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REPORT ON THE USE OF SMART MOBILITY AND SMART TICKETING SYSTEMS TESTED IN PILOT AREA **VERSION 1**
04 2020



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1. Introduction

The main objective of the DRTS is to improve the attractiveness of public transport through more efficient connections between the peripheral areas of Trieste and the Municipality and among the small villages and the main centres in the peripheral areas around Trieste on the Karst Plateau.

During PERIPHEAL ACCESS pilot activities, the innovative solution - called SMARTBUS - is initially designed to provide a complementary public transport service in the areas, that is, not substituting existing services. Based on overall pilot results' assessment, a number of further developments and policy recommendations are foreseen to promote innovation at regional level by enhancing cross-border synergies.

2. Territorial overview

2.1. The study area

The pilot study area is the former province of Trieste, made up of 6 Municipalities: Trieste, Muggia, San Dorligo della Valle, Monrupino, Sgonico, Duino-Aurisina. The territory is composed by a narrow (5-10 km) land strip about 30 km long, which extends between the Adriatic sea and the Karst plateau (about 400 meters above the sea level) from the north-west (province of Gorizia, Monfalcone, Gulf of Panzano) to the south-east (Trieste), bordering Slovenia (coast) and west with the Gulf of Trieste (in the Adriatic Sea). Its peculiarity is the central localization of Trieste, as the main hub of the area with the other five Municipalities as hinterland spokes, also partially incorporated in the urban settlements of Trieste.

