

# ANALYZING NEW INTERMODALITY SOLUTIONS

D.4.1.3.

Analysis on market potential research – with  
railway through Istria: route Rijeka-Šapjane

### Document Control Sheet

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## 1 Action overview

Within the MIMOSA project, PP12 conducts research activities related to investigation of market potential, with the emphasis on urban and suburban rail transport – with possible cross-border connections on two specific routes:

- I. (D.4.1.2) No. 1 Analysis of market potential research – across Istria by rail: Buzet–Pula route. Market potential investigation, including possible connections towards SLO and IT. Resp. PP12 (M10)
- II. (D.4.1.3) No. 1 Analysis of market potential research – across Istria by rail: Rijeka–Šapjane route. Market potential investigation, including possible connections towards SLO and IT. Resp. PP12 (M18)

The purpose of this research carried out within D.4.1.3, was to obtain information on passengers' habits and population needs in hub Rijeka, as well as mobility needs of visitors to Istria. With survey created for purpose of this study, answers regarding selection of means of transport, reason for travelling, ticket purchase, sustainable transportation, usage of railway transport, disadvantages of railway transport and travelling to Italy and Slovenia were retrieved. This survey was in railway hub in Rijeka as well as in trains operating in the region Istria and Primorje-Gorski Kotar County on the route from Rijeka to Šapjane. The survey was conducted among 246 public transport users and general public in the research area.

## 2 Geographical scope / area background

### 2.1 Primorje-Gorski kotar County

The functional region covers three territories i.e. three basic sub regional units: the Istrian peninsula with the City of Pula, the Kvarner Bay with the port in Rijeka and the hinterland territory with hills and mountains. Those areas are not geographically homogeneous but consist of several smaller morphogenetic, pedological, hydrographic, climatic and vegetation zones. Primorje-Gorski Kotar County, with city Rijeka as its capital, covers an area of 3,588 km<sup>2</sup>, or 6.34% of the Croatian state territory. According to the results of the 2011 census, Primorje-Gorski Kotar County has a total population of 296,195 and, with a share of 6.9%, is the fifth-largest county in Croatia (4,284,889).

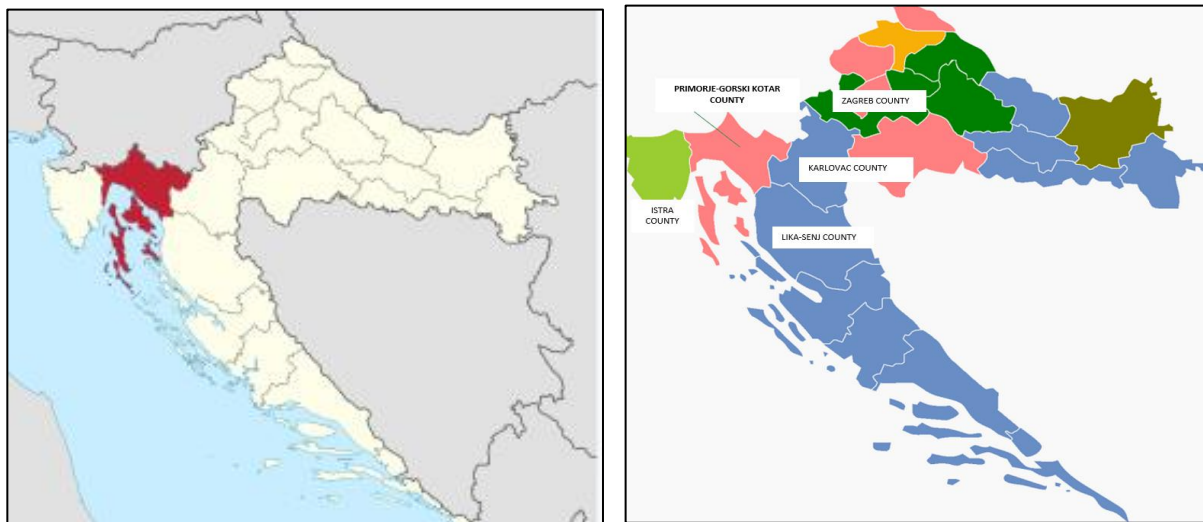


Figure 1. Map of Primorje-Gorski Kotar County

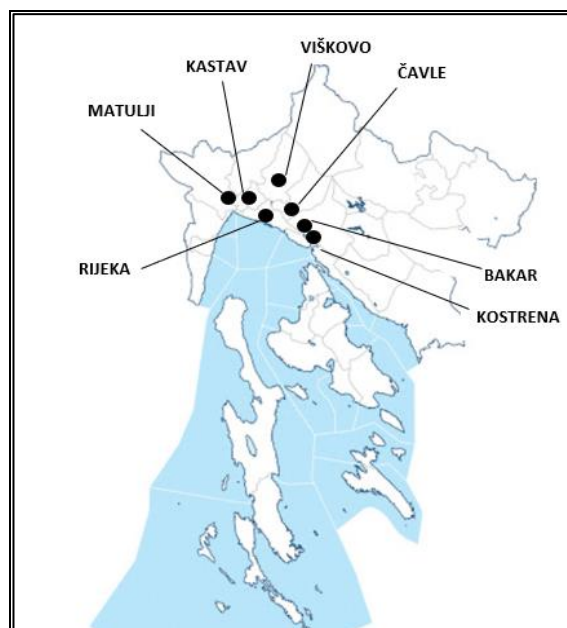


Figure 2. Primorje-Gorski Kotar County

	No of settlements	Area [km <sup>2</sup> ]	No of inhabitants	Population density [inhabitants/km <sup>2</sup> ]
<b>Croatia</b>	<b>6.762</b>	<b>56.594</b>	<b>4.284.889</b>	<b>75,7</b>
<b>Primorje- Gorski Kotar County</b>	<b>509</b>	<b>3.588</b>	<b>296.195</b>	<b>82,6</b>
Rijeka city	1	44	128.624	2.967,0
Bakar city	9	125	8.254	66,0
Kastav city	1	11	10.472	952,0
Čavle municipality	10	85	7.215	84,9
Kostrena municipality	1	12	4.179	348,3
Matulji municipality	23	176	11.274	64,0
Viškovo municipality	7	19	14.495	762,9

*Table 1. Population data in Primorje-Gorski Kotar County, City of Rijeka and settlements in the Rijeka Ring (Source: Census 2011, CBS)*

According to the administrative-territorial division of the Republic of Croatia, the section Škrljevo-Rijeka is located in the Primorje-Gorski Kotar County, i.e. in the City of Rijeka and the Municipality of Matulji. The county is marked by an exceptionally well-indented coastline, special climate advantages and its geographical proximity to Central Europe. Favourable geological position for transport sector has affected the economy so that a significant portion of the population pursue economic activities related to transport and the sea. As a consequence of the above-mentioned, centres with developed ports, maritime transport, shipbuilding and tourism activities are important for the entire Republic of Croatia. At the national and international levels, the Primorje-Gorski Kotar County has an exceptional role in integration of wider areas of the Danube region with the Adriatic and Central European (Alpine) areas with South-Eastern Europe. There are two primary traffic routes in the Primorje-Gorski Kotar area, which integrate Croatian territories into the European economic and transport system. The County belongs to the Adriatic part of Croatia within the NUTS 2 statistical classification.

## 2.2 Hub Rijeka

The city of Rijeka is the administrative, business, economic and cultural centre of the Primorje-Gorski Kotar County. The Rijeka hub connects to the Danube-Adriatic-Mediterranean route, from Budapest via Zagreb, that connects Central European Alpine and Danube area with ports on the Adriatic, and thus with the Mediterranean. Favourable geographical position for transport sector enables the city and also the County to achieve significant economic flows of goods and passengers and offers the possibility of economic progress, but it should be significantly improved as well. The

geostrategic position gives the city of Rijeka an opportunity to position itself as an energy and traffic hub, but also as an affordable tourist destination.

Population of the City of Rijeka<sup>1</sup>, according to the Central Bureau of Statistics regarding the number of inhabitants, is based on the census population from 2011 and Rijeka is the third most populated city in the Republic of Croatia (after Zagreb and Split). with 128,624 inhabitants.

Year	No of population in total over the years including net migration and the natural increase
1948	98.780
1953	75.328
1961	100.989
1971	129.636
1981	155.709
1991	162.705
2001	144.043
2011	128.624

*Table 2. Population migration within Rijeka (Source: City of Rijeka, CBS)*

Based on the available data, we can talk about the demographic trends that have led to a reduction of total population in the city of Rijeka:

- Negative population trend - according to the Educational Public Health Institute of Primorje-Gorski Kotar County, in the period from 2000 to 2010, 17,010 inhabitants died and 12,145 (-4,865) were born.
- Negative trend of mechanical movement of the population (migration) - more people migrated from Rijeka (mostly to the surrounding cities and municipalities) than moved to it. Data on migration shows that in the period 2000-2011, 33,328 people migrated from Rijeka, and 21,533 moved to Rijeka. From the total number of people who moved away, 66.4% moved to other municipalities and cities within the Primorje-Gorski Kotar County.

### 2.3 History of Rijeka railways (Rijeka-Šapjane railway line)

The construction of railway towards Rijeka began at the end of the year 1863 with funds provided by state. With great difficulty, the railway was completed and put into operation on June 25<sup>th</sup>, 1873. Rijeka was afterwards connected with Slovenia, Austria and Hungary by Southern Railway, and with Italy after construction of the Kanjiža-Kotoriba-Pragersko railway line in 1861.

<sup>1</sup> Development Strategy of the City of Rijeka for the period 2014-2020

After the First World War, the St. Petar – Rijeka railway fell under the administration of the Italian State Railways with headquarters in Trieste. In 1936, the Italian railways electrified this line with a 3,000 V Direct Current (DC) system, which gradually replaced steam locomotives with electric ones. Freight and passenger traffic on this line was intensive until World War II. Afterwards, in accordance with the number of passengers and scope of work when providing services to passengers, the number of trains was reduced. After World War II, the railway entered the Yugoslavian Railway system, where it remained until 1991. With the independence of Croatia and Slovenia, part of that line became part of the Croatian Railways (HŽ) and partly Slovenian railway (SŽ). From the total length of the railway tracks (55.4 km), 33.4 km are owned by HŽ. The border demarcation of this railway line between SŽ and HŽ is located between the stations Šapjane and Ilirska Bistrica, i.e. between kilometres 22 + 060.

At present, there are three main stations on HŽ's part of the railway, Šapjane as a border station, and intermediate stations in Jurdani and Opatija-Matulji.



Figure 3. Pivka-Rijeka Railway Line



## 2.4 Rijeka transport hub

Rijeka transport hub is the most complex one in the Republic of Croatia. It is the origin and destination of road and rail transport corridors that have international importance for transport of goods and passengers.

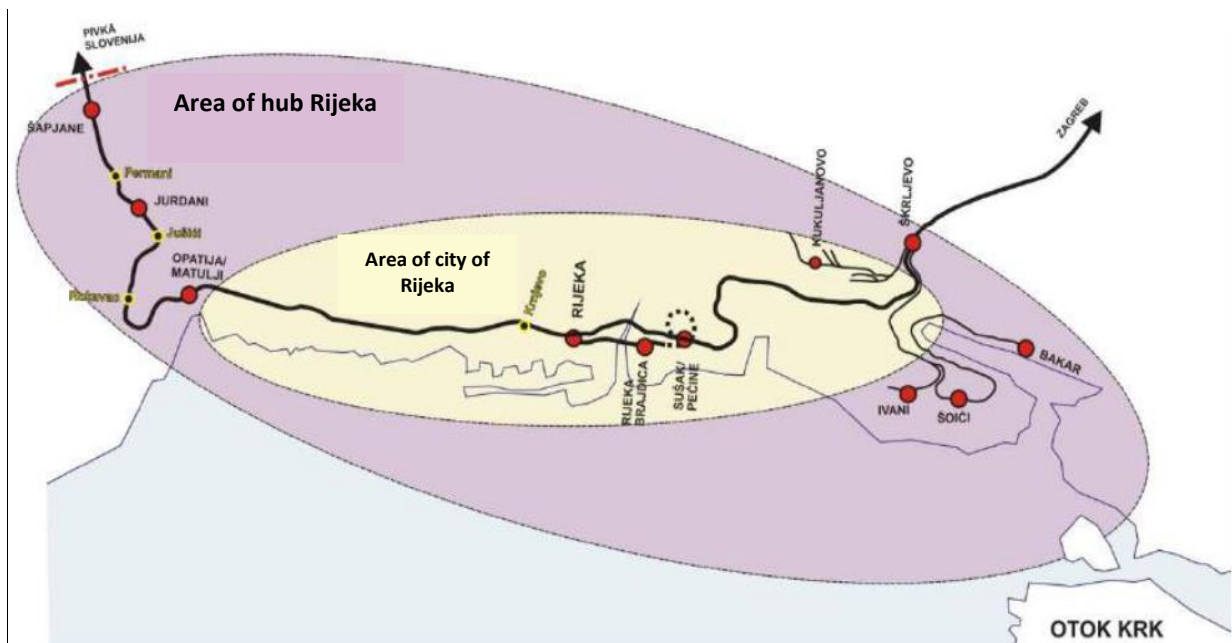


Figure 4. Rijeka hub area

The Rijeka railway hub is part of the transport system called “Rijeka traffic direction”, which connects Rijeka with the inland part of Croatia and the entire European transport system. The backbone of the Rijeka hub is a section of the railway track from Škrljevo to Jurdani, with a railway connection to the ports in the Rijeka, Sušak and Bakar basins. The Rijeka railway hub has not changed significantly in the last hundred years since the track construction towards the port in the hub. The Rijeka Railway line was built at the end of the 19th century as a single-track line, with small radius and large slopes. Later, it was electrified with 25kV / 50Hz AC system and fitted for the maximum nominal load of railway vehicles D4 (22.5 t/o and 8 t/m). It is one of the most important and busiest railway lines in Croatia. All terminals/ports and connected railway routes are linked to the main section line from Škrljevo to Jurdani. Besides, the railway section from Škrljevo to Šapjane has grown into the city of Rijeka and represents a potential that can be conveniently used for fast and efficient passenger transport in the city area and its surroundings.



Figure 5: Railway Stations

Further from Rijeka hub, railway tracks are leading toward Slovenian border. Railway line M203 Rijeka - Šapjane – State border (known as Ilirska Bistrica) belongs to the lines of importance for international traffic in the County. Rijeka is also connected to Trieste and Ljubljana by a separate electrified line that extends northwards from the city. Traffic corridors of national and international importance, along with the port system, integrate coastal and other areas of the County into the national and international transport network and into the European economic and transport system.

