

Analysis of the current state and potentials for development of the innovative services

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1. Introduction

a. The METRO project

METRO project aims to improve **the environmental sustainability in the field of maritime transport**, with a **specific focus on touristic connections in the North Adriatic area**. Also, to improve the quality, safety and environmental sustainability of marine and coastal transport services and nodes by promoting multimodality in the programme area. This objective will be pursued both from the technological point of view (**development of hybrid solutions to be adopted in vessels used for passenger's transportation**), and from the logistic one (**study on the adaptation of power supply infrastructures in small harbours, definition of new routes to be established among north Adriatic ports**). Targeted groups within the project are general public, local, regional and national public authorities, enterprise, transport operators including operators of multimodal logistics hubs, infrastructure providers, education and training organisations and universities and research institutes. The project addresses various challenges that affect the Programme area, such as the need for more **integrated, efficient and sustainable maritime connections** between the eligible territories, the necessity to **reduce traffic congestion** caused by seasonal tourism flows, and **the need to tackle the continuous lack of competitiveness of companies in shipbuilding**. Start of the project was on 1.1.2019. and it's scheduled to finish on 31.12.2021. with total budget of 2.959.605 euros. The lead partner of project is high education research centre University of Trieste with other partners Wartsila Italia, Port Network Authority of the Eastern Adriatic Sea, Tehnomont shipyard ltd, Istrian Development Agency (IDA), University of Rijeka – Faculty of Engineering and Faculty of Maritime Studies.

b. Purpose of Analysis of the current state and potentials for development of the innovative services within METRO – Maritime Environment-friendly TRanspOrt systems Project

The purpose of analysis of the current state and potentials for development of the innovative services within METRO is to define existing and potential innovative services in Istrian ports (Pula, Rovinj, Poreč, Novigrad, Umag and Rabac) and its accompanying infrastructure for the purpose of developing multimodal and sustainable transport modes with the aim of reducing CO2 emissions, especially with regard to the use of e-bikes, e-scooters, hybrid cars and motorbikes, e-ships for coastal tourism, etc.

Also, the analysis will help to explore the potential for integration (intermodality) between maritime, road, railway, and biking transport in Region of Istria, with special emphasis on the possibility of introducing the “Tw” project, an electric tram along Pula’s seafront. Furthermore, it will provide possibilities and needs for the information throughout application of smart card/app system and similar tools in Istrian ports. Also, it will provide the information on the intensity of cooperation of Istrian ports with local institutions and companies in the field of maritime transport and other transport sectors in the Istrian Region, with the aim of installing and introducing multimodal transport modes in Istrian ports.

2. Analysis of the current state and potential for innovative products and services in Istrian ports

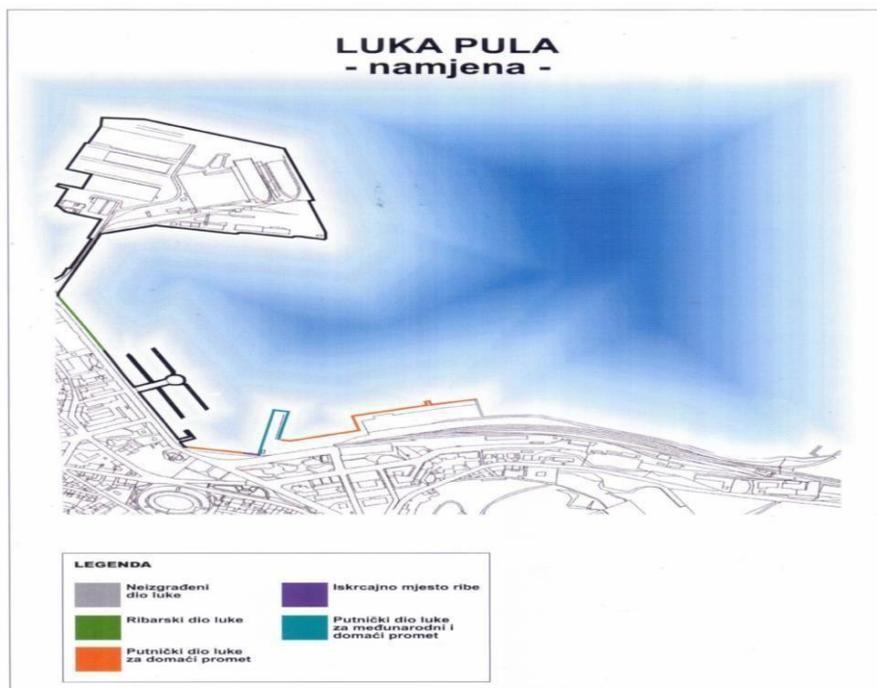
Below there has been performed analysis of the existing and potential future innovative products and services in Istrian ports (Pula, Rovinj, Poreč, Novigrad, Umag and Rabac) as well as the related infrastructure with the goals of developing the multimodal and sustainable transport models that will result in smaller emission of CO2 emissions, having in focus e-bicycles, hybrid cars and motorbikes, electric ships for tourism purposes and other.

2.1 Port of Pula

a. Current state

Port of Pula is port located in the Bay of Pula. It is on the west side of City of Pula, at the Riva and close to famous amphitheater called Arena. The figure below shows how the Port of Pula is divided depending on the purpose for which it is used with each color representing specific part of port. Starting from the right (Figure 1), the orange part, that is passenger part, is used for passengers which are on domestic trips. Passenger part for international and domestic traffic is colored in blue and next to it there is a small landing place for fishery boats colored in purple. The black color on map represents unbuilt parts and between them is stationed fishing part of port highlighted with green color. The number of municipal berths that are open for public transport at Port of Pula were 90 in 2018.

Figure 1 Division of Port of Pula by purpose



Source: <https://www.lup.hr/luka-pula/>

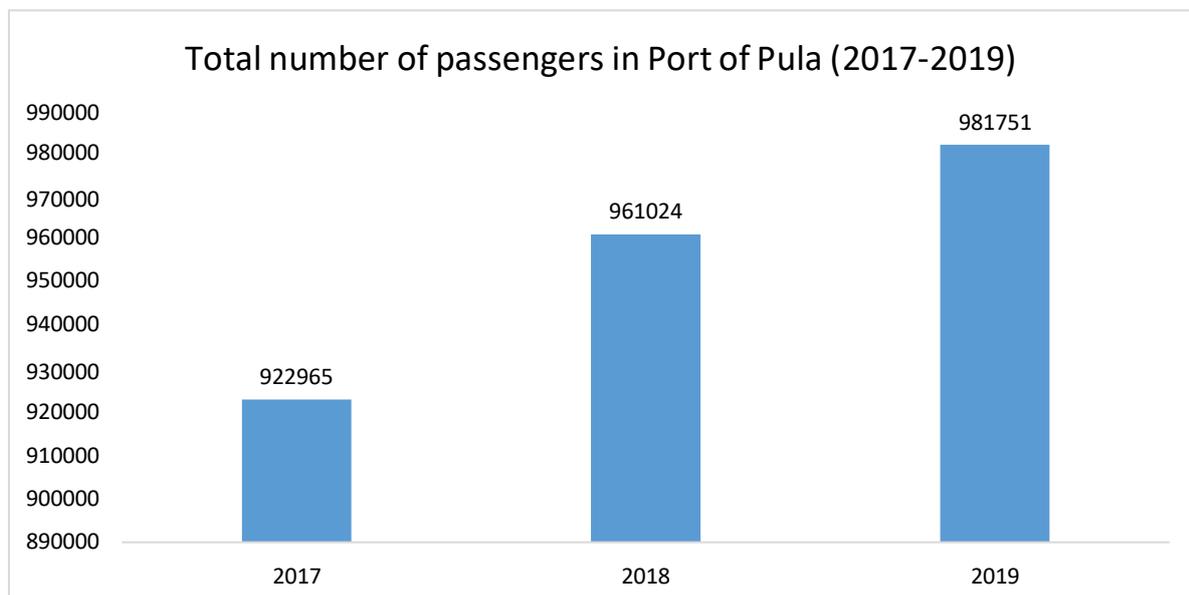
Table 1 Number of passengers in Port of Pula port in 2019.

Type/Direction	Arrived	Departed	Total
Domestic	469053	472712	941765
International	21096	18890	39986
Total	490149	491602	981751

Source: authors according to data from Croatian Bureau of Statistics

The most passengers in 2019 at Port of Pula were domestic travelers (96%), with slightly more passengers departing from Port of Pula than arriving to it. Only 5% of all passengers were the ones that have left and departed from port of Pula, and there were slightly more passengers that arrived to Port of Pula from abroad. From above listed information we can conclude that passenger traffic in Port of Pula is currently primarily dominantly domestic.

Graph 1: Total number of passengers in Port of Pula (2017-2019)



Source: authors according to data from Croatian Bureau of Statistics

In last 3 years there was constant growth in total number of passengers in Port of Pula (Graph 1), on average 3% per year, remaining the same distribution between domestic and international travels, as well as between arrived and departed number of passengers.

Type of ships with which are passengers travelling to/from Port of Pula are, in general, catamarans and cruisers. As we can see (Table 2) almost all of passengers arrived to/departed from Port of Pula were using catamarans, and less than 1% were ones using cruisers. From that we can conclude that Port of Pula did not have developed part of tourism that includes cruisers to its full potential, but that is mainly due to the current state of the port infrastructure and inability to attract cruisers so that Pula would be its home port.

Table 2: Type of ships passengers travelled at Port of Pula in 2019

Type of ships passengers travelled	Arrived	Departed	Total
Passengers (excl. passengers on cruise ships)	487494	491600	979094
Passengers on cruise ships starting/finishing the journey	1	2	3
Passengers on cruise ships visiting	2654	0	2654
Total	490149	491602	981751

Source: authors according to data from Croatian Bureau of Statistics

From the table below (Table 3) it can be seen the cruiser traffic in Port of Pula is very variable and the average passenger number per call mostly records growth. Also, it is important to mention that in 2017 a record number of 13 758 passengers and 37 calls was achieved.

