also integrate information on available train solutions.

The additional IP4MaaS partners involved in the Osijek demonstration site are DYVOLVE (demonstration site leader) and FIT.

8.1. High-level User Journeys

For the IP4MaaS Osijek demonstration site, two high-level user journeys are defined. This section describes the main information for each high-level user journey extracted to enable the definition of AS-IS User Journey Maps. The complete *High-level User Journeys Template* filled for Osijek is reported in Annex III (Section 15.4).

1st High-level User Journey

- **Title**: **Traveling to UNIOS student campus**
- ***Description of the typology of journeys considered:*** Passengers travelling from rural areas nearby the City of Osijek to the UNIOS student campus in Osijek. The potential origin could be nearby municipalities that are part of Osijek urban agglomeration (e.g., Antunovac, Čepin, Valpovo, Erdut, Darda, etc.).
- ***Expected target users***: students, employees
- ***Selected user journeys***:
  - *Origin*: Čepin, *Destination*: Student Campus Osijek
  - *Origin:* Antunovac, *Destination*: Student Campus Osijek

2nd High-level User Journeys

- **Title**: **Travelling to the Osijek city centre**
- ***Description of the typology of journeys considered:*** Citizens from the suburban area (e.g., retired population from Višnjevac) travelling to the Osijek city centre.
- ***Expected target users***: daily commuters (students, employees), retired people, visitors (people coming to the city centre for leisure or recreational activities)

- ***Selected user journeys***:
  - *Origin*: Višnjevac, *Destination*: Tvrđa.
  - *Origin:* Bijelo Brdo, *Destination*: Square Ante Starčević.

For each user journey selected, all the available travel solutions, enabled by PTOs and TSPs involved in IP4MaaS to complete the origin/destination itinerary considered, were identified and discussed (cf. Annex III - Section 15.4). Table 11 reports for each user journey a list of travel solutions selected by the involved stakeholders considering the areas of potential improvement due to current limitations and pain points.

Table 11 - Osijek: High-level user journeys and selected travel solutions

High-level User Journeys	User journeys	Travel Solutions
Travelling to UNIOS student campus *TSP involved*: GPP Osijek *Expected target users*: students, employees	**Origin:** Čepin **Destination:** Student Campus Osijek	Private car/Ridesharing → Train (HŽPP) → Tram (GPP) *Transfer Points*: Railway station Osijek Dravski most
		Private car/Ridesharing → Train (HŽPP) → Bike/E-bike sharing (GPP) → Walking *Transfer Points*: Main railway station
	Origin: Antunovac **Destination:** Student Campus Osijek	Private car/Ridesharing → Bus (GPP) → Bike/E-bike sharing (GPP) → Walking Transfer Points: Bus station Trpimirova
		Walking → Train (HŽPP) → Carsharing (GPP) *Transfer Points*: Railway station Osijek Dravski most or Main railway station Osijek
Travelling to the Osijek city centre *TSP involved*: GPP Osijek *Expected target users*: daily commuters (students, employees), retired people, visitors (people coming to the city centre for leisure or recreational activities)	**Origin:** Višnjevac **Destination:** Tvrđa	Private car/Ridesharing → Bus (GPP) → Bike/E-bike sharing (GPP) → Walking *Transfer Points:* Vij. Ivana Meštrovića
		Walking → Train (HŽPP) → Tram (GPP) → Tram (GPP) → Walking *Transfer Points:* 1. Main railway station Osijek, 2. Sakuntala park
	Origin: Bijelo Brdo **Destination:** Square Ante Starčević	Private car/Ridesharing → Bus (GPP) → Bike/E-bike sharing (GPP) → Walking *Transfer Points:* Vukovarska / Zeleno polje or Gajev trg
		Private car/Ridesharing → Train (HŽPP) → Tram (GPP) → Walking *Transfer Points*: Main railway station Osijek

Considering the travel solutions reported in Table 11, a further selection (orange boxes in the table) is performed to support the discussion and definition of detailed AS-IS User Journey Maps. The criterion for the selection is to pick travel solutions that can be representative of the travel experiences of all the others. For Osijek, the involved stakeholders selected the following travel solutions to ensure the coverage of all the TSPs involved in IP4MaaS and to analyse the combination of public transport and other services: (i) a travel solution involving the usage of a private car, the train service offered by HŽPP, the tram service offered by GPP (1st high-level user journey), and (ii) a travel solution involving the bus service and the bike-sharing service provided by GPP (2nd high-level user journey).

8.2. AS-IS User Journey Maps

Considering the travel solutions selected from the high-level user journeys template, the involved stakeholders filled the AS-IS user journey maps template describing the current travel experience for a traveller and focusing on current pain points and areas of potential improvement.

In the following paragraphs, we summarise the main information collected through the template. The current paint points identified for the analysed travel solutions are reported in Figure 11. The produced AS-IS User Journey Maps will be finalized and validated during the Osijek TO-BE workshop that will be organized for F-REL.

GPP currently doesn't provide a journey planner for their public transport services (bus and tram). A user can instead plan a travel solution by train using the HŽPP website and the mobile app through the *HŽPP Planner*[13]. The *HŽPP Planner* provides only station-to-station planning (not door-to-door) and it includes only solutions covered by HŽPP train services. Using the *HŽPP Planner* it is possible to see train departure/arrival times and updated information on delays/cancellations for each station (which also means for each leg).
GPP manages through third-party applications the services of car-, e-scooter- and bike-sharing but they do not provide journey planning. Currently, different applications are available for each sharing mobility service or will soon be available, but GPP is investigating the possibility of integrating them in a single app.
A web-based app for multimodal planning in the Osijek region is currently under development (testing phase) and not yet publicly available. The app will be based on the Digitransit[14] platform and will include the GPP public transport and shared mobility services, and the HŽPP train services.

Physical tickets for GPP and HŽPP can be purchased at sale points and/or from vehicle drivers. The BUTRA card is needed to buy monthly subscriptions for GPP.
Tickets for GPP public transport services can be purchased online using the mobile app SMARTICA[15] (transactions via SMS - telecom operators and bank cards) provided by GPP. Tickets

[13] https://prodaja.HŽPP.hr/en/Ticket
[14] https://digitransit.fi/en/services/
[15] https://apps.apple.com/it/app/smartica/id1298966682 and https://play.google.com/store/apps/details?id=hr.grafiknet.smartcitycommute

that can be purchased via mobile app SMARTICA are the single ticket, daily ticket, bundle of 3-single tickets. From February 2021, it is also possible to digitalise a BUTRA physical travel card within the SMARTICA app to buy monthly subscriptions online[16].
Tickets for HŽPP trains can be purchased online via web or mobile app HŽPP KARTE[17] for trains (TSP HŽPP). The tickets available are single tickets in one direction, return tickets, social group tickets with discounts. Monthly subscriptions and other discounted tickets (e.g., for students) cannot be bought online.
Both GPP and HŽPP tickets bought using the app/website are issued using QR codes/barcodes which can be used for ticket control.
No integrated ticket for GPP and HŽPP public transport services is available. There is a 28% discount for purchasing monthly subscriptions for both HŽPP and GPP Osijek but the subscriptions are issued separately by the two TSPs.
GPP mobility sharing services can be booked and paid for using the related app. For example, the *CCS Flexible Car sharing* app[18] provides a car-sharing booking service.

Mobility packages for GPP, combining public transport and one/multiple sharing mobility services, are not currently available, but GPP is investigating the possibility of defining mobility packages for their services. The definition of integrated tickets involving GPP and HŽPP is not currently planned.

There are no real-time updates in an app or on the web for GPP public transport services. Real-time information on the number of vehicles available at each station is available for station-based mobility sharing services. The HŽPP Planner app provides updated but limited information on the train delay. There is no notification mechanism for disruptions available for GPP and HŽPP, updates are published on social media and on the website. There are no navigation tools available during the travel for the user.

A user can request a refund for an HŽPP and/or GPP ticket/subscription under certain circumstances by going to the related office.

Ticket inspection is different for each TSP (using two different mobile apps) since there are no integrated tickets available. Ticket validation for HŽPP is needed only during ticket inspection, for GPP the ticket/card should be validated using the validator in vehicles.

[16] https://gpp-osijek.com/digitalizacija-personaliziranie-butre-od-1-2-2021/
[17] https://play.google.com/store/apps/details?id=hr.HŽPP.HŽPP and https://apps.apple.com/us/app/h%C5%BEpp-karte/id1140519740
[18] https://play.google.com/store/apps/details?id=it.ccsflex.app and https://apps.apple.com/it/app/ccs-flexible-car-sharing/id1474177441

Figure 11 - Osijek: AS-IS User Journey Maps

8.3. User Needs Table

Considering the pain points highlighted in the AS-IS User Journey Maps, Table 12 defines a set of user needs that can be addressed through IP4 enablers for the Osijek demonstration site. For each user need the set of current pain points (and related identifiers in the AS-IS Maps) and the involved TSPs are reported.

Table 12 - Osijek: User Needs Table

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Planner integrating all the transport services provided by GPP	GPP	A user can not plan a door-to-door journey involving GPP public transport services (tram/bus) and GPP sharing mobility services (bike-, e-scooter-, car- sharing). GPP doesn't provide a journey planning service at the moment (PPA2, PPB1). GPP has different applications for public transport and shared mobility services (PPB2).	Journey Planner / Offer Builder
Planner integrating services from GPP e HŽPP	GPP, HŽPP	A user needs to access different platforms to plan a journey involving GPP tram/bus and HŽPP train (PPA1). No door-to-door journey planning is available for HŽPP but only station-to-station (PPA3).	Journey Planner / Offer Builder
Definition of Mobility Packages to access both public transport and sharing mobility services provided by GPP	GPP	A user needs to purchase separately tickets/subscriptions for GPP public transport services and GPP sharing mobility services (PPB5).	Mobility Packages / CMMP
Definition of integrated rates for GPP public transport and HŽPP trains	GPP, HŽPP	No integrated rates are available for HŽPP trains and GPP public transport (PPA5).	Mobility Packages / CMMP

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Booking of sharing mobility rides with the purchase of a public transport ticket	GPP	A user needs different applications to purchase a ticket for public transport and to book a sharing mobility ride (PPB3). A user may not find a vehicle for sharing mobility services because it is not possible to book it in advance (PPB4).	Booking / Issuing
Integrated booking and purchase of bus/tram and train tickets	GPP, HŽPP	A user needs to purchase separately tickets/subscriptions for GPP public transport services and HŽPP (PPA4). A user needs to validate separate tickets for GPP and HŽPP (PPA8).	Booking / Issuing
Re-planning how to reach the destination if a sharing vehicle is not available	GPP	If a sharing vehicle is not available, e.g., a bike, the user should use a different application to find an alternative sharing service, e.g., car/scooter (PPB8)	Calculation of alternatives
Trip tracking on planned journeys with live notifications	GPP, HŽPP	No real-time updates about delays and cancellations on the planned journey (PPA6, PPB6).	Trip Tracking
Information/Experiences for tourists to discover the city	GPP	Find information to visit/Discover the city after leaving a sharing vehicle at the station (PPB9).	LBE / LBE Editor
Application offering navigation for planned journeys when travelling	GPP, HŽPP	No tool for navigation during the travel. The user may have difficulties in finding information on when to get off (PPA7) and/or on the location of the bike-sharing station (PPB7).	Navigation

9. Warsaw

The Młociny transport hub, which is situated in the North of Warsaw, is the focus of the demonstration site. This transport hub is the Interchange building connecting the P + R car park with the bus, tram and subway terminus. Młociny node itself is a modern facility on the surface enabling the uninterrupted flow of passengers from the metro to the city and suburban buses, trams and cars. It includes a 4-storey car park with 1452 parking spaces, a bus station with a loop, a roofed tram terminus, commercial premises, traveller services and technical service. The car park is connected to the Młociny transport hub and has a bus depot and a waiting room at the bus station with a passenger service point. There are 4 tram lines, 12 daily bus lines, 7 nightly bus lines and one metro line. There are also 2 bike-sharing stations with 45 bicycles available to use between March and November. The Młociny transport hub is mainly used by the inhabitants from North districts of Warsaw (Bielany, Białołęka) and neighbouring communes (Warszawa Zachód, Nowy Dwór Mazowiecki, Legionowo). The main objectives of the demonstrations are to trigger MaaS principle implementation and to improve the current ecosystem by adopting new technologies.

The PTO and TSP involved in the IP4MaaS Warsaw demonstration site are:

- **MZA** (Miejskie Zakłady Autobusowe): the largest bus operator in the Warsaw Metropolitan Area.
- **TRAM WARSZAWA:** a municipal tram operator in Warsaw Metropolitan Area.
- **MIASTO WARSZAWA**: the coordinator of public transport services and park+ride systems of the Warsaw Metropolitan Area.

The additional IP4MaaS partner involved in the Warsaw demonstration site is AITEC.

9.1. High-level User Journeys

For the IP4MaaS Warsaw demonstration site, two high-level user journeys are defined. This section describes the main information for each high-level user journey extracted to enable the definition of AS-IS User Journey Maps. The complete *High-level User Journeys Template* filled for Warsaw is reported in Annex III (Section 15.5).

1st High-level User Journey

- **Title**: **Travelling to UKSW Campus**
- ***Description of the typology of journeys considered:*** Passengers travelling from the suburban area nearby Warsaw or from huge residential area to the Uniwersytet Kardynała Stefana Wyszyńskiego (UKSW).
- ***Expected target users***: commuters (workers and students).
- ***Selected user journeys***:
  - *Origin*: Raszyn, *Destination*: UKSW Campus.
  - *Origin:* Praga Południe, *Destination*: UKSW Campus.