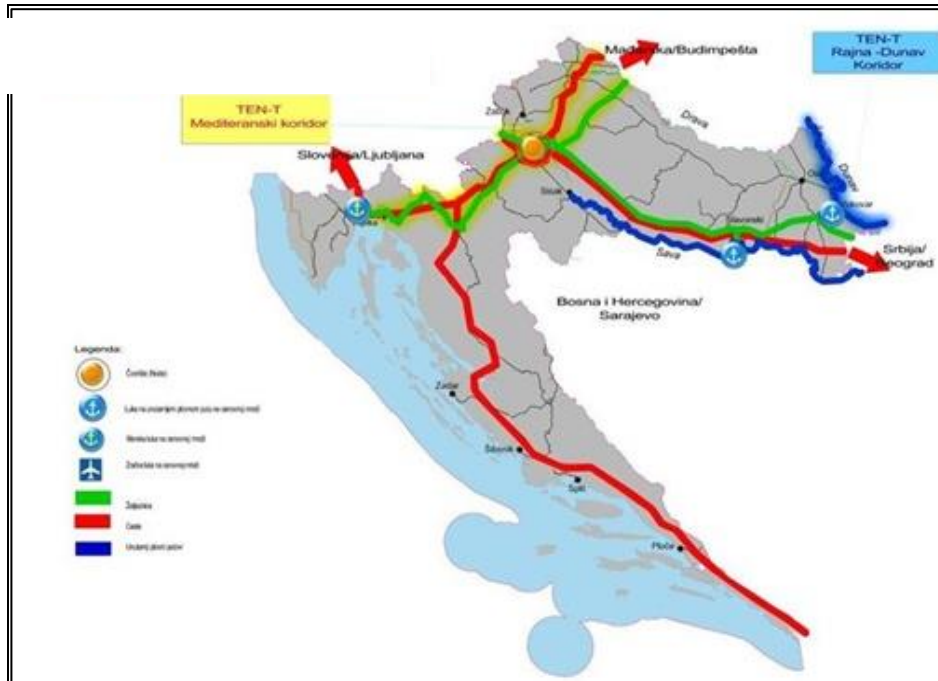


Figure 6. TEN-T corridors connecting hub Rijeka with Europe

Currently, Rijeka-Šapjane section is quite worn-out. Parts under the sections were renovated during different times, in the period between 1968 and 1982, and after that, revitalization works were performed as part of maintenance activities. Due to decay, the allowed infrastructure speed was reduced from 80 km/h to 50 km/h. There are no signalling and safety devices on the open railway line and train traffic takes place according to the station distance. On this sub-section there is only radio-dispatching telecommunication system available. On the railway section Škrljevo-Rijeka-Šapjane there are 6 stations (Škrljevo, Sušak-Pećine, Rijeka, Opatija-Matulji, Jurdani and Šapjane) and 4 stops (Krnjevo, Rukavac, Jušići, Permani), while Brgud stop was abolished.

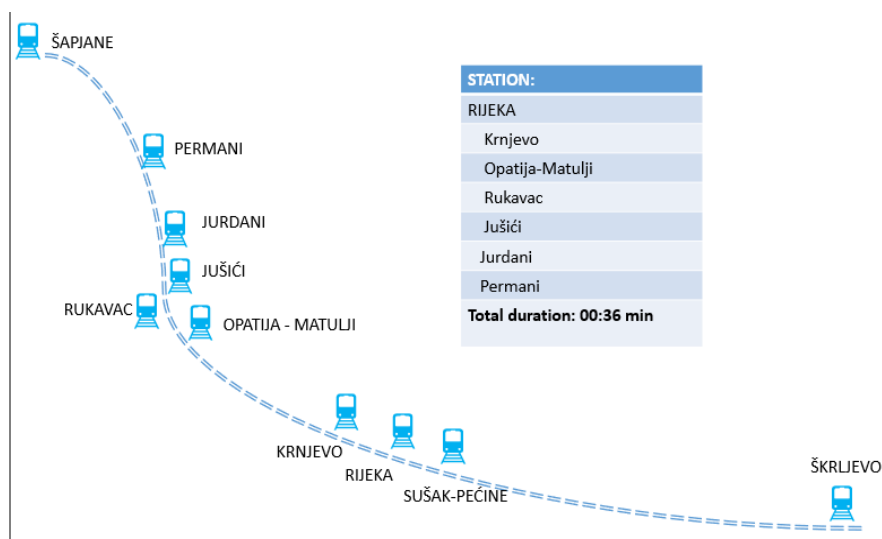


Figure 7. Stops and stations on analyzed route

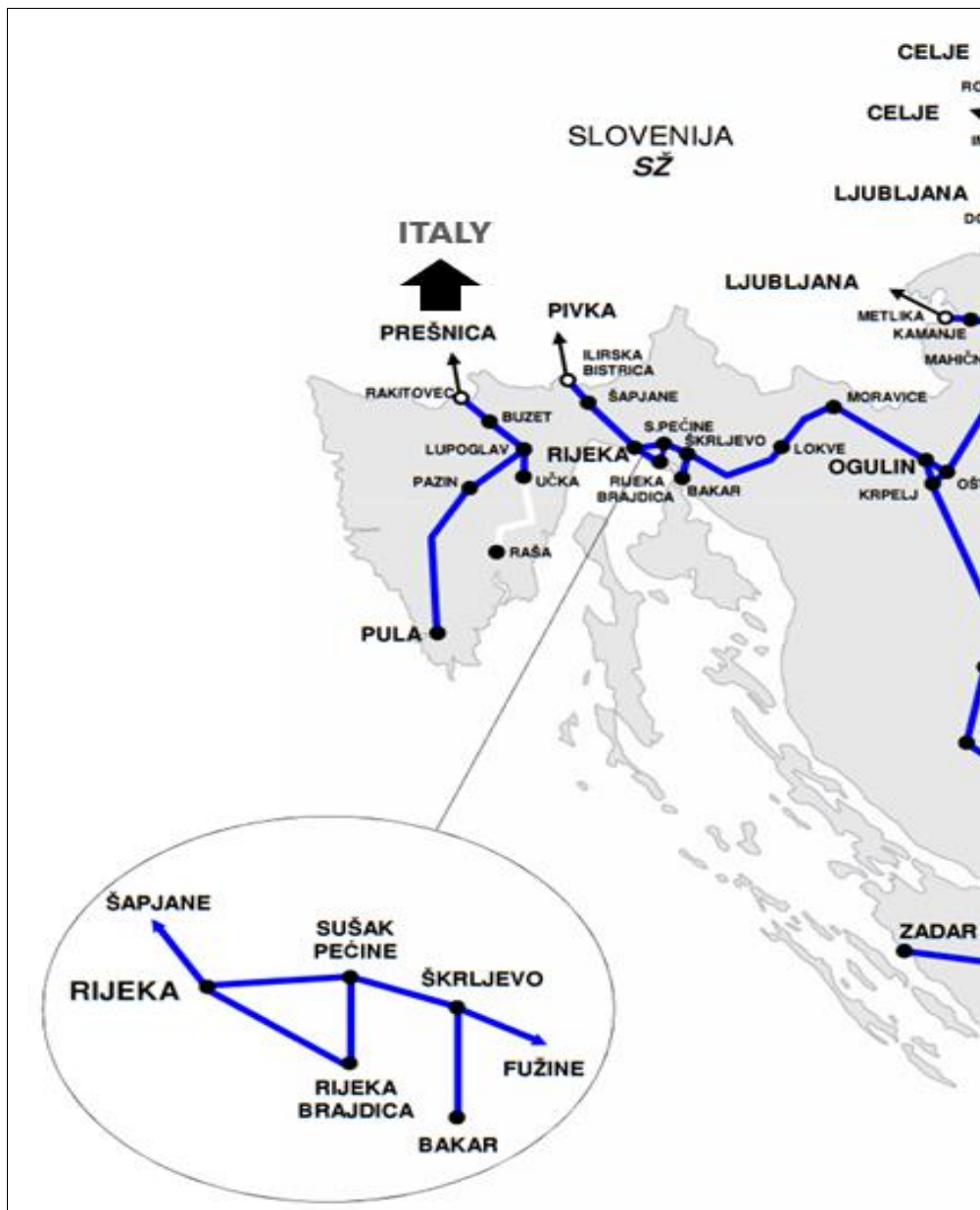


Figure 8. Railway Network in Istria and Primorje-Gorski Kotar County

The Opatija-Matulji and Jurdani stations are located on the Rijeka – Jurdani railway section. Currently, it is not possible – at the existing Rijeka-Jurdani subsection stations – to have reception and departure of passengers due to the lack of passenger platforms. Because of it, Opatija-Matulji station modernization is required so that it becomes a transit station for all trains and that Jurdani station can serve as the final/departure station for suburban traffic. The technical solution of the reconstruction envisages the extension of the tracks, enlarging spacing between tracks and construction of island platforms, secure access to the platforms over the tracks by underpasses. All stations also require access roads, parking lots and the station plateau, with the noise protection

barriers and horticultural landscaping. All stations should have a passenger information system and the possibility of installing ticket vending machines.



Figure 9. Opatija-Matulji Station



Figure 10. Jurdani Station



Figure 11. Permani station



Figure 12. Šapjane station

Rijeka Station is a unique station that consists of two functional parts, passenger and freight, and in addition, there is a part of the station intended for the maintenance of railway vehicles. An electromechanical signalling and safety device are installed in the station. In the passenger part of the station there are low platforms, from which eaves had to be removed due to safety inspection decision. The Opatija-Matulji station is provided with simplified relay signalling and safety devices, and the Jurdani and Šapjane stations with a mechanical signalling and safety device. Due to the condition of signalling and safety devices, allowed infrastructure speed in the Opatija-Matulji Šapjane stations is limited to 40 km/h.

**Railway section Škrljevo-Rijeka-Šapjane counts:**

- 3 tunnels:
  - Baudine tunnel (at the entrance to the Škrljevo station, 162 m)
  - Kalvarija tunnel (between the Sušak-Pećine and Rijeka station, 452 m)
  - Rukavac tunnel (between Opatija-Matulji and Jurdani station, 312 m)
- 2 bridges over the Rječina
- 9 road overpasses
- 4 road underpasses
- 5 pedestrian underpasses
- 1 pedestrian overpass
- Zagrad gallery
- 1 railway viaduct over Kumičićeva Street in the city of Rijeka
- The buildings are of different lengths (from 9 m to 173 m), with an opening size less than 20 m, except for the bridges over the Rječina (which are 26 m and 36 m wide).

**Section Rijeka – Šapjane counts:**

- 10 road overpasses (8 railway-road crossings on unclassified roads without security crossing devices, one crossing on the local road with security device)
- 12 road underpasses
- 8 pedestrian overpasses (pedestrian crossings over the railway tracks secured only with passing fences)
- 1 pedestrian underpass
- The buildings are of different lengths (from 8 m to 77 m) and the largest opening of the underpass is 32 m.












**Section Škrljevo – Rijeka counts:**





- 1 railway-road crossing
- 7 pedestrian crossings over the railway tracks. At 4 railway pedestrian crossings, there are no devices to secure the crossing, only bypass fences.

Besides railway routes it is also important to mention road infrastructure which is also crucial for Istrian peninsula as well as for Primorje-Gorski Kotar county. Rijeka road junction is one of Croatian main traffic junctions and plays an important role in linking the Croatian motorway network: A7 motorway links A8 motorway (Istrian “Y”) and A6 motorway (Rijeka – Bosiljevo). The Port of Rijeka is the main Croatian port (core port) and the development of the port must be harmonised with road development. Rijeka bypass is part of the A7 motorway, being one of the roads in Croatia with the highest traffic intensity. All necessary measures for port modernization must be coordinated with the reorganisation of the internal road network in the City of Rijeka, taking into account the necessities for public transport and soft modes, the development of the port and the development plans of other relevant stakeholders such as the railway company. For that reason, further analyses through Functional Region Concept are necessary to define the final set of interventions as well as the required technical parameters, taking into consideration the expected demand and economical and environmental aspects.

## MOTORWAYS IN THE REPUBLIC OF CROATIA

### Network and companies

Company	Motorways	Status of construction	Km in service
 HRVATSKE AUTOCESTE d.o.o.		 IN SERVICE  IN CONSTRUCTION	918.50
 AUTOCESTA RIJEKA-ZAGREB d.d.		 IN PROJECT	187.03
 BINA-ISTRA d.d.			141.00
 AUTOCESTA ZAGREB-MACELJ d.o.o.			60.00
<b>TOTAL in service as per 31/12/2018</b>			<b>1,306.53</b>

-  Part of the motorway A1 from Zagreb to Bosiljevo is operated by ARZ d.d.
-  Part of the motorway A7 is operated by ARZ d.d.
-  D10 i D12 were handed over to Croatian Roads Authority
-  D12

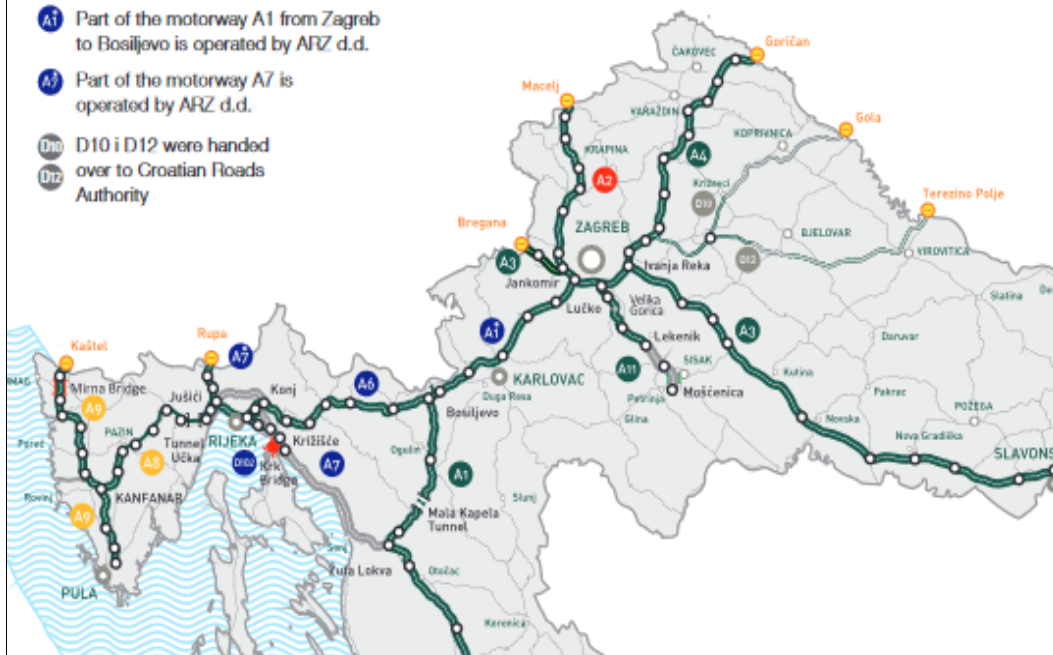


Figure 13. Motorways in Croatia (Source: HUKA\_The Croatian association of toll motorways concessionaires)