Table 3: The cruiser traffic trend in Pula, including the average passenger number per call 2008 - 2017

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Passenger movement	9,656	1,948	3,370	4,357	8,322	4,541	2,873	5,288	5,498	13,758
Calls	75	19	20	30	33	22	15	14	19	37
Average passenger/call number	127.1	102.5	168.5	145.2	252.2	227.1	191.5	377.8	289.3	371.8

Source: Master plan for developing the traffic system of the functional region of Northern Adriatic

Port of Pula maintenance and service facilities covers gas station for boats, but it does not have e-charger for electric boats. The port has parking lot and there are few more parking lots nearby. Close to port there is bus station for public transportation. City of Pula (Pulapromet) has implemented smart cards for public transport which acts as e-wallet on which you add money and then buy tickets for public transport at exclusive prices. In the city of Pula there are few places where you can rent a e-bike but none of them are located at the Port of Pula. Also, Pula is 1 of 15 cities that cooperate with HŽ (Croatian railways) which allows them to have smart cards with all kinds of exclusive prices for travelling with trains. According to that, Railway station of Pula is near the Port of Pula which offers great opportunity of connecting these ways of transport. Furthermore, through ICARUS project, which aims to develop a green type of transport, HŽ will enable wagons of regular railway lines in County of Istria for the transportation of bicycles which will significantly contribute to connecting and multimodality, as well as additional promotion and tourism valorization and development of new products on the territory of the entire Istria County.

Figure 2: Map of city bus lines and E-bike stations in Pula



Source: Pulapromet's official web site and City of Pula's official web site

Figure 2 shows map of city bus lines and position of e-bike stations. There are 9 lines that connects all parts of city, from north to south and from east to west. Every line goes through the center of City of Pula. Furthermore, map shows points of sale for public transport where you can buy ticket or smart card, marked by BUSCARD mark. Yellow stars represent positions of city e-bike stations where you can rent a E-bike. There are 8 stations in City of Pula, one at bus station, two near the Arena, another one at city market, opposite the entrance ramp on Verudela, at the Stoja returnee, at Zlatne Stijene and near the school court. There are 29 bikes that can be rented by buying code with smartphone. Price for 1 hour is 4 kunas, 30 kunas for a day and 100 kunas for a whole week. Users of e-bikes can rent them at one station and leave them at another one and because of that this position of E-bike stations, represents great way of connecting 2 ways of transport (by bus and cycling).

Figure 3 shows suburban bus lines of Pulapromet. City of Pula is very well connected with sever smaller places in Pula agglomeration which offers great opportunity for connecting them with tourist offer of City of Pula. One of the bus lines connects the city with the airport, providing a good opportunity for further develop of multimodal transport in City of Pula, and in Istria County.

Figure 3: Suburban bus lines



Source: Pulapromet

As mentioned earlier, in City of Pula, Pulapromet is responsible for public transport. They are also working on more sustainable and more ecological way of public transport. According to that, they are participating in several projects that for aim have reducing pollution and ensuring sustainable public transport. One of those projects is NO REGRET project. Specific goals of it is to increase the comfort and availability of public transport, to reduce adverse environmental impact and CO2 emissions, to increase safety in public transport and to reduce vehicle maintenance costs. To achieve that, through this project, 12 diesel buses are procured. Buses are equipped with an air-condition, a ramp for less mobile persons and a video surveillance system. For reducing environmental pollution, the euro 6 engines were installed. 85% of costs are financed by EU and the rest is financed by the Ministry of Sea, Transport and Infrastructure.

Furthermore, Pulapromet participated in another project that for goal has the purchase of 20 buses that drives on natural compressed gas and the construction of charging station for such vehicles which would increase passengers in public transport and have significant impact on the quality of the environment and also on switching to another energy source (compressed natural gas). Pulapromet is in this project with Pula's Plinara as a partner. The entire project is co-financed with as much as 88% of the non-refundable funds. From this we can inevitably conclude that the City of Pula has committed itself to clean urban transport and a high level of sustainable urban mobility which directly contributes to a better quality of life for its inhabitants and is in line with trends and new European guidelines.

Besides making public transport more sustainable and eco-friendlier, City of Pula and Pulapromet are working on digitalization of it. They implemented static TFT panels at bus stations for the purpose of interactive provision of information to travelers, insight into the status of an e-ticket, advertising, or marketing activities.

Figure 4: Panel at bus station



Source: BusCard

Figure 5: Info about public transport on panel (screenshot)



Source: BusCard

The Port of Pula authority participates in the INTERREG Italy-Croatia project ADRIGREEN. The main goal of the ADRIGREEN project is to improve the connection between the ports and airports of Italy and Croatia with other transport modes with the intention of increasing passenger traffic during the summer season and to improve the environmental performance of the Adriatic Maritime and Air systems.

Another important project in which the Luka Pula Authority participates is the INTERPASS project. The project is realized in a consortium of 8 project partners and one associate member consisting of:

- 3 airports (Dubrovnik, Pula, Apulia)
- 4 Port authorities (Dubrovnik, Pula, South Adriatic, Corfu)
- 1 scientific partner (Technological Institute of Epirus)

The main goal of the INTERPASS project is to improve the connection of seaports with airports in the Adriatic Ionian region in order to enable numerous tourists and passengers to arrive at the desired Adriatic Ionian region destinations during the peak season.

At Port of Pula's web site, they mentioned ACI marine Pula which uses smart cards in their marine. Smart cards allow marine reception to have faster and more accurate service and they also have other exclusive offers in every ACI marine.

b. Future interests and potential

There are 3 projects that are ongoing at Port of Pula. The one is construction of passenger terminal which will have important role in development of City of Pula as a starting port (“home port”) and promoting cruise tourism in Pula. Benefits from this project should be for various entrepreneurs that offer services connected with this type of tourism. Feasibility study and cost-benefit analysis for the construction of terminals for maritime and passenger transport has been prepared.

Another project covers refurbishment of seafront which will make existing seafront more attractive and more accessible to all its users.

The last important project is Verudela Port. The aim of this project is to encourage the development of more elite tourism outside the peak season which is essential for the development of the destination. Also, this project would create the basic conditions for the City of Pula to be the leading nautical destination of the Adriatic, enable new berths, landscape design and generate the development of new facilities around the port itself.

Furthermore, “Tw” project in the City of Pula, as well as the other clean means of public transport (CNG or electric buses), would integrate all types of transport in City of Pula developing transport multimodality of the City and ensuring sustainable and ecological public transport.

There is also big potential in continuous developing of smart cards and connecting them to other services beside public bus transport, such as boat maintain services, cruising tours, etc. This potential is recognized by EU and it is organizing “European Capital of Smart Tourism competition”. In 2019. one of the winners was Helsinki. Helsinki made their “Helsinki Card” which is a comprehensive sightseeing package, which allows visitors to experience the best of Helsinki while saving time and money. Key benefits from cards are free entry to 25+ attractions, tours and museums, free Hop On Hop Off Bus Tour, free unlimited journeys on public transport with Helsinki Card City and Helsinki Card Region (optional upgrade) including train to/from the Helsinki Airport, free Helsinki Card Guidebook and discounted price to 25+ extra attractions, tours and experiences. Card is available in 1,2 and 3-day durations, starting from first use. Besides that, there are 3 more options depending on do you want city travel or airport travel included, or none of those. The price for 1 day adult card is 44 euros, 52 euros for 2-day adult card and 59 euros for 3-day adult card. Prices for child cards are approximately 50% cheaper. To get Helsinki Card you need to order it online and then it can be shipped to you or you can use it as mobile card (by downloading it).

Another good practice of using smart cards in tourism can be seen in Ljubljana, the capital of Slovenia. Ljubljana has Ljubljana Card, it is a combined ticket to Ljubljana's major sights enabling visitors to explore the city in a comfortable way and at the lowest cost. The Ljubljana Card offers you the following benefits: free admission to 19 museums and galleries, the Ljubljana Zoo and several other attractions, a free guided city tour and free hire of a digital tour guide, free travel on city buses, 24-hours access to WiFree Ljubljana, a funicular to Ljubljana Castel, a tourist boat cruise and four-hour bicycle hire, free internet access at the Slovenian Tourist Information Center. Card can be bought in 3 types (1, 2 or 3-day duration) and the price varies from 31 euros for 24-hour card, 39 euros for 48-hour card and 45 euros for 72-hour card. You can purchase your Ljubljana Card at Ljubljana's Tourist Information Centers, hotels or online, at 10% discount.

Such examples should be considered during the further developing of Pula's smart card. Furthermore, except that smart cards provide discounts to tourists, one should not ignore the component that enables tourists to have everything in one place, from public transport tickets to museum tickets, which makes their stay less stressful, and thus makes such location more desirable.

Pula ports has a significant potential as international ports for cruisers, especially for large ships.

2.2 Port of Rovinj

a. Current state

The number of municipal berths that are open for public transport at Port of Rovinj were 650 in 2018.

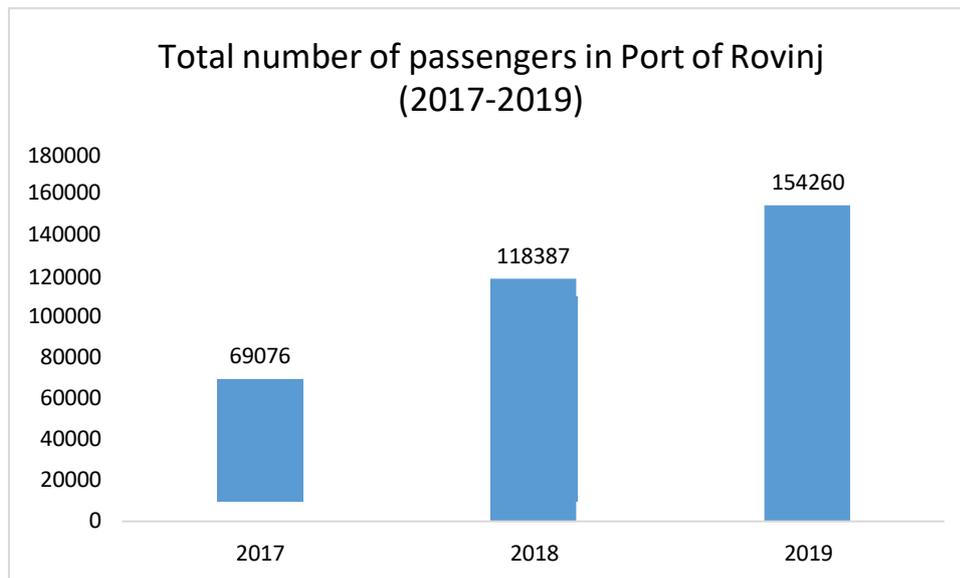
Table 4: Number of passengers in Port of Rovinj in 2019.

Type/Direction	Arrived	Departed	Total
Domestic	48989	57729	106718
International	27058	20484	47542
Total	76047	78213	154260

Source: authors according to data from Croatian Bureau of Statistics

Table above (Table 4) shows that 69% of all passenger travels were domestic travels, with 17,8% more departures than arrivals. On the other side, 31% of passengers travelled from/to outside of the country from Port of Rovinj, with 32% more arrivals than departures. That shows us important role of international travels in Port of Rovinj which offers opportunity further development of it.