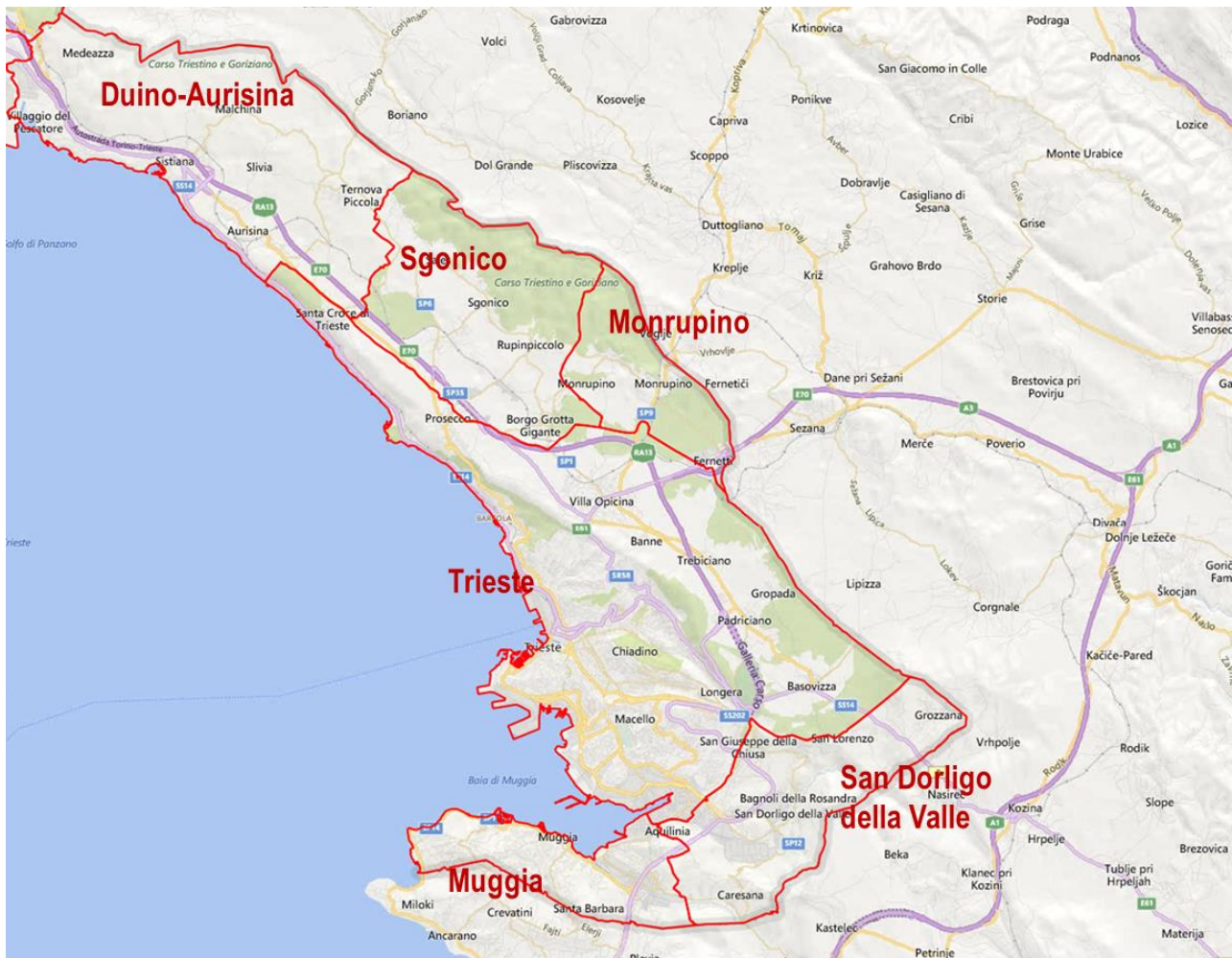


Figure 1: the pilot study area

For a comprehensive understanding of the territory, the new Master Plan of the Municipality of Trieste (2016) describes the study-area through the identification of seven territorial layers (figure 2) that are represented by the overlapping of seven thematic maps:

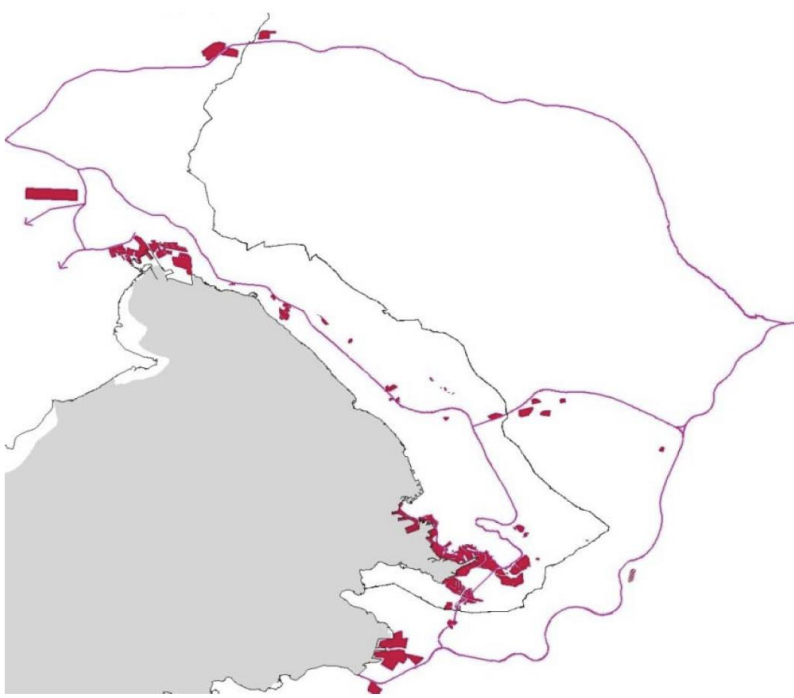








1. Logistics and manufacturing hubs;
2. Metropolitan Mobility System;
3. Network of the Karst villages;
4. Linear development of the road SP n.1;
5. The “compact” city;
6. The “water” city;
7. Territorial Hubs.







Figure 2: the pilot study-area depicted by the new Master Plan of the Municipality of Trieste (2016)

The seven thematic maps are reported in the following pages with the aim of highlighting the patterns of the territory, the land-use, the transport infrastructures and their implications to the movements of people within the case-study area.