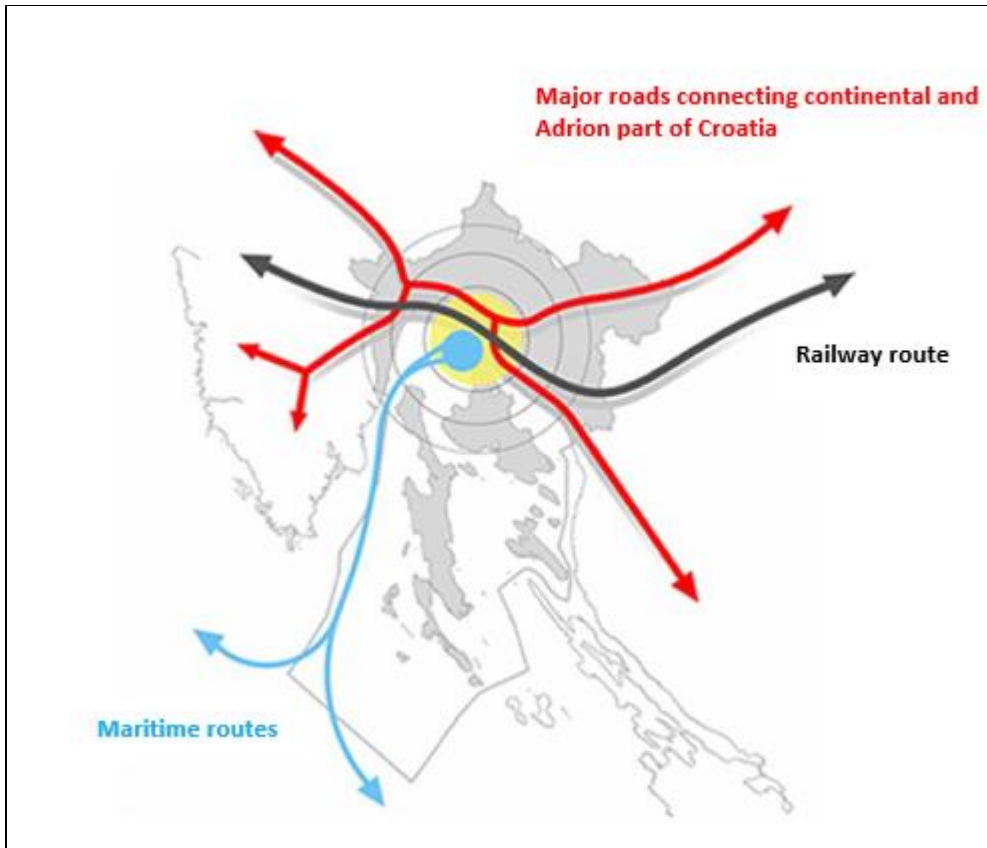


Figure 14. Rijeka hub – traffic junction



### 3 Data collection

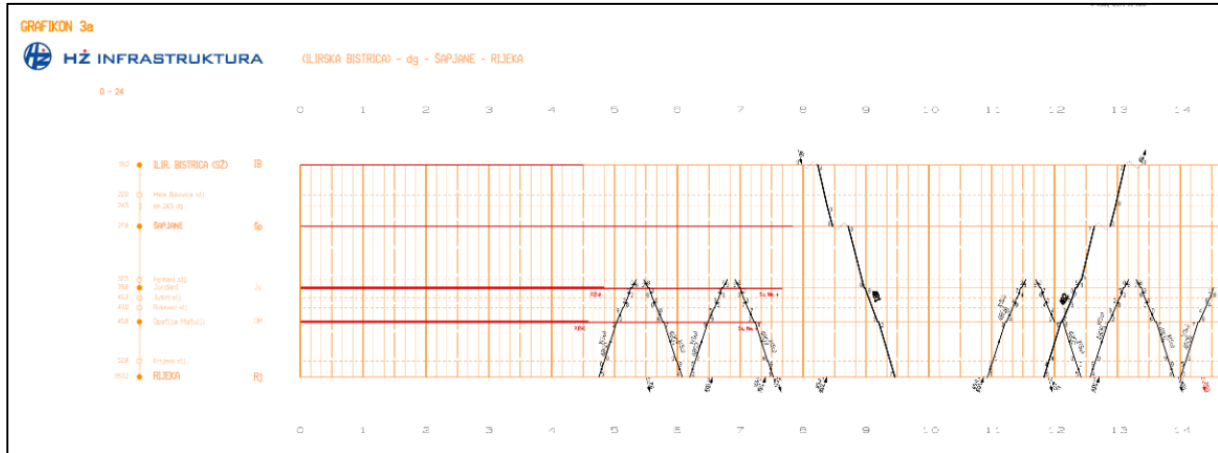
Operational management begins with forecasting planning activities. It is necessary to anticipate the demand for the service so that the quantity of services can be planned. In the process of producing services, it is necessary to plan physical capacities (infrastructure related to transport), operation and maintenance, network of lines, passenger transport units, and human resources (drivers, management staff, physical capacity maintenance staff, supervisory staff, etc.).

Strategic logistic management is the basic management principle, which can be reduced to planning, organizing, implementing, and controlling. Therefore, this is the process of defining long-term goals, the steps needed to achieve those goals and the implementation of certain strategies. Logistics management is not only anticipating the needs of the delivery of a transport service, but it is also a very demanding creative task in the distribution and timing of a particular transport service.

It includes the following:

- analysis of the current situation in transport
- setting direct and indirect goals
- creation of concepts and evaluation of strategic opportunities
- selection of strategies
- development of specific tactical plans for selected strategies
- revision of the strategic management process.

Effective planning of transport operations, development of timetables, efficiency analysis and meeting the needs of users requires precise and accurate data on how well transport lines are used. Therefore, HŽ Passenger Transport (HŽPP), as an operator, needs to organize the collection, maintenance, and regular updating of databases. Databases are maintained by systematic data collection through various types of surveys, which are conducted periodically or continuously by monitoring and counting. The counting of passengers determines their flow according to the routes of the line. As a rule, one observer is required for each vehicle at each location. If the route is very busy or there is simultaneous boarding of several passengers, a higher number of observers is required. Larger stations require bigger teams of observers. The most detailed information on the flow of passengers on the line is obtained by counting the entries and exits of passengers at each station along the line. Such counting provides data on the number of passengers per station. In this way, HŽPP collects data for timetable creation, by analysing the vehicle route, extending, or shortening the line, adding, or avoiding certain stops etc. As part of regular business activities, HŽPP is conducting regular passenger counting three times per year (February, July and October) in order to have a clear picture regarding train capacities. Each timetable contains number of trains going in one direction. Therefore, train number 4800 is operating on route starting from Škrljevo towards Permani, and train number 4801 is the same train on return journey. At figure 15. is can be seen that HŽPP has 8 pair of local trains operating daily i.e. 16 trains daily in both direction and 2 international trains with numbers 480/481 and 482/483.



**80** Rijeka Šapjane Ilirska Bistrica

	4800	4802	4804	B 482	4806	4808	4810	4812	4814	B 480
	2.	2.	2.	1.2. R	2.	2.	2.	2.	2.	1.2. R
				≠						≠
km	od									
0	4.45	6.12	10.56	11.50	13.24	14.00	14.40	16.30	19.20	20.45
3	4.50	6.17	11.01	11.54	13.29	14.05	14.45	16.35	19.25	21.02
10	5.03	6.29	11.14	12.07	13.55	14.18	15.04	16.48	19.38	21.02
13	5.06	6.35	11.20	12.13	13.55	14.24	15.10	16.54	19.44	21.02
14	5.12	6.30	11.24	12.18	13.55	14.28	15.14	16.58	19.48	21.02
16	5.16	6.43	11.28	12.22	13.06	14.31	15.18	17.02	19.52	21.15
18	5.20	6.47	11.32	12.26	13.10	14.31	15.22	17.06	19.56	21.15
28				12.38	13.10					21.30
0				12.53						21.45
6				13.07						21.59
12										21.59
	prema									
				Ljubljana						Ljubljana

Ne vozi subotom, nedjeljom i blagdanom.

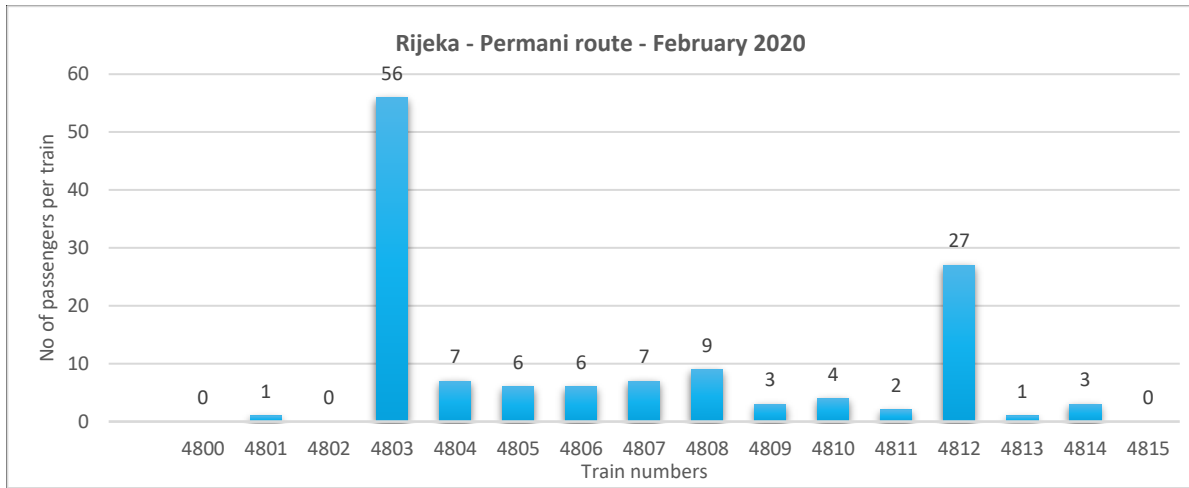
**80** Ilirska Bistrica Šapjane Rijeka

	4801	4803	B 481	4805	4807	4809	4811	4813	B 483	4815
	2.	2.	1.2. R	2.	2.	2.	2.	2.	1.2. R	2.
			≠						≠	
km	od									
0			8.14						16.58	
6			8.28						17.12	
12			8.43						17.27	
0	5.28	6.55	8.43	11.42	13.18	14.52	15.30	17.16	17.39	20.05
10	5.33	7.00	8.59	11.47	13.23	14.57	15.35	17.21	17.44	20.10
12	5.36	7.03	9.03	11.50	13.26	14.52	15.38	17.24	17.48	20.13
14	5.40	7.07	9.07	11.54	13.30	14.56	15.42	17.28	17.52	20.17
15	5.47	7.14	9.12	12.08	13.37	15.03	15.49	17.35	17.59	20.24
18	5.59	7.26	9.20	12.20	13.49	15.15	16.01	17.47	18.10	20.36
25	6.04	7.31	9.27	12.25	13.54	15.20	16.06	17.52	18.15	20.41
28										20.41
	prema									
				Ljubljana						Ljubljana

Ne vozi subotom, nedjeljom i blagdanom.

Figure 15. Time-table Rijeka (CRO) - Ilirska Bistrica (SLO) – Rijeka 2020-2021 (Source: HŽPP)

**Number of passengers per route in February, July and October 2020:**



*Chart 1. Passengers per train on Rijeka-Permani route in February 2020 (Source: HŽPP)*

*Note: Five trains operating only on route Škrljevo-Rijeka are excluded because they are not operating within this route parameters and trains which are not operating during the weekend are also excluded*

<b>No of trains in February 2020</b>	<b>16 (8 in each direction)</b>
Passengers daily	139
<b>TOTAL number of passengers per year according to February numbers</b>	<b>34.750</b>

*Table 3. Passengers per train on Rijeka-Permani route in February 2020 (Source: HŽPP)*

Chart no 1 shows number of passengers per train in February. It also shows that trains number 4803 and 4812 has the most passengers. This train starts journey in Šapjane in the early morning when most population starts everyday journey. This is also showing daily migration clearly as well as need for rail service. In July (chart 2), same trains have significant decline in numbers while in October (chart 3) passengers are back in trains. For that reason, with no obvious demand during summer period, railway operator might consider reducing trains only during summer months.

Number of passengers at the Škrljevo – Rijeka – Permani route in the year 2020 on average, on working days (Saturdays and Sundays are excluded), is 23.750.

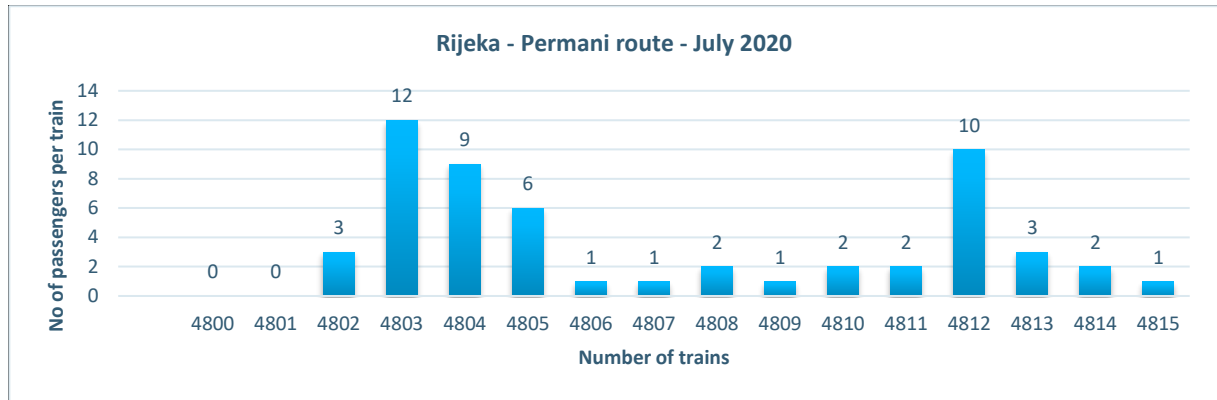


Chart 2. Passengers per train on Rijeka-Permani route in July 2020 (Source: HŽPP)

Note: Five trains are excluded because they are not operating on whole route and trains not operating during the weekend are also excluded

<b>No of trains in July 2020</b>	<b>16 (8 in each direction)</b>
Passengers daily	56
<b>TOTAL number of passengers per year according to July numbers</b>	<b>14.000</b>

Table 4. Passengers per train on Rijeka-Permani route in July 2020 (Source: HŽPP)

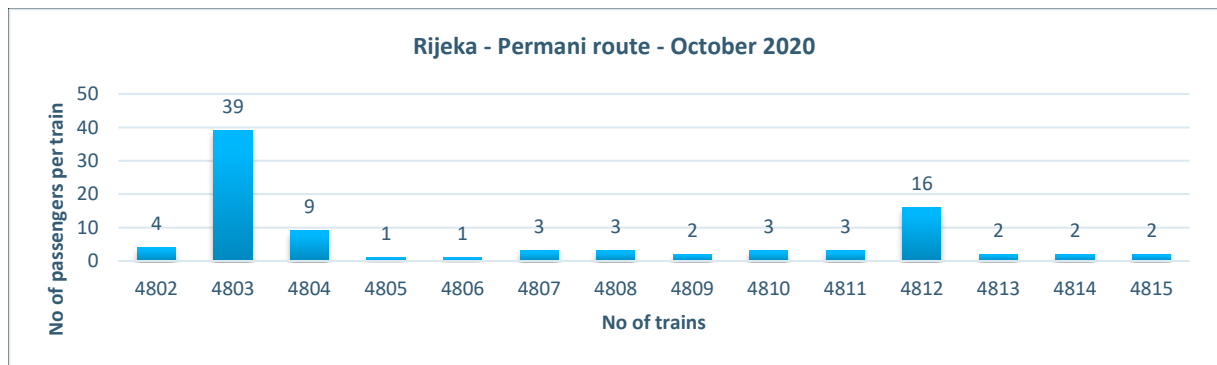


Chart 3. Passengers per train on Rijeka -Permani route in October 2020 (Source: HŽPP)