2nd High-level User Journeys

- **Title**: **Travelling to SGGW Campus**
- ***Description of the typology of journeys considered:*** Passengers travelling from residential areas in Warsaw to Agricultural University (SGGW).
- ***Expected target users***: commuters (workers)
- ***Selected user journeys***:
  - *Origin*: Dąbrówka Wiślana, *Destination*: SGGW Campus.
  - *Origin:* Nowodwory, *Destination*: SGGW Campus.

For each user journey selected, all the available travel solutions, enabled by PTOs and TSPs involved in IP4MaaS to complete the origin/destination itinerary considered, were identified and discussed (cf. Annex III - Section 15.5). Table 13 reports for each user journey a list of travel solutions selected by the involved stakeholders considering the areas of potential improvement due to current limitations and pain points.

Table 13 - Warsaw: High-level user journeys and selected travel solutions

High-level User Journeys	User journeys	Travel Solutions
Travelling to UKSW Campus *TSP involved*: MZA (bus), TW (tram), MIASTO WARSZAWA (metro) *Expected target users*: Commuters (workers and students)	**Origin**: Raszyn **Destination**: UKSW Campus	Private Car → Tram (TW) → Metro (MW) → Bus (MZA) → Walking *Transfer Points*: 1. P+R Aleja Krakowska 2. Metro Centrum 3. Metro Młociny 4. Młociny UKSW
		W/C → Bus (MZA) → Tram (TW) → Bus (MZA) → Tram (TW) → Bus (MZA) → Walking *Transfer Points*: 1. Sportowa 2. P+R Aleja Krakowska 3. Dickensa 4. Park Kaskada 5. Metro Młociny 6. Młociny UKSW
	Origin: Praga Południe **Destination:** UKSW Campus	W/C → Tram (TW) → Metro (MW) → Bus (MZA) → Walking *Transfer Points*: 1. Rondo Wiatraczna 2. Metro Ratusz Aresnał 3. Metro Młociny 4. Młociny UKSW
		W/C → Bus (MZA) → Metro (MW) → Bus (MZA) → Walking *Transfer Points*: 1. Rondo Wiatraczna 2. Metro Politechnika 3. Metro Młociny 4. Młociny UKSW

High-level User Journeys	User journeys	Travel Solutions
Travelling to SGGW Campus *TSP involved*: MZA (bus), TW (tram), MIASTO WARSZAWA (metro) *Expected target users*: Commuters (workers and students)	**Origin**: Dąbrówka Wiślana **Destination**: SGGW Campus	W/C → Bus (MZA) → Metro (MW) → Bus (MZA) → Walking *Transfer Points*: 1. Dąbrówka Wiślana 2. Metro Młociny 3. Metro Służew 4. SGGW – Rektorat
		W/C → Bus (MZA) → Metro (MW) → Walking *Transfer Points*: 1. Dąbrówka Wiślana 2. Metro Młociny 3. Metro Ursynów
	Origin: Nowodowry **Destination**: SGGW Campus	W/C → Tram (TW) → Metro (MW) → Bus (MZA) → Walking Transfer Points: 1. Nowodwory 2. Metro Młociny 3. Metro Służew 4. SGGW – Rektorat

Considering the travel solutions reported in Table 13, a further selection (orange boxes in the table) is performed to support the discussion and definition of detailed AS-IS User Journey Maps. The criterion for the selection is to pick travel solutions that can be representative of the travel experiences of all the others. For Warsaw, the involved stakeholders selected the following travel solutions to ensure the coverage of all the TSPs involved in IP4MaaS and to analyse the combination of public transport and private vehicles: (i) a travel solution involving the usage of a private car, the tramway service offered by Tram Warsaw (TW), the metro service offered by MIASTO WARSZAWA (MW), and the bus service offered by MZA (1st high-level user journey), and (ii) a travel solution involving the metro service offered by MIASTO WARSZAWA (MW), and the bus service offered by MZA (2nd high-level user journey).

9.2. AS-IS User Journey Maps

Considering the travel solutions selected from the high-level user journeys template, the involved stakeholders filled the AS-IS user journey maps template describing the current travel experience for a traveller and focusing on current pain points and areas of potential improvement.

In the following paragraphs, we summarise the main information collected through the template. The current paint points identified for the analysed travel solutions are reported in Figure 12. The produced AS-IS User Journey Maps will be finalized and validated during the Warsaw TO-BE workshop that will be organized for F-REL.

A user can plan a trip using the Jakdojade[19] App that includes all the TSPs operating in Warsaw. The App identifies travel solutions based on the usage of public transportation; solutions based on

[19] https://jakdojade.pl/

the usage of private vehicles are not proposed. Bus and trams have real-time positions which are included in the proposed travel.

Jakdojade, other certified Apps, or ticket machines at the stations/stops can be used to purchase a single ticket or a 24-hours ticket. A unified ticket tariff is offered and it covers all the PT modes. Digital tickets are in the QR-code format and are not refundable.

Tickets must be validated only at the beginning of the trip; Ticket inspection could happen on board (bus and tram) or before entering the metro platform.

Disruptions (e.g., delays, cancellations) are communicated via speakers by the drivers and displayed on monitors at the metro stations. Disruptions are not notified by the Jakdojade App used for trip planning. Moreover, in case of disruption, the App does not offer a re-accommodation service.

Jakdojade does not provide a live navigation/positioning service to help the user during the travel (e.g. notifying when it's time to board or get off of any means of transport) and to move around at the interchanges or destination.

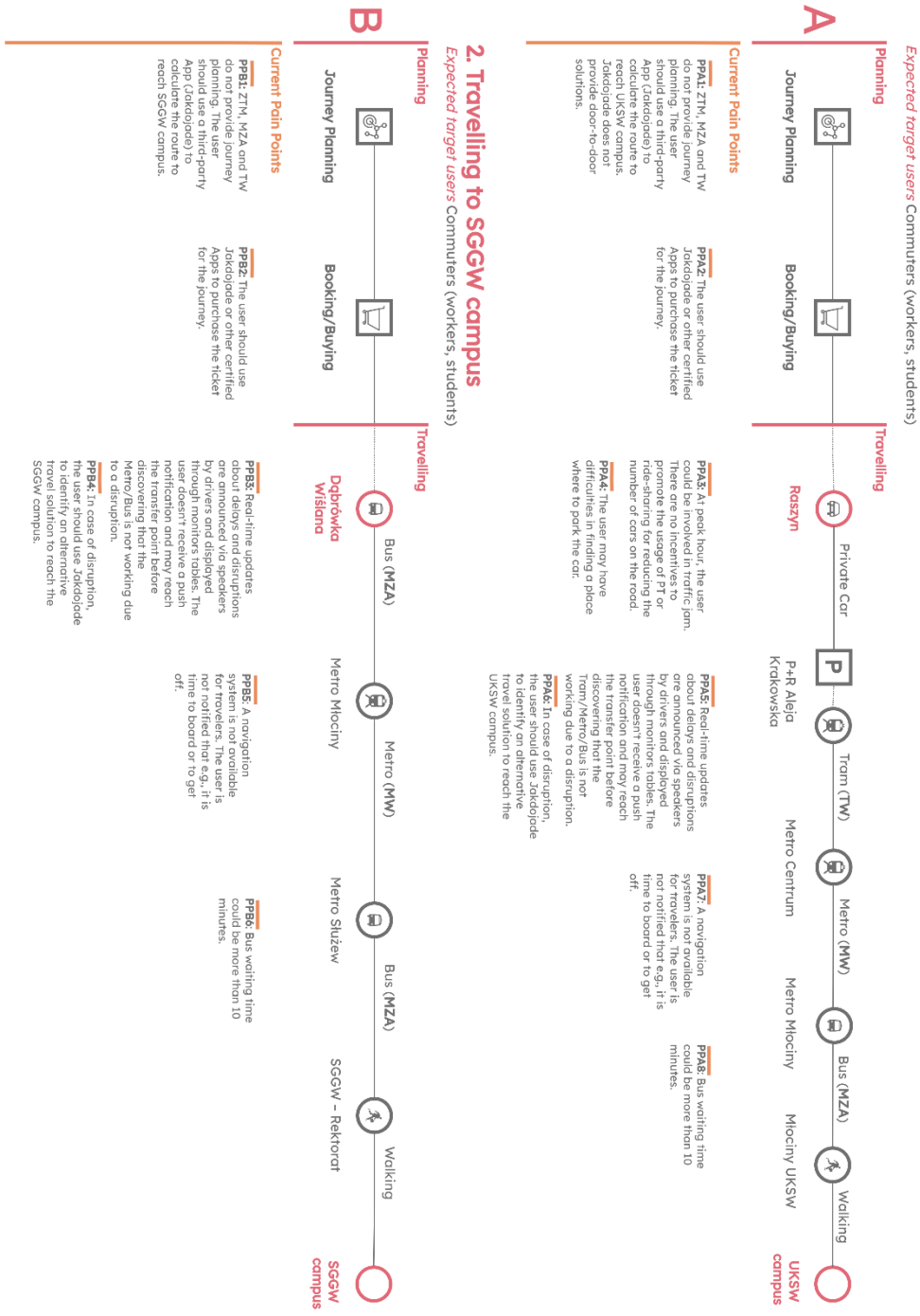


Figure 12 - Warsaw: AS-IS User Journey Maps

9.3. User Needs Table

Considering the pain points highlighted in the AS-IS User Journey Maps, Table 14 defines a set of user needs that can be addressed through IP4 enablers. For each user need the set of current pain points (and related identifiers in the AS-IS Maps) and the involved TSPs are reported.

Table 14 - Warsaw: User Needs Table

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Multimodal door-to-door journey planning integrating the usage of public transport and private vehicles	ZTM, MZA, TW	A user needs to use the Jakdojade App and Google Maps to plan a multimodal journey integrating public transportation and private vehicles (PPA1, PPB1)	Journey Planner / Offer Builder
Plan journeys and notify colleagues/friends about them	ZTM, MZA, TW	Incentivize the use of PT to reduce the number of private vehicles (PPA3, PPA4)	Trip sharing
Booking/issuing of tickets	ZTM, MZA, TW	Purchase of tickets covering all the PT modes (PPA2, PPB2).	Booking / Issuing
Trip tracking on planned journeys with live notifications	ZTM, MZA, TW	A user would like to have real-time updates about delays and cancellations on the planned journey (PPA5, PPB3)	Trip Tracking
Find alternatives in case of disruption	ZTM, MZA, TW	In case of disruption, it may be difficult to find an alternative solution combining ZTM, MZA, and TW services (PPA6, PPB4)	Calculation of alternatives
Navigation during the trip to be notified that e.g., it is time to board or to get off	ZTM, MZA, TW	The traveller would like to receive notifications during the trip to get knowledge about e.g., the time to board or to get off (PPA7, PPB5)	Navigation
Entertainment when waiting for the bus	MZA	The traveller would like to play with quiz game when waiting for the bus (PPA8, PPB6)	LBE / LBE Editor

10. Liberec

The demonstration site of Liberec focuses on the Liberec Region in the Czech Republic, with possible extension to the entire area of Borderland CZ/D/PL comprising Liberec, Zittau and Bogatynia regions. The demonstration site focuses on empowering travel solutions in the cross-border section to serve countryside high school students commuting to Liberec and the tourist from outside of the region.

The **KORID LK** regional transport authority is involved in the IP4MaaS Warsaw demonstration site and coordinated transport services in the region. The *ČSAD Liberec,* PTO and school-bus operator, and *ARRIVA vlaky,* rail operator, are not directly involved in the project but offered support to include their transport services.

The additional IP4MaaS partners involved in the Osijek demonstration site are OLTIS (demonstration site leader) and UNIZA.

10.1. High-level User Journeys

For the IP4MaaS Liberec demonstration site, three high-level user journeys are defined. Two high-level user journeys focus on the rural area and Liberec, the third one is a long-distance high-level user journey connecting the demonstration sites of Liberec and Warsaw. This section describes the main information for each high-level user journey extracted to enable the definition of AS-IS User Journey Maps. The complete *High-level User Journeys Template* filled for Liberec is reported in Annex III (Section 15.6).

1st High-level User Journey

- **Title**: **Travelling to the hospital in Liberec**
- ***Description of the typology of journeys considered:*** Passengers travel from the towns within the Liberec region to the hospital in Liberec.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *KORID LK:* transport authority in Liberec region
  - *ČSAD Liberec:* PTO and school-bus operator
  - *ARRIVA:* rail operator
- ***Expected target users***: Commuters.
- ***Selected user journeys***:
  - *Origin*: Nový Bor, T.G.Masaryka, *Destination*: Liberec, regional hospital
  - *Origin:* Mimoň, Komenského 37, *Destination*: Liberec, regional hospital

2nd High-level User Journeys

- **Title**: **Trip through the historical beauties of Liberec region**
- ***Description of the typology of journeys considered:*** Tourist travels from Germany/Poland to visit interesting places in Liberec region.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***

- *KORID LK:* transport authority in Liberec region
- *ČSAD Liberec:* PTO and school-bus operator

- ***Expected target users***: Tourists who aren't familiar with travelling in the Liberec region
- ***Selected user journeys***:
  - *Origin*: Zittau, Bahnhofstraße 29, *Destination*: Castle and chateau Frýdlant, Hejnice monastery
  - *Origin:* Bogatynia, 3 Maja 10, *Destination*: Castle and chateau Frýdlant, Hejnice monastery

3rd High-level User Journeys

- **Title**: **Business trip to Warsaw**
- ***Description of the typology of journeys considered:*** Businessman travels to a business meeting in Warsaw.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *KORID LK:* transport authority in Liberec region
  - *MIASTO WARSZAWA:* transport authority in Warsaw
  - *TRAM WARSAW:* tramway operator
- ***Expected target users***: Businessman who is familiar with travelling between Jablonec and Nisou, and Warsaw.
- ***Selected user journeys***:
  - *Origin*: Jablonec nad Nisou, Zlatá ulička 154, *Destination*: Warsaw

For each user journey selected, all the available travel solutions, enabled by PTOs and TSPs involved in IP4MaaS to complete the origin/destination itinerary considered, were identified and discussed (cf. Annex III - Section 15.6). Table 15 reports for each user journey a list of travel solutions selected by the involved stakeholders considering the areas of potential improvement due to current limitations and pain points.