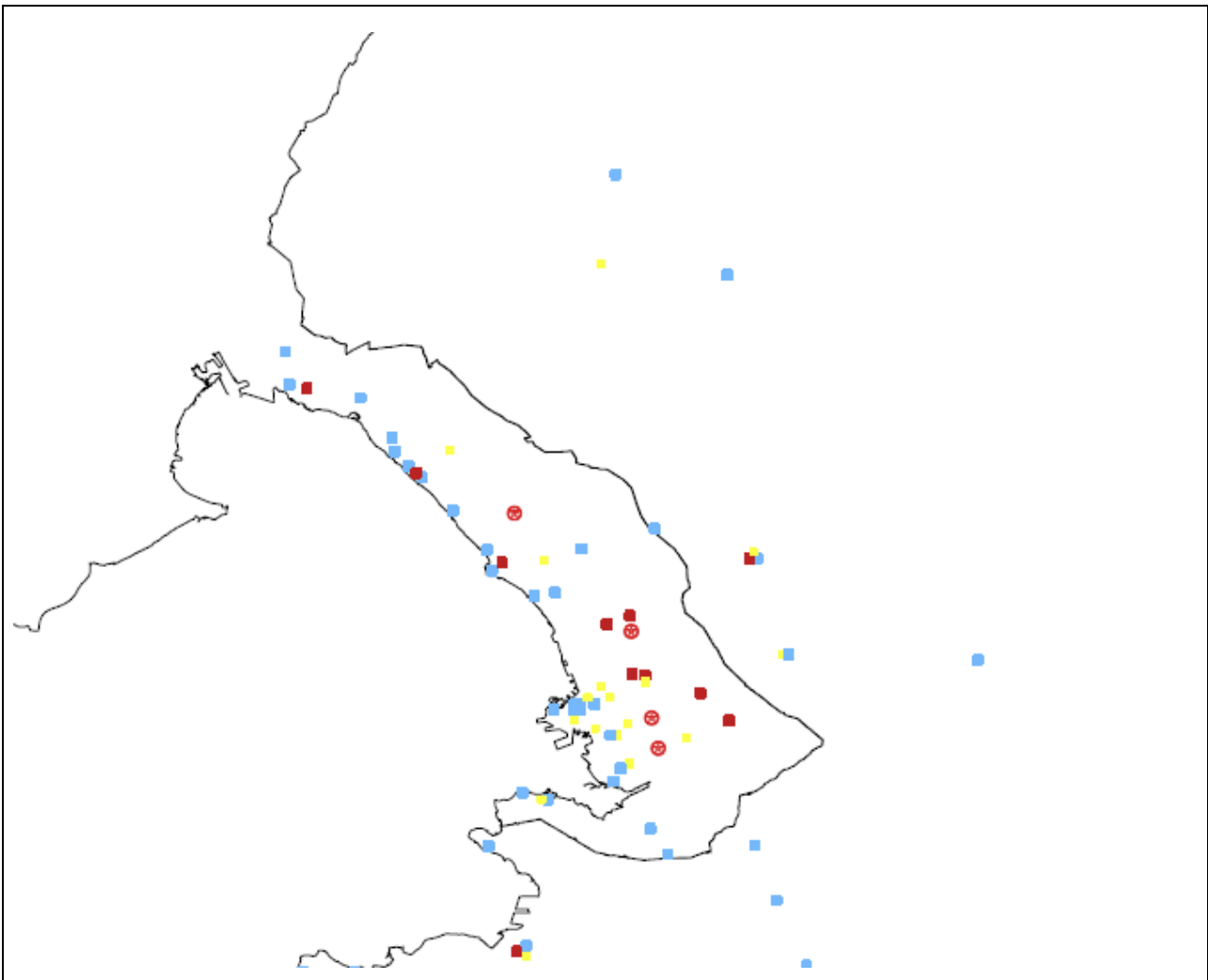
	<p>1 - Logistics and manufacturing hubs</p> <p>LEGENDA (ITA)</p> <ul style="list-style-type: none">  Gli insediamenti pesanti (industrie, logistica, porti, aeroporto)  Le attività estrattive  Gli insediamenti commerciali  La grande viabilità <p>LEGENDA(ENG)</p> <ul style="list-style-type: none"> - Main settlements (manufacturing, logistics, ports and airports) - Mining settlements - Settlements of commercial services - Main road network <p>Source: Master Plan of the Municipality of Trieste (2016)</p>
	<p>2 - Metropolitan Mobility System</p> <p>LEGENDA (ITA)</p> <ul style="list-style-type: none">  La rete ferroviaria esistente  La rete ferroviaria di progetto  La rete viaria metropolitana <p>LEGENDA (ENG)</p> <ul style="list-style-type: none"> - Existing rail network - Rail network project - Metropolitan road network <p>Source: Master Plan of the Municipality of Trieste (2016)</p>



	<p>3 - Network of the Karst villages</p> <p>LEGENDA (ITA)</p> <p> Borghi di origine rurale collocati sul corso italiano e sloveno</p> <p>LEGEND (ENG)</p> <p>Rural villages of Karst (Italy and Slovenia)</p> <p>Source: Master Plan of the Municipality of Trieste (2016)</p>
	<p>4 - Linear development of the road SP n.1</p> <p>LEGENDA (ITA)</p> <p> Il sistema insediativo lineare della S.P. n. 1</p> <p>LEGEND (ENG)</p> <p>Linear development along the road SP n.1</p> <p>Source: Master Plan of the Municipality of Trieste (2016)</p>