Note: One train is excluded because it is not operating on the whole route

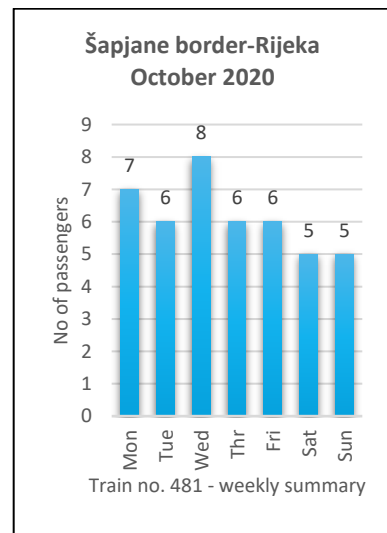
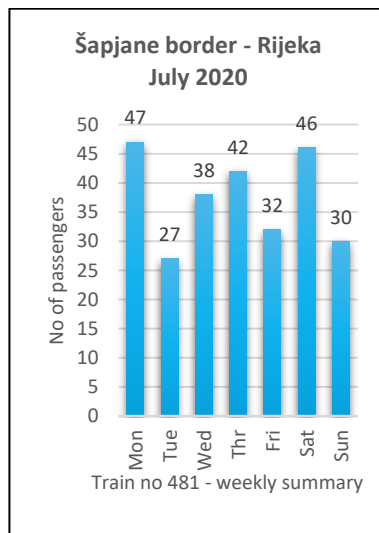
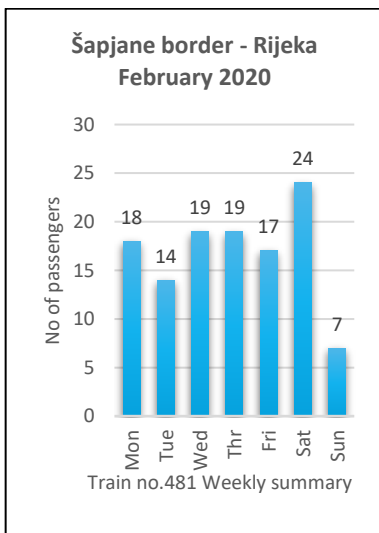
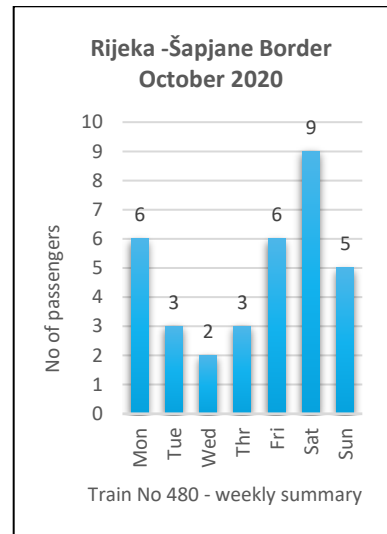
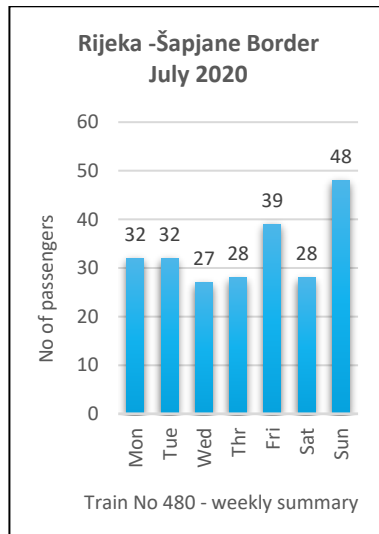
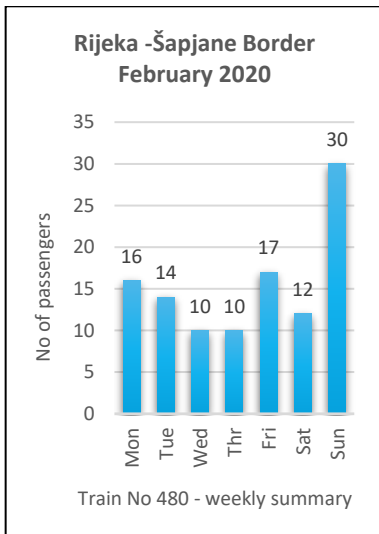
<b>No of trains in October 2020</b>	<b>14 (7 in each direction)</b>
Passengers daily	92
<b>TOTAL number of passengers per year according to October numbers</b>	<b>23,000</b>

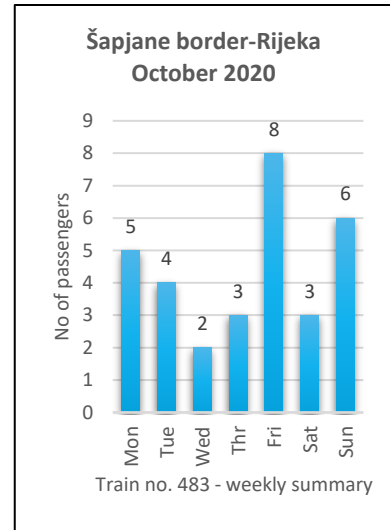
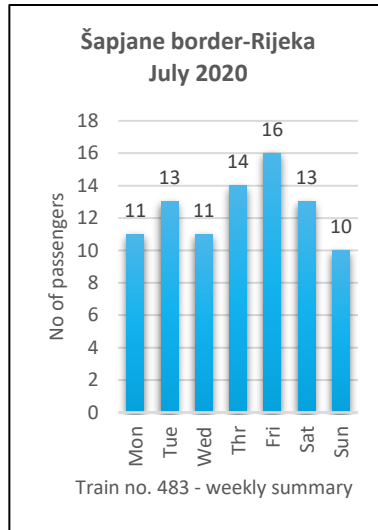
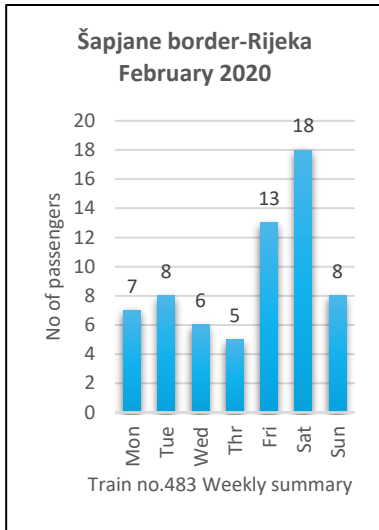
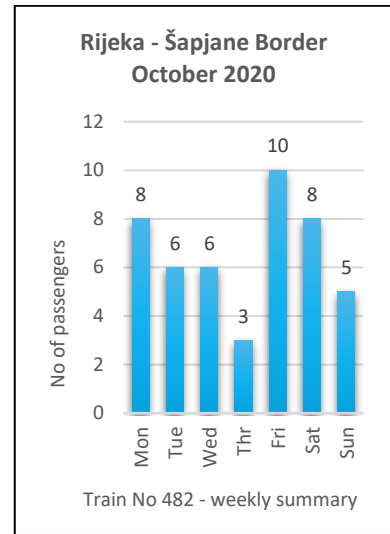
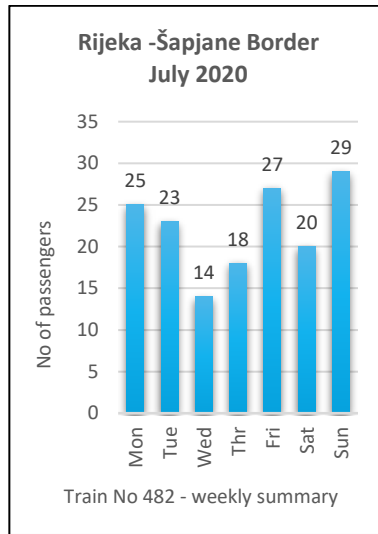
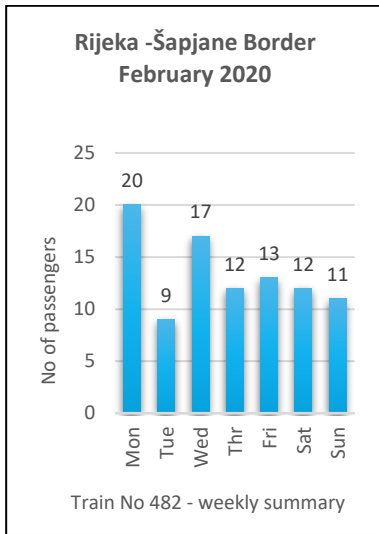
Table 5. Passengers per train on Rijeka - Permani route in October 2020 (Source: HŽPP)

**Number of passengers in international trains to Slovenia:**

Route	Month	Average No of passengers in trains daily			
		Train no. 480	Train no. 481	Train no. 482	Train no. 483
Rijeka-Šapjane – State border	Feb 2020	17	20	16	13
	Jul 2020	34	43	22	15
	Oct 2020	5	7	8	5
		Average No of passengers in trains monthly			
Rijeka-Šapjane – State border	Feb 2020	482	576	457	363
	Jul 2020	1.045	1.335	670	476
	Oct 2020	162	210	240	164

Table 6. Passengers in cross-border trains (Source: HŽPP)





Charts 4-15. Passengers in cross-border trains (Source: HŽPP)

## 4 Analysis

To promote sustainability and to outreach the goals for sustainable development, the efficient development of transportation means in the city area requires a thorough analysis of economic, social and environmental aspects. Given that a static situation, lacking development, brings with its intrinsic conditions of non-sustainability, the development of public transportation and the improvement of the conditions of sustainability are an objective to be pursued jointly.

Public transport services dominate in larger city areas and are characterised by dense population, while – for suburban areas – public transport is considered as more expensive and irrational. The main characteristics of public services are availability, speed, comfort and liability. Average transport speed and approach to different city locations are main factors and, also, deciding factors for individuals while deciding which means of transport to use on daily journeys.

### 4.1 Surveys

The purpose of the research is to obtain information about the habits and needs of the inhabitants and visitors to Istria and Primorje-Gorski kotar County related to mobility. Questionnaires were conducted in person with individuals as well as online via different web pages and portals. The answers will serve to improve activity planning and priorities in the project.

The research was conducted on trains in Istria and at Rijeka and Pula stations between 18th February and 31st March 2021, and online survey was available from February 15th to March 31st.

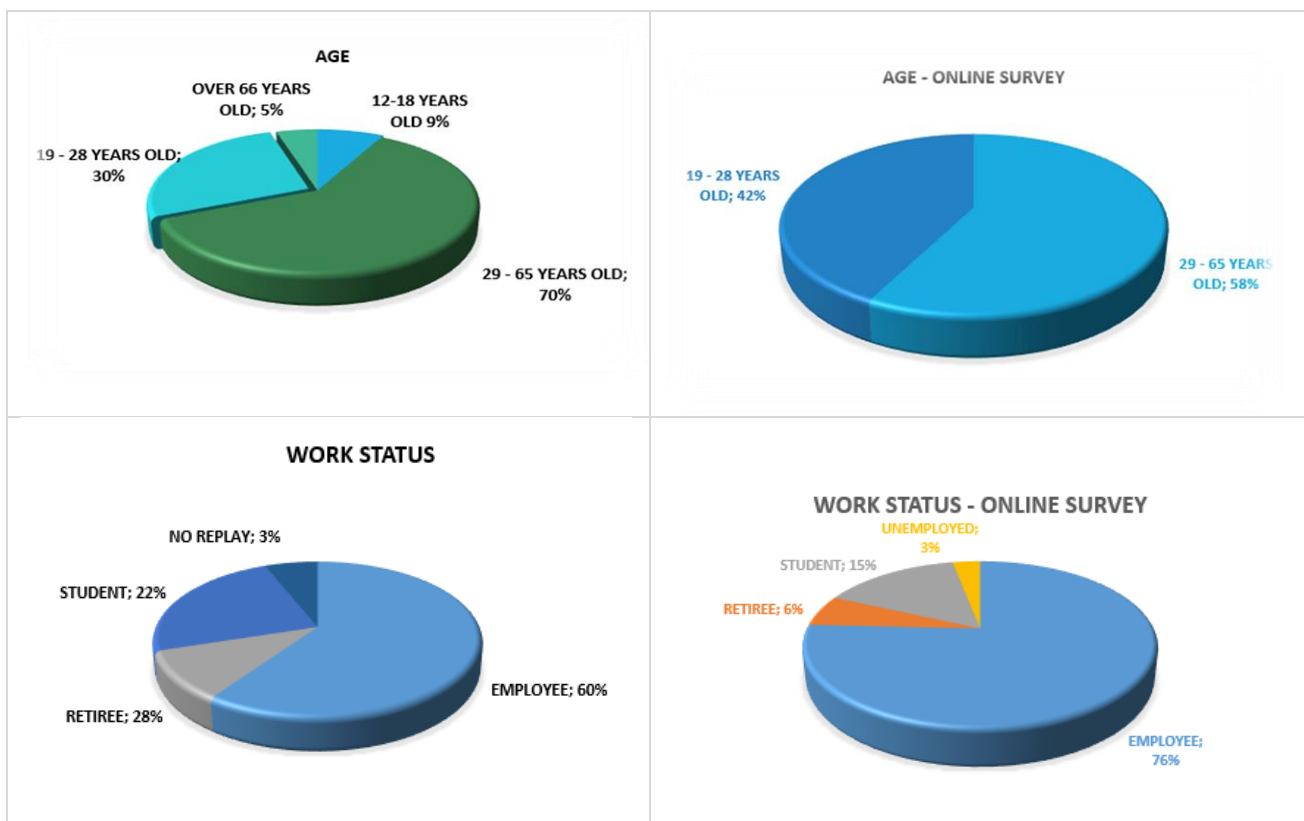
The research showed answers related to:

- selection of means of transport for daily commute
- reasons for travelling
- combination of different transport means
- most frequent travelling routes
- ticket purchase
- familiarity with the concept of a transport sustainability
- tendency to use rail transport or continue using rail transport
- shortcomings of railway transport in Istria
- information on changes/improvement of the Transport System of Istria
- trips to Italy/Slovenia – frequency of travel to Italy/Slovenia – selection of transport means to travel to Italy/Slovenia - reasons for travelling to Italy/Slovenia
- personal information of respondent.

## 4.2 Survey results

During the survey period, 246 responses have been gathered from online surveys as well as in person inquires.