Graph 2: Total number of passengers in Port of Rovinj (2017-2019)



Source: authors according to data from Croatian Bureau of Statistics

As shown in graph above (Graph 2) Port of Rovinj experienced large growth of total number of passengers between 2017. and 2018., around 71%. That growth was generated by increase in number of passengers that travelled domestically, while international travels remained the same. Number of passengers travelling from Port of Rovinj continued to rise in 2019, for around 30%.

At Port of Rovinj passengers travel via catamarans and cruisers. Most of passengers arrived to/departed from port via catamarans (Table 5). Only small number of passengers arrived at Port of Rovinj was ones on cruise ships visiting Rovinj on tour. There were no starting nor finishing journey on cruise ships at Port of Rovinj in 2019.

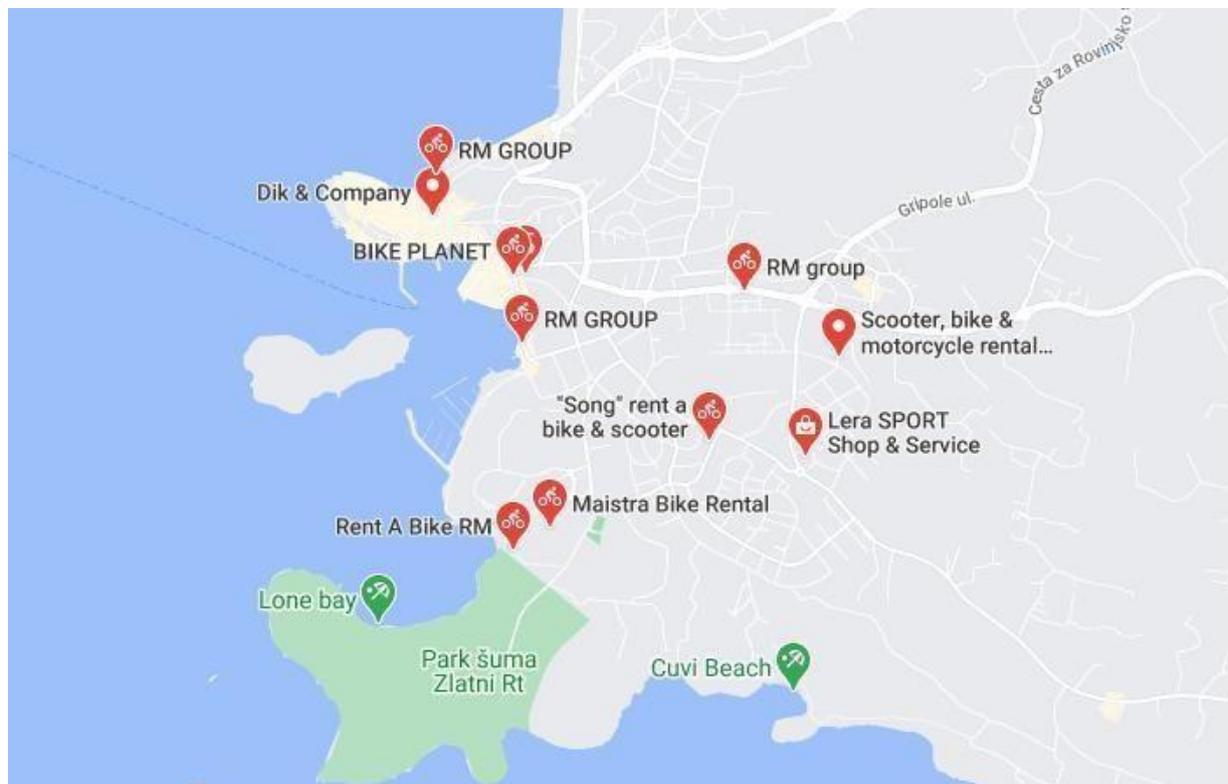
Table 5: Type of ships passengers travelled at Port of Rovinj in 2019

Type of ships passengers travelled	Arrived	Departed	Total
Passengers (excl. passengers on cruise ships)	70194	78213	148407
Passengers on cruise ships starting/finishing the journey	0	0	0
Passengers on cruise ships visiting	5853	0	5853
Total	76047	78213	154260

Source: authors according to data from Croatian Bureau of Statistics

When talking about multimodal and sustainable transport, City of Rovinj has 3 places where you can charge your e-bike, at Resort Amarin and Resort Villas Rubin, and at hotel Eden. Also, city has several charging stations for hybrid cars. There are no city bikes available for rent but there are numerous rent-a-bike firms that also offers city tours on bikes.

Figure 6: Rent-a-bike firms in Rovinj



Source: Google maps

Public transport is available during tourist season, from 01.06. until 15.09. Furthermore, as a part of ICARUS project, the agreement on cooperation with IDA was signed by HŽ with the aim of developing

bicycle and railway transport in Istria, in which City of Rovinj is included. The Agreement will introduce pilot activities related to the potential for development of railway transport with the aim of more efficient integration and multimodality, as well as additional promotion and tourist valorization and development of new products in Istria County, including cyclotourism. As a part of this initiative, the area of the diesel-motor train of the series 7122 will be renovated and information panels and installation of e-bikes charging stations along the railways route in City of Rovinj will be implemented. Also, City of Rovinj and Municipality of Kanfanar will transform the former railway route into a bicycle track that will be connected to the railway transport in order to achieve multimodality.

The Port of Rovinj is also a part of project MIMOSA which includes cooperation between Italy and Croatia, and is being implemented with the aim of improving the offer of sustainable multimodal solutions and services in public passenger transport and promoting a new approach to passenger mobility between countries. Project started at 1.1.2020. and its scheduled to finish at 30.12.2022. Total budget of project is 7.140.000€ and 240.500€ is connected and dedicated to Port of Rovinj.

Another project that is started is building of new small port called San Pelagio. The number of applications for berth in Rovinj has significantly exceeded existing port's capacity. With this project number of berths will increase for approximately 250-300. In addition to the port, it is planned to establish the coastal zone for sunbathing area and beach.

b. Future interests and potential

City of Rovinj has developed cycling roads that should be supported with city e-bike (and rent e-bike) stations as a part of more sustainable and multimodal transport solution. Also, there should be considered interconnections of different types of transport with unique smart cards which would offer exclusive offers for different types of transport (rent of e-bikes, trains, catamarans). Furthermore, there is a big area of cruising tourism that is not covered, and which offer great opportunity for strengthening of many other aspects in local economy. As public transport is available only during tourist season, ensuring public e-bikes for rent would provide more sustainable and cheaper transport solutions for tourists that are visiting city outside of season.

2.3 Port of Poreč

a. Current state

The number of municipal berths that are open for public transport at Port of Poreč were 37 in 2018.

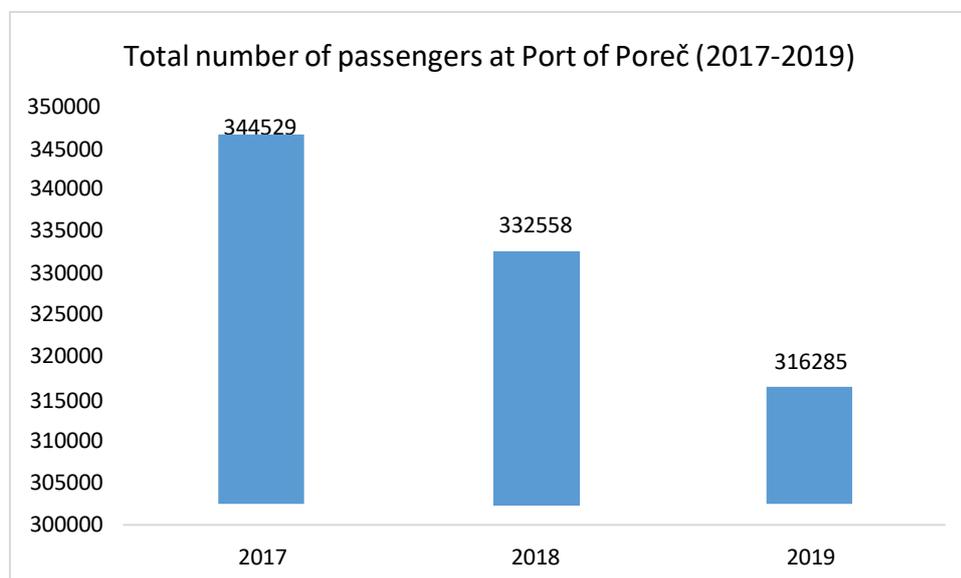
Table 6: Number of passengers at Port of Poreč in 2019.

Type/Direction	Arrived	Departed	Total
Domestic	111951	106907	218858
International	48339	49088	97427
Total	160290	155995	316285

Source: authors according to data from Croatian Bureau of Statistics

Around 69% of passenger at Port of Poreč are on/from domestic travels, with raise of the ones that came to port in 2019 (Table 6). Other 31% were ones who traveled international, from other countries or to other countries, with similar number of those departing then arriving. When looking in total, there were more passengers that arrived at Port of Poreč then ones who departed.

Graph 3: Total number of passengers at Port of Poreč (2017-2019)



Source: authors according to data from Croatian Bureau of Statistics

The Port of Poreč experienced slightly decline in number of passengers at port from 2017-2019, on average 4% per year (Graph 3). Decline was generated by fewer domestic travels, while international ones were growing in number.

Table 7: Type of ships passengers travelled at Port of Poreč in 2019.

Type of ships passengers travelled	Arrived	Departed	Total
Passengers (excl. passengers on cruise ships)	160114	155995	316109
Passengers on cruise ships starting/finishing the journey	0	0	0
Passengers on cruise ships visiting	176	0	176
Total	160290	155995	316285

Source: authors according to data from Croatian Bureau of Statistics

Passengers at Port of Poreč may come on catamarans and cruisers. Mostly, in 2019, passengers arrived/departed with catamarans (Table 7). Only few of them arrived on cruise ships visiting city, but there were not starting nor finishing cruising tours at Port of Poreč.

City of Poreč does not have public transport but through EU project SUTRA has acquired mini-electric bus for purpose of public transport. The project aims to develop an innovative mobility concept for passenger transport that would reduce traffic congestion in urban center, improve air quality and locally reduce CO2 emissions. The planned completion of the project is June 2021, when the city of Poreč should have established public transport. Besides that, city is well equipped with e-bikes and e-bikes charging stations that offers opportunity for sustainable and multimodal transport in Poreč. In addition, city has several e-car charging stations. While city is well equipped with e-charging stations, none of them are at Port of Poreč.