	<p>5 - The “compact” city</p> <p>LEGENDA (ITA)</p> <p> La città densa</p> <p>LEGEND (ENG)</p> <p><i>The “compact” city</i></p> <p><i>Source: Master Plan of the Municipality of Trieste (2016)</i></p>
	<p>6 - The “water” city</p> <p>LEGENDA (ITA)</p> <p> Luoghi di interesse ricreativo e di sviluppo del turismo sostenibile lungo la costa</p> <p> Le connessioni marittime</p> <p>LEGEND (ENG)</p> <ul style="list-style-type: none"> - <i>Leisure points of interest</i> - <i>Maritime connections</i> <p><i>Source: Master Plan of the Municipality of Trieste (2016)</i></p>



7 – Territorial Hubs

LEGENDA (ITA)

-  S Sport
-  H Ospedali e assistenza
-  D Direzionali e amministrativi
-  R Università e ricerca e formazione superiore
-  C Grandi attrattori culturali
-  L Grandi attrattori del "tempo libero"
-  Aree militari dismesse

LEGENDA (ENG)

- S: Sport
- H: Hospital
- D: Business districts
- R: University and research centers
- C: Main cultural points of interest
- L: Main leisure points of interest
- Dismissed military sites

Source: Master Plan of the Municipality of Trieste (2016)



2.2. Focus on the Karst

Within the study area, the focus is on the 5 municipalities within the Karst plateau: Sgonico, Duino-Aurisina, Monrupino, San Dorligo della Valle and partially Trieste (District I and II). The following table depicts the Villages that are part of the Municipalities along with the population, landarea and density of the five considered municipalities.

MUNICIPALITY		VILLAGES	POPULATION (INHAB.)	AREA (KM ²)	DENSITY (INHAB/K M ²)
Trieste	District: I Circostrizione, Altipiano Ovest	Santa Croce, Prosecco, Contovello e Borgo San Nazario	3.643	10,19	357,51
	District: II Circostrizione, Altipiano Est	Villa Opicina, Banne, Trebiciano, Padriciano, Gropada e Basovizza.	10.473	35,00	299,06
Sgonico		Borgo Grotta Gigante/Briščiki, Bristie/Brišče, Campo Sacro/BožjePolje, Colludrozza/Koludrovca, Devincina/Devinščina, Gabrovizza/Gabrovec, Rupinpiccolo/Repnič, Sagrado/Zagradec, Sales/Salež, Samatorza/Samatorca, Stazione di Prosecco/ProseškaPostaja	2.066	31,4	65,8
Duino-Aurisina		Aurisina/Nabrežina (sede comunale), Aurisina Santa Croce/NabrežinaKriž, Ceroglie/Cerovlje, Duino/Devin, Malchina/Mavhinje, Medeazza/Medjevas, Precenico/Prečnik, Prepotto/Praprot, San Giovanni di Duino/Štivan, San Pelagio/Šempolaj, Sistiana/Sesljan, Slivia/Slivno, Ternova/Trnovca, Villaggio del Pescatore/Ribiškonaselje, Visogliano/Vižovlje	8.443	45,31	186,34
Monrupino		Col (sede comunale), Ferneti/Fernetiči, Repen	881	12,61	69,87



San Dorligo della Valle	Aquilinia/Žavlje, Bagnoli della Rosandra/Boljunec, Bagnoli Superiore/Gornjikonec, Botazzo/Botač, Caresana/Mačkolje, Crociata/Križpot, Crogole/Kroglje, Dolina (sede comunale), Domio/Domjo, Draga, Francovez/Frankovec, Grozzana/Gročana, Hervati/Hrvati, Lacotisce/Lakotiče, Log, Mattonaia/Krmenka, Moccò/Zabrežec, Monte d'Oro/Mont, Pesek, Prebeneg, Puglie/Pulje, San Giuseppe della Chiusa/Ricmanje, Sant'Antonio in Bosco/Boršt, San Lorenzo/Jezero, Zona Industriale/Industrijska	5.745	24,22	237,2
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Table 1: Municipalities and villages considered within the study area

The Karst is a virtuous example of land use combining settlements needs and landscape preservation. The network of the small Karst centres (thematic map n.3) is made up by rural villages and the irregular network of secondary roads that link them. There is a relation among the forms of the territory and its agricultural uses. The villages are situated around the dolines (as arable areas), and form some concentrations at the base of hills that cross the Karst from north to south and mark the southern boundary.

The relationship with the coastal areas is limited, due to the interruption or loss of importance of the ancient paths, partly caused by the realization of the infrastructure system parallel to the sea. This territory is characterized by historical, cultural and naturalistic points of interest (Monrupino, Lipiza, Staniel, Grotta Gigante, Monte Hermada, Monte Lanaro, Šcozian caves), and also by localities with famous wine productions (Prepotto, Prosecco, Sgonico, Dutovlje). In the area, there is also a significant presence of the autochthonous Slovene minority, in particular in the Municipalities of Sgonico (Zgonik) Monrupino (Repentabor) and San Dorligo della Valle (Dolina).