The largest number of respondents, 148 of them responded on question regarding age. 70% of them are aged 29 to 65, 30% are aged 19 to 28, 9% is aged between 18-29 and 5% are aged 66 and over. 60% of them is working population, 28% retiree and 22% students. Valid online surveys were collected only from 33 respondents where 42% of them are 19-28 years old and 58% from 29-65 years old.



Charts 16-19. Age & professional status of respondents

For the majority of respondents (54%), the most common reason for travelling is work and then leisure (25%) and school/faculty (20%). 45% of respondents combine train and car on their journey, 27% train and bus, while 10% combine car and bus. Most respondents use public transport service on routes: Rijeka – Pula (53%), Rijeka – Pazin (12%), Rijeka – Opatija – Matulji (9%) and Rijeka city centre (5%).

The highest percentage of respondents (50%) is using train as a main transport mode. Out of 102 replays for train as main transport mode, 56% of them are age 29-65, then 26% are age 19-28, 10% are age 12-18 and 6 % are age 66 and more. 29% of passengers used a car, 11% of examines are walking and 9% using a bus. Only 2% of respondents are using a bicycle/scooter every day.



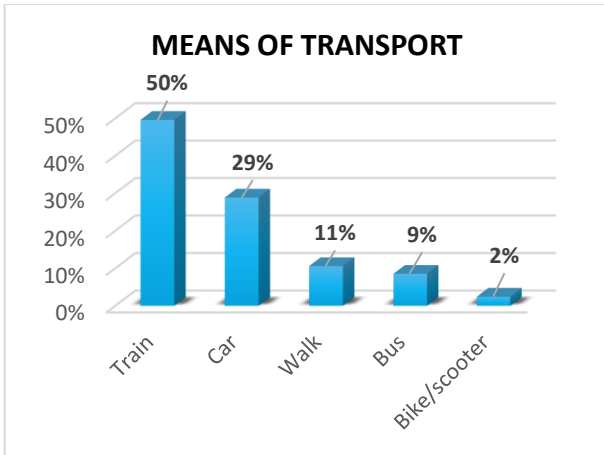


Chart 20. Which means of transport do respondents use on a daily basis

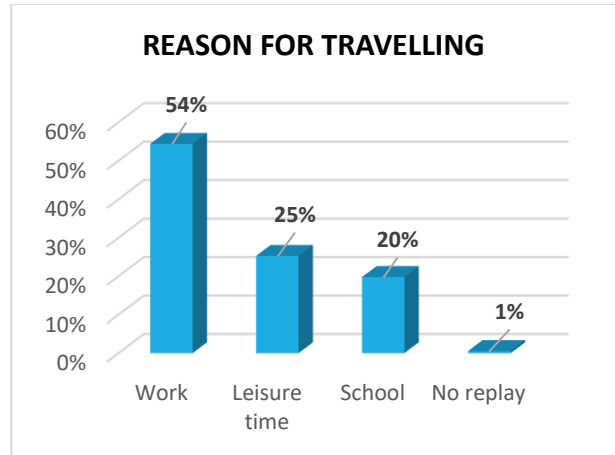


Chart 21. Reasons for travelling

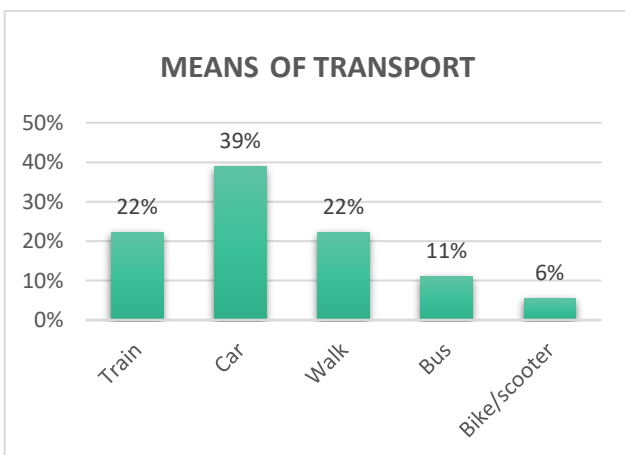


Chart 22. Which means of transport do respondents use on a daily basis – ONLINE SURVEY

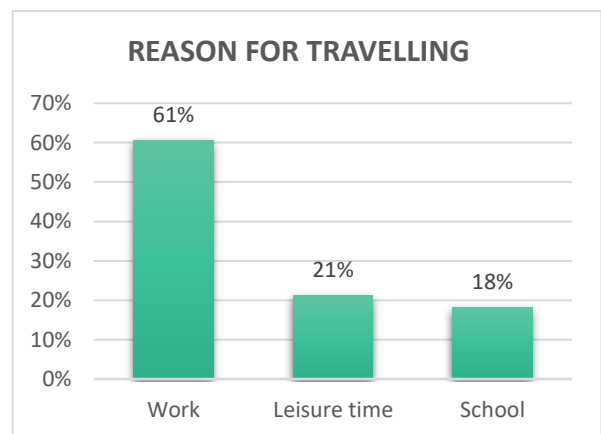


Chart 23. Reasons for travelling – ONLINE SURVEY

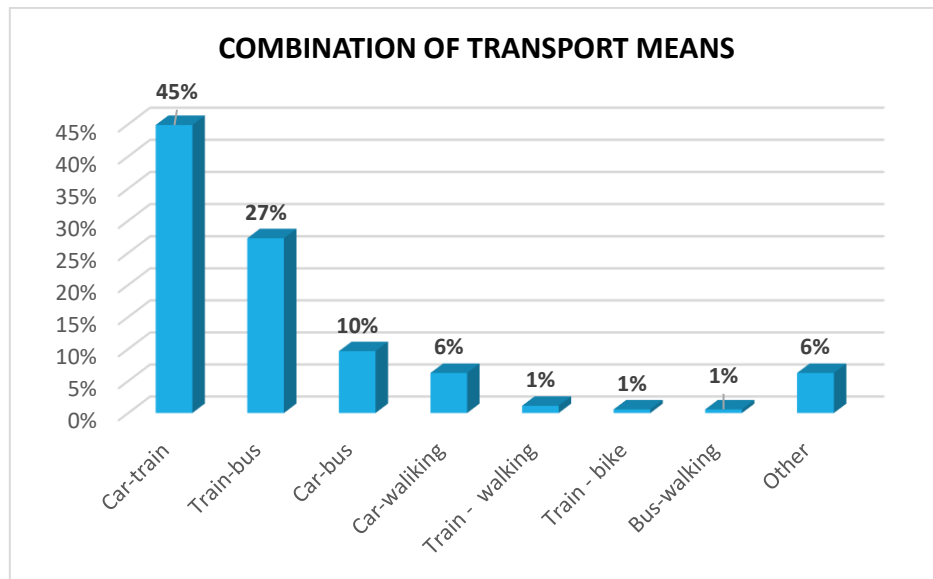
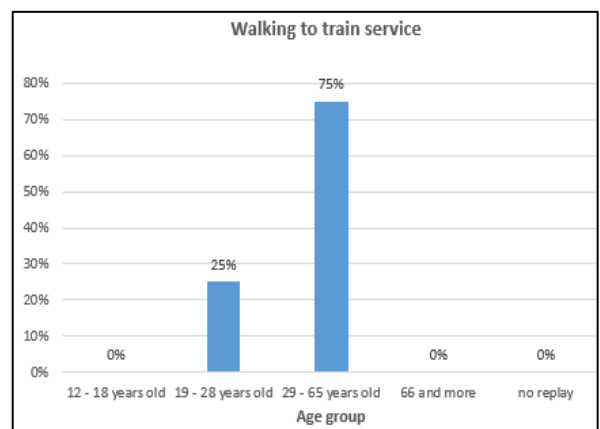
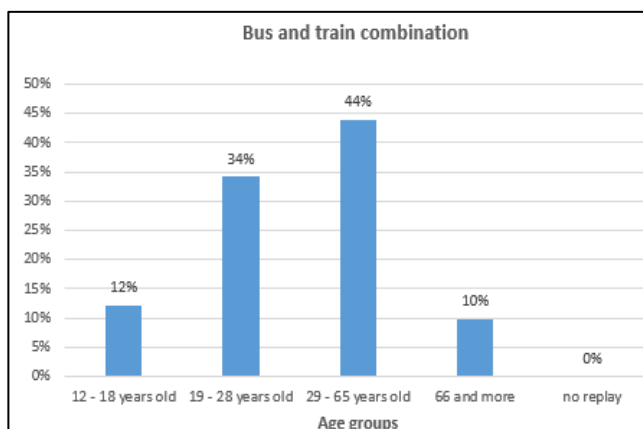
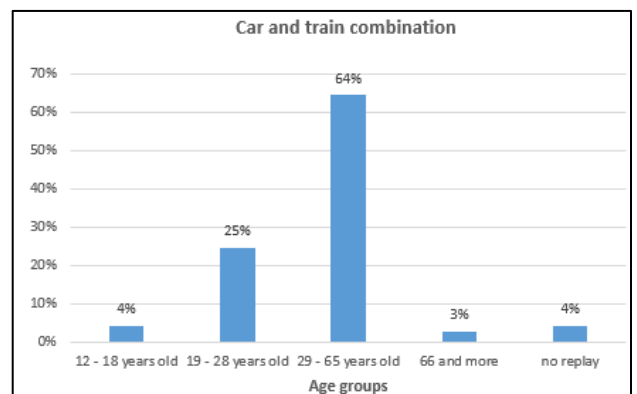
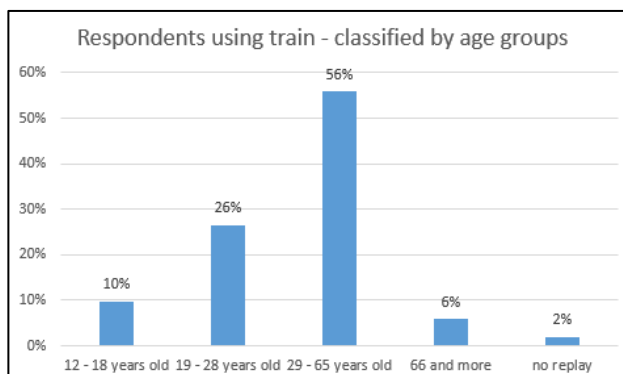


Chart 24. Which means of transport do they combine while travelling

When analyzing respondents answers regarding making combination between transport means, a detailed numbers are gathered. Car and train combination is used by 45% respondents, out of which 64% is between age 29 and 65. Same age group is using combination bus and train as well as well as combination of walking to train station and continuing journey by train.