Table 15 - Liberec: High-level user journeys and selected travel solutions

High-level User Journeys	User journeys	Travel Solutions
Travelling to the hospital in Liberec *TSP involved*: KORID (bus, tram, car-sharing), ARRIVA (Train), CSAD (bus) *Expected target users*: commuters	**Origin**: Nový Bor, T.G.Masaryka **Destination**: Liberec, regional hospital	W → Bus (KORID) → Train (ARRIVA vlaky) → Tram (KORID) → W *Transfer Points*: 1. Nový Bor 2. Jablonné v Podještědí 3. Nádraží (Liberec) 4. Šaldovo náměstí
		W → Bus (KORID) → Tram (KORID) → W *Transfer Points*: 1. Nový Bor T.G.Masaryka 2. Liberec,aut.nádr. 3. Šaldovo náměstí

High-level User Journeys	User journeys	Travel Solutions
	Origin: Mimoň, Komenského 37 **Destination**: Liberec, regional hospital	W → Bus (KORID) → Bus (ČSAD Liberec) → Tram (KORID) → W *Transfer Points*: 1. Mimoň,aut.st; 2. Stráž p.Ralskem,aut.st.; 3. Liberec,aut.nádr.; 4. Šaldovo náměstí
		W → Train (ARRIVA vlaky) → Tram (KORID) → W *Transfer Points*: 1. Mimoň; 2. Nádraží (Liberec); 3. Šaldovo náměstí
Trip through the historical beauties of Liberec region *TSP involved*: KORID (train), CSAD (bus) *Expected target users*: tourists	**Origin**: Zittau, Bahnhofstraße 29 **Destination**: castle and chateau Frýdlant, Hejnice monastery	W → Train (KORID - TL) → Train (KORID) → Train (KORID) →Train (KORID) → W *Transfer Points*: 1. Zittau; 2. Liberec; 3. Frýdlant v Čechách; 4. Raspenava; 5. Hejnice
		W → Train (KORID) → Train (KORID) → Bus (ČSAD Liberec) → W *Transfer Points*: 1. Zittau; 2. Liberec; 3. Frýdlant, aut.nádr.; 4. Hejnice, aut.st.
	Origin: Bogatynia, 3 Maja 10 **Destination**: castle and chateau Frýdlant, Hejnice monastery	W → Bus (ČSAD Liberec) → Train (KORID) → Bus (ČSAD Liberec) → W *Transfer Points*: 1. Bogatynia, Liceum; 2. Liberec,Krásná Studánka,kovárna; 3. Krásna Studánka; 4. Frýdlant v Čechách; 5. Frýdlant,,aut.nádr.; 6. Hejnice,,aut.st
		W → Bus (ČSAD Liberec) → Bus (ČSAD Liberec) → Bus (ČSAD Liberec) → W *Transfer Points*: 1. Bogatynia,Liceum; 2. Dětřichov; 3. Frýdlant,aut.nádr.; 4. Hejnice,,aut.st.
Business trip to Warsaw *TSP involved*: KORID (tram, train), ARRIVA (train), TRAM WARSAW (Tram), PKP (Intercity), Koleje Dolnoslaskie (train) *Expected target users*: Businessman who is familiar with travelling between Jablonec and Nisou and Warsaw	**Origin**: Jablonec nad Nisou, Zlatá ulička 154 **Destination**: Warsaw	W → Tram (KORID) → Train (KORID, Koleje Dolnoslaskie) → Train (Koleje Dolnoslaskie) → Train (PKP Intercity) → Tram (TW) → W *Transfer Points*: 1. Nový Svět; 2. Jablonec n.N.dol.n. ; 3. Szklarska Poreba Go.; 4. Wroclaw Glowny; 5. Warszawa Centralna; 6. Domaniewska 50

Considering the travel solutions reported in Table 15, a further selection (orange boxes in the table) is performed to support the discussion and definition of detailed AS-IS User Journey Maps. The criterion for the selection is to pick travel solutions that can be representative of the travel

experiences of all the others. For Liberec, the involved stakeholders selected the following travel solutions to ensure the coverage of all the TSPs involved in IP4MaaS and to analyse the combination of public transport and other services: (i) a travel solution composed by a first bus leg offered by KORID followed by two legs by train respectively offered by ARRIVA and KORID (1st high-level user journey), (ii) a travel solution involving two train legs offered by KORID and a bus leg by ČSAD Liberec (2nd high-level user journey), and (iii) the long-distance travel solution involving tram legs offered by KORID in Liberec and TW in Warsaw, and train legs to reach Warsaw covered by external TSPs (3rd high-level user journey).

10.2. AS-IS User Journey Maps

Considering the travel solutions selected from the high-level user journeys template, the involved stakeholders filled the AS-IS user journey maps template describing the current travel experience for a traveller and focusing on current pain points and areas of potential improvement. The collected information is summarised in this section and the current paint points identified are reported in Figure 13 and Figure 14. The produced AS-IS User Journey Maps will be finalized and validated during the Liberec TO-BE workshop that will be organized for F-REL with all the involved stakeholders.

A user can plan a travel solution using the IDOS tool, available as a web app or on Android and iOS. The tool integrates trains, busses, and all the available public transports, allowing the user to select solutions from different TSPs, and covering door-to-door first and last miles. The app provides information about the various transports' timetables and allows the purchase of some of the tickets, depending on the TSPs involved. Single digital tickets can also be purchased via the IDOLKA app and can later be validated using a QR Code or NFC, seasonal tickets will be available starting next year.

Concerning the services offered during the travel, information about delays is included in CRWS, which is already integrated within the Shift2MaaS project. A map output displaying a chosen route with an indication of the real-time update vehicle position will be available in the future. No tool currently offers either replanning or live navigation services.

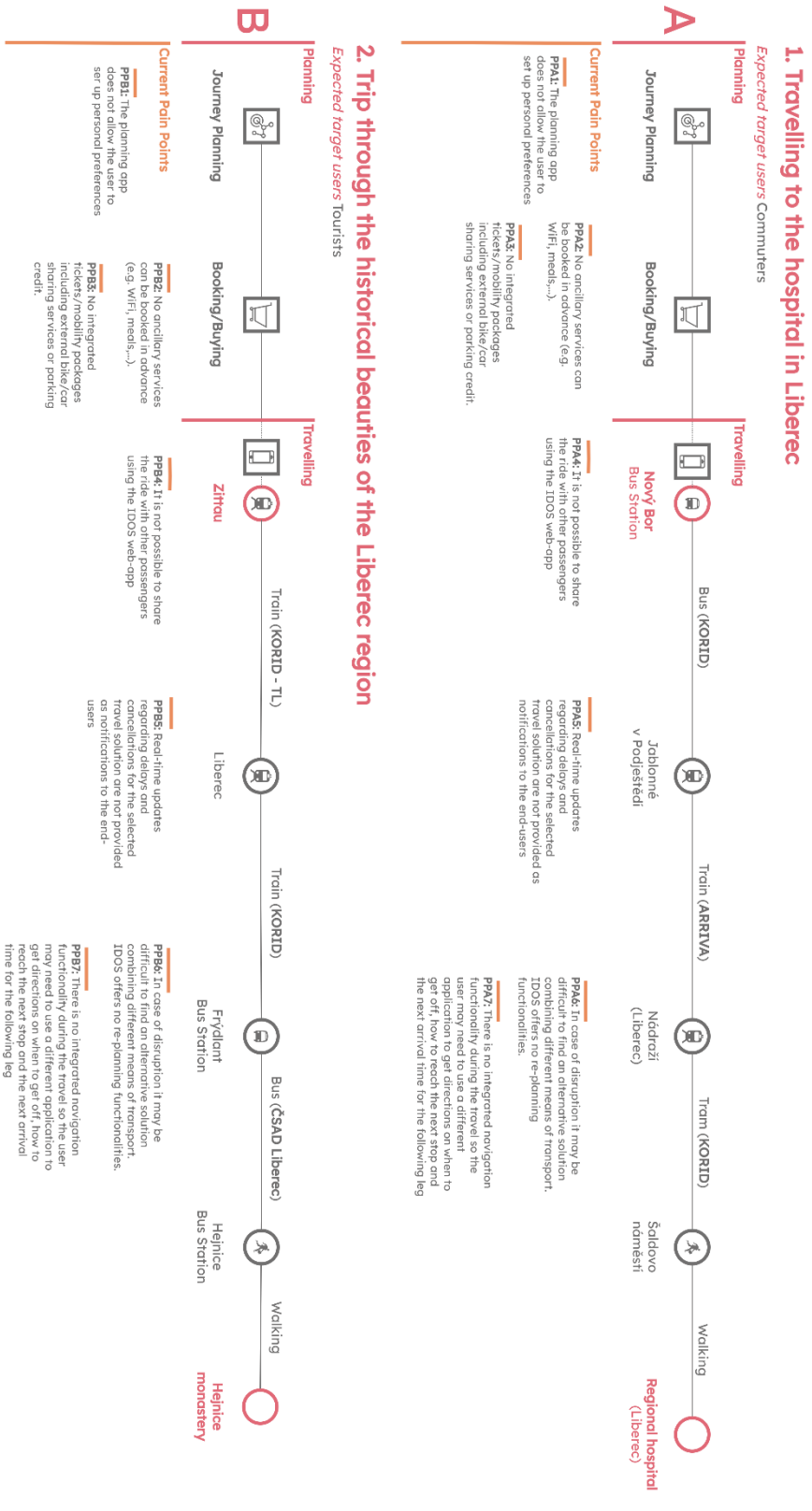


Figure 13 - Liberec AS-IS Journey Maps

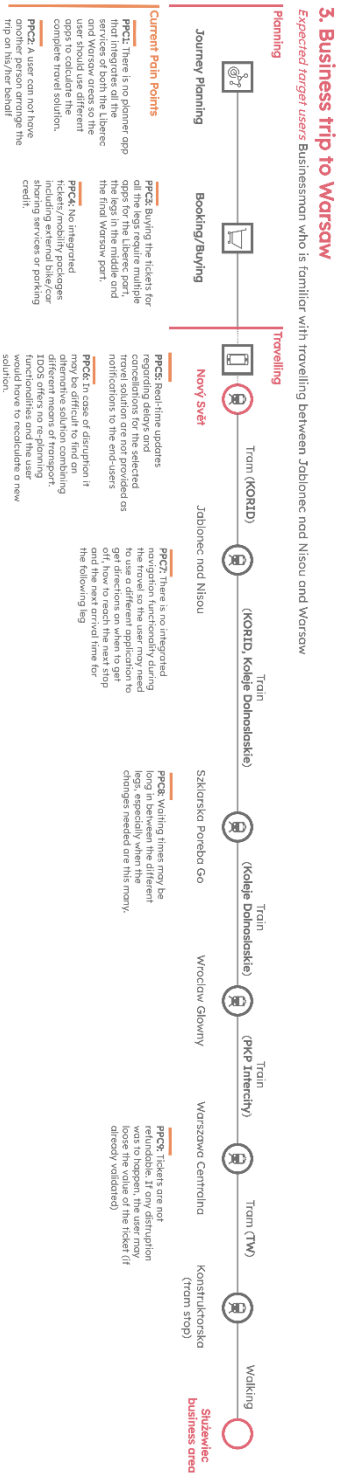


Figure 14 - Liberec AS-IS Journey Map 3

10.3. User Needs Table

Considering the pain points highlighted in the AS-IS User Journey Maps, Table 14 defines a set of user needs that can be addressed through IP4 enablers. For each user need the set of current pain points (and related identifiers in the AS-IS Maps) and the involved TSPs are reported.