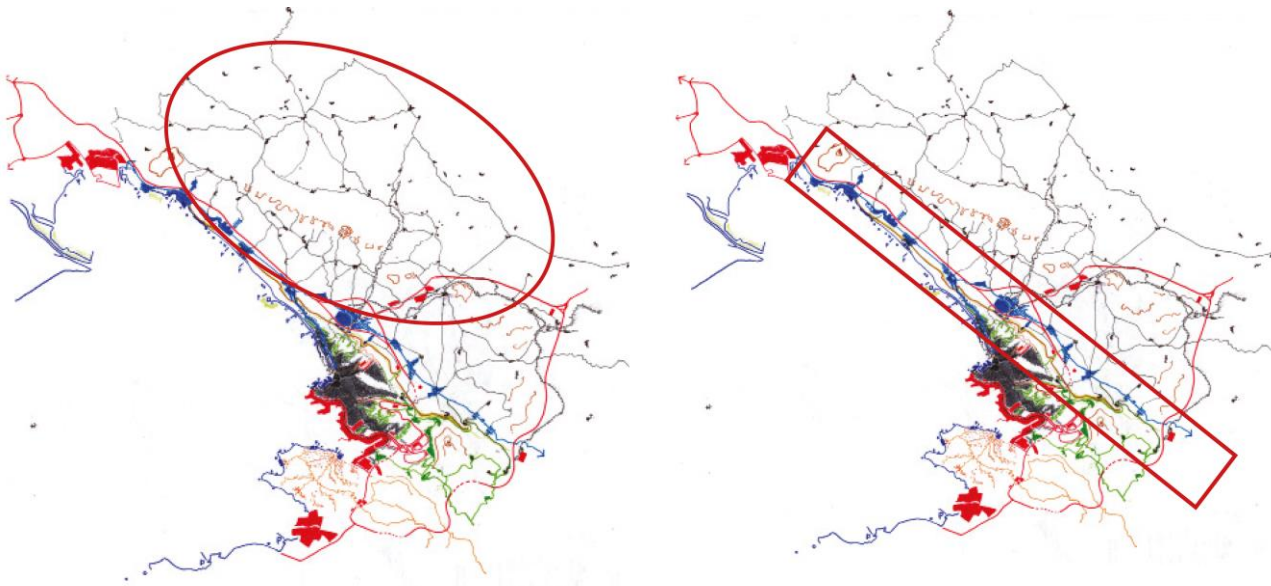


Figure 3: Karst villages and the SP1 road

The road SP1 is also a relevant element of the studyarea focus. From Duino to the Pesek border, the road SP n.1 (thematic map n.4) is a settlement system made up of a crossing axis linking the main inhabited centres of the Trieste Karst (Aurisina, Sistiana, Prosecco, Opicina, Trebiciano, Basovizza). The relevance of the road for the area accessibility has partially decreased the quality of the central places that overlook it and modified the ancient compact structure of the villages toward a linear development of the settlements along the road.

Within the focus area the Area Scientific park settlement is also located (thematic map n.7): it is Italy's largest Science and Technology Park, and boosts a concentration of some of Europe's most important researchers. The Area Science Park hosts Italian, foreign and international research centres and national and regional institutes for basic and applied research in various sectors. The Park is composed of two neighbouring campus developments located near the exit of the motorway. It covers 50 hectares, with 2.600 employees and 72 enterprises and research centres.

3. Users' needs and system solution selection

As mentioned, according to the Regional Public Local Transport Plan, the proposed DRTS may be considered as a service belonging to the functional typology number 3. These services may be offered either in urban areas in specific time periods (according to demand needs) replacing existing services, or in sub-urban areas, in order to improve the connection from/to the main municipalities through the integration of suburban or inter-municipal services with a flexible service.

In the regulatory context of the PRTPL, the pilot project of Trieste Trasporti is compliant with the general strategy of integrating the different levels of the public transport service, but it is not consistent with the aim of providing users also cross-border connections since, at least in the experimental phase, its operation will be restricted within the province of Trieste.

From a transport planning perspective, a quantitative analysis about the people living in the plateau, who are the possible customers of the on-demand service, does not actually exist. However, the main municipalities and several small villages located in the selected peripheral areas are linked to the town centre of Trieste by limited, low frequency bus lines. For this reason, there is quite a significant demand



of mobility and flexible services between the plateau and the city centre. TT receives every year about 14 thousand comments on the state of service: about 10% of these comments refer to the services of the plateau and the pilot area; in particular, they refer to the inefficient connection between these areas and the city centre. In fact, the current service guarantees only four trips a day in many areas of the pilot action.