Charts 25-28. Transport means combination divided by age groups

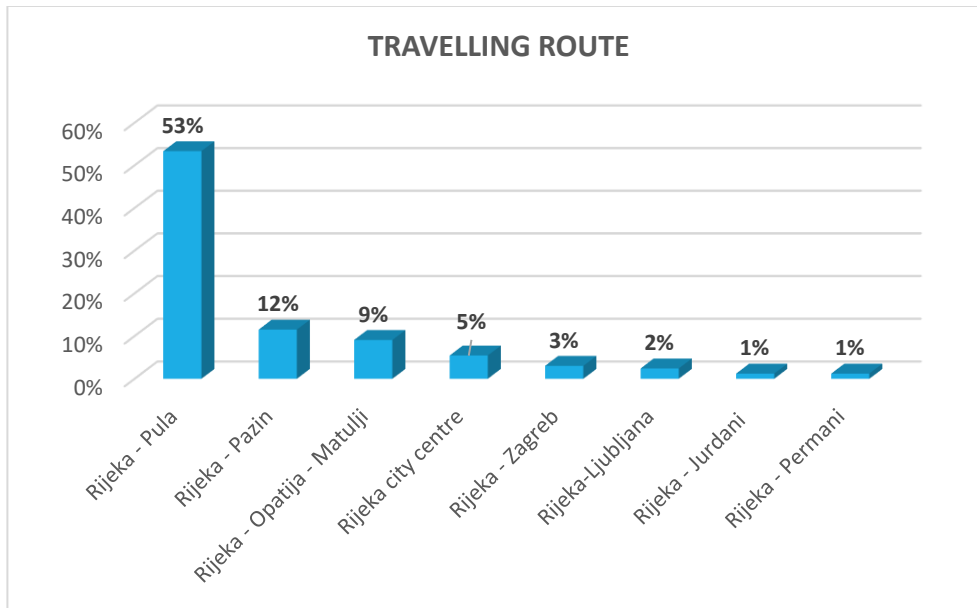
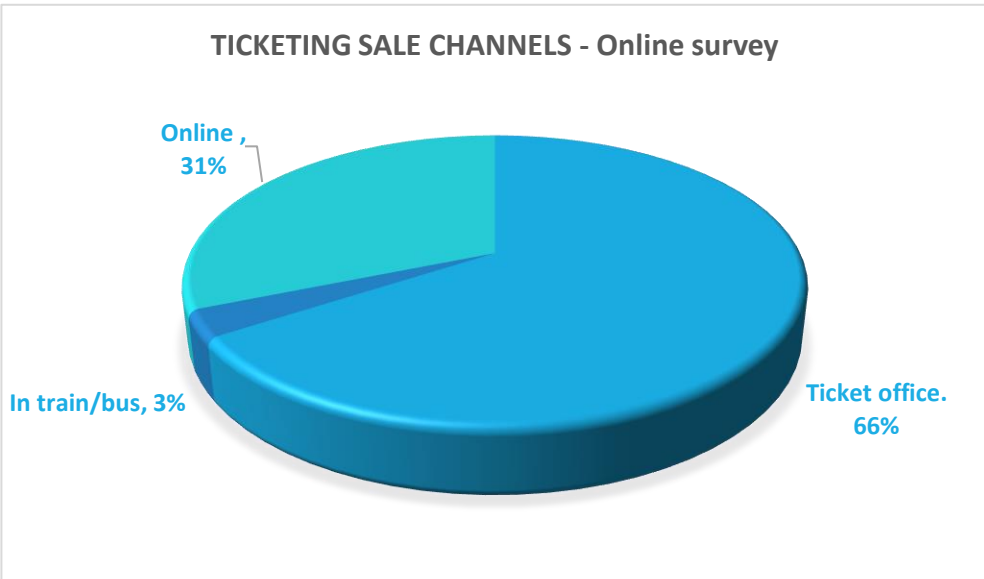
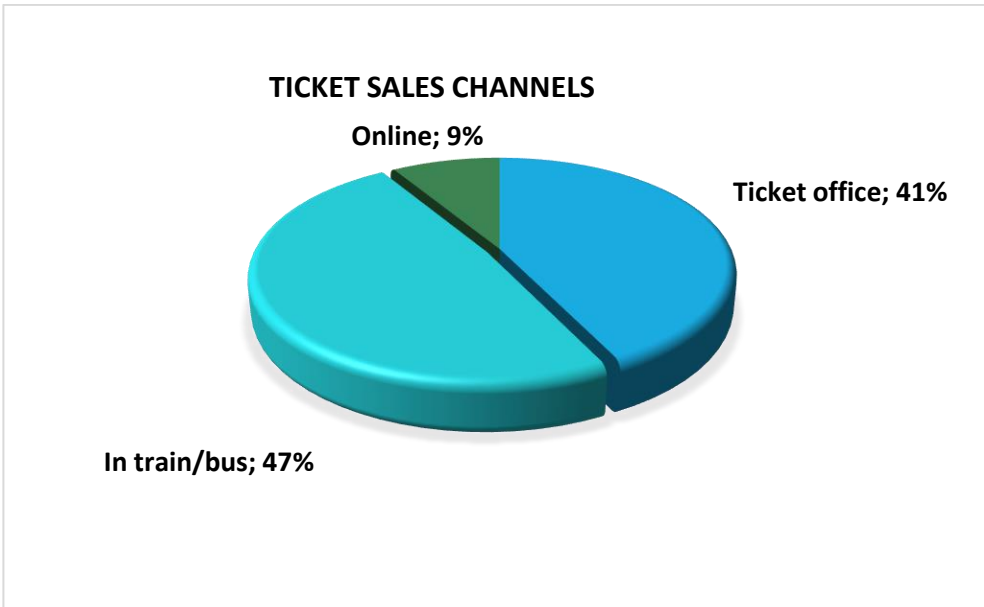
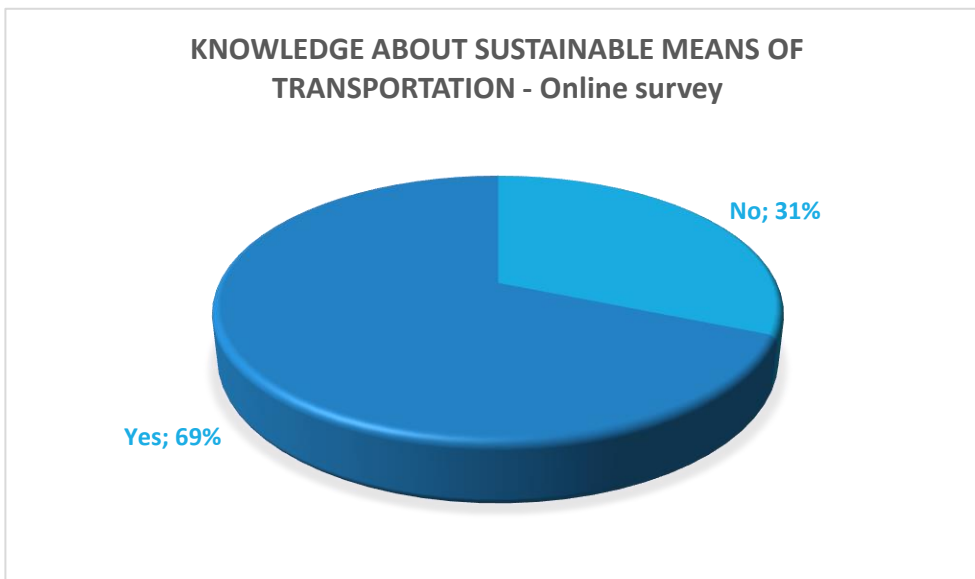
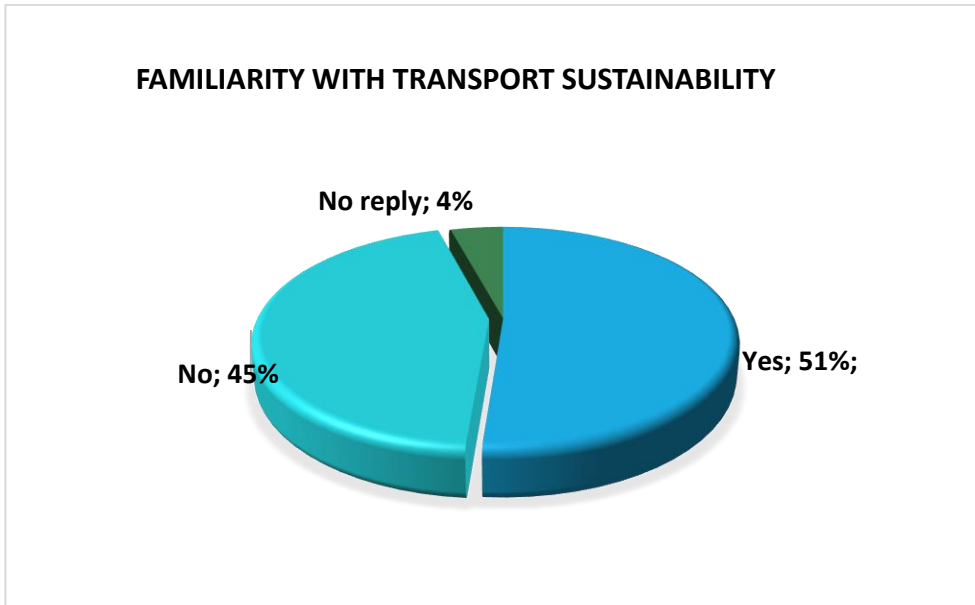


Chart 29. Most often travelling routes

Most passengers buy transport tickets on a train or bus (47% of them) and cash registers in official places (41%), while 9% of passengers buy tickets online. Almost the same number of respondents (51%) know about the concept of a sustainable form of transport, while 45% of them haven't heard about it and 4% of respondents did not answer this question due to various reasons. This shows us that the concept of sustainable transport needs more visibility and that general population should be introduced with this concept by promoting it through targeted media campaign. On the other hand, respondent completing survey online gave us different results such as 31% of them buy tickets online, 66% at ticket offices and only 3% in bus/train. The knowledge about sustainable means of transportation is also different and going in favour of knowledge where 69% does know and 31% doesn't.

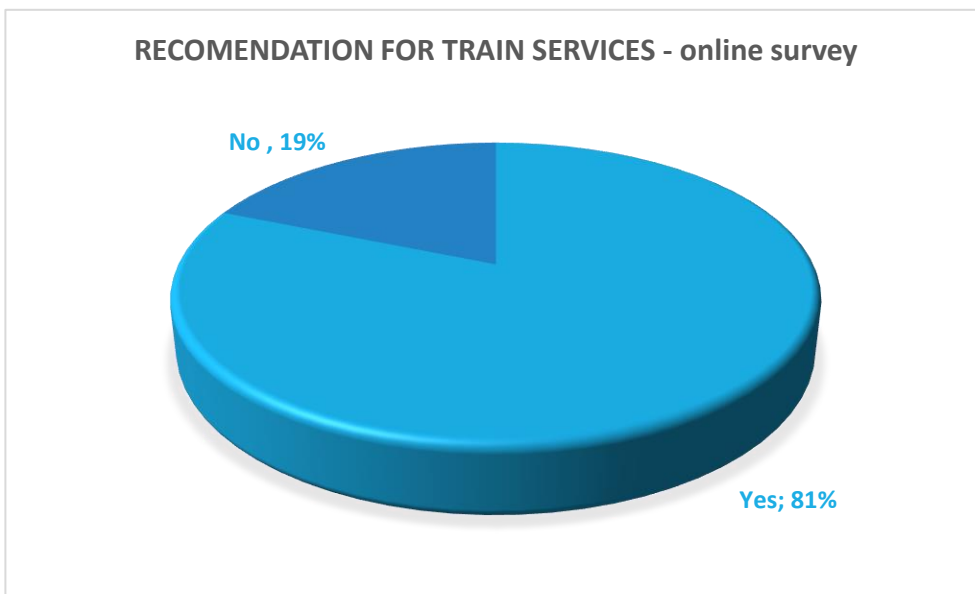
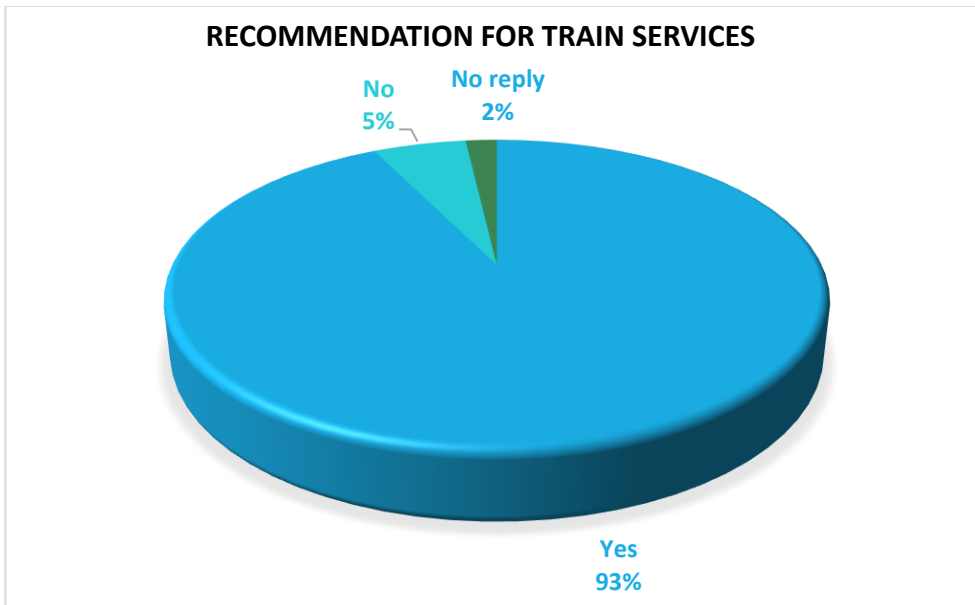


Charts 30 & 31. Sales channels



*Charts 32 & 33. Knowledge about “sustainable transport”*

As many as 93% of respondents use rail transport or will continue to use it. Since the places of conducting the survey are official train stops and stations and also trains operating in the Istrian County and Primorje Gorski Kotar County and the survey included the highest users of rail transport, this percentage is expected, but it is also an extremely good indicator that almost all respondents will continue to use the rail service. Results for online survey showed almost same results meaning that 81% of users would recommend rail service or will continue to use it. This analysis was further elaborated with further charts showing percentage of railway service users classified by age group. Conclusion is that working population, everyday travellers, age between 29 and 65 is most conscious about sustainable transport as well as how to use offered public transportation services to maximum. This is a reminder that mobility concept, sustainability and eco-friendly transport solutions require more marketing support and promotion in order to spread concept towards younger and older population.



*Charts 34 & 35. For current train service users, the question was whether they recommend train, and will they continue to use it*

41% of respondents cited the age of trains as the main disadvantage in railway transport in Istria. The following shortcomings are travel time (18%) and timetables (18%). Respondents were given the opportunity to list shortcomings as an additional answer, but they mostly relate to the determinants already defined by the questionnaire: old trains, timetables and travel times. Respondents were given the opportunity to give their opinion on what they would change in the Istria transport system and what they would improve. A total of 152 proposals were obtained, which were sorted by category in following chapter. The respondents' answers showed that the need to procure new trains, better train timetables and shorter journey times are priorities in listing the necessary changes or making proposals for improvement.

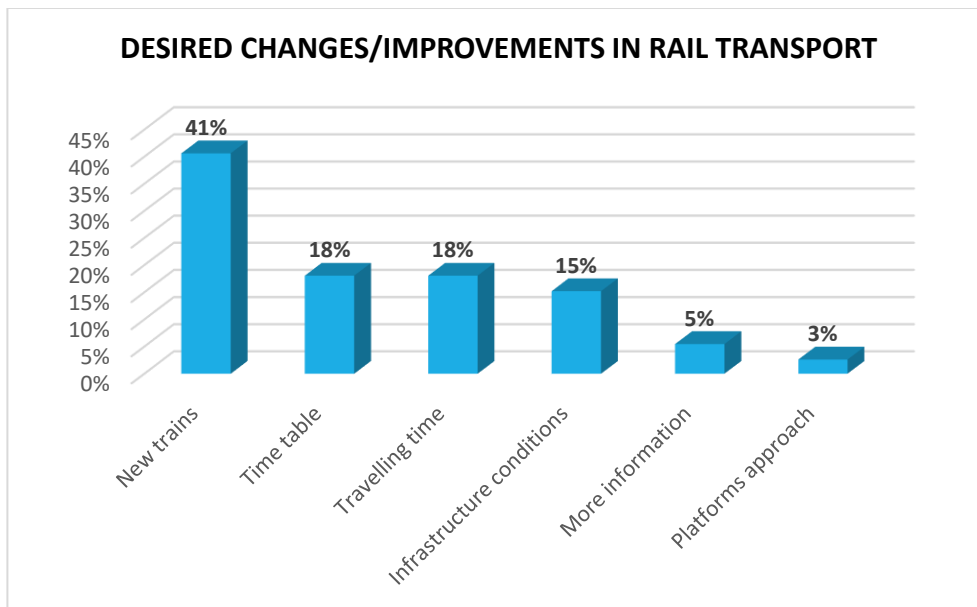
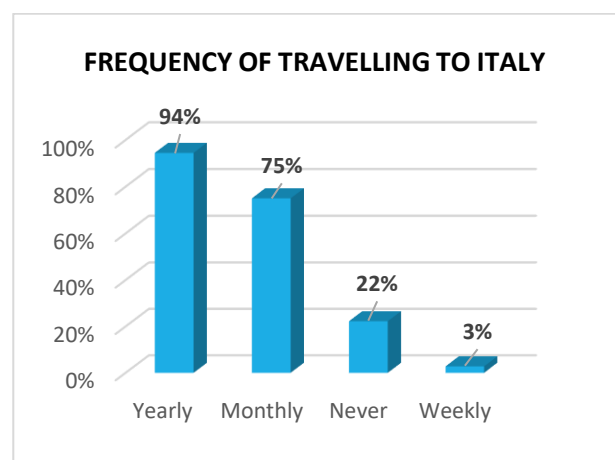
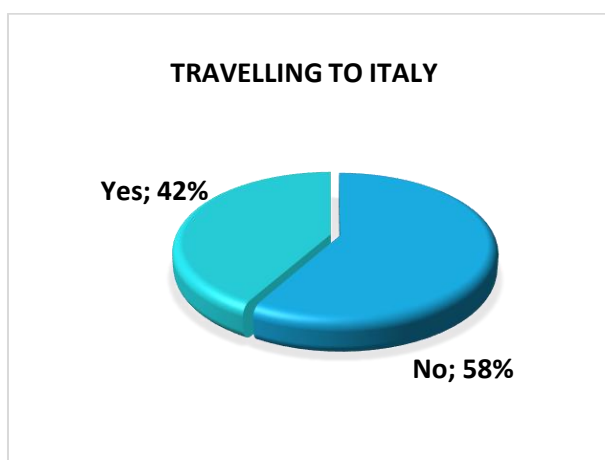
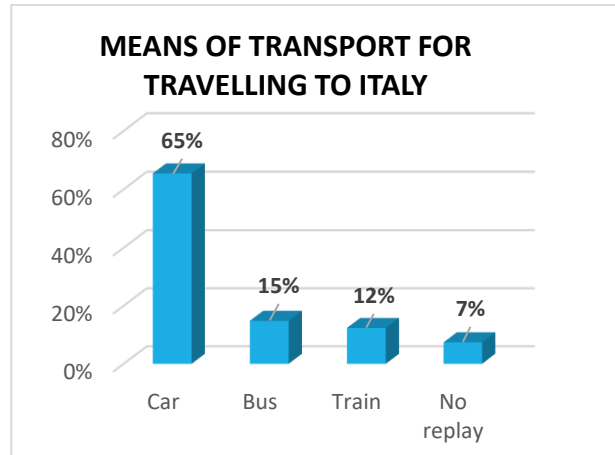
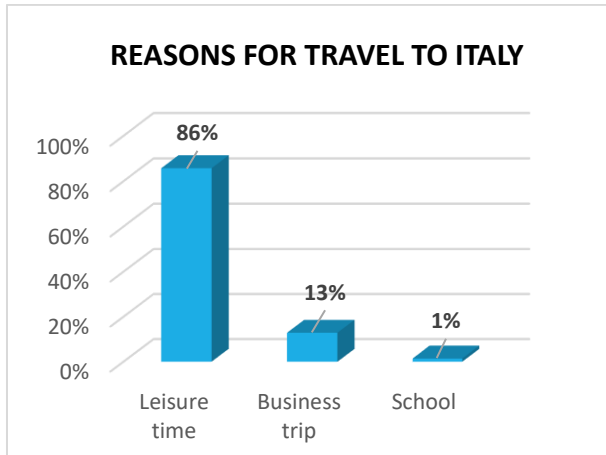