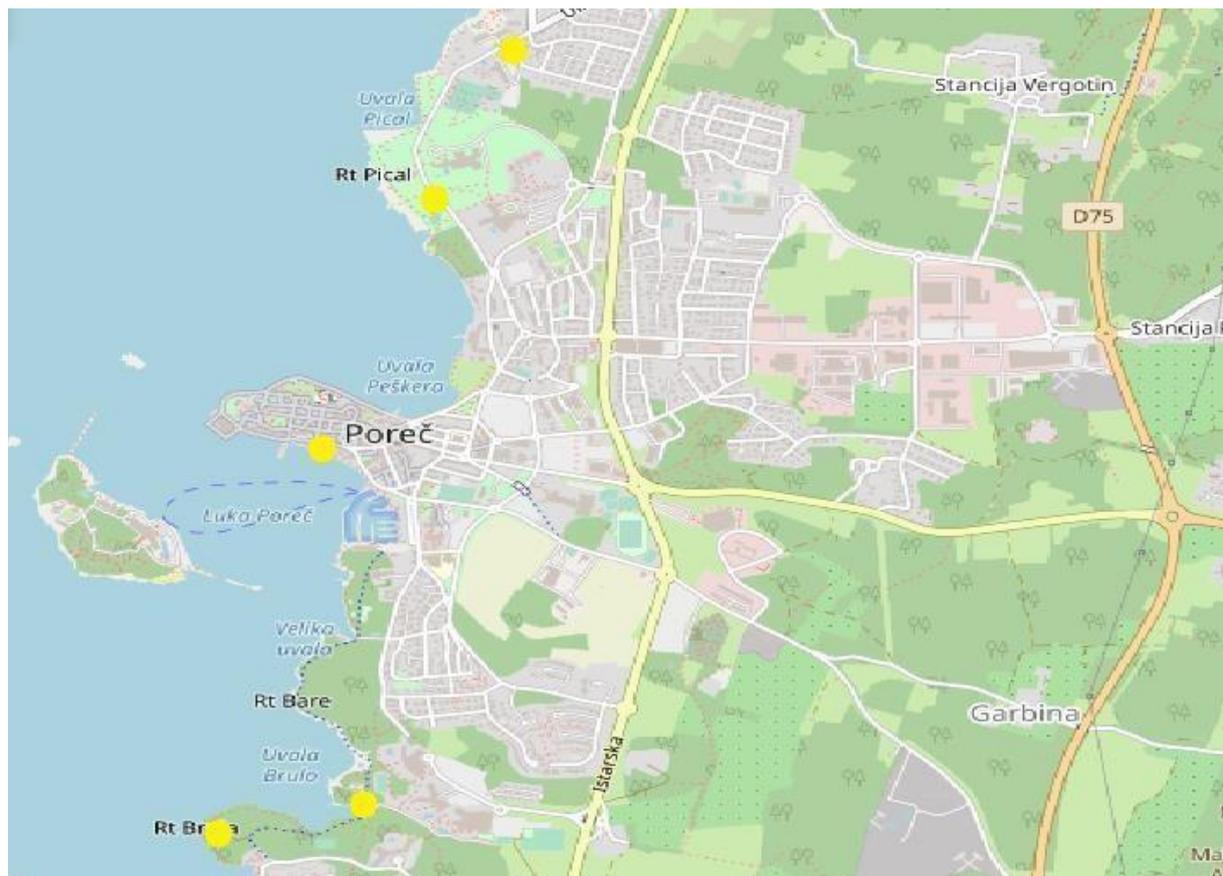
Figure 5 shows map of City of Poreč with 5 yellow dots that represents stations where you can rent one of 35 mechanical bikes or 35 e-bikes. Stations are hold by Valamar Riviera. Rent price for 30 minutes of bike usage is 10 kunas. Before first rent you must create Poreč Bike Share account. This can be done via web page or mobile app, or directly on terminal at bike station. Poreč Bike Share stations are located at the following locations (yellow dots from north to south on Figure 5): Spadici near the Hotel Pinia, Borik, Riva Center, Brulo, Lungomare Center.

For those who have their own e-Bike there are 8 charging stations in Poreč at:

- Valamar Riviera Head Office, Stancija
- Pinia Residence, Beach Bar Luna
- Valamar Diamant Hotel
- Hotel Laguna Parentium
- Villa, Village & Apartments Laguna Galijot

- Camping Bijela Uvala
- Naturist Camping Ulika
- Zelena Laguna Resort, Laguna Lounge

Figure 7: Bike share Poreč stations



Source: porecbikeshare.com

b. Future interests and potential

For better development and promotion of multimodal and sustainable transport Port od Poreč should keep in mind possibility of e-bike stations at the port. Also, IDA released public call for cities and entrepreneurs in Istria County to participate in develop of smart card/app and “Via Istria” platform which would integrate transport services and special offers from local producers and entrepreneurs. That is a chance for Poreč to participate in this and to connect their services through smart card/app.

2.4 Port of Umag/Novigrad

a. Current state

The number of municipal berths that are open for public transport at Port of Umag were 400 and 208 at Port of Novigrad, in 2018.

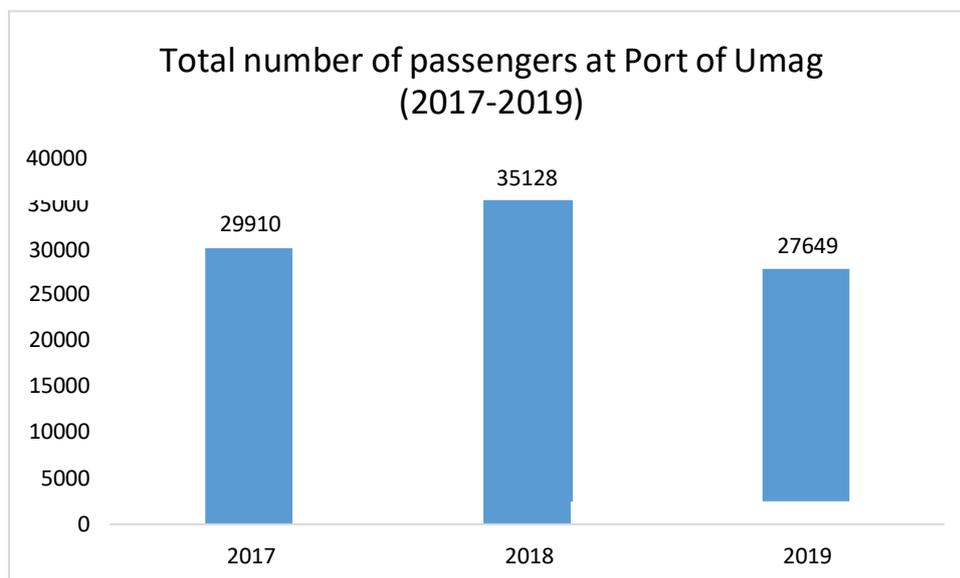
Table 8: Number of passengers at Port of Umag in 2019.

Type/Direction	Arrived	Departed	Total
Domestic	9512	9400	18912
International	4357	4380	8737
Total	13869	13780	27649

Source: authors according to data from Croatian Bureau of Statistics

Domestic travels are making 68% of all travels at Port of Umag, with almost equally arrived and departed ones (Table 8). Remaining 32% are international travels, also with almost equally proportion of arrived and departed passengers.

Graph 4: Total number of passengers at Port of Umag (2017-2019)



Source: authors according to data from Croatian Bureau of Statistics

When looking last 3 years at Port of Umag (Graph 4), in 2018. there was a rise of total passengers and it shrieked in 2019. Comparing 2017. and 2019. The number of domestic travels remain, more or less, the same, but number of passengers that travels international was lower in 2019.

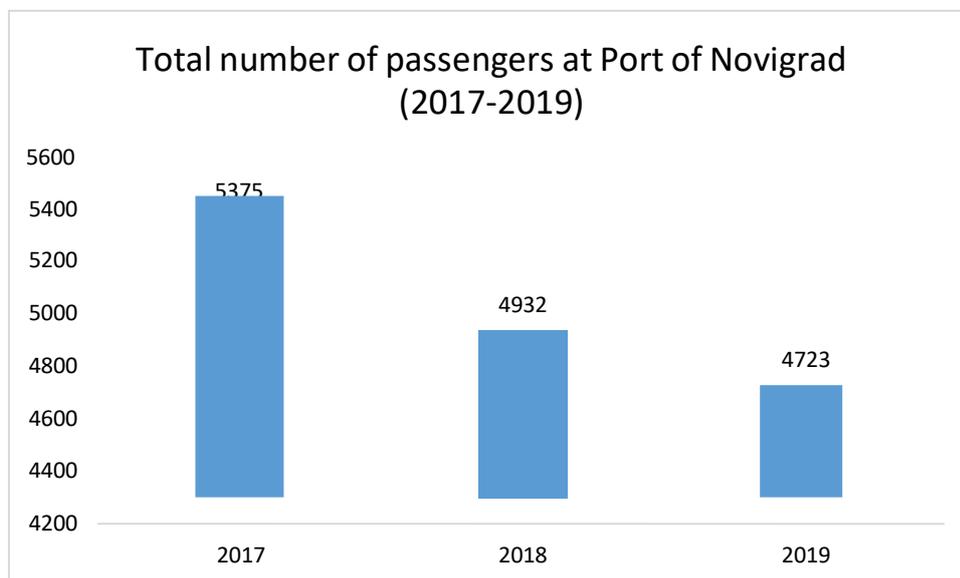
Table 9: Number of passengers at Port of Novigrad in 2019

Type/Direction	Arrived	Departed	Total
Domestic	2359	2364	4723
International	0	0	0
Total	2359	2364	4723

Source: authors according to data from Croatian Bureau of Statistics

All of passengers at Port of Novigrad were on domestic travels, with equally proportion of both arrived and departed (Table 9).

Graph 5: Total number of passengers at Port of Novigrad (2017-2019)



Source: authors according to data from Croatian Bureau of Statistics

In last 3 years, total number of passengers at Port of Novigrad decreased, on average 6% per year (Graph 5).

Both Umag and Novigrad ports did not have passengers from cruise ships in 2019. Mostly, type of ships on which passengers travel to/from these ports were catamarans.