At present, although several operational synergies are in place, the pilot action does not provide for specific cross-border solutions since current legislation does not allow them. However, the FVG Region has declared to be interested in cross border solutions and services, regarding the possibility to extend TT public transport in Slovenia. This possibility will be based on an agreement between FVG Region and Slovenia and cross border solutions could be implemented as follow-up developments of the proposed on-demand service. A study by the regional CGIL (a major union workers association) underlines that there are about 15 thousand cross border workers between Italy and Slovenia. Most of them are occasional, but a part of them are regular and work in services, consultancy and craft sectors. There is not a demand analysis on whether an on-demand service will be useful for those people, but they could represent the potential users of a cross border service.

TT is also involved in a project called Connect2ce, which aims at improving rail connections and smart mobility by promoting innovative public transport solutions in rural, peripheral and cross-border regions. In Connect2ce TT aims at integrating the service offered by the connection between Opicina and the city centre with the Slovenian railway service between Ljubljana and Trieste by using a single ticket.

Referring to the European ITS Architecture, the planning of the pilot project has been based in particular on the specific area of ITS called "Public Transport Management", which covers the following issues: regular and on-demand services, schedules, fares, fleet and driver management. In this regard, the introduction of the information platform for the routing and booking of the proposed service specifically refers to the fleet management. Furthermore, another ITS area, named "Traffic Management", has been taken into account for the development of the pilot project: it concerns urban and inter-urban traffic management in general, with a specific focus on demand management. This last aspect is one of the key features to be considered when planning the on-demand service, so that it can appropriately meet users' requests of transfer.

4. Business model and actual solution features: assessing processes and overall assessment

4.1. Processes

Introduction

An overall methodological approach has been followed during the implementation and evaluation of pilot activities. Most of the data was collected originally (e.g., primary sources), mainly through the pilot IT platform, Trieste Trasporti data sources and face-to-face interviews with Trieste Trasporti staff. Additional information came out from meetings with relevant stakeholders. Some secondary sources were used as well, namely consisting of relevant regional planning documents. No significant limitations were identified.

In the following, relevant processes related to pilot activities deployment are identified and a number of indicators are associated to them.

Equipment: IT platform features and type of vehicles



The selection of the most suitable IT solutions was performed through a specific public procedure specifying detailed requirements, namely:

- a map based support to be easily integrated with the Trieste Trasporti cartographic system;
- a monitoring system;
- service reservation channels (such as apps for smartphones and tablets, a web site and a call centre);
- a user-friendly driver interface, providing real time data and information.

As for the vehicles employed in the operations of the on-demand service, traditional 10.5 meters buses already belonging to the Trieste Trasporti fleet long were deployed. The buses were rebranded with the PERIPHERAL ACCESS colours and logos. A bus with the required equipment for people with physical disabilities was employed in each area as well.

Human resources needed and training

Each driver went through a one-day training programme to get used to the operating system, tablet features and overall smart solution modes of operation, including driver's behaviour towards users.

Authorization paths

Trieste Trasporti represents the local public transport company, which is subject to regional legislation and planning. According to the Regional Public Transport Plan, Trieste Trasporti and the Friuli-Venezia Giulia Region signed a Service Agreement to deal with the provision of public transport services in the regional area. The Service Agreement includes the pricing policy. Based on that, the proposal of additional public transport services must be agreed between the two bodies. Thus, Trieste Trasporti had to be formally authorized by the Region to carry out a new on-demand service. Trieste Trasporti and Friuli-Venezia Giulia Region met several times to eventually come up with the necessary authorizations to implement the pilot activities. The whole process was rather articulated, since in PERIPHERAL ACCESS not-already existing services are at stake and no previous experience exists in the whole region.

The on-demand service to be tested in Peripheral Access was finally approved as a 3rd level public transport service, according to the Regional Public Transport Plan. It consists of innovative solutions of public transport services based on flexible routing and timetables. Pilot activities were implemented in the peripheral and rural areas around Trieste, with the aim to extend the provision of the service in other regional areas while considering cross-border (e.g., with Slovenia) issues and synergies.

Tenders

The selection of the most suitable IT solutions was performed through a specific public procedure specifying detailed requirements. Four IT companies were called, while only three of them participated to the tender. The companies were invited to present a demo of an IT platform solution for the planning and management of the on-demand service. Specific platform' requirements and functionalities were requested.