Chart 36. Main issues for railway service improvement

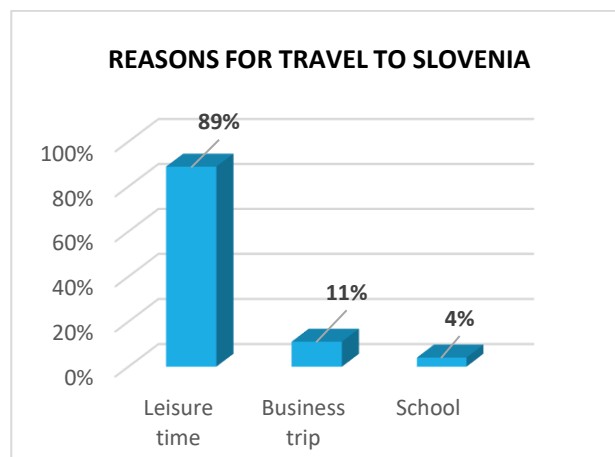
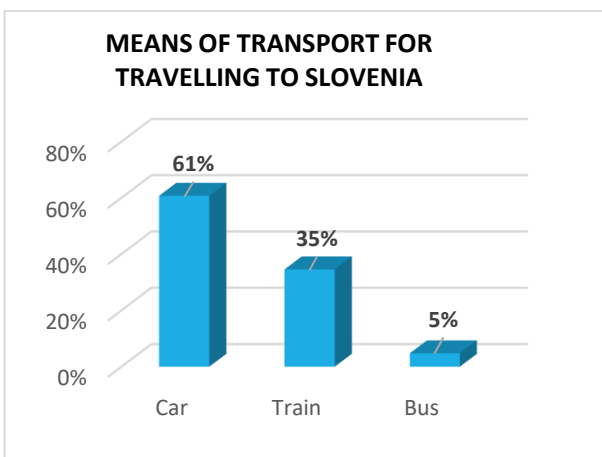
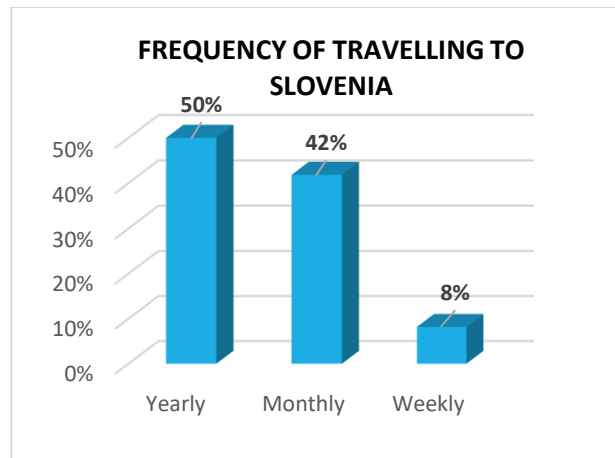
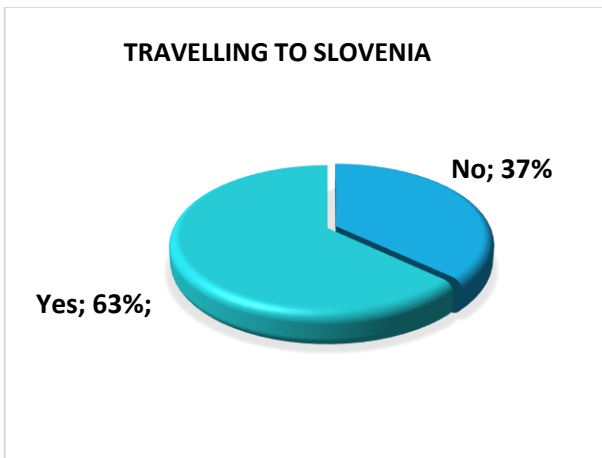
Out of 42% of respondents travelling to Italy, 75% of them travel monthly and 94% a yearly. Only 3% of respondents have a weekly need to travel to Italy, and no respondents need daily trips to Italy. 65% of respondents travel to Italy by car, while the 15% respondents travel by bus and 12% by train. 86% of respondents go to Italy in their spare time, while 13% travel for work. Only one respondent travels to Italy for school or college. High percentage of population travelling to Italy by car appreciate fast and reliable transport service. Lack of rail connections and long bus journey are not acceptable and are also time consuming. Working population making business trips to Italy also appreciate arriving fast to destination and not to waste any time on changing transport means during the trip.





Charts 37-40. Travelling to Italy

Situation with travelling to Slovenia is slightly different. Considering that Slovenia is a neighbouring country, 63% of respondents are travelling to Slovenia. 50% of them travel yearly, 42% monthly and 8% on a weekly basis. Reasons for travelling are 89% due to leisure and free time, 11% for work purposes and 4% due to school obligations. 61% of travellers use a private car to travel to Slovenia, 35% of them use train due to regular train service, while 5% use bus services.



Charts 41-44. Travelling to Slovenia



### 4.3 Result analysis

In conducting the survey, it was necessary to ask which mobility gaps and needs users are faced with. Considering that most of the respondents are from working population and young adults, it can be concluded that their daily commute is lacking connections and that they very often depend on using their private car with other transportation means. Population gravitating to Rijeka city centre has more options due to regular bus services and walking distances to destinations. However, the lack of infrastructure connections via trains is not working in favour of railway system. For that reason, intermodal transport seems to have most sense and respondents gave us clear status. Survey was also referring to travels abroad to Italy and Slovenia, and considering that numerous respondents are travelling, mostly by car at yearly basis, the conclusion is that public means of transport are not satisfying their needs.

Most crucial identified disadvantages addressing infrastructure conditions vs. vehicle conditions:

<b>Infrastructure manager:</b>	<b>Railway operator:</b>
<ul style="list-style-type: none"> <li>▪ More lines in Rijeka urban transport network</li> <li>▪ Better travelling conditions such as faster and more comfortable journeys</li> <li>▪ Better approach to rail platforms</li> <li>▪ Infrastructure conditions require improvements so that trains can run faster</li> <li>▪ Staff education</li> <li>▪ Infrastructure modernization on non-profitable routes as well</li> <li>▪ Connection to EU railways</li> </ul>	<ul style="list-style-type: none"> <li>▪ More vehicles in transport fleet</li> <li>▪ Old trains need to be replaced by new ones to be more comfortable</li> <li>▪ Travelling times need to be reduced</li> <li>▪ More frequent departures, especially during weekends</li> <li>▪ Trains need Internet connection</li> <li>▪ Differentiated prices and better PR</li> <li>▪ Timetable adjustments</li> <li>▪ Accuracy</li> <li>▪ Integrated transport</li> <li>▪ Staff education</li> <li>▪ Delays</li> </ul>

Although it is clear that radical improvements are required, both on the part of infrastructure company and railway passenger operator, it cannot be ignored that railway system is a synergy between those two. For a passenger operator to provide reliable and sustainable service, it is required to have well-maintained and safe infrastructure conditions. New trains cannot improve service unless railway tracks are adjusted to higher speed and optimal conditions for vehicles to run on time and with extra comfort. Urban area of the city of Rijeka has dense population and public transport system needs to provide population with frequent and reliable service. Market demand for service needs to be understood and for that reason operators conduct different analysis.

## 5 Infrastructure concept

### 5.1 General

General infrastructure modernization concept is comprehended in the feasibility study<sup>2</sup> which is conceptual solution for the construction of the second railway track, and the reconstruction of the stations and stops covers the area from the entrance to Škrljevo station in front of the Baudine tunnel in km approx. 639 + 640 to the exit from Šapjane station (at km 28 + 480). Research done for MIMOSA D.4.1.3. i.e. within this study shows that infrastructure concept is very important for having clear general picture and is also according to passenger needs. Hub Rijeka and reception building in Rijeka represents the end of the railway route M202 Zagreb main station – Karlovac – Rijeka and also the beginning of railway route M203 Rijeka – Šapjane – State border – (Ilirska Bistrica). On the railway route from Škrljevo to Rijeka and Šapjane, there are stations named Škrljevo, Sušak-Pećine, Rijeka, Opatija-Matulji, Jurdani and Šapjane, and in addition, Krnjevo, Rukavac, Jušići and Permani stops. The entire section Škrljevo-Rijeka-Šapjane mostly passes through difficult terrain through high embankments, deep cuts and steep notches with numerous escarpments and landslides deformations.

The railway route capacity depends on the usable characteristics of each individual section, and for 2017 it was as follows:

- Škrljevo – Rijeka 67 trains/day (*passenger and cargo trains*)
- Rijeka – Šapjane 39 trains/day (*passenger and cargo trains*)

Average speed on sections was:

- Škrljevo – Sušak-Pećine route – 70 km/h
- Sušak-Pećine – Rijeka route – 80 km/h
- Rijeka – Šapjane route – 80 km/h

Due to obsolete, worn-out and poor technical condition of signalling devices in Rijeka, Opatija-Matulji and Šapjane stations, speed on the Rijeka-Šapjane route was reduced to 35 - 40 - 50 km/h.

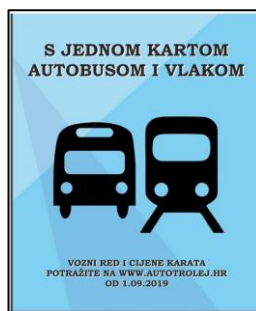
### 5.2 Analysis of the current situation in urban transport

One of the key goals for modernization of this particular railway route is to establish a modern high-efficiency urban and suburban railway passenger traffic in the wider Rijeka area with construction of second railway track. The basic starting point for forecasting the scope and structure in the railway urban and suburban traffic is a detailed analysis of the bus traffic volume, which performs a

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<sup>2</sup> FS-CONCEPTUAL SOLUTION FOR THE CONSTRUCTION OF THE SECOND RAILWAY TRACK, AND THE RECONSTRUCTION OF THE STATIONS AND STOPS  
<https://www.hzinfra.hr/wp-content/uploads/2016/10/Knjiga-A.2..pdf>

bus company named Autotrolej Rijeka and railway traffic operated by HŽPP. An agreement on multimodal transport integration in the city of Rijeka was signed by the local authorities, passenger train operator HŽPP and bus operator Autotrolej on June 12<sup>th</sup>, 2020. The agreement defined new ticket prices and timetables and Autotrolej had to revise its bus network to feed the rail services. From September 2020, HŽPP was operating 12 daily return services from Rijeka north to Jurdani, eight pairs of trains continuing to Šapjane, and 14 pairs running to the east from Rijeka to Fužine. Frequencies were further increased with the December timetable change. Two trains are operating across border; due to COVID 19 pandemic, however, those trains were suspended.



RIJEKA - JURDANI											JURDANI - RIJEKA										
BR. VLAKA	4800	4802	4804	B 482	4806	4808	4810	4812	4814	B 480	BR. VLAKA	4801	4803	B 481	4805	4807	4809	4811	4813	B 483	4815
RIJEKA	4:45	6:12	10:58	11:50	12:34	14:00	14:40	16:30	19:20	20:45	PERMANI	5:28	6:55	8:55	11:42	13:18	/	15:30	17:14	17:39	20:05
KRNJEVO	4:50	6:17	11:01	11:54	12:39	14:05	14:45	16:35	19:25	20:49	JURDANI	5:33	7:00	9:00	11:47	13:23	14:49	15:35	17:19	17:44	20:10
O. MATULJI	5:02	6:29	11:14	12:07	12:52	14:18	15:04	16:48	19:38	21:02	JUŠIĆI	5:36	7:03	9:03	11:50	13:26	14:52	15:38	17:22	17:47	20:13
RUKAVAC	5:08	6:35	11:20	12:13	12:58	14:24	15:10	16:54	19:44	21:09	RUKAVAC	5:40	7:07	9:07	11:54	13:30	14:56	15:42	17:26	17:51	20:17
JUŠIĆI	5:12	6:39	11:24	12:17	13:02	14:28	15:14	16:58	19:48	21:13	O. MATULJI	5:47	7:14	9:14	12:08	13:37	15:03	15:49	17:33	17:58	20:24
JURDANI	5:16	6:43	11:28	12:21	13:06	14:31	15:18	17:02	19:52	21:17	KRNJEVO	5:59	7:26	9:25	12:20	13:49	15:15	16:01	17:45	18:09	20:36
PERMANI	5:20	6:47	11:32	12:25	13:10	/	15:22	17:06	19:56	21:21	RIJEKA	6:04	7:31	9:30	12:25	13:54	15:20	16:06	17:50	18:14	20:41

Ne vozi subotom, nedjeljom i blagdanom

RIJEKA - ŠKRLJEVO										ŠKRLJEVO - RIJEKA										
BR. VLAKA	B 703	4620	4601	4622	4603	4001	4605	4624	B 1701	4607	BR. VLAKA	4600	4621	4602	4804	4000	4604	4623	4606	B 702
RIJEKA	5:30	6:45	7:35	10:11	11:54	13:58	15:23	16:45	17:30	19:22	ŠKRLJEVO	6:19	7:10	8:08	10:38	12:28	16:11	17:15	18:04	20:36
S. PEĆINE	5:36	6:50	7:41	10:17	12:00	14:04	15:29	16:51	17:36	19:28	S. PEĆINE	6:29	7:20	8:18	10:48	12:38	16:21	17:25	18:14	20:47
ŠKRLJEVO	5:47	6:59	7:50	10:26	12:09	14:13	15:38	17:00	/	19:37	RIJEKA	6:33	7:24	8:22	10:52	12:42	16:25	17:29	18:18	20:51

ne vozi subotom, nedjeljom i blagdanom  
ne vozi subotom, nedjeljom i blagdanom, kao ni od 22.6. do 4.9.  
vozi nedjeljom do 7.6. i od 4.10., vozi i 13.4., ne vozi 12.4.

ne vozi subotom, nedjeljom i blagdanom, kao ni od 22.6. do 4.9.