Table 16 - Liberec User Needs Table

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Input different travel preferences based on the user needs	KORID, ARRIVA, ČSAD Liberec	A user needs to be able to provide different travel preferences such as preferred TSPs, quality of the trains, etc. (PPA1, PPB1)	Preferences and Profiles
Multimodal door-to-door journey planning integrating the usage of shared transport services or private vehicles and all the TSPs	KORID, ARRIVA, ČSAD Liberec	A user needs to use the IDOS App and Google Maps to plan a multimodal journey integrating public transportation and private vehicles (PPC1)	Journey Planner / Offer Builder
Plan journeys and share them with colleagues/friends	KORID, ARRIVA, ČSAD Liberec	It is not possible to share the ride with other passengers using the IDOS web app (PPA4, PPB4)	Trip sharing
Booking of ancillary services	KORID, ARRIVA, ČSAD Liberec	It is not possible to book ancillary services in advance (PPA2, PPB2)	Ancillary Services
Booking/issuing of tickets	KORID, ARRIVA, ČSAD Liberec, others	Purchase of tickets covering all the PT modes (PPC3).	Booking / Issuing
Planning a trip for a different person	KORID, ARRIVA, ČSAD Liberec	A user can not have a different person arrange the trip on his/her behalf (PPC2)	Travel arrangement

User Needs	TSPs involved	Pain points from AS-IS Maps	Proposed IP4 Solution
Mobility packages that integrate all TSPs	KORID, ARRIVA, ČSAD Liberec	There are no integrated tickets/mobility packages available to support the combined usage of public transport and taxi/bike/car rides. (PPA3, PPB3, PPC4)	Mobility Packages / CMMP
Trip tracking on planned journeys with live notifications	KORID, ARRIVA, ČSAD Liberec	A user would like to have real-time updates about delays and cancellations on the planned journey (PPA5, PPB5, PPC5)	Trip Tracking
Find alternatives in case of disruption.	KORID, ARRIVA, ČSAD Liberec	In case of disruption, it may be difficult to find an alternative solution (PPA6, PPB6, PPC6)	Calculation of Alternatives
Navigation during the trip to be notified that e.g., it is time to board or to get off	KORID, ARRIVA, ČSAD Liberec	The traveller would like to receive notifications during the trip to get knowledge about e.g., the time to board or to get off (PPA7, PPB7, PC7)	Navigation
Entertainment when waiting for the bus	KORID, ARRIVA, ČSAD Liberec, others	The traveller would like to play with quiz game when waiting for the bus (PPC8)	LBE / LBE Editor

11. Conclusions

This deliverable has provided a detailed description of the 4-steps methodology adopted by the IP4MaaS project for the definition of requirements and scenarios for C-REL demonstrations in Barcelona, Athens, and Padua.

The application of the 4-steps methodology on each demonstration site resulted in the definition of:

- *High-level user journeys* representing typologies of journeys performed by a large pool of users in the demonstration site. The high-level user journeys have been identified considering the objectives of the demonstration site mentioned in the DoA;
- *AS-IS user journey maps* providing a clear picture of current multimodal travel experiences in the demo site, highlighting problems and areas for potential improvement;
- *TO-BE user journey maps* drawing new travel experiences enabled by the integration of IP4 technologies and TSP services;
- C-REL *demonstration scenarios* for each demonstration site, defined as the intersection of a functionality provided by Shift2Rail IP4 and a TSP involved in the project, *and a set of related requirements*.

Table 17 represents the list of potential functionalities identified by IP4MaaS for C-REL demonstrations, with the specification of the involved TSPs per each demonstration site. The provided table constitutes an input for IP4MaaS WP4 and it is complemented by: (i) the analysis described in the IP4MaaS deliverable "D2.1: Technology Survey C-REL", and (ii) the report, presented in this deliverable, on foreseen issues identified by TSPs during the TO-BE workshops. Moreover, the list of potential functionalities for C-REL demonstrations is also complemented by the operation KPIs (i.e., quantitative and objective operational indicators that measure the gain or benefit of an IP4 functionality for a specific TSP and for a specific user profile), defined and described in "D3.1: ist of operational KPIs, analysis of the users' satisfaction and methodology as a whole, C-REL".

The elements provided by D2.1, D2.2 and D3.1 are inputs for WP4 to enable the definition of a technology integration plan and an execution plan for each C-REL demonstration.

Table 17 – Potential list of IP4 functionalities to be tested for C-REL demonstration

Functionality	User	Barcelona			Athens				Padua	
		TMB	BusUp	SocialCar	OASA	Miraklio	Brainbox	Taxiway	Trenitalia	Busitalia
1 – Journey Planner / Offer Builder	Traveller	X	X	X	X	X	X	X	X	X
2 – Booking	Traveller		X	X			X	X	X	

Functionality	User	Barcelona			Athens				Padua	
		TMB	BusUp	SocialCar	OASA	Miraklio	Brainbox	Taxiway	Trenitalia	Busitalia
3 – Issuing	Traveller	X	X	X	X		X	X	X	X
4 – Ancillary service	Traveller								X	
5 – Mobility packages	Traveller	X	X	X	X		X	X	X	X
6 – Validation and Inspection	Traveller	X	X				X			
7 – Trip tracking	Traveller	X	X			X		X	X	X
8 – Calculation of alternatives	Traveller	X	X	X	X	X	X	X	X	X
9 – Location based experiences	Traveller				X	X		X		
10 – Navigation	Traveller	X	X	X	X	X			X	X
11 – Traveller's feedback	Traveller	X	X		X	X			X	X
12 – Trip sharing	Traveller	X	X	X			X	X	X	X
13 – Group travelling	Traveller								X	X
14 – Travel Arrangement	Traveller									
15 – Travel companion Web-Portal	Traveller									
16 – Guest user	Traveller	X	X	X	X	X	X	X	X	X
17 – Preferences and Profiles	Traveller	X	X	X	X	X	X	X	X	X
18 – Best price optimization	Traveller									
19 – Commuter detection	Traveller									
20 – Travel Companion for Kids	Traveller									
21 – Asset manager	TSP									
22 – Contractual Management Market Place (CMMP)	TSP	X	X	X	X		X	X	X	X
22 – Business analytics	TSP									

Functionality	User	Barcelona			Athens				Padua	
		TMB	BusUp	SocialCar	OASA	Miraklio	Brainbox	Taxiway	Trenitalia	Busitalia
23 – Trip Tracking CEP configuration	TSP									
24 – LBE editor	TSP				X	X		X		
25 – Inspection with fraud control	TSP									

The first 2-steps of the IP4MaaS methodology have also been applied to the other three IP4MaaS demonstration sites (i.e., Osijek, Warsaw, and Liberec). The results (i.e., high-level user journeys and AS-IS user journey maps) will contribute to the definition of demonstration scenarios for the IP4MaaS F-REL demonstrations. Table 18 represents a draft list of IP4 Functionalities addressing the user needs identified for Osijek, Warsaw and Liberec.

Table 18 - IP4 Functionalities addressing user needs identified for Osijek, Warsaw and Liberec

Functionality	User	Osijek	Warsaw	Liberec
1 – Journey Planner / Offer Builder	Traveller	X	X	X
2 – Booking	Traveller	X	X	X
3 – Issuing	Traveller	X	X	X
4 – Ancillary service	Traveller			X
5 – Mobility packages	Traveller	X		X
6 – Validation and Inspection	Traveller			
7 – Trip tracking	Traveller	X		X
8 – Calculation of alternatives	Traveller	X	X	X
9 – Location based experiences (LBE)	Traveller	X	X	X
10 – Navigation	Traveller	X	X	X
11 – Traveller's feedback	Traveller			
12 – Trip sharing	Traveller		X	X
13 – Group travelling	Traveller			
14 – Travel Arrangement	Traveller			X
15 – Travel companion Web-Portal	Traveller			
16 – Guest user	Traveller			
17 – Preferences and Profiles	Traveller			X
18 – Best price optimization	Traveller			
19 – Commuter detection	Traveller			
20 – Travel Companion for Kids	Traveller			
21 – Asset manager	TSP			

Functionality	User	Osijek	Warsaw	Liberec
22 – Contractual Management Market Place (CMMP)	TSP			X
22 – Business analytics	TSP			
23 – Trip Tracking CEP configuration	TSP			
24 – LBE editor	TSP	X	X	X
25 – Inspection with fraud control	TSP			

11.1. Next steps and links with other work packages

To conclude, we summarise the next steps in WP2 Task 2.2 and Task 2.3, highlighting the expected interactions also with other WPs of the IP4MaaS project:

- Needs and expectations collected through the AS-IS template and the potential functionalities for C-REL demonstrations are used to finalize the list of operational KPIs and the satisfaction survey in WP3 (T3.1 and T3.2, respectively). The results are described in "D3.1: list of operational KPIs, analysis of the users' satisfaction and methodology as a whole, C-REL".
- WP4 will integrate the demonstration scenarios and requirements, defined in this deliverable, with the technology survey for C-REL, reported in D2.1, to define a detailed technology integration plan ("D4.1: Technology Integration Plan, C-REL") and an execution plan ("D4.2: Demonstration Execution Plan, C-REL") for C-REL demonstrations in Barcelona, Athens and Padua.
- WP2 T2.2, considering the group of travellers/profiles identified within WP3 T3.2, will gather preferences, needs and expectations from travellers by: (i) defining and administering a conversational survey, and (ii) performing opinion mining through social networks.
- WP2 will define the F-REL version of demonstration scenarios and requirements for all the demonstration sites involved in the second demonstration phase of the IP4MaaS project:
    - Feedback provided by WP3 and WP4 on C-REL will be integrated;
    - Preferences, needs and expectations from travellers will support an update of the AS-IS User Journey Maps for each demonstration site;
    - New IP4 functionalities released by complementary CFM projects MaaSIVE and ExtenSive will be considered in order to match them with user needs identified for each demonstration site;
    - The last two steps of the methodology will be carried out for Liberec, Osijek and Warsaw to define TO-BE User Journey Maps and demonstration scenarios and requirements;

- The TO-BE User Journey Maps and demonstration scenarios and requirements for Barcelona, Athens and Padua will be updated considering the new available functionalities.

12. References

1. Schuler, Douglas, and Aki Namioka, eds. *Participatory design: Principles and practices*. CRC Press, 1993.

13. Annex I

A blank template for the definition of High-level User Journeys is provided in the attached document "IP4MaaS_D2.2_Annex_I_High-level_User_Journey_Template.docx".

14. Annex II

A blank template for the definition of AS-IS User Journey Maps is provided in the attached document "IP4MaaS_D2.2_Annex_II_AS-IS_User_Journey_Maps_Template.xlsx".

15. Annex III

This Annex reports the complete high-level user journeys template filled for each demonstration site.

15.1. Barcelona - High-level User Journeys Template

The high-level user journey template, filled for the Barcelona demonstration site.

15.1.1. 1st High-level User Journey - Barcelona

Description

- **Title**: **Travelling from a suburban area to the UPC campus in Barcelona**
- ***Description of the typology of journeys considered:*** Passengers travelling from the suburban area (mostly residential) nearby Barcelona to the Universitat Politècnica de Catalunya (UPC). Potential origin can be medium-sized cities (e.g., Matarò, Sabadell, Terrassa, Sant Cugat) or residential areas (e.g., Canet or Arenys).
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *TMB*: metro and bus lines in the urban metropolitan area of Barcelona
  - *BUSUP*: bus ridesharing and on-demand services
  - *Social Car*: a car-sharing and car renting company
- ***Expected target users***:
  - commuters (workers, students), participants to conferences/meetings/events hold by UPC.

15.1.1.1. User Journey: Sabadell-UPC Campus

Itinerary of the user journey

- ***Origin:*** Sabadell Central station
- ***Destination:*** Les Corts (UPC Campus)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Train (RENFE or FGC) in combination with Metro/bus-TMB
- Train (RENFE or FGC) in combination with Tram (Tramvia Metropolità SA)
- Bus-Expres.cat in combination with Metro/bus-TMB

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg		Last-mile	Potential transfer points
1	Ride-Sharing/Taxi/Social Car				-
2	Private Car + Park & Ride		Metro (TMB)	W/C/MM	Sants Estació or Plaça d'Espanya
3	**Ridesharing/Taxi/Social Car**		**Metro (TMB)**	**W/C/MM**	**Any Metro station or Sants Estació or Plaça d'Espanya**
4	W/C/MM	Bus (TMB)	Metro (TMB)	W/C/MM	1. Sant Andreu Arenal 2. Sants- Sants Estació
5	**W/C/MM**	**DRT (BusUp)**	**Metro (TMB)**	**W/C/MM**	**1.Sant Andreu Arenal 2. Sants- Sants Estació**
6	W/C/MM	Bus (TMB)	Bus (TMB)	W/C/MM	1. Fabra i Puig - Meridiana
7	Ridesharing/Taxi /Social Car	DRT (BusUp)	Metro (TMB)	W/C/MM	1.Sant Andreu Arenal 2. Sants- Sants Estació
8	Social Car	Metro-TMB	DRT (BusUp)	W/C/MM	1. Sagrada Familia 2. Maria Christina
9	Ridesharing/Taxi /Social Car	DRT (BusUp)		W/C/MM	1. Sagrada Familia

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#3** this multimodal chain includes 2 IP4MaaS TSPs, its main pain point is booking, and it provides the advantage to the travellers of certain flexibility and reduces the solo drivers.
- **#5** this multimodal chain includes 2 IP4MaaS TSPs, its main pain point is booking, and it promotes DRT services as well as the reduction of car usage and minimization of CO2 levels.

15.1.1.2. User Journey: Mataró-UPC Campus

Itinerary of the user journey

- ***Origin*** Mataró Station
- ***Destination*** Les Corts (UPC Campus)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Ride-Sharing/Taxi and Metro

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg		Last-mile	Potential Transfer Points
1	Ride-Sharing/Taxi/Social Car				-
2	Private Car		Metro (TMB)	W/C/MM	1.Sants or El Clot Aragó
3	**Ridesharing/Taxi/Social Car**		**Metro (TMB)**	**W/C/MM**	**1.Sants or El Clot Aragó**
4	W/C/MM	DRT (BusUP)	Metro (TMB)	W/C/MM	1.Sants
5	W/C/MM	Bus (TMB)	Bus (TMB)	W/C/MM	1.Barcelona - Pl Tetuan-Gran Via - Roger de Flor
6	W/C/MM	DRT (BusUP)	Bus (TMB)	W/C/MM	1.Barcelona - Pl Tetuan-Gran Via - Roger de Flor
7	Ridesharing/Taxi/Social Car	Metro (TMB)	Bus (TMB)	W/C/MM	1. Sagrada Família 2. Mallorca - Marina
8	**Ridesharing/Taxi/Social Car**	**Metro (TMB)**	**DRT (BusUP)**	**W/C/MM**	**1. Sagrada Família 2.Mallorca - Marina**

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#3** include 2 out of 3 of the IP4MaaS TSPs of Barcelona's demo site.
- **#8** it is complex and includes all the IP4MaaS TSPs which makes it challenging.