Each company met individually with a commission and presented a proposal including both technical and economical requirements. TT identified the most suitable platform through a technical and economic comparison of the proposals presented. Eventually, the solution proposed by PluService was selected as the best option and subsequently implemented.

Delays

Following the authorization paths and tender procedures, the smart solution (“SMARTBUS”) was tested from July, 1st 2019 to November, 11th 2019 in selected peripheral and rural areas around Trieste. SMARTBUS is still operational. No significant delays were reported.

Booking system

The booking system of the SMARTBUS is based on the selected IT platform. In particular, it can be accessed either through the Trieste Trasporti website or a dedicated call center (which was made operational in a later stage of the pilot). Booking can be made by users up to 2 hours prior departure. Confirmation is received 10 minutes after the request, displaying stop and departure time. Some additional booking choices about departure time are also provided. The booking system delivers routing and scheduling programmes according to requests. Payment methods include tickets, prepaid cards and smart ticketing systems relying upon the SMARTBUS mobile app.

Network design, routing and timetable

SMARTBUS operations are based on a specific network design, routing and timetable in the selected areas. In particular, two interconnected sub-areas are identified to run the service, covering the Western (“ADD West”) and Eastern (“ADD East) sections of the Karst plateau respectively. A major interchange hub is identified in the village of Prosecco. Overall, the SMARTBUS routing and network design include 68 stops in the Eastern areas and 199 stops in the Western ones. The service uses the existing stops and routes, but it is operative only upon requests by users.

SMARTBUS is operational daily, 7 days/week, from 9.00 a.m. to 9 p.m.