Table 10: Type of ships passengers travelled at Port of Umag in 2019

Type of ships passengers travelled	Arrived	Departed	Total
Passengers (excl. passengers on cruise ships)	13869	13780	27649
Passengers on cruise ships starting/finishing the journey	0	0	0
Passengers on cruise ships visiting	0	0	0
Total	13869	13780	27649

Source: authors according to data from Croatian Bureau of Statistics

Table 11: Type of ships passengers travelled at Port of Novigrad in 2019

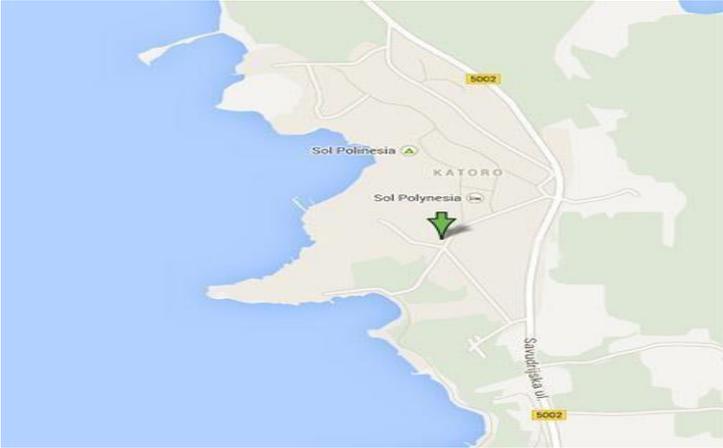
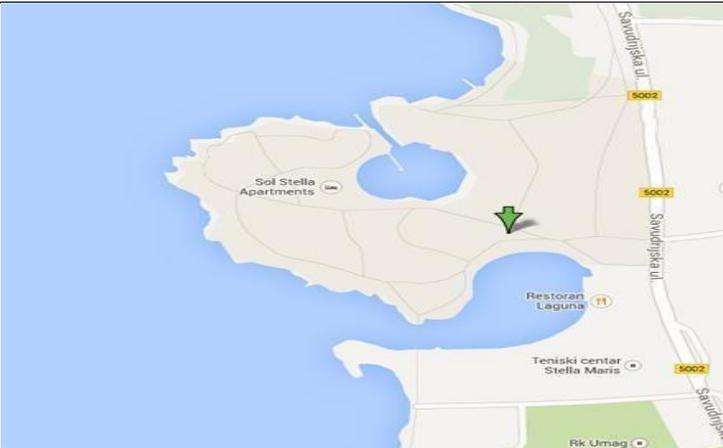
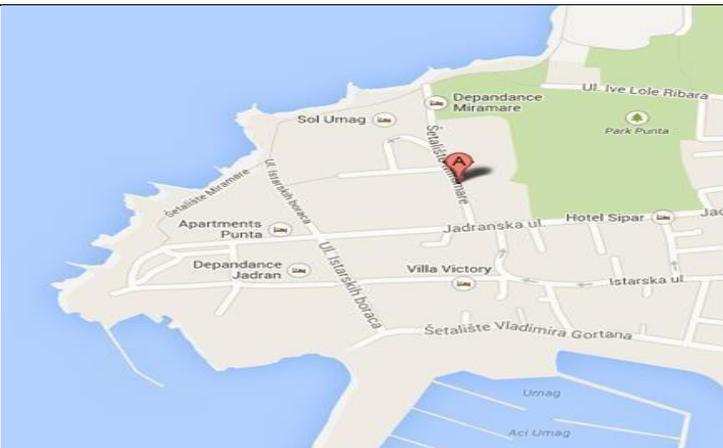
Type of ships passengers travelled	Arrived	Departed	Total
Passengers (excl. passengers on cruise ships)	2359	2364	4723
Passengers on cruise ships starting/finishing the journey	0	0	0
Passengers on cruise ships visiting	0	0	0
Total	2359	2364	4723

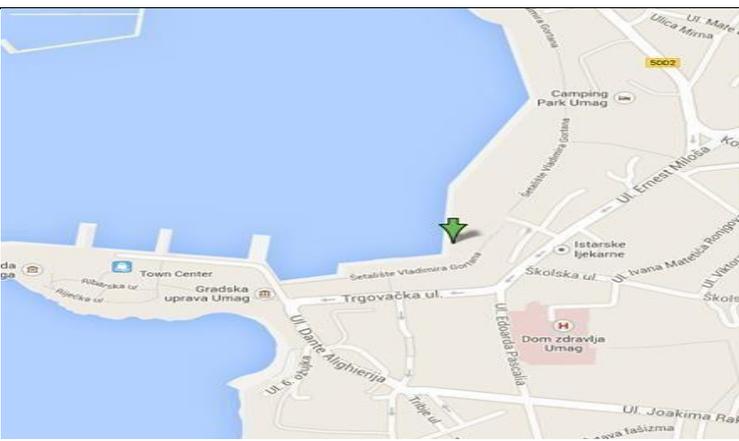
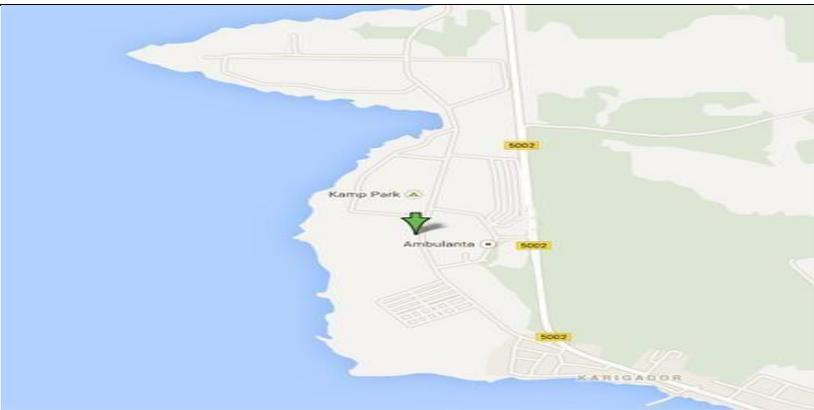
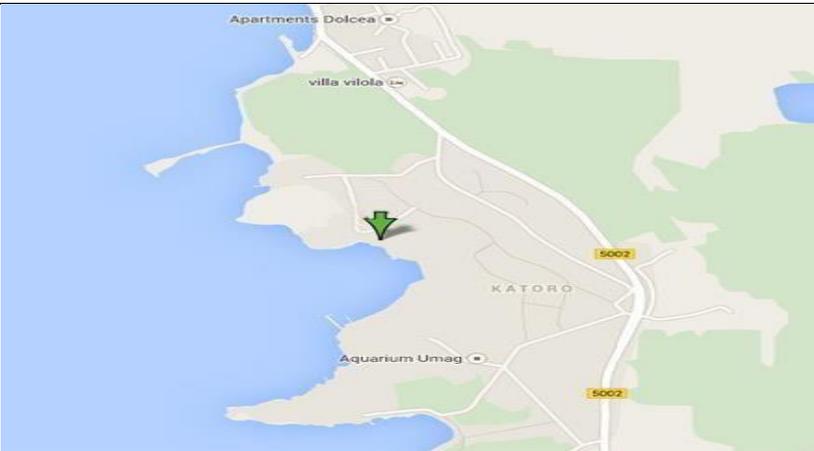
Source: authors according to data from Croatian Bureau of Statistics

The Port of Umag-Novigrad Authority is a partner of the international EU project FRAMESPORT (Framework Initiative fostering the sustainable development of Adriatic small ports). The project will contribute to strengthening the role of the port administration and increasing institutional and technical intervention fields and networks. The project began and it will be on going until 31.12.2022. and budget of Port of Umag-Novigrad is 327.043€.

In Table 12 we can see list of Park&Ride stations in Umag. Park&Ride system is the first public bike service in the City of Umag, involving more than 70 bikes for renting. You can use it in the area of the City of Umag and Camping Park Umag. There are 6 locations where you can rent your mechanical or E-bike. Price for 1 hour for mechanical bike is 18 kunas and 42 kunas for E-bike. You can rent them for whole day, 3 days or for a week(s). To use bikes from Park&Ride system you must log in at Istria Experience info station, where you pay for it (using credit card), after which you enter the code and take a bike. Bikes can be returned at any station.

Table 12: List of Park&Ride stations in Umag

Location	Map
<p>Katoro; next to Istria Experience info station</p>	
<p>Stella Maris; next to Istria Experience info station</p>	
<p>Punta; next to Istria Experience info station</p>	

<p>Umag Center; next to kids park, near tourist bus station</p>	
<p>Camping Park Umag; opposite of tennis courts, next to Istria Experience info station</p>	
<p>Polynesia; in the apartment village Polynesia, near the reception of the Katoro Resort</p>	

Source: coloursofistria.com

b. Future interests and potential

IDA released public call for cities and entrepreneurs in Istria County to participate in develop of smart card/app and “Via Istria” platform which would integrate transport services and special offers from local producers and entrepreneurs. That is a chance for Umag and Novigrad to participate in this and to connect their services through smart card/app. There is huge empty area in cruising tourism that could be connected with ATP Umag.

2.5 Port of Rabac

a. Current state

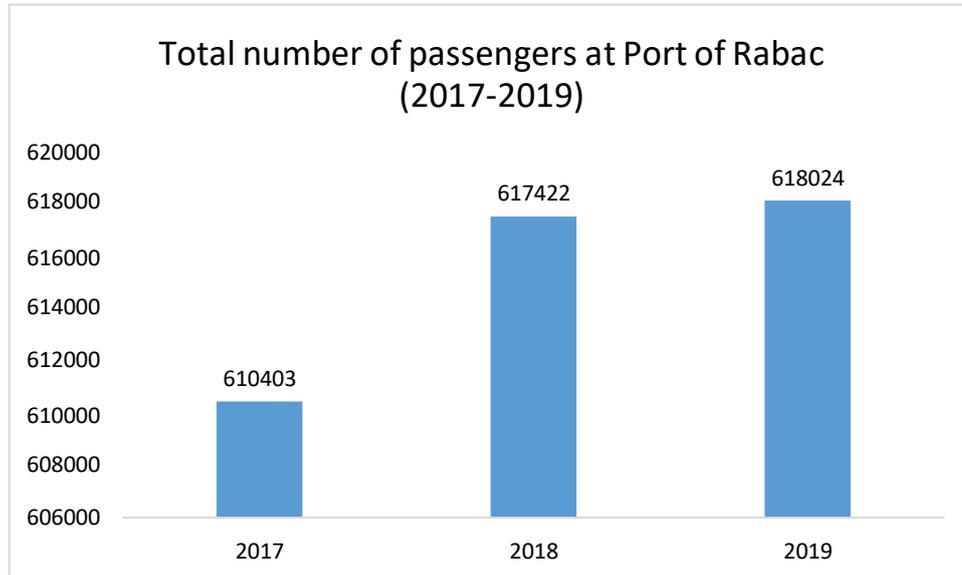
Table 13: Number of passengers at Port of Rabac in 2019

Type/Direction	Arrived	Departed	Total
Domestic	287769	330255	618024
International	0	0	0
Total	287769	330255	618024

Source: authors according to data from Croatian Bureau of Statistics

All of travels (Table 13) at Port of Rabac in 2019. were domestic with slightly dominating departure ones. Looking at last 3 years, there was small rise in number of total passengers at Port of Rabac, lower than 1% per year on average (Graph 6).