15.1.2. 2nd High-level User Journey - Barcelona

Description

- **Title**: **Travelling from Barcelona to suburban industrial areas for work**
- ***Description of the typology of journeys considered:*** Passengers travelling from Barcelona to a suburban area that has an industry or a scientific park. Potential origin can be anywhere in Barcelona and the destination a location that gathers business activity such an industry, a scientific park or an airport located at the surroundings of Barcelona.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *TMB*: metro and bus lines in the urban metropolitan area of Barcelona
  - *BUSUP*: bus ridesharing and on-demand services
  - *Social Car*: a car-sharing and car renting company
- ***Expected target users***:
  - commuters (workers)

15.1.2.1. User Journey: Barcelona-Martorell

Itinerary of the user journey

- ***Origin***: Barcelona Area
- ***Destination:*** Martorell (and Seat's premises, Solvay chemistry facilities and factory)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Metro/bus-TMB in combination with Train RENFE
- Metro/bus-TMB in combination with Bus-Expres.cat

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg		Last-mile	Potential transfer points
1	Ridesharing/Taxi/Social Car				-
2	**W/C/MM**	**Metro (TMB)**		**Ridesharing/Taxi/Social Car**	**Any Metro station**
3	W/C/MM	Metro (TMB)	Bus (TMB)	W/C/MM	1.Sant Andreu Arenal 2. Sants-Sants Estació
4	**W/C/MM**	**Metro (TMB)**	**DRT (BusUp)**	**W/C/MM**	**1.Sant Andreu Arenal 2. Sants-Sants Estació**
5	W/C/MM	Bus (TMB)	DRT (BusUp)	W/C/MM	1. Fabra i Puig - Meridiana

#	First mile	Main leg		Last-mile	Potential transfer points
6	W/C/MM	Metro (TMB)	DRT (BusUp)	Ridesharing/Taxi/Social Car	1.Sant Andreu Arenal 2. Sants-Sants Estació
7	W/C/MM	DRT (BusUp)		W/C/MM	1. Sagrada Familia 2. Maria Christina

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#2** this trip chain includes 2 TSPs of IP4MaaS and will allow us to test the combination of public transport with ride-sharing.
- **#4** this trip chain included 2 TSPs of IP4MaaS and will allow us to test the combination of public transport and DRT services.

15.1.2.2. User Journey: Barcelona-Sant Cugat

Itinerary of the user journey

- ***Origin***: Barcelona Area
- ***Destination:*** Sant Cugat del Vallès (Can Sant Joan, Business Area)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private Car
- Metro or Bus -TMB in combination with Train-FGC
- Train-FGC

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg		Last-mile	Potential transfer points
1	Ridesharing/Taxi/Social Car				-
2	W/C/MM	Metro (TMB)	DRT (BusUp)	W/C/MM	Calabria 16, Entença 68, Entença 194 Entença 320 Pg. Sant Juan Bosco 6
3	**W/C/MM**	**Bus (TMB)**	**DRT (BusUp)**	**W/C/MM**	**Calabria 16, Entença 68,**

#	First mile	Main leg		Last-mile	Potential transfer points
					Entença 194 **Entença 320** **Pg. Sant Juan Bosco 6**
4	**W/C/MM**	**Metro (TMB)**	**DRT (BusUp)**	**W/C/MM**	**Lepant 278** **Gran Via de les Corts 814** **Bac de Roda 192** **Av. Meridiana 274** **Av. Meridiana 375** **Av. Meridiana /Av. Mossèn Clapés**
5	W/C/MM	Ridesharing/Taxi/Social Car			-

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering area of potential improvement due to current limitations and pain points.

- ***#3*** this multimodal chain includes 2 IP4MaaS TSPs
- ***#4*** this multimodal chain includes 2 IP4MaaS TSPs

The two solutions chosen are similar nevertheless we would like to measure the differences between the multimodal chain and its effect on mobility packages.

15.2. Athens - High-level User Journeys Template

The high-level user journey template, filled for the Athens demonstration site.

15.2.1. 1st High-level User Journey – Athens

Description

- ***Title***: Travelling to and from the Northern sector of Athens for work/education (and recreation)
- ***Description of the typology of journeys considered:*** Passengers travelling from Central Athens to the Northern part of the capital (or vice versa), specifically from and to the Municipality of Iraklio to reach the place of their employment, education, and recreation. For the first case, the potential origin can be the Metro Station of Keramikos, or any other metro station nearby, while, for the second one, the opposite route is chosen, from the Municipality of Iraklio to the centre of the city.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***

- *OASA*: The responsible authority for planning, coordinating, and financing the public transport system in the Athens metropolitan area. The subsidiaries include OSY S.A. (buses and trolleybuses) and STASY S.A. (metro and tram). OASA provides the ATH.ENA Card, a reloadable card that can be topped up with multiple fare products depending on trip needs and affordability.
- *MIRAKLIO*: Municipal PT service operator.
- *Taxiway*: Taxi service provider
- *Brainbox*: a bike-sharing service offering company

- ***Expected target users***: Commuters, moving around the Athens agglomeration for work, education and/or leisure purposes.

15.2.1.1. User Journey: Keramikos – OAED school

Itinerary of the user journey

- ***Origin:*** Keramikos station
- ***Destination:*** Manpower employment organization school (OAED) at the Municipality of Iraklio

Most common travel solutions

The most common travel solutions currently adopted by users for the specific itinerary include:

- Private car
- Taxi (Taxiway)
- Metro (OASA)
- Train (TRAINOSE)
- Bus + metro (combination of modes offered by OASA)
- Metro and local PT (OASA and MIRAKLIO)

Travel solutions supported by IP4MaaS

#	First mile	Main leg	Last-mile	Potential transfer points
1	Taxi/carpooling			-
2	Private car			
3	Private Car	Train (TRAINOSE)	W/C	1. Metro st. Rouf 2.Metro st. Iraklio
4	Taxi (Taxiway)	Train (TRAINOSE)	W/C	1. Metro st. Rouf 2.Metro st. Iraklio
5	W/C	Train (TRAINOSE)	Local PT service (MIRAKLIO)	1. Metro st. Rouf 2.Metro st. Iraklio
6	W/C	Metro (OASA)	Local PT	1. Keramikos Metro

#	First mile	Main leg		Last-mile	Potential transfer points
				service (MIRAKLIO)	st. 2.Monastiraki metro st. 3.Iraklio metro st.
7	Taxi (Taxiway)	Metro (OASA)		Local PT service (MIRAKLIO)	1. Keramikos Metro st. 2.Monastiraki metro st. 3.Iraklio metro st.
8	W/C	Bus (OASA)		W/C	1. Asomaton 2. Omonoia 3. Polytexneio 4. Trois
9	Taxi (Taxiway)	Bus (OASA)		Local PT service (MIRAKLIO)	1.Asomaton bus st. 2.Omonoia bus st. 3. Polytexneio bus st. 4. Troias bus st.
10	Taxi (Taxiway)	Bus (OASA)	Metro (OASA)	W/C	1.Asomaton bus st. 2.Omonoia bus st. (change to metro) 3. Iraklio
11	Taxi (Taxiway)	Bus (OASA)	Metro (OASA)	Local PT service (MIRAKLIO)	1.Asomaton bus st. 2.Omonoia bus st. (change to metro) 3. Iraklio

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#7** This multimodal chain includes 3 IP4MaaS TSPs, its main pain point is the booking process, and it could provide an advantage to the travellers or certain flexibility and reduces the solo drivers.
- **#11** It is the most complicated and includes 4 different modes (3 IP4MaaS TSPs -2 different OASA modes included) and can facilitate the smart contracts between different TSPs.

15.2.1.2. User Journey: Neo Iraklio – SNFCC

Itinerary of the user journey

- ***Origin*** Municipality of Iraklio
- ***Destination*** Stavros Niarchos Foundation Cultural Center (SNFCC)

Most common travel solutions

The most common travel solutions currently adopted by users for the specific itinerary include:

- Private car;

- Taxi (*Taxiway)*;
- Bus + metro (combination of modes offered by OASA)
- Local PT service (MIRAKLIO)

Travel solutions supported by IP4MaaS

#	First mile	Main leg		Last-mile	Potential Transfer Points
1	Private car				-
2	Taxi (*Taxiway)*				
3	Carpooling				
4	Local PT service (MIRAKLIO)	Metro (OASA)	Bus (OASA)	Taxi (*Taxiway)*	1.Iraklio metro st. 2. Faliro metro st. 3. Faliro bus st. 4.Peisistratou bus st.
5	Taxi (*Taxiway)*	Metro (OASA)	Bus (OASA)	Taxi (*Taxiway)*	1.Iraklio metro st. 2. Faliro metro st. 3. Faliro bus st. 4.Peisistratou bus st.
6	Taxi (*Taxiway)*	Metro (OASA)	Bus (OASA)	W/C/electric car	1.Iraklio metro st. 2. Faliro metro st. 3. Faliro bus st. 4.Peisistratou bus st.
7	W/C/electric car	Metro (OASA)	Bus (OASA)	W/C/electric car	1. Iraklio metro st. 2. Attiki metro st. 3. Suggrou fix metro st. 4. Onasio bus st.
8	Local PT transport (MIRAKLIO)	Metro (OASA)	Bus (OASA)	W/C/electric car	1. Iraklio metro st. 2. Attiki metro st. 3. Suggrou fix metro st. 4. Onasio bus st.
9	Local PT transport (MIRAKLIO)	Metro (OASA)	Bus (OASA)	Taxi (*Taxiway)*	1.Iraklio metro st. 2.Attiki metro st. 3.Suggrou fix metro st. 4.Onasio bus st.

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#6** This multimodal chain includes 3 IP4MaaS TSPs, its main pain point is booking, and it could provide an advantage to the travellers or certain flexibility and reduces the solo drivers.
- **#9** It is the most complicated and includes 4 different modes (3 IP4MaaS TSPs -2 different OASA modes included) and can facilitate the smart contracts between different TSPs.

Note: In the cases where cycling and electric cars are mentioned, we refer to shared services, provided that these are available (offered by Brainbox).

15.2.2. 2nd High-level User Journey – Athens

Description

- **Title**: **Travelling to Kerameikos district (touristic area)**
- ***Description of the typology of journeys considered:*** Passengers, in this case, are tourists arriving or departing to and from a central touristic district in Athens (e.g., Keramikos, Syntagma, Kolonaki, Petralona). Potential transportation hubs that may be considered as origin and destinations include the Port of Piraeus, the El. Venizelos National airport, the railway station St. Larisis. The passenger is not intended to make further trips within the central district as they are considered to hold and carry at least one piece of luggage.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *OASA*: The responsible authority for planning, coordinating and financing the public transport system in the Athens metropolitan area. The subsidiaries include OSY S.A. (buses and trolleybuses) and STASY S.A. (metro and tram). OASA provides the ATH.ENA Card, a reloadable card that can be topped up with multiple fare products depending on trip needs and affordability.
  - *MIRAKLIO*: Municipal PT service operator.
  - *Taxiway*: Taxi service provider.
  - *Brainbox*: a bike-sharing service offering company.
  - *Welcome pickups*: a company specialized in guided tours, transfers and pickups, sightseeing rides, touristic information.
- ***Expected target users***:
  - Passengers arriving and departing from a central district of Athens for touristic purposes.

15.2.2.1. User Journey: Port of Piraeus – Keramikos

Itinerary of the user journey

- ***Origin:*** Port of Piraeus
- ***Destination:*** Keramikos metro station and access to accommodation in the Keramikos district.

Most common travel solutions

The most common travel solutions currently adopted by users for the specific itinerary include:

- Private car
- Taxi (Taxiway)
- Metro (OASA)

- Bus and metro (combination of modes offered by OASA)

Travel solutions supported by IP4MaaS

#	First mile	Main leg			Last-mile	Potential transfer points
1	Taxi (*Taxiway)*					-
2	Private car					-
3	W	Metro (OASA)			W/C	-
4	W	Metro (OASA)	Metro (OASA)		W/C	1. Monastiraki station
5	Bus	Bus (OASA)			W	1. Venizelou bus station
6	W	Metro (OASA)			Taxi (*Taxiway)*	-
7	W	Bus (OASA)	Bus (OASA)		W	1.Apollon bus station
8	W	Bus (OASA)	Bus (OASA)		W	1.Legaki bus station
9	W	Suburban (TRAINOSE)			W	-
10	W	Bus (OASA)	W	Tram (OASA)	W/C	1. Plastigges bus station 2. Gymnastirio tram station
11	Taxi (*Taxiway)*	Metro (OASA)			Taxi (*Taxiway)*	Nikaia metro station
12	W	Bus (OASA)	Metro (OASA)		Taxi (*Taxiway)*	Nikaia metro station

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#6** this multimodal chain includes 2 IP4MaaS TSPs, its main pain point is booking, and it could provide an advantage to the travellers of reliability and reduces anxiety.
- **#12** it is the most complicated and includes all 3 of the IP4MaaS TSPs (2 different OASA modes included) and can facilitate the smart contracts between different TSPs.