Figure 4: network and routing of the service

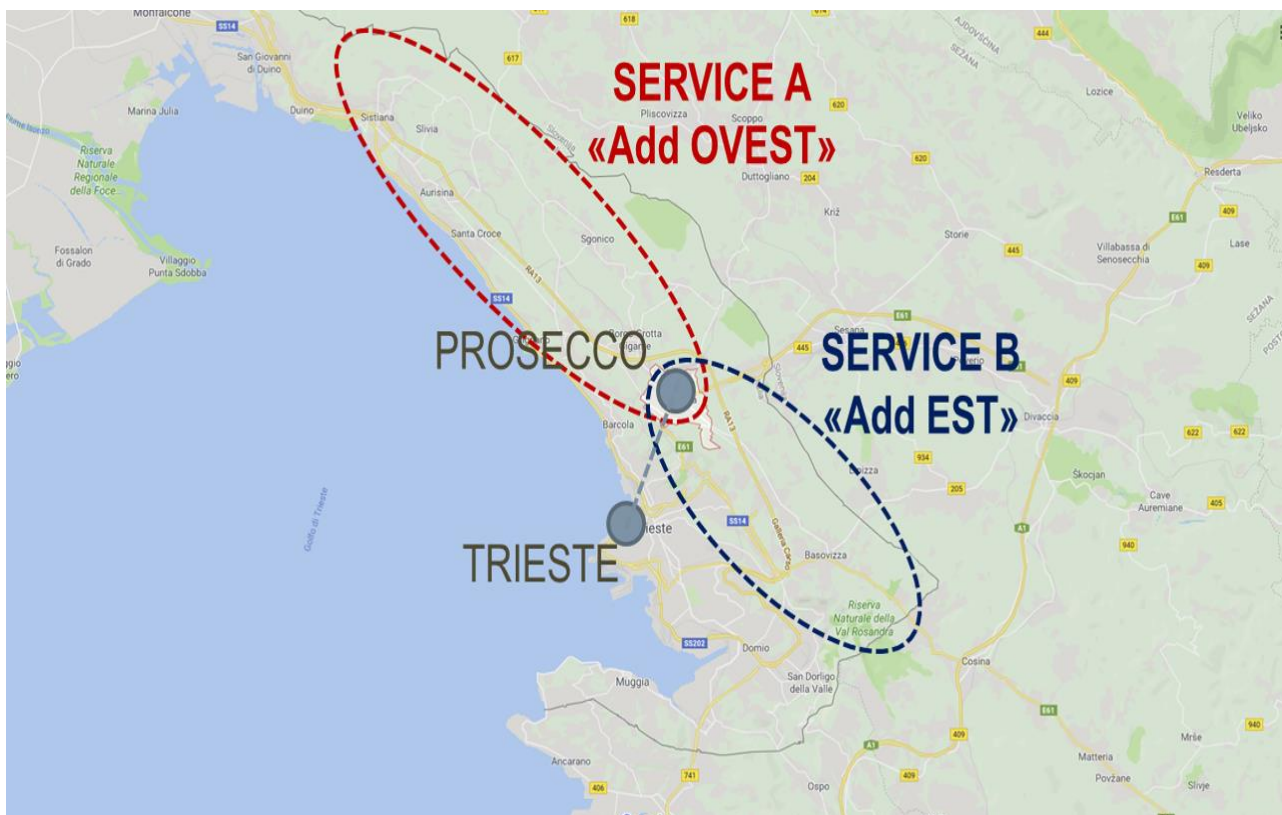


Figure 5: concept of the service

Ticketing and pricing policy

SMARTBUS was provided for free until September, 15th 2019 to all users. Afterwards, a ticket of 2 €/run was introduced. The service remains free for annual subscribers. Users can access the service by buying tickets or prepaid cards (coupons of 2-6 €) or they can use the SMARTBUS mobile app (smart ticketing).

4.2. Performance

Overall, targets and expectations were identified mostly on a strategic and qualitative level. In particular:

- Verifying a strong political and technical will by relevant stakeholders to gain experience and build expertise on innovative solutions in the field of public transport. That was certainly achieved;
- Introducing innovative public transport solutions at regional level for the first time ever. That was certainly achieved;
- Deploying pilot activities to consequently be able to extend innovative solutions at regional and cross-border level. That was certainly achieved;
- Building an “innovation ecosystem” for public transport supported by a brand new IT platform selected through a public tender to test innovative solutions. That was certainly achieved.

In summary, the overall strategic targets set by project partners and relevant stakeholders involved was to develop and test a completely new “innovation ecosystem” for public transport at regional level. Rooms for further improvements would certainly follow from pilot activities. Pilot outcomes are then the



basis for a radical change in the attitudes towards innovation in the field at regional and cross-border level. Thus, Peripheral Access was an opportunity to drive such a change. Overall, strategic targets were achieved. A significant added value related to performance assessment is represented by the fact that innovative solutions were deployed “on the road” during PERIPHERAL ACCESS activities and they are still operational.

The effect of the pilot action has been particularly relevant in terms of knowledge increase. The operational experience acquired during pilot activities on innovative services allows for a better planning and management of similar initiatives in other regional and urban areas (particularly in off-peak periods such as during the nights or for specific users’ targets). The pilot action also increased the knowledge by users, thus, making it possible a change in their behaviour and attitude toward innovation in public transport (also, thanks to various communication initiatives during the project).

Additional qualitative indicators: users’ satisfaction

Although high users’ satisfaction was reported during pilot activities, the initially proposed online questionnaire for users is not already in place. It could be developed some time soon. A survey on University students was carried out - since the University of Trieste represents a major generation and attraction transport node and it is located close to the Karst plateau - to assess the smart solutions and its probable development to include a night timetable.

Additional quantitative indicators: transport demand analysis and service assessment

Several indicators were identified and assessed to provide insights into the decision-making process by users. As mentioned, an online questionnaire reporting on users’ satisfaction is envisaged to be implemented soon.

Indicators about users’ assessment of the SMARTBUS service are listed and discussed below. They were reported by collecting and elaborating data from the IT platform.

- Number of passengers using the service: 1.761;
- Number of requests: 2.234;
- Number of requests from the Eastern Area: 60%;
- Number of requests from the Western Area: 40%;
- % fulfilled requests (trips): 78%;
- % partially fulfilled requests (trips): none. All the requests were totally fulfilled;
- % not fulfilled trips: 22%;
- Number of additional users: estimates show that some 75% of users are subscribers, thus, some 25% could be considered as additional users, meaning some 440 over the period;
- Number of fulfilled requests from disabled users: 3.

Additional output indicators were analysed and elaborated for the overall assessment, namely:

- 14.739 km travelled;
- 750 routes;
- 19.65 km/route;
- 2.35 passengers/route;
- 0.12 passengers-km;



- Number of vehicles employed: 2.

Stakeholders

Several meetings were organized with relevant stakeholders during the pilot activities in order to get feedbacks and recommendations to possibly improve the characteristics of the proposed innovative solutions. In particular, the following stakeholders were involved:

- Area Science Park: it consists of a major scientific and technological park located in the outskirts of Trieste. It is of utmost relevance for the pilot project, since it represents a major generation and attraction transport node;
- Sincrotone: similarly to the above;
- Municipalities in peripheral and rural areas, including Monrupino, Duino-Aurisina, Sgonico;
- Citizens' associations;
- Institutions in the Karst Plateau.