Graph 6: Total number of passengers at Port of Rabac (2017-2019)



Source: authors according to data from Croatian Bureau of Statistics

In 2019. (Table 14: Type of ships passengers travelled at Port of Rabac in 2019), Port of Rabac did not have any cruisers and passenger arrived to/departed from port were, in general, on catamarans. Recent information states that every hour there is ship traveling to/from Brestova and, on average, once a week there are small cruisers with cyclists from Dalmatia.

Table 14: Type of ships passengers travelled at Port of Rabac in 2019

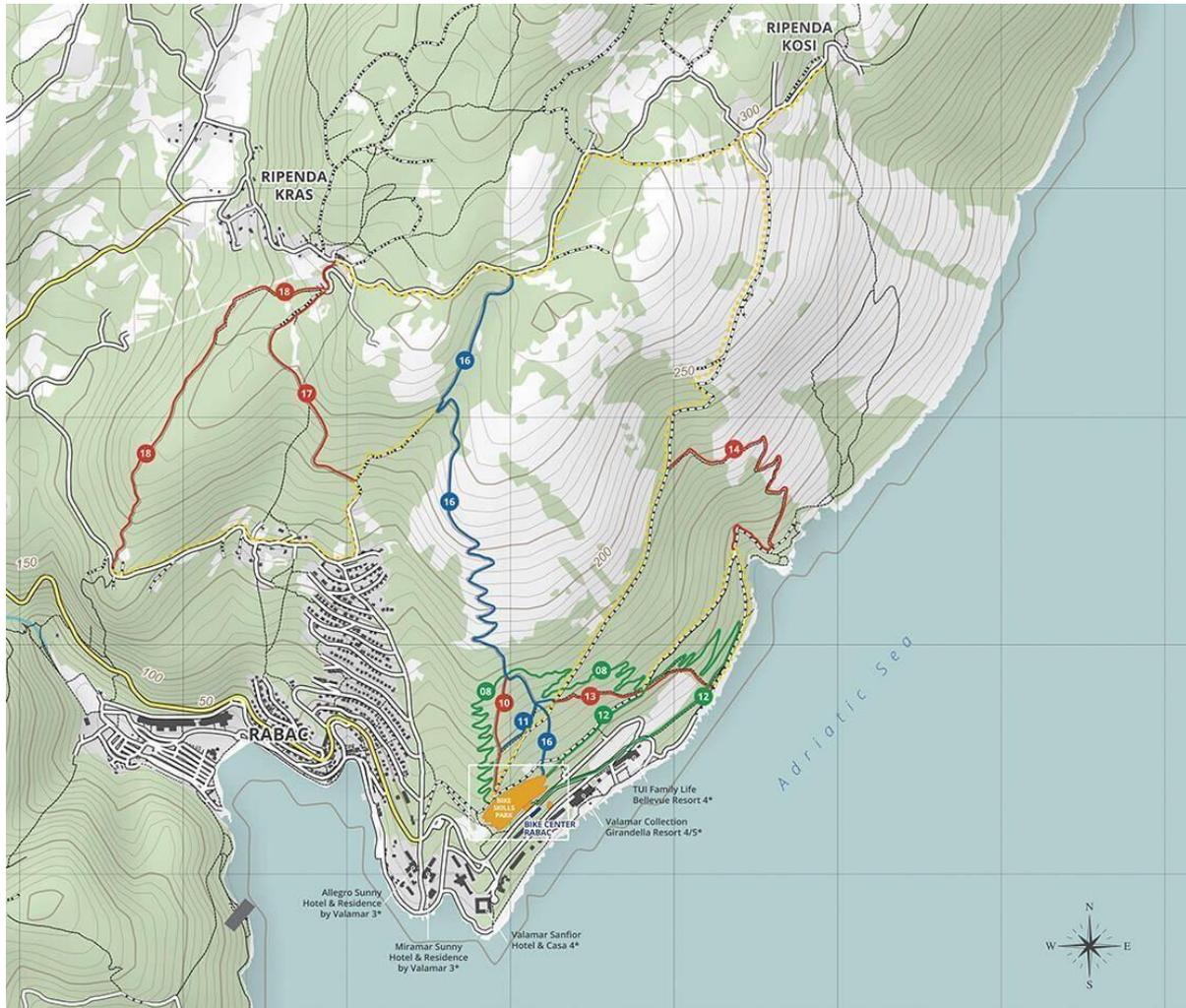
Type of ships passengers travelled	Arrived	Departed	Total
Passengers (excl. passengers on cruise ships)	287769	330255	618024
Passengers on cruise ships starting/finishing the journey	0	0	0
Passengers on cruise ships visiting	0	0	0
Total	287769	330255	618024

Source: authors according to data from Croatian Bureau of Statistics

Valamar Riviera has developed their cycling tourism in Rabac, through Bike Center Rabac. Bike Center Rabac is located on the eastern coast of Istria in Croatia's most popular bike destination - Rabac. The center is aimed at both professional and recreational cyclists as well as active families. The center has all the services and facilities that cyclists need during holidays, ranging from Bike Park Rabac, with its pump track for training and various specialised single & flow tracks of different levels of difficulty, to a bike transfer service and guided tours in the destination. The centre's comprehensive service is suitable for all types of cyclists and families with children. Its quality infrastructure guarantees an excellent cycling experience. In 2019., for the second year in a row, Valamar Collection Girandella Resort in Rabac was the center of the Croatian and European cycling community for two weeks since the central

and largest retailer event in Europe was held, bringing together representatives of as many as 650 European companies.

Figure 8: Cycling tracks in Bike Center Rabac



Source: Bike Center Rabac

Figure 8 shows cycling tracks that are part of Bike Center Rabac offer. Green tracks are the easiest one, blue ones are characterized as medium difficulty tracks and the red ones are the most demanding tracks. Yellow lines represents guided tours.

Despite important role that Rabac has in cycling community, City of Rabac has only 1 E-bike charging station in Valamar Sanfior Hotel&Casa and no city rent (e-)bike stations.

b. Future interests and potential

City of Labin has numerous tourist projects (as Labin's mine). E-bike charging stations are interesting thing to keep in mind. Ropeway from Labin to Old Town is planned. Important role of City of Rabac in cycling community offers great opportunity for branding city in that way and that should be supported with public (city) rent-a-bike stations as well as e-bike charging stations.

3. Analysis of the potential for connecting the maritime, road, railway and bicycle transport in Istrian county with focus on „Tw“ project that covers sustainable rail city transport in City of Pula

Most of the Istrian ports recognized importance of connecting different types of transport by entering in numerous EU projects that for the aim have develop of multimodal transport, mostly in partnership with Italy. Furthermore, cities also recognized importance of sustainable and ecological transport by introducing e-bikes and e-charging stations (for bikes and cars). However, these types of transport do not exist at ports and here lays opportunity for further development of multimodal and sustainable transport. In addition, none of the ports have e-charging station for boats that could help in developing of elite tourism. When speaking about public transport it is not well developed in most of the cities and here also lays another opportunity to develop sustainable and ecological transport with low (or zero) CO2 emission. Improvement in availability and accessibility of the ports by connecting them with the intermodal land infrastructure is needed. Such development is recognized in “Tw” project in City of Pula. Within the “Tw” project plan, there is intention to refurbish old railway on Pula's Riva throughout its revitalization and upgrade, integrating in addition to the existing bus transport into urban mobility another form of ecological transport – tram transport. This would reduce traffic jams, noise, and CO2 emissions in the city center and on the City of Pula Riva, especially during the summer months. In addition to reducing congestion and pollution, the introduction of a tram line would connect port terminals with other facilities in the city, such as a tourist resort, parking lots, airport and thus contribute to the multimodality of transport in City of Pula. This kind of connection achieves synergy among all modes of public transport: cars, buses, ships, bicycles, trams, trains, planes, etc., which opens the possibility to integrate bus and parking tickets and extend the scope of smart cards to economic branches outside of public transport. Usage of smart cards, such as in City of Pula, should be introduced into every city and port with aim of connecting different types of transports and economics branches.

Furthermore, whole region would benefit from development of an integrated IT platform and service for public transport trip planning. Local government should play active role in all of these activities.

4. Conclusion

Throughout analysis of the current state of the port passengers, infrastructure and development aims we can conclude that there is the biggest impact and benefits that could be reached throughout implementation of the specific measures in the Port of Pula, as well as in Poreč and Labin (Port of Rabac).

The highest impact, within available budget, could be reached throughout placement of the several touch screen interactive panels on the frequent locations. The information that should be presented on given panels should consist of at least:

- Information on local, national and international transport options that are relevant for given location (e.g. public transport info, places where the bicycles are placed within the city, ferry/catamaran schedule, where to buy tickets for public transport,...)
- City map and guide with information of the local and tourist attractions and local gastronomy. This should be suited for the specific time when someone is using the panel
- Goals and aims of the METRO project.

The content that is presented through panels should be easily adjustable for the location where they are placed and for the specific time of the year/month/week, so there should be developed CMS (Content Management System) that will allow the administrator to update content on given panels (each of them separately). Also, content should have multi language options that could be easily selected by the users.

Besides the interactive panels, we believe that it would be handy to provide to the passengers possibility to charge e-bikes as well as the e-scooters, and mobile phones/laptops/tablets as well.

In order for easier tracking of the passengers that have arrived and commuted through port, we believe that having the automated tracking/counting of the international passengers that have arrived to Pula or have left Pula (Rijeka gat) would be beneficial for the purpose of the METRO project but also for the further usage from the Port of Pula.