15.2.2.2. User Journey: Port of Piraeus – Koukaki

Itinerary of the user journey

- ***Origin:*** Port of Piraeus
- ***Destination:*** Syggrou-Fix metro station and access to accommodation in the Koukaki district.

Most common travel solutions

The most common travel solutions currently adopted by users for the specific itinerary include:

- Private car
- Taxi (*Taxiway)*
- Metro (OASA)
- Bus and metro (combination of modes offered by OASA)

Travel solutions supported by IP4MaaS

#	First mile	Main leg			Last-mile	Potential transfer points
1	Taxi (Taxiway*)*					-
2	Private car					-
3	W	Metro (OASA)			W/C	-
4	W	Bus (OASA)	Bus (OASA)	Trolley (OASA)	W/C	1 Isap bus station 2 Davaki bus stop 3 Koukaki trolley stop
5	W	Bus (OASA)	Bus (OASA)	Bus (OASA)	W/C	1 Ethnikis antistaseos bus stop 2 Trokadero bus stop 3 Olympiaki bus stop
6	W	Metro (OASA)			Taxi (*Taxiway)*	Petralona
7	W	Metro (OASA)	Metro (OASA)		W/Taxi (*Taxiway)*/C	Omonia
8	W	Metro (OASA)	Metro (OASA)	Tram (OASA)	W	1 Sydagma 2 Syggrou fix
9	W	Bus (OASA)	Bus (OASA)		W	Telonio bus station
10	W	Metro (OASA)	Trolley (OASA)		W	Petralona
11	W/Taxi (*Taxiway)*	Metro (OASA)	Metro (OASA)		W/Taxi (*Taxiway)*	Nikaia Sydagma Syggrou-fix

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#6** this multimodal chain includes 2 IP4MaaS TSPs, its main pain point is booking. It is the most reliable and less anxious solution. It is the most common choice for someone that would like to make only one transfer and use public transport.
- **#11** it is a complicated trip (it includes one metro transfer and at least one taxi trip) and includes 2 of the IP4MaaS TSPs; it can facilitate the smart contracts between different TSPs. It would be chosen by someone that would like to keep the taxi cost as low as possible.

15.2.2.3. User Journey: Keramikos – El.Venizelos Aiport

Itinerary of the user journey

- ***Origin:*** Keramikos metro station, egress from accommodation in the Keramikos district.
- ***Destination:*** El. Venizelos Airport

Most common travel solutions

The most common travel solutions currently adopted by users for the specific itinerary include:

- Private car
- Taxi
- Bus and metro (combination of modes offered by OASA)

Travel solutions supported by IP4MaaS

#	First mile	Main leg		Last-mile	Potential transfer points
1	Taxi (*Taxiway)*				
2	Private car				
3	W	Bus (OASA)	Bus (OASA)	W	Syntagma bus station
4	W	Bus (OASA)	Bus (OASA)	W	Vys. Mouseio bus station
5	W	Bus (OASA)	Bus (OASA)	W	Kolokinthous bus station
6	W	Bus (OASA)	Bus (OASA)	W	Kifisou bus station
7	W	Metro (OASA)		W	
8	W/C	Metro (OASA)	Bus (OASA)	W	Syntagma bus station
9	W	Suburban rail (TRAINOSE)		W	-
10	Taxi (*Taxiway)*	Metro (OASA)		W	Syntagma st.
11	Taxi (*Taxiway)*	Bus (OASA)		W	Syntagma bus station

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement

due to current limitations and pain points.

- **#8** includes 2 IP4MaaS TSPs of Athens's demo site, that required different itineraries.
- **#11** it is a complex solution and includes 2 of the IP4MaaS TSPs with different itineraries.

15.2.3. 3rd High-level User Journey – Athens

Description

- **Title**: **Travelling to a metro station located in a rural area of Attica**
- ***Description of the typology of journeys considered:*** Passengers travelling from and from the centre of the city of Athens to a metro station located to a (semi) rural area, for different activities, such as work and shopping/leisure.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *OASA:* the responsible authority for planning, coordinating and financing the public transport system in the Athens metropolitan area. OASA provides the ATH.ENA Card, a reloadable card that can be topped up with multiple fare products depending on trip needs and affordability.
  - *TAXIWAY: provision of taxi services to citizens.*
  - *Brainbox*: a bike-sharing service offering company.
- ***Expected target users***:
  - Commuters, moving in the Athens agglomeration for work, shopping and/or leisure purposes.

15.2.3.1. User Journey: Keramikos-The Mall Athens

Itinerary of the user journey

- ***Origin:*** Keramikos Metro station
- ***Destination:*** "The Mall Athens"

Most common travel solutions

The most common travel solutions currently adopted by users for the specific journey include the following:

- Private car
- Taxi (*Taxiway)*
- Metro (OASA)
- Metro and bus (combination of modes offered by OASA)

Travel solutions supported by IP4MaaS

#	First mile	Main leg		Last-mile	Potential transfer points
1	Carpooling				-
2	Private Car				-
3	Taxi (*Taxiway)*				-
4	W/C/electric car	Metro (OASA)		W/C/ electric car	1. Keramikos Metro st. 2. Thisio metro st. 3.Neratziotisa metro st.
5	C/ electric car	Taxi (*Taxiway)*	Metro (OASA)	W/C/ electric car	1. Omonoia metro st. 2. Neratziotisa metro st.
6	Carpooling	Metro (OASA)		W/C/ electric car	1. Keramikos Metro st. 2. Thisio metro st. 3.Neratziotisa metro st.
7	W/C/ electric car	Metro (OASA)	Bus (OASA)	W/C/ electric car	1. Keramikos metro st. 2.Evaggelismos metro st. 3. Ethinko idryma ereynon bus st. 4. OTE bus st.

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#5** this multimodal chain includes 3 IP4MaaS TSPs, its main pain point is booking since it requires a different itinerary, and it provides certain flexibility and reduces the solo drivers.
- **#7** is the most complicated scenario and considers 2 IP4MaaS TSPs.

Note: In the case where cycling and/or electric car is mentioned, this refers to services offered by Brainbox, depending on availability.

15.2.3.2. User Journey: Palaio Faliro – N. Heraklion

Itinerary of the user journey

- ***Origin*** Palaio Faliro (Ag. Alexandrou Sq)
- ***Destination*** N. Heraklion (Central Square near Metro Station Line 1)

Most common travel solutions

The most common travel solutions currently adopted by users for the specific journey include the following:

- Private car
- Taxi (taxiway)
- Bus (OASA)
- Tram (OASA)
- Municipality of Iraklio
- Metro and bus (combination of modes offered by OASA)

Travel solutions supported by IP4MaaS

#	First mile	Main leg		Last-mile	Potential transfer points
1	Carpooling				-
2	Private Car				-
3	Taxi (Taxiway)				-
4	W/C/MM	Bus (OASA)		Local PT service	1 Sygrou-Fix Metro St. 2 Omonoia Metro St or Attiki Metro st 1 Tram Stop 2 Faliro Metro St. or Tram St.
5	W/C/MM	Metro (OASA)	Taxi (Taxify)	W/C	1 Tram Stop or Taxi 2 Faliro Metro St.
7	Carpooling	Metro (OASA)	Bus (OASA)	W/C	1 Sygrou-Fix Metro St 2 Omonoia Metro St or Attiki Metro st ---------- 1 Tram Stop or Taxi 2 Faliro Metro St.
8	W/C/MM	Bus (OASA)	Metro (OASA)	Taxi (Taxify)	1 Tram Stop or Taxi 2 Faliro Metro St.

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#5** include 2 out of 4 of the IP4MaaS TSPs of the Athens demo site and different itineraries.
- **#8** it is complex and includes all the IP4MaaS TSPs, which makes it challenging.

15.3. Padua - High-level User Journeys Template

The high-level user journey template, filled for the Padua demonstration site.

15.3.1. 1st High-level User Journey - Padua

Description

- **Title**: **Travelling to Venice University (Ca' Foscari)**
- ***Description of the typology of journeys considered:*** Travelling from a town in a rural area surrounding Padua to the University of Venice (Ca' Foscari) Campus.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
    - Trenitalia
    - Busitalia Veneto
- ***Expected target users***: Commuters (workers, students)

15.3.1.1. User Journey: Montegalda-Venice University

Itinerary of the user journey

- ***Origin***: Montegalda
- ***Destination:*** Venice Ca' Foscari University Campus

Most common travel solutions

What solutions users usually adopt for this itinerary:

- Private car
- Bus (Busitalia) + Train (Trenitalia)

Travel solutions supported by IP4MaaS

#	First mile	Main leg		Last-mile	Potential transfer points
1	W/MM	Bus (Busitalia)	Train (Trenitalia)	W/MM	1 Padua central station 2 Venice St. Lucia
2	Private car/Ridesharing	Train (Trenitalia)		W/MM	1 Padua central station 2 Venice St. Lucia
3	Ridesharing			W/MM	1 Venice piazzale Roma

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#1** this multimodal chain foresees 2 IP4MaaS TSPs (train and bus), pain points are modal changes that increase the complexity of the trip and makes travellers feel not in control of their trip
- **#2** this multimodal chain foresees 2 IP4MaaS TSPs (train and ride-sharing), pain points are modal changes that increase the complexity of the trip and makes travellers feel not in

control of their trip, even though ride-sharing is a more personalized travel service that can mitigate this perception.

15.3.1.2. User Journey: Torri di Quartesolo-Venice University

Itinerary of the user journey

- ***Origin***: Torri di Quartesolo
- ***Destination****:* Venice Ca' Foscari University Campus

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Bus (Busitalia) + Train (Trenitalia)

Travel solutions supported by IP4MaaS

#	First mile	Main leg		Last-mile	Potential transfer points
1	W/MM	Bus (Busitalia)	Train (Trenitalia)	W/MM	1 Padua central station 2 Venice St. Lucia
2	Private car/Ridesharing	Train (Trenitalia)		W/MM	1 Padua central station 2 Venice St. Lucia
3	Ridesharing			W/MM	1 Venice piazzale Roma

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#1** this multimodal chain foresees 2 IP4MaaS TSPs (train and bus), pain points are modal changes that increase the complexity of the trip and makes travellers feel not in control of their trip
- **#2** this multimodal chain foresees 2 IP4MaaS TSPs (train and ride-sharing), pain points are modal changes that increase the complexity of the trip and makes travellers feel not in control of their trip, even though ride-sharing is a more personalized travel service that can mitigate this perception.

15.3.2. 2nd High-level User Journey - Padua

Description

- **Title**: **Travelling home from Arcella to the Padua rural area**
- ***Description of the typology of journeys considered:*** Commuters working within the sub-urban area of Padua (Arcella) and travelling back home in a small town in the rural area.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
    - FST
    - Busitalia Veneto
- ***Addressed demonstration site objectives***:
    - To enhance mobility planning and management services of FSI Group;
    - To offer to customers multimodal services thanks to the IP4 technical features integration;
    - To assimilate all mobility options available within the Padua area into mobility packages centred around the specific requirements of citizens;
    - To connect a sub-urban area to a rural town
- ***Expected target users:*** commuters (workers)

15.3.2.1. User Journey: Arcella-Trebaseleghe

Itinerary of the user journey

- ***Origin***: Arcella
- ***Destination****:* Trebaseleghe

Most common travel solutions

What solutions users usually adopt for this itinerary, either complementary or alternative:

- Private car
- Bus (Busitalia)
- Train (Trenitalia)

Travel solutions supported by IP4MaaS

#	First mile	Main leg		Last-mile	Potential transfer points
1	W/MM/C	Bus (Busitalia)	Train (Trenitalia)	Walking	1 Piombino Dese
2	W/MM/C	Train (Trenitalia)	Train (Trenitalia)	Walking	1 Castelfranco Veneto
3	W/MM/C	Train (Trenitalia)	Train (Trenitalia)	Walking	1 Venezia S. Lucia / Venezia Mestre
4	Ride sharing				-

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#1** and **#3** This itinerary provides a valid alternative to fill the existing gap on the scheduled offer. Pain points are the modal changes and related waiting times together with the perception of not feeling in control of their trip.

15.3.2.2. User Journey: Arcella-Camposampiero

Itinerary of the user journey

- ***Origin***: Arcella
- ***Destination****:* Camposampiero

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS), either in combination or as alternatives

- Private car
- Bus (Busitalia)
- Train (Trenitalia)

Travel solutions supported by IP4MaaS

#	First mile	Main leg	Last-mile	Potential transfer points
1	W/MM/C	Train (Trenitalia)	W	1 Padua Central station
2	Ride-sharing		W	-

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#1** and **#2** Train is the most comfortable solution for a bigger city with traffic.

15.4. Osijek – High-level User Journeys Template

The high-level user journey template, filled for the Osijek demonstration site.

15.4.1. 1st High-level User Journey - Osijek

Description

- **Title**: **Traveling to UNIOS student campus**
- ***Description of the typology of journeys considered:*** Passengers travelling from the rural

areas nearby the City of Osijek to the UNIOS student campus in Osijek. The potential origin could be nearby municipalities that are part of Osijek urban agglomeration (e.g., Antunovac, Čepin, Valpovo, Erdut, Darda, etc.).

- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *GPP Osijek*: PTO currently operating in the City of Osijek wider administrative area (City of Osijek, Čepin, Antunovac and Erdut), providing transport services with its 12 Bus and 2 tram lines. GPP Osijek is the managing company of e-bike sharing, car sharing and e-scooter sharing systems.
- ***Expected target users***: students, employees

15.4.1.1. User Journey: Čepin-Student Campus Osijek

Itinerary of the user journey

- ***Origin***: Čepin
- ***Destination****:* Student Campus Osijek

The municipality of Čepin is 3rd by population number (11.599) in the whole agglomeration (3% of county population). It has one of the highest densities in Osijek agglomeration (109 cit./km2) which is potential for public transit and shared mobility solutions. Since the targeted group is made of students and employees travelling to campus, it defines relevant use journeys because commuters (students and employees) in Čepin are highest in number in comparison to other areas of agglomeration. 18% of all GPP monthly ticket renewals in Čepin are student renewals (highest of all municipalities in the GPP transport area excluding Osijek).

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Bus (GPP Osijek)
- Private car
- Ridesharing

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg	Last-mile	Potential transfer points
1	Walking	Train (HŽPP)	Walking	-
2	Walking	Train (HŽPP)	Carsharing (GPP)	Railway station Osijek Dravski most or Main railway station Osijek

#	First mile	Main leg		Last-mile		Potential transfer points
3	Walking	Train (HŽPP)		Walking	E-scooter sharing (GPP)	Railway station OLT or Main railway station Osijek
4	Private car/Ridesharing	Train (HŽPP)		Tram (GPP)		Railway station Osijek Dravski most
5	Private car/Ridesharing	Train (HŽPP)	Bike/E-bike sharing (GPP)	Walking		Main railway station
6	Walking	Bus (GPP)		E-scooter sharing (GPP)		Bus station Vukovarska 41 or Central bus station

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#4** Current limitation is that passengers don't have a seamless multimodal service available in a single journey, and sometimes private car seams as a more convenient mode of transport for them. The alternative offers more integrated, easier-to-use multimodal transport in a single trip with a better customer experience (potential demonstration of journey planning, navigation, and other services) for a larger student population. There is also the possibility to test the connection of different back-end systems providing added value to PT users.
- **#5** Current limitation is private car dependency and limited public transport integration. The alternative offers more integrated, easier-to-use multimodal transport in a single journey and demonstration of new services currently in implementation (bike & e-bike sharing). It could offer different back-end systems integration and testing of Journey planning, Navigation, and Location-based services with potential seamless ticketing services.

15.4.1.2. User Journey: Antunovac-Student Campus Osijek

Itinerary of the user journey

- ***Origin***: Antunovac
- ***Destination****:* Student Campus Osijek

Antunovac has 13% of monthly ticket renewals made by students gravitating to Osijek and it has the highest population in the southern area of agglomeration after Čepin.

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Bus (GPP Osijek)
- Private car
- Ridesharing

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg		Last-mile		Potential transfer points
1	Walking	Bus (GPP)		Bus (GPP)		Bus station Trpimirova
2	Private car/Ridesharing	Bus (GPP)		Tram (GPP)		Bus station Trpimirova
3	Walking	Bus (GPP)		E-scooter sharing (GPP)		Bus station Trpimirova
4	Private car/Ridesharing	Bus (GPP)	Bike/E-bike sharing (GPP)	Walking		Bus station Trpimirova
5	Walking	Bus (GPP)		Carsharing (GPP)		Bus station Trpimirova
6	Walking	Train (HŽPP)		Walking		-
7	Walking	Train (HŽPP)		Carsharing (GPP)		Railway station Osijek Dravski most or Main railway station Osijek
8	Walking	Train (HŽPP)		Walking	E-scooter sharing (GPP)	Railway station OLT or Main railway station
9	Walking	Train (HŽPP)		Tram (GPP)		Railway station Osijek Dravski most
10	Walking	Train (HŽPP)	Bike/E-bike sharing (GPP)	Walking		Main railway station Osijek

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#4** Current limitation is that passengers seamless multimodal service available in a single journey, and sometimes they are dependent on a private car. The alternative offers a more integrated, easier-to-use transport service with a higher number of available services of GPP Osijek available in a single journey. Current transport services could have a better customer

experience for a larger student population due to seamless multimodal travel and demonstration of new services currently in implementation - bike & e-bike sharing.

- **#7** Current limitation is that passengers don't have seamless, flexible service available in a single journey, and sometimes they are dependent on a private car. The alternative offers more integrated, easier-to-use multimodal services of two PT operators while providing the flexibility that the car-sharing system offers (better demonstration of car-sharing service). Demonstration of trip planning tools could lead to a better customer experience with the potential of unified ticketing system development in the future.

15.4.2. 2nd High-level User Journey - Osijek

Description

- **Title**: **Travelling to the Osijek city centre**
- ***Description of the typology of journeys considered:*** Citizens from the suburban area (e.g., retired population from Višnjevac) travelling to the Osijek city centre.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *GPP Osijek*: PTO currently operating in the City of Osijek wider administrative area (City of Osijek, Čepin, Antunovac and Erdut), providing transport services with its 12 Bus and 2 tram lines. GPP Osijek is to be a company managing e-bike sharing, car sharing and e-scooter sharing systems.
- ***Expected target users***: daily commuters (students, employees), retired people, visitors (people coming to the city centre for leisure or recreational activities)

15.4.2.1. User Journey: Višnjevac-Tvrđa

Itinerary of the user journey

- ***Origin:*** Višnjevac
- ***Destination:*** Tvrđa

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Ridesharing
- Private Car
- Tram (GPP Osijek)
- Bus (GPP Osijek)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg		Last-mile	Potential transfer points
1	Walking	Bus (GPP)		Walking	-
2	Walking	Tram (GPP)		Walking	-
3	Walking	Bike/E-bike sharing (GPP)		Walking	-
4	Walking	Tram (GPP)	Bike/E-bike sharing (GPP)	Walking	Raftala or Square Ante Starčević
5	Private car/Ridesharing	Tram (GPP)	E-scooter (GPP)	Walking	Raftala or Square Ante Starčević
6	Walking	Tram (GPP)	Car sharing (GPP)	Walking	Raftala or Square Ante Starčević
7	Private car/Ridesharing	Bus (GPP)	Bike/E-bike sharing (GPP)	Walking	Vij. Ivana Meštrovića
8	Walking	Bus (GPP)	E-scooter (GPP)	Walking	Vij. Ivana Meštrovića
9	Walking	Bike/E-bike sharing (GPP)	Tram (GPP)	Walking	Square Ante Starčević
10	Walking	Train (HŽPP)	Tram (GPP) / Tram (GPP)	Walking	1. Main railway station Osijek, 2. Sakuntala park
11	Walking	Train (HŽPP)	Bike/E-bike sharing (GPP)	Walking	Main railway station Osijek
12	Walking	Train (HŽPP)	E-scooter (GPP)	Walking	Main railway station Osijek
13	Private car/Ridesharing	Train (HŽPP)	E-scooter (GPP)	Walking	Main railway station Osijek
14	Walking	Train (HŽPP)	Car sharing (GPP)	Walking	Main railway station Osijek

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#7** Information about departures and arrivals in public transport could, in some cases, be limited and there is a possibility to get stuck in traffic jams. The alternative offers a more integrated, easier-to-use transport service with a higher number of GPP Osijek services available in a single journey (bus and bike/e-bike-sharing system) together with private vehicle usage which leads to a better customer experience for daily commuters and visitors.
- **#10** Current limitation is that more transfer points make the journey complex and the usage of a private car more convenient (in some cases). Instead, the alternative could offer integration of many GPP services combined with HŽPP services, making transfers seamless and public transport more easy-to-use, and attractive. Because of more transfer points, the alternative could emphasize the benefits of a possible journey planning service.

15.4.2.2. User Journey

Itinerary of the user journey

- ***Origin***: Bijelo Brdo
- ***Destination****:* Square Ante Starčević

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Ridesharing
- Private Car
- Tram (GPP Osijek)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg		Last-mile	Potential transfer points
1	Walking	Bus (GPP)	Tram (GPP)		Vukovarska / Zeleno polje
2	Walking	Bus (GPP)		Walking	-
3	Private car/Ridesharing	Bus (GPP)	Bike/E-bike sharing (GPP)	Walking	Vukovarska / Zeleno polje or Gajev trg
4	Walking	Bus (GPP)	E-scooter sharing (GPP)	Walking	Kampus or Vij. Ivana Meštrovića
5	Private car/Ridesharing	Train (HŽPP)	Tram (GPP)		Main railway station Osijek
6	Walking	Train (HŽPP)	Bike/E-bike sharing (GPP)	Walking	Main railway station Osijek
7	Walking	Train (HŽPP)	E-scooter sharing (GPP)	Walking	Main railway station Osijek
8	Walking	Train (HŽPP)	Car sharing (GPP)	Walking	Main railway station Osijek

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#3** People coming from Bijelo Brdo to Square Ante Starčević are limited with the bus service schedule, multimodal service is not seamlessly integrated and private car transport could sometimes be a more convenient solution for them. The alternative offers a more integrated, easier-to-use transport service with a higher number of GPP Osijek services available in a

single journey (bus and bike/e-bike sharing system) because of better customer experience for people coming from Bijelo Brdo.

- **#5** Current limitation is that passengers coming from Bijelo Brdo don't have a seamless multimodal service available in a single journey and could sometimes be dependent on private cars. The alternative offers more integrated, easier-to-use multimodal transport in a single trip with a better customer experience (potential demonstration of journey planning, navigation, and other services). There is also the possibility to test the connection of different back-end systems (GPP and HŽPP), providing added value to PT users.

15.5. Warsaw - High-level User Journeys Template

The high-level user journey template, filled for the Warsaw demonstration site.

15.5.1. 1st High-level User Journey – Warsaw

Description

- **Title**: **Travelling to UKSW Campuses**
- ***Description of the typology of journeys considered:***
- Passengers travelling from the suburban area nearby Warsaw or from a huge residential area to the Uniwersytet Kardynała Stefana Wyszyńskiego (UKSW).
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *MZA (bus lines)*
  - *TW (tram lines)*
  - *Metro*
- ***Expected target users***:
  - Commuters- workers and students

15.5.1.1. User Journey: Raszyn – UKSW Campus

Itinerary of the user journey

- ***Origin:*** Raszyn ("Sportowa" – bus stop)
- ***Destination:*** UKSW Campus ("Młociny UKSW"- bus stop)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site.

- Private car
- Bus (MZA)
- Metro (City of Warsaw)
- Tram (TW)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS.

#	First mile	Main leg	Last-mile	Potential transfer points
1	W/C	BUS/TRAM/METRO/BUS *4 means of transport and 3 transfers*	W/C	1.P+R Aleja Krakowska 2. Metro Centrum 3. Metro Młociny
2	Private Car	TRAM/METRO/BUS	W/C	1.P+R Aleja Krakowska 2. Metro Centrum 3. Metro Młociny
3	W/C	BUS/TRAM/BUS/TRAM/BUS	W/C	1.P+R Aleja Krakowska 2.Dickensa 3.Park Kaskada 4.Metro Młociny
4	Private Car	BUS/TRAM/BUS/TRAM/BUS	W/C	1.P+R Aleja Krakowska 2.Dickensa 3.Park Kaskada 4.Metro Młociny
5	Private Car			

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#3** and **#4** are alternatives. They include several interchanges and they are potentially influenced by traffic.
- **#2** and **#4** require parking at P+R.

15.5.1.2. User Journey: Praga Południe – UKSW Campus

Itinerary of the user journey

- ***Origin:*** Praga Południe (“Rondo Wiatraczna” – tram stop)
- ***Destination:*** UKSW Campus (“Młociny UKSW”- bus stop)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site.

- Private car
- Bus (MZA)

- Metro (City of Warsaw)
- Tram (TW)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS.

#	First mile	Main leg	Last-mile	Potential transfer points
1	W/C	TRAM/METRO/BUS	W/C	1.Metro Ratusz Aresnał 2. Metro Młociny
2	W/C	BUS/METRO/BUS		1. Metro Politechnika 2. Metro Młociny
3	Private Car			

15.5.2. 2nd High-level User Journey – Warsaw

Description

- **Title**: **Travelling to SGGW**
- ***Description of the typology of journeys considered:***
- Passengers travelling from residential areas in Warsaw to Agricultural University (SGGW)
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *MZA (bus lines)*
  - *TW (tram lines)*
  - *Metro*
- ***Expected target users***:
  - Commuters- workers and students

15.5.2.1. User Journey: Dąbrówka Wiślana-SGGW Campus

Itinerary of the user journey

- ***Origin*** Dąbrówka Wiślana (“Dąbrówka Wiślana”- bus stop)
- ***Destination*** SGGW Campus (“SGGW – Rektorat”- bus stop)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Bus (MZA)
- Metro (City of Warsaw)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg	Last-mile	Potential Transfer Points
1	W/C	BUS/METRO/BUS	W/C	1. Metro Młociny 2. Metro Służew
2	W/C	BUS/METRO	W/C	1.Metro Młociny 2. Metro Ursynów
3	Private Car			

15.5.2.2. User Journey: Nowodwory - SGGW Campus

Itinerary of the user journey

- ***Origin*** Nowodwory ("Nowodwory"- tram stop)
- ***Destination*** SGGW Campus ("SGGW – Rektorat"- bus stop)

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Tram (TW)
- Bus (MZA)
- Metro (City of Warsaw)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg	Last-mile	Potential Transfer Points
1	W/C	TRAM/METRO/BUS	W/C	1. Metro Młociny

#	First mile	Main leg	Last-mile	Potential Transfer Points
				2. Metro Służew
2	Private Car			

15.6. Liberec – High-level User Journeys Template

The high-level user journey template, filled for the Liberec demonstration site.