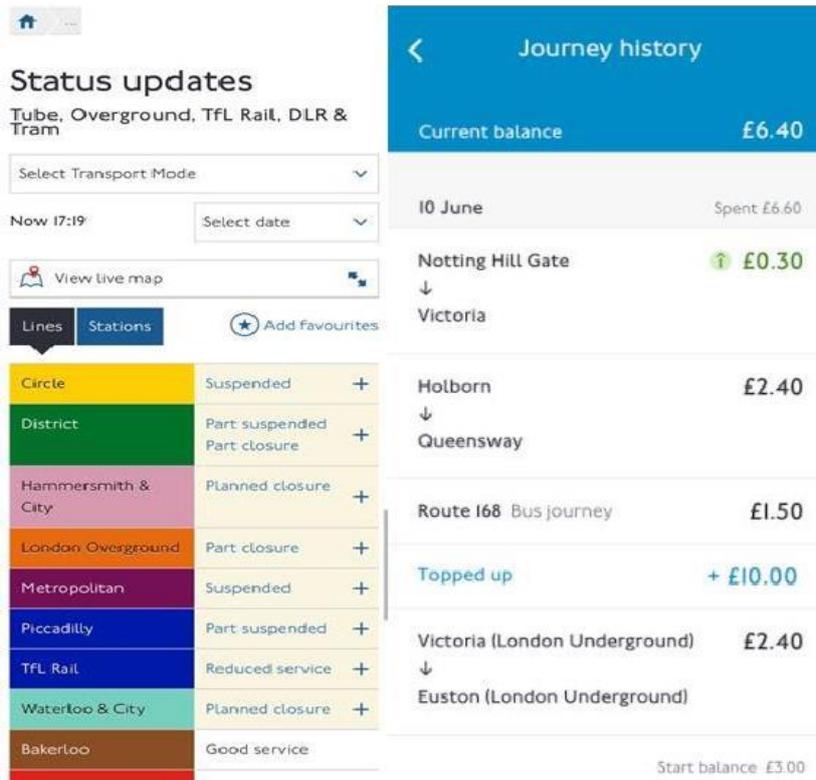
We believe that implementation of the above listed infrastructure and functionalities would be beneficial for the passengers and that would directly help fulfilment of the METRO project goals.

Out of all analyzed towns in Istria County, only the City of Pula introduced smart cards with certain functionalities in public transport. These smart cards act like an e-wallet on which you put money and buy tickets at exclusive prices. Many European cities use smart cards to connect different tourist attractions and services that tourists need when visiting the city. In particular, some cities offer the purchase of cards that enable free entry into various museums, free public transportation rides, discounts on certain attractions, etc. The next step in the development of smart tourism and multimodal transport is the development of an application that would enable the purchase of various tickets and services through one application. IDA has launched a tender for the development of an application that integrates transport services and benefits of local producers and entrepreneurs. This tender offers an excellent opportunity for further digitalisation in transport and tourism and further develop of multimodal transport in Istria County. There is a possibility of consolidating relevant information for different types of transport, from train and bus, to bicycles and ships. Putting all this information into one mobile application, in one place, would make it easier to combine different types of transport in the Istria County and thus increase the tourist competitiveness of the entire region. Also, this kind of application could be good platform for further public services development. Such mobile applications have already been implemented in some European cities. These mobile applications enable users to access all relevant transport information in this area in a few clicks, and most of them allow tickets to be purchased through an application that makes travel much simpler and cheaper.

London has one of the largest urban public transport networks in the world, with integrated bus, river and road systems stretching across 32 city districts. In London, more than nine million passengers are transported daily via public transport, including buses, metro and trains. Due to such a large number of passengers, in three years they launched contactless transportation payments, using open-loop solutions implemented by credit card issuers and Mastercard. London benefits from an integrated ticketing system under which one card can be used for all transport services across London. It also allows travel on most national rail services in London and some outside London. This system also enables generation of job travel data used to model the impact of delays on congestion and travel patterns to work for better informing about investment decisions. The integrated card issuing system operates through the mobile application **TfL Oyster and contactless app**. The application is free of charge and allows you to manage contactless cards and devices and Oyster cards. Mobile payments can be made using devices such as phones, watches, intact payment pendants or bracelets.

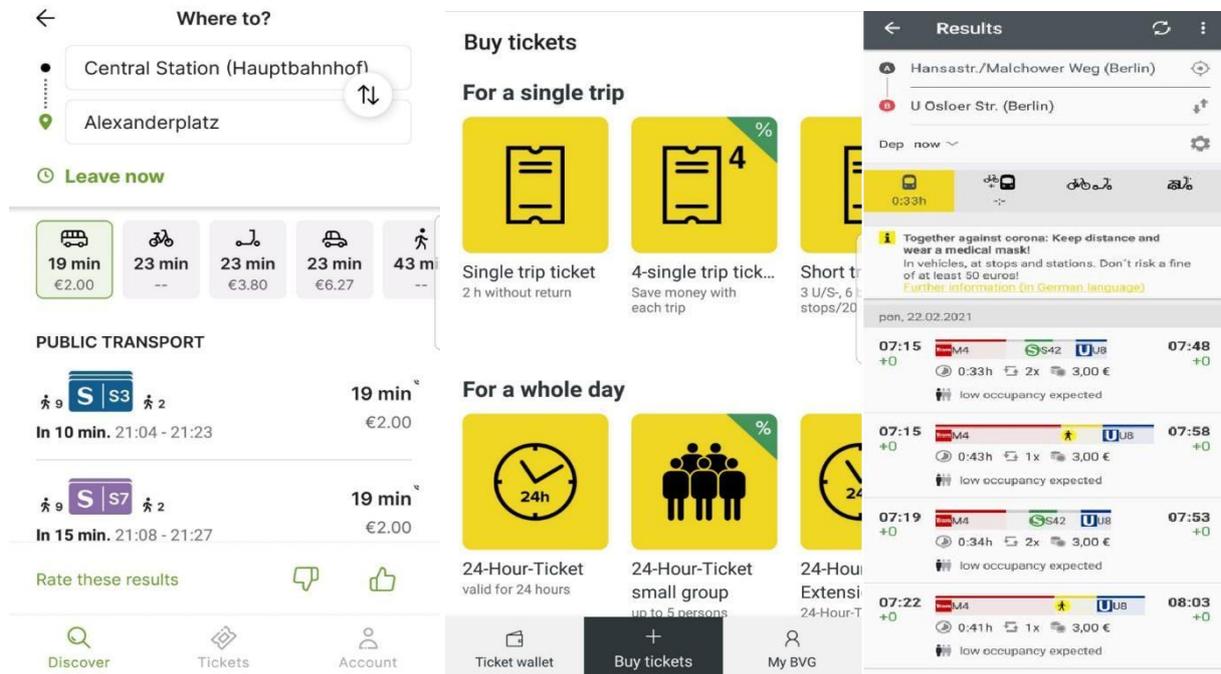
Upon entering the selected means of transport, the contactless card or device or Oyster card shall be leaned to the card readers recording the starting point. When exiting the means of transport, it is also necessary to lean the same used card or device to record the station of destination. If it is not registered at the exit, or if the same card or device is not attached, a larger amount will be charged. Furthermore, tickets are significantly more expensive if they are purchased at points of sale rather than through an application. On the application you can see maps with lines on which public transport drives, journey history and all relevant information about delays and other transport events.

Figure 9: Screenshots of TFL Oyster and contactless app



In the public transport of Berlin, there are three applications available for the purchase of tickets: Jelbi, BVG Ticket, BVG Fahrinfo. **BVG Ticket** is an official application for the purchase of public transportation tickets in Berlin. Through the BVG Ticket application you can buy tickets for trains and buses and travel anywhere in Berlin. Tickets are bought and downloaded directly in the application. Registering to an app is simple, all you have to is enter an email address, password, first name, and last name. **BVG Fahrinfo** offers detailed information on the route with real-time data and navigational data, including ticket sales. The **Jelbi** application combines all Berlin public transport and sharing services in only one application. Through the Jelbi application you can buy tickets for bus, train, motorcycle scooter, electric scooter, bike, car, taxi and car rides. After registering, saving payment data and confirming the driver's license and identity card, any service can be booked and paid directly in the application with only a few clicks. For all three applications, a map choice is offered between a ticket, where the price depends on the zones, and a fixed ticket with a time frame of 24 hours, 7 days, etc., whose price also depends on the number of zones for which it is purchased.

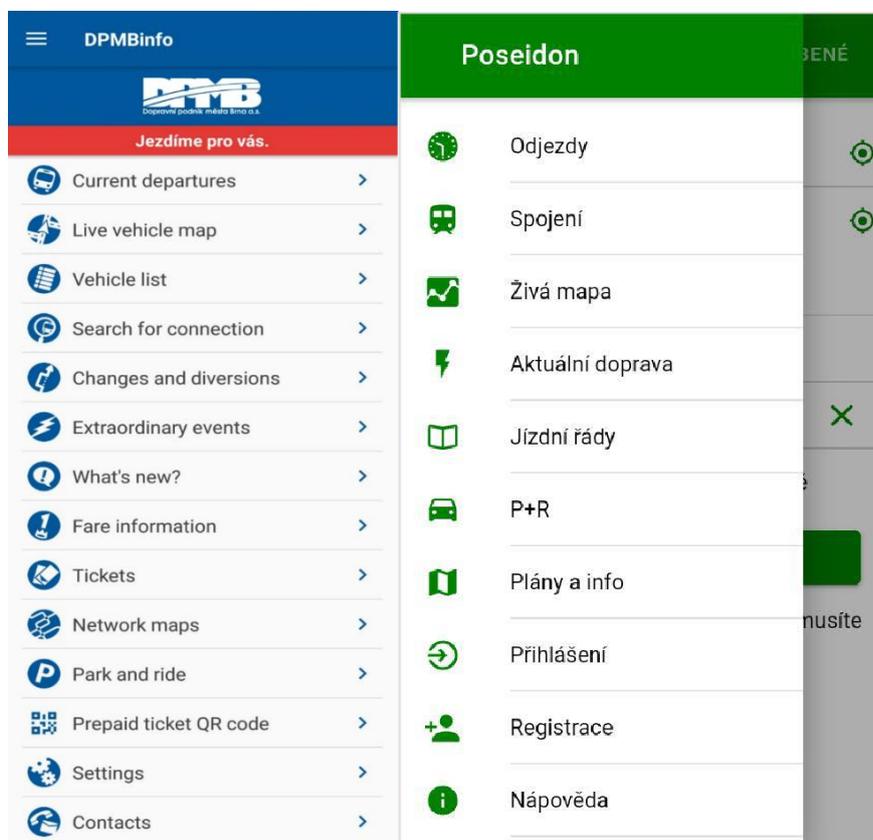
Figure 10: Screenshots of Jelbi, BVG Ticket and BVG Fahrinfo apps



Public transport in Brno and the rest of Jihomoravsky region ensures Integrovaný Dopravní systém Jihomoravského. Tickets apply to any form of public transport, so you just have to pay attention to how long you travel (tickets are worth for limited period) and through which zones you travel. Tickets can be bought in any of the Yellow card vending machines located in different positions throughout the city or can be bought in information centres, stations and kiosks. The ticket can be purchased directly from the driver at a slightly higher price. If a person holds a Czech telephone number, tickets can be bought by SMS or by mobile application. In vehicles you can pay contactless. **Free BMBInfo** application is available in Brno. The application contains departures from any station in the city, GPS vehicle tracking and a tour planner to the selected destination. The application updates the map and schedules for any events, delays and route changes due to construction works, etc. Also, the application allows you to buy a ticket. The application is primarily intended for passengers of the public transport system Brno, who also use regional connections to varying degrees. Passengers must have a valid fare ticket when boarding a vehicle, during the journey and at the time when they depart from a tram/bus, etc. They must check (certified) their tickets into the machine as soon as they board the vehicle. After checking, passengers have to check that the data is on the ticket, if there is any irregularity, they have to talk to the driver as soon as possible. If they use the SMS card, passengers on boarding must already have a valid SMS ticket on their mobile device.

If a traveler does not get a text ticket on his/her mobile device, he/she has to buy another travel ticket in order to travel. Otherwise, the traveler will be considered to travel without a valid ticket. **The IDS JMK Poseidon** mobile application provides information and tickets for transport in South Morava and Brno. Furthermore, the IDS JMK Poseidon application enables the purchase of cheaper tickets than usual and provides some useful information for travel through the region. The application allows you to plan trips and find departures from the nearest point of view with a displayed delay in real time. It also provides an overview of the current vehicle positions on the live map. It enables downloading of current timetables and network maps and receiving news about traffic information. Everything in one application.

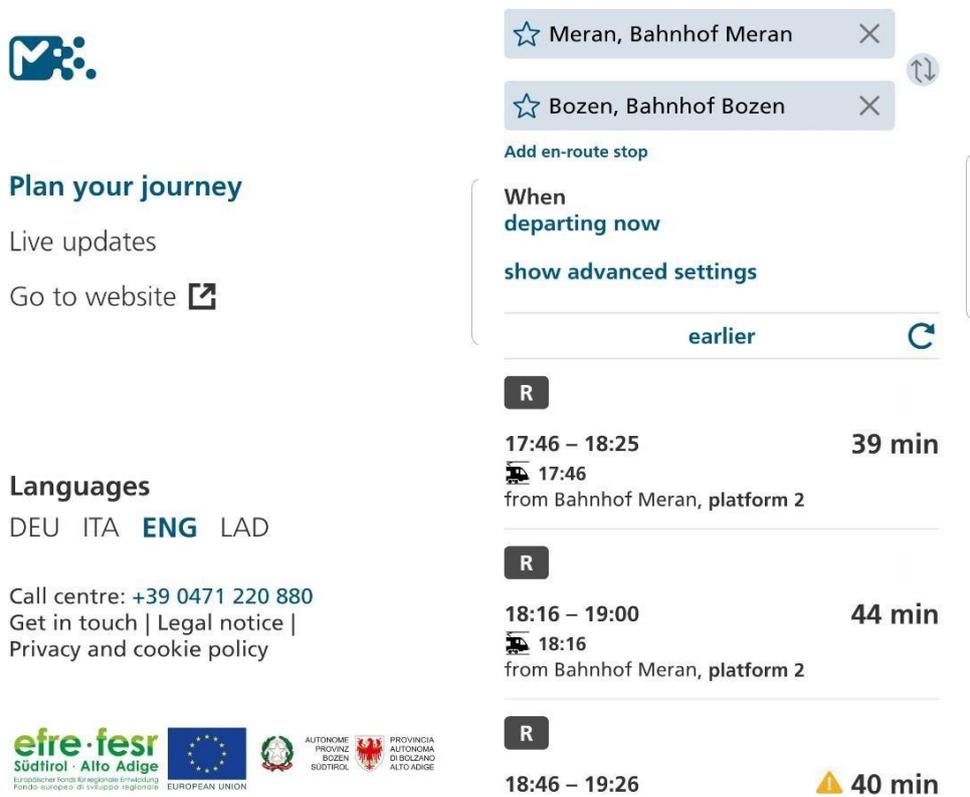
Figure 11: Screenshots of DPMBinfo and Poseidon apps



The South Tyrol Transport Association brings together city and intercity lines, city buses, regional trains, and the Italian railway TRENITALIA (between Innsbruck and Trento), as well as the South Tyrol's railway trains in region of South Tyrol. Climbers Mendel pass, railway Rittnerbahn and cableway installations in Ritten/Renon, Jenesien/San Genesio Atesino, Vöran/Verano, Mölten/Meltina and Meransen/Maranza can also be used with one ticket.

The regional trains of Trenitalia (Italian Railways) and the South Tyrol’s Railway operate four routes at half an hour or hour intervals. With Mobilcard, passengers have full flexibility because it enables the use of the whole network of integrated public transport of South Tyrol. By bus or train, you can reach (almost) all destinations of South Tyrol. A tightly woven public transport network and precisely coordinated timetables supply passengers with hours and half-hour connections between places and popular destinations. The mobile card offers practical strategies and an unlimited use of the entire public transport across South Tyrol in one, three or seven consecutive days. When boarding a bus or train, it is necessary to register: in order to confirm and use the ticket, it is necessary to simply lean Mobilecard to the sensor of blue card confirmation machines at the train station or any bus. The mobile card is available at all points of sale of the integrated public transport of South Tyrol, in tourist offices and in many accommodation service providers. “Südtirolmobil” mobile application is used as a complement service for mobile card in this region. The mobile application “Südtirolmobil” enables an overview of public transport timetables, route calculation, including stopping order, price information, warnings and cartography but does not allow for the purchase of a ticket.

Figure 12: Screenshots of Sudtirolmobil app

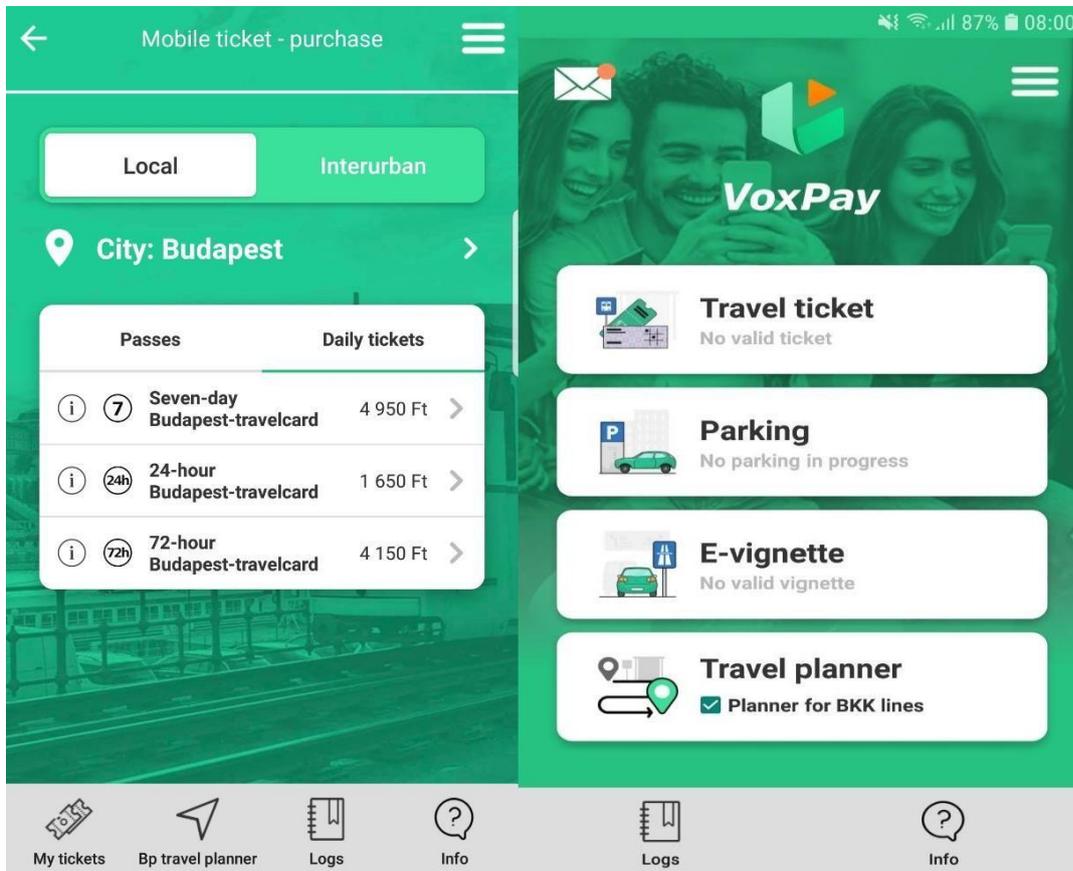


Budapest introduced Mobile public transport tickets in June 2019. They allow for the purchase of a public transport ticket with mobile phones, even just before entering the vehicle. Registered users of the National Mobile Payment Plc can purchase public transportation tickets and pass through mobile card applications (Kozlekedsi Mobiljegy and VoxPay).

A debit card is used for the purchase or the balance is added. Mobile payments are a simple, fast, and secure way of purchasing transport tickets without additional charges. In most cases, daily, weekly, and monthly passes do not require further post-purchase actions. Tickets can be bought for buses, trolleybuses, railways, and ships (for ships only valid for working days). For Kozlekedsi Mobiljegy application, before entering the metro, it is necessary to select an already valid ticket or pass. Then tap “Scan the driving code” and scan the code on the front or side of the map checking machine. The “metro cells” button may also be used if the application has this function. Click the button, and then select the cell name of the metro. The animated symbol that appears in the application must be displayed to the supervisory staff. An active cellular data connection is required to scan code. Payment is made very simply, can be paid through simple account or application. Only the card number, the name and surname of the cardholder, the shelf life and THE CVC/CVV must be entered. The ticket starts to be valid 2 minutes after the purchase.

In the mobile application VoxPay, along with a ticket for public transportation, it is also possible to buy a vignette for highways and parking tickets. Unified system of services and payments in transport which can be used throughout Hungary and which can be purchased without paper, simply, without waiting and cash. All you need is a mobile phone and Internet connection, whether you travel by car or public transport. In addition to local transport tickets, it is also possible to buy inter-city tickets on the application. These tickets are not limited by time but relation, and they depend on the kilometers travelled. When entering means of transport including subways, it is necessary to read the QR code at the entrance to the subway and at the front door of other means of transport.

Figure 13: Screenshots of VoxPay app



Tickets for transport in Stuttgart and its surroundings can be purchased via the VSS Mobile mobile application. Tickets are valid for S-Bahn and regional trains (RB, RE, IRE), urban railway, buses, trams, and funicular. The uniform tariff rates are valid in Stuttgart and the surrounding Böblingen, Esslingen, Ludwigsburg, Rems-Murr County, and trains from/to Geislingena and Lorch. Tickets for vehicles are bought as time tickets and the price depends on the zones through which the passenger passes. Tickets purchased with a mobile application are cheaper than tickets purchased on an automatic. After selecting an appropriate ticket, it is necessary to determine the time of activation of the ticket, the number of zones through which the passenger passes to his destination and the exact zones through which he passes in order to determine the price of the ticket.

Figure 14: Screenshots of VSS Mobile app