15.6.1. 1st High-level User Journey

Description

- **Title**: **Travelling to the hospital in Liberec**
- ***Description of the typology of journeys considered:*** Passengers travel from the towns within the Liberec region to the hospital in Liberec.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *KORID LK:* transport authority in Liberec region (the coordination of transport services including MaaS services in the region)
  - *ČSAD Liberec:* PTO and school-bus operator
  - *ARRIVA:* rail operator
- ***Expected target users***: Commuters.

15.6.1.1. Nový Bor - Liberec

Itinerary of the user journey

- ***Origin***: Nový Bor, T.G.Masaryka
- ***Destination:*** Liberec, Regional hospital

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Train (ARRIVA vlaky)
- Bus (ČSAD Česká Lípa)
- Tram (Dopravní podnik měst Liberce a Jablonce nad Nisou)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg			Last-mile	Potential transfer points
1	Private car					-
2	Walking	Bus-KORID	Bus-KORID	Tram-KORID	Walking	Nový Bor,, T.G.Masaryka; Nový Bor,,nám. Míru; Liberec,,aut.nádr.; Šaldovo náměstí
3	Walking	Bus-KORID	Bus-KORID	Train-ARRIVA vlaky	Tram-KORID	Walking	Nový Bor, T.G.Masaryka; Nový Bor, aut.nádr.; Jablonné v Podj.,,žel.st.; Nádraží (Liberec); Šaldovo náměstí
4	Walking	Bus-KORID	Train-KORID	Tram-KORID	Walking	Nový Bor,, T.G.Masaryka; Česká Lípa,,aut.nádr.; Nádraží (Liberec); Šaldovo náměstí
5	Walking	Train-KORID	Train-KORID	Tram-KORID	Walking	Nový Bor, Česká Lípa hl.n.; Nádraží (Liberec); Šaldovo náměstí
6	Walking	Bus-KORID	Train-ARRIVA vlaky	Tram-KORID	Walking	Nový Bor, Jablonné v Podještědí; Nádraží (Lliberec); Šaldovo náměstí
7	Walking	Bus-KORID	Car sharing-KORID			Nový Bor,, T.G.Masaryka; Liberec,,aut.nádr.
8	Walking	Bus-KORID	Tram-KORID		Walking	Nový Bor,, T.G.Masaryka; Liberec,,aut.nádr.; Šaldovo náměstí

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#6** includes 2 out of 3 of the IP4MaaS TSPs of Liberec's demo site. In particular, it includes the train connections operated by ARRIVA vlaky.
- **#8** includes 1 out of 3 of the IP4MaaS TSPs of Liberec's demo site with two demo sites and it is the option with the least number of the changes.

15.6.1.2. Mimoň - Liberec

Itinerary of the user journey

- ***Origin***: Mimoň, Komenského 37

- ***Destination:*** Liberec, Regional hospital

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Train (ARRIVA vlaky, České dráhy)
- Bus (ČSAD Česká Lípa, ČSAD Liberec)
- Tram (Dopravní podnik měst Liberce a Jablonce nad Nisou)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg			Last-mile	Potential transfer points
1	Private car					-
2	Walking	Bus-KORID	Bus-ČSAD Liberec	Tram-KORID	Walking	Mimoň,,aut.st; Stráž p.Ralskem,,aut.st.;Liberec,,aut.nádr.; Šaldovo náměstí
3	Walking	Train-ARRIVA vlaky		Tram-KORID	Walking	Mimoň; Nádraží (Liberec); Šaldovo náměstí
4	Walking	Train-KORID		Tram-KORID	Walking	Mimoň; Nádraží (Liberec); Šaldovo náměstí
5	Walking	Train-KORID		Car sharing-KORID		Mimoň; Nádraží (Liberec)
6	Walking	Train-ARRIVA vlaky		Car sharing-KORID		Mimoň; Nádraží (Liberec)
7	Walking	Bus-KORID	Bus-KORID	Tram-KORID	Walking	Mimoň,,aut.st; Jablonné v Podj.,,žel.st.; Liberec,,aut.nádr.; Šaldovo náměstí
8	Walking	Bus-KORID	Bus-KORID	Car sharing-KORID		Mimoň,,aut.st; Jablonné v Podj.,,žel.st.; Liberec,,aut.nádr.
9	Walking	Bus-KORID	Bus-ČSAD Liberec	Car sharing-KORID		Mimoň,,aut.st; Stráž p.Ralskem,,aut.st.; Liberec,,aut.nádr.

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#2** includes 2 out of 3 of the IP4MaaS TSPs of Liberec's demo site and the main part of the journey is covered by buses.
- **#3** includes 2 out of 3 of the IP4MaaS TSPs of Liberec's demo site. It is one of the options with the least number of changes and it includes the train connection operated by ARRIVA vlaky.

15.6.2. 2nd High-level User Journey

Description

- **Title**: **Trip through the historical beauties of Liberec region**
- ***Description of the typology of journeys considered:*** Tourist travels from Germany/Poland to visit interesting places in Liberec region.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *KORID LK:* transport authority in Liberec region (the coordination of transport services including MaaS services in the region)
  - *ČSAD Liberec:* PTO and school-bus operator
- ***Expected target users***: Tourists who aren't familiar with travelling in the Liberec region

15.6.2.1. Zittau – Frýdlant – Hejnice

Itinerary of the user journey

- ***Origin***: Zittau, Bahnhofstraße 29
- ***Destination****:* castle and chateau Frýdlant, Hejnice monastery

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Train (Die Länderbahn, České dráhy)
- Bus (ČSAD Liberec)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg	Last mile	Potential transfer points
1		Private car		-

#	First mile	Main leg					Last mile	Potential transfer points
2	Walking	Train-KORID (TL)	Train-KORID	Walking	Bus- ČSAD Liberec		Walking	Zittau; Liberec; Frýdlant v Čechách; Frýdlant,,aut.nádr.; Hejnice,,aut. st.
3	Walking	Train-KORID (TL)	Train-KORID	Walking	Train-KORID	Train-KORID	Walking	Zittau; Liberec; Frýdlant v Čechách; Raspenava; Hejnice
4	Walking	Train-KORID (TL)	Train-KORID	Walking	Train-KORID	Bus- ČSAD Liberec	Walking	Zittau; Liberec; Frýdlant v Čechách; Raspenava; Hejnice,,aut.st.
5	Walking	Train-KORID (TL)	Bus-ČSAD Liberec	Walking	Bus- ČSAD Liberec		Walking	Zittau; Liberec; Frýdlant,,aut.nádr.; Hejnice,,aut.st.
6	Walking	Train-KORID (TL)	Bus-ČSAD Liberec	Walking	Train-KORID	Train-KORID	Walking	Zittau; Liberec; Frýdlant,,aut.nádr.; Frýdlant v Čechách; Raspenava; Hejnice
7	Walking	Train-KORID (TL)	Bus-ČSAD Liberec	Walking	Train-KORID	Bus-ČSAD Liberec	Walking	Zittau; Liberec; Frýdlant,,aut.nádr.; Frýdlant v Čechách; Raspenava; Hejnice,,aut.st
8	Walking	Train-KORID (TL)	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Walking	Bus-ČSAD Liberec	Walking	Zittau; Chrastava; Nová Ves,,křiž.; Frýdlant,,aut.nádr.; Hejnice,,aut.st.

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#2** includes 2 out of 3 of the IP4MaaS TSPs of Liberec's demo site and all legs are operated by trains.
- **#3** includes 2 out of 3 of the IP4MaaS TSPs of Liberec's demo site and it is the option with the least number of the changes.

15.6.2.2. Bogatynia – Frýdlant – Hejnice

Itinerary of the user journey

- ***Origin***: Bogatynia, 3 Maja 10
- ***Destination****:* castle and chateau Frýdlant, Hejnice monastery

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Train (České dráhy)
- Bus (ČSAD Liberec)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg						Last mile	Potential transfer points
1	Private car								-
2	Walking	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Walking	Bus-ČSAD Liberec		Walking	Bogatynia,,Liceum; Dětřichov; Mníšek,,Frýdlantská; Frýdlant,,aut.nádr.; Hejnice,,aut.st.
3	Walking	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Walking	Train-KORID	Bus-ČSAD Liberec	Walking	Bogatynia,,Liceum; Dětřichov; Mníšek,,Frýdlantská; Frýdlant,,aut.nádr.;Frýdlant v Čechách; Raspenava; Hejnice,,aut.st

4	Walking	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Walking	Train-KORID	Train-KORID	Walking	Bogatynia,,Liceum; Dětřichov; Mníšek,,Frýdlantská; Frýdlant,,aut.nádr.; Frýdlant v Čechách; Raspenava; Hejnice
5	Walking	Bus-ČSAD Liberec		Train-KORID	Walking		Bus-ČSAD Liberec	Walking	Bogatynia,,Liceum; Liberec,Krásná Studánka,kovárna; Krásna Studánka; Frýdlant v Čechách; Frýdlant,,aut.nádr.; Hejnice,,aut.st.
6	Walking	Bus-ČSAD Liberec	Train-KORID	Walking	Train-KORID	Bus-ČSAD Liberec		Walking	Bogatynia,,Liceum; Liberec,Krásná Studánka,kovárna; Frýdlant v Čechách; Raspenava; Hejnice,,aut.st
7	Walking	Bus-ČSAD Liberec	Train-KORID	Walking	Train-KORID	Train-KORID		Walking	Bogatynia,,Liceum; Liberec,Krásná Studánka,kovárna; Frýdlant v Čechách; Raspenava; Hejnice
8	Walking	Bus-ČSAD Liberec		Bus-ČSAD Liberec	Walking		Bus-ČSAD Liberec	Walking	Bogatynia,,Liceum; Dětřichov; Frýdlant,,aut.nádr.; Hejnice,,aut.st.
9	Walking	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Walking	Train-KORID	Bus-ČSAD Liberec		Walking	Bogatynia,,Liceum; Dětřichov; Frýdlant,,aut.nádr.; Frýdlant v Čechách; Raspenava; Hejnice,,aut.st.
10	Walking	Bus-ČSAD Liberec	Bus-ČSAD Liberec	Walking	Train-KORID	Train-KORID		Walking	Bogatynia,,Liceum; Dětřichov; Frýdlant,,aut.nádr.; Frýdlant v Čechách; Raspenava; Hejnice

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#5** includes 2 out of 3 of the IP4MaaS TSPs of Liberec's demo site. It is the option including bus and train connections and it is also one of the options with the least number of changes.
- **#8** includes 1 out of 3 of the IP4MaaS TSPs of Liberec's demo site only with buses connections and it is also one of the options with the least number of changes.

15.6.3. 3rd High-level User Journey

Description

- **Title**: **Business trip to Warsaw**
- ***Description of the typology of journeys considered:*** Businessman travels to a business meeting in Warsaw.
- ***TSP involved (IP4MaaS Partners/Supporting Partners)***
  - *KORID LK:* transport authority in Liberec region (the coordination of transport services including MaaS services in the region)
  - *MIASTO WARSZAWA:* transport authority in Warsaw
  - *TRAM WARSAW:* tramway operator
- ***Expected target users***: Businessman who is familiar with travelling between Jablonec nad Nisou and Warsaw.

15.6.3.1. Jablonec nad Nisou - Warsaw

Itinerary of the user journey

- ***Origin***: Jablonec nad Nisou, Zlatá ulička 154
- ***Destination:*** Warsaw

Most common travel solutions

Most common travel solutions currently adopted by users for the itinerary considering private vehicles and services offered by ALL the TSPs operating in the demonstration site (also TSPs not involved in IP4MaaS).

- Private car
- Train (České dráhy, Koleje Dolnoslaskie, PKP Intercity)
- Tram (Dopravní podnik měst Liberce a Jablonce nad Nisou, TRAM WARSAW)

Travel solutions supported by IP4MaaS

Travel solutions considering private vehicles and services offered by the TSPs involved in IP4MaaS. Do NOT report travel solutions including TSPs not involved in IP4MaaS.

#	First mile	Main leg						Last-mile	Potential transfer points
1	Private car								-
2	Walking	Tram-KORID	Walking	Train-KORID, Koleje Dolnoslaskie	Train-Koleje Dolnoslaskie	Train-PKP Intercity	Tram-WARSAW (WTP)	Walking	Nový Svět; Brandl; Jablonec n.N.dol.n. ; Szklarska Poreba Go.; Wroclaw Glowny; Warszawa Centralna
3	Walking	Private car	Walking	Train-ARRIVA vlaky	Train-KORID	Tram-WARSAW (WTP)		Walking	Jablonec nad Nisou; P+R Železný brod; Železný Brod; Pardubice hl.n.; Warszawa Centralna

Discussion of alternatives

Selection of **2 travel solutions** from the table above considering the area of potential improvement due to current limitations and pain points.

- **#2** is the best solution because it doesn't include a private car as one of the legs and it includes a train connection operated by PKP Intercity.

16. Annex IV

High-resolution AS-IS and TO-BE maps are provided in the attached document "IP4MaaS_D2.2_Annex_IV_AS-IS_TO-BE_Maps.pdf".