Figure 16: Rail and bus operator cooperation, joint tickets and timetable

## 5.3 Railway infrastructure disadvantages in Rijeka hub

### Disadvantages in safety area:

- no video surveillance system (except in the part of Rijeka station which is not operational)
- the fire protection measures are insufficient, certain passages under the railway are not allowing access of fire trucks to settlements on the other side of the railway tracks
- devices and procedures used in traffic control and systems for safety signalling do not allow trains to run according to safety level that matches network objectives
- existing safety devices are made by using mechanical or relay technology, they are obsolete and therefore difficult to maintain
- most pedestrian crossings are not adequately secured (existing security is only safety fence)
- some residential buildings near the railway do not have adequate access so they use unmarked crossings over the tracks to access property
- certain tracks in the Škrljevo station (shunting group of tracks), Rijeka (tracks in the Marina group) and Šapjane (tracks in the Park group) are in poor condition and unsafe to use
- in the Draga settlement there are unstable embankments with unstable notches.

### Deficiencies in the field of health and environmental protection:

- The track is made with wooden sleepers that are harmful to health due to the way they are treated for preservation
- Part of the railway line goes through a water protected area and existing railway line does not have a controlled drainage structure
- The railway line goes through a populated area and there are no noise and vibration protection measures
- Facilities that are protected cultural assets are not adequately maintained
- Inadequate outdoor and indoor lighting for working spaces
- Insufficient and inadequate workspace equipment and the lack of ergonomic furniture and information equipment.

### Disadvantages in the area of accessibility of persons with reduced mobility

Stations and stops from Škrljevo to Šapjane do not meet the basic requirements according to the TSI PRM, i.e. they are not accessible to people with disabilities and people with reduced mobility the same way as to other persons:

- Platforms and surfaces for access are not marked in a way to provide information for visually impaired persons
- Toilets in stations are not accessible for persons in wheelchairs and there is also no changing room for mothers with small children
- Platforms and landscaped areas are 20-35 cm above running surface of the rail, with unarranged upper area and without platform ramps

- All areas in station buildings accessible for public have door dimensions and entrances contrary to regulations, the same applies to floor surfaces and there are no marks for transparent obstacles
- There are no designated parking areas with a sufficient number of parking spaces adapted and reserved for persons with reduced mobility
- existing underpasses located alongside the railway line do not have access for people with reduced mobility (no ramps, elevators ...).

#### **Non-compliance with existing legislation:**

- Currently, passengers at railway stations can cross directly over railway tracks in order to reach platform, which is not in line with Croatian regulations (Ordinance on the conditions for determining railway crossings railways and other roads, OG<sup>3</sup> 111/2015).
- Certain railway crossings are not protected with signalling devices and barriers at level crossing, which is not according to Ordinance on the manner of ensuring traffic on railway-road crossings and pedestrian crossings over the railway, OG 111/2015.
- Most pedestrian crossings are not equipped with security devices for pedestrian crossing, they are only protected with bypass fences which are also not consistent with the Ordinance on the method of insurance traffic at railway-road crossings and pedestrian crossings over the railway, NN 111/2015.
- The distance between two railway tracks in the Rijeka station is less than 4.5m, which is not in accordance with Ordinance on technical conditions for railway safety which railways must meet, OG 128/2008.

#### **Non-compliance with the required parameters for the proposed line traffic sign according to TSI**

Railway lines categorization in line with TSI<sup>4</sup> - the proposed traffic code M202 and M203<sup>5</sup> is P4 F2<sup>6</sup> with an additional request for a GC<sup>7</sup> free profile.

Accordingly, the existing line does not meet the following required parameters:

- Structure gauge
- Speed: 120-200 km / h (P4), 100-120 km / h (F2)
- Useful platform length for interoperable stations: 200-400 m (P4)
- Train length 600-1050 (F2) ERTMS<sup>8</sup> has not been implemented on the railways.
- ERTMS has not been implemented on railway lines.

<sup>3</sup> OG - The Official Gazette

<sup>4</sup> TSI - Technical Specifications for Interoperability

<sup>5</sup> M is marking for international railway track

<sup>6</sup> Specified marking for railway track. P is for labelling passenger transport; F symbolizes freight transport. In this particular case, railway track has both labels and symbolizes that tracks are suitable for mix transport. Numbers are for so called „effects parameters“ which are free rail profile, axel load, speed, useful length of platform (important for categorization of passenger tracks); train length (important for categorization of freight trains).

<sup>7</sup> GC represents label for rules for the application of kinematic profile according to UIC regulation no 506 – named GA, GB, GB1, GB2, GC i GI3,

<sup>8</sup> ERTMS - The European Rail Traffic Management System

## 5.4 Infrastructure construction work

In 2021, HŽ Infrastruktura (HŽI) company will start a €270 million 42-month worth project on the construction of a double track at the Škrljevo – Rijeka – Opatija-Matulji – Jurdani route, which is 21.5 km long, and the project will also include the modernisation of six large and four minor stations as well as provide 13 new stops.



Figure 17. Rijeka Railway station

Relation	Current state	Učka route	Ćićarija route
Rijeka – Pula	200	95	106
Rijeka – Raša	179	68	90
Rijeka – Trieste	124	84	106

Table 7. Railway distances from Rijeka to Pula, Raša and Trieste – in comparison to tunnel routes (in km)

The development plan of the Rijeka railway junction consists of four phases, while the dynamic plan of reconstruction forecasts completion is over 20 years long. It is important to mention that the schedule of activities within various phases vary, depending on the financial resources available for the investment as well as on the priorities at a given moment.

The **first phase** was completed in 2012. It was mostly the modernization of the existing railway capacity.

The **second phase** was running from 2012 to 2017, construction of the new high-efficiency Rijeka-Zagreb railroad.

In accordance with a dynamic plan of development, the **third phase** should run from 2017 to 2022. The **fourth phase** is planned for the period after 2022 or after the construction of a new high efficiency railway and the construction of a container terminal on the Island of Krk.



Figure 18. Railway Route Rijeka-Šapjane Border

## 5.5 Forecast for urban/suburban traffic

After the modernization of the railway line, and in a joint agreement between the carriers (railway and bus operators), it will be possible to reorganize the existing bus transport around the city of Rijeka and its surroundings. To introduce integrated passenger transport, it is necessary that railway and bus passenger operators cooperate with the city of Rijeka and achieve the following:

- reorganization of bus lines
- elimination of individual lines
- adaptation of the bus timetable to the railway timetable
- construction of new road stops next to railway stations
- introduction of the so-called "fishbone" transport organization
- introduction of joint ticket
- improved information on timetables and other services.

"Fishbone" transport organization is based exclusively on rail transport, and then bus traffic is leaned on it, in a way that passengers are picked up by buses at railway stations and transported to

destinations in settlements without railway tracks. The same principle applies to passengers at arrival. On the railway side and at railway stations, it is necessary to provide passengers with:

- timetable of bus operators
- possibility to buy joint tickets (ticket vending machines)
- possibility for buses to enter the railway station area (turning points).

When planning train and bus services as well as timetables, it is necessary to perform a market analysis according to which operators can organize quality service and obtain or attract more passengers. Based on the analysis of the existing bus services, which are providing transport alongside railway tracks, it can be concluded that the introduction of urban/suburban transport will:

- help reduce city roads load
- make positive effect on the environment
- enable larger population migrations on a daily basis in Rijeka and surrounding areas.

Based on the traffic forecast, an analysis was made regarding required number of stops for urban – suburban traffic.

The traffic forecast (next table) is based on the number of passengers transferring from the bus and individual transport. Individual transport itself is represented minimally since according to the number of vehicles analysis in Rijeka there are 48,000 vehicles on average, i.e. 24,000 per one direction. It must be considered that many vehicles in Rijeka are in transit, primarily due to one major road that provides access to Opatija on the one hand and Bakar on the other hand.

According to the research published by GIZ (*Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH*)<sup>9</sup>, it has been observed how public transport users are more sensitive to changes in travel time than to costs of public transport. It was found that the increase in travel time related to work in amount of 10%, in private transport affects the increase in the number of users in public transport for 3.1%. Also, a 10% increase of travelling time for all other personal trip's effects on increased number of users in public transport by 2.3%. Due to a lack of data and experiences related to domicile conditions, the author has taken earlier mentioned percentages for evaluation of the number of passengers who will use new public rail service.

Considering shares of individual travels (20% business, 50% journey to work and 30% others), the author has evaluated elasticity on the level of -0.29 (reducing travelling times in comparison to traffic demand). The so-called elasticity was accepted by the author (although these are the only changes within public transport) for reducing travelling times, which is obtained in new railway transport regarding to an increased number of users which are transferring from bus services to railway services in urban and suburban public transport. The average travelling time by bus is 0.335

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<sup>9</sup> Transport Elasticities: Impact on Travel Behaviour, Federal Ministry for Economic Cooperation and Development of Germany, 2013; published by GIZ



h (travelling time based on 9.3 km – the average travelling length and operational bus speed according to data from Autotrolej d.o.o., while the average time for the same length on new railway track in urban and suburban transport is expected on level of 0.150 h (travelling time based on 9.3 km – the average travelling length and operational speed of trains in new public urban and suburban railway transport). With elasticity scope and because of travelling speed, it is expected for passengers to switch transportation means, i.e. to use train instead of bus at the level of 17%. As mentioned before, around 48,000 vehicles pass through Rijeka daily. The author's estimation is that a minimum of 10% vehicles in traffic load is transportation by private cars in the future railway corridor. Considering the average travelling time with private car is at the 0.302 h level (15% faster than bus transport) and the same elasticity used for calculations for transferring passengers from bus to train in public transportation system, results are as expected, crossing from private cars to railway at the level of 14%. The average car occupancy is 1.45 passengers<sup>10</sup>. Forecasted number of passengers per stations/stops of future railway urban and suburban transport is estimated according to mutual distance between bus station/stops and future railway stations/stops. Number of passengers from stations in bus transport was joined to closest stops of future railway urban and suburban transport at the level of 17%, as already mentioned.

Estimated number of passengers which are changing bus services for railway services							
Official place	Status	2025	2030	2035	2040	2045	2050
ŠKRLJEVO	Station	6,334	6,993	7,721	8,524	8,959	9,416
Draga	new stop	8,116	8,960	9,893	10,923	11,480	12,065
Vežica	new stop	230,667	254,675	281,182	310,448	326,284	342,928
SUŠAK-PEĆINE	Station	250,271	276,320	305,079	336,832	354,014	372,072
Školjić	new stop	1,204,060	1,329,380	1,467,743	1,620,507	1,703,169	1,790,048
Zagrad	new stop	852,233	940,934	1,038,867	1,146,993	1,205,502	1,266,994
RIJEKA	Station	643,829	710,839	784,824	866,509	910,710	957,165
Krnjevo	existing stop	203,743	224,949	248,362	274,211	288,199	302,900
Kantrida	new stop	174,515	192,679	212,733	234,875	246,856	259,448
Zamet	new stop	141,285	155,990	172,225	190,151	199,850	210,045
Martinkovac	new stop	17,410	19,223	21,223	23,432	24,627	25,884
OPATIJA MATULJI	Station	29,886	32,996	36,430	40,222	42,274	44,430
In total, transfers from bus to train		<b>3,397,278</b>	<b>3,750,870</b>	<b>4,141,263</b>	<b>4,572,289</b>	<b>4,805,522</b>	<b>5,050,652</b>
<b>Forecast for number of travellers transferring from private car to train</b>							
In total, transfers from private car to train		<b>365,071</b>	<b>403,068</b>	<b>445,020</b>	<b>491,338</b>	<b>516,401</b>	<b>542,742</b>
<b>Forecast for number of travellers in the train</b>							
		<b>3,762,349</b>	<b>4,153,938</b>	<b>4,586,283</b>	<b>5,063,627</b>	<b>5,321,923</b>	<b>5,593,394</b>

Table 8. Urban and suburban traffic on Škrljevo-Opatija Matulji route (Source: Feasibility Study - construction, modernization and renovation of second gauge on route ŠKRLJEVO-RIJEKA-JURDANI)

<sup>10</sup> Feasibility study for state road D403 from junction Škurinje to port Rijeka, Hrvatske ceste, 2016.

**Forecast of total number of railway passengers relates to:**

- Long distance passenger transport
- Regional passenger transport
- Urban and suburban passenger transport.

Mode of transport	2020	2025	2030	2035	2040	2045	2050
Long distance	172,349	190,752	196,771	207,397	215,730	226,120	237,000
Regional	106,050	125,381	127,900	130,499	133,153	135,892	138,710
Urban and suburban		3,762,349	4,153.938	4,586,283	5,063,627	5,321,923	5,593,394

*Table 9. Total passengers transport forecast (10<sup>3</sup> passengers/year) (Source: Feasibility Study - construction, modernization and renovation of second gauge on route ŠKRLJEVO-RIJEKA-JURDANI)*

## 6 Conclusion

Public transport in Rijeka area, with its geographical specifics, offers train and bus services. Train service is operated on the basis of timetables adjusted to students and workers, and it's subsidized by the State (the State is financing a minimum service package). On the other hand, buses operate with subsidies from the County, mostly for student and working population transportation. This is why their timetables are adjusted to student's and worker's needs as well. No operator offers market-based services due to lack of major demands for service (market assessment). The level of PT development is very low and is not 'demand based' but rather 'supply based' (amount of money available for PT), thus HŽPP wanted to try a new approach and introduce a new (for Croatia) way of thinking to stakeholders, to provide a better PT service. For the purpose of creating FS which will explain necessary actions for public transport improvements, survey was created and conducted among PT users in hub Rijeka and surrounding areas. Survey analysis and results is showing interest in sustainable transport by PT users however public transport itself is faced with lack of positive conditions which would make public transport first transport choice among numerous population. Considering mentioned, public transport will generate more enthusiasm in rural areas such as Jurani, Permani and other places gravitating towards Slovenian border if more public transport means will be available on more frequent time scale, because local population is aware of the necessity of public transport in the region. Although private cars are faster and simpler to use, recommendations for general public is to use buses and trains in order to keep ecological sustainability of each region as well as have a safe, fast and reliable service. Public transport is not available always and everywhere, therefore the need for more buses and trains without delay, exists for potential users. Another issue which needs to be addressed is spreading information about public transport services which is difficult to communicate due to dispersion of competences. During the last two decades, mobilization degree in the City and the County has been constantly increasing. Considering that during the same time parking offer has not increased, the present situation in the City of Rijeka is characterised by a substantial lack of parking and garage spaces. The most difficult situation is in the city centre due to numerous shopping, business, public and management contents, but a similar situation is in residential areas with numerous buildings. The lack of parking space in the city centre is causing private car owners to make circles around the city while searching for free parking spaces. The fate of traffic problems on the streets of Rijeka is similar to that of public city transportation which is organized by buses and offers a low-level transport service with insufficient capacities and reduced speed, especially in the rush hour. There are 19 bus lines in the urban area of Rijeka and there are 8 lines operating in the inner-city area. Almost all lines in the local and inner-city area offer services parallel to the railway line from Škrljevo through Rijeka to Jurdani, which means that most of the buses could be replaced by contemporary high-quality trains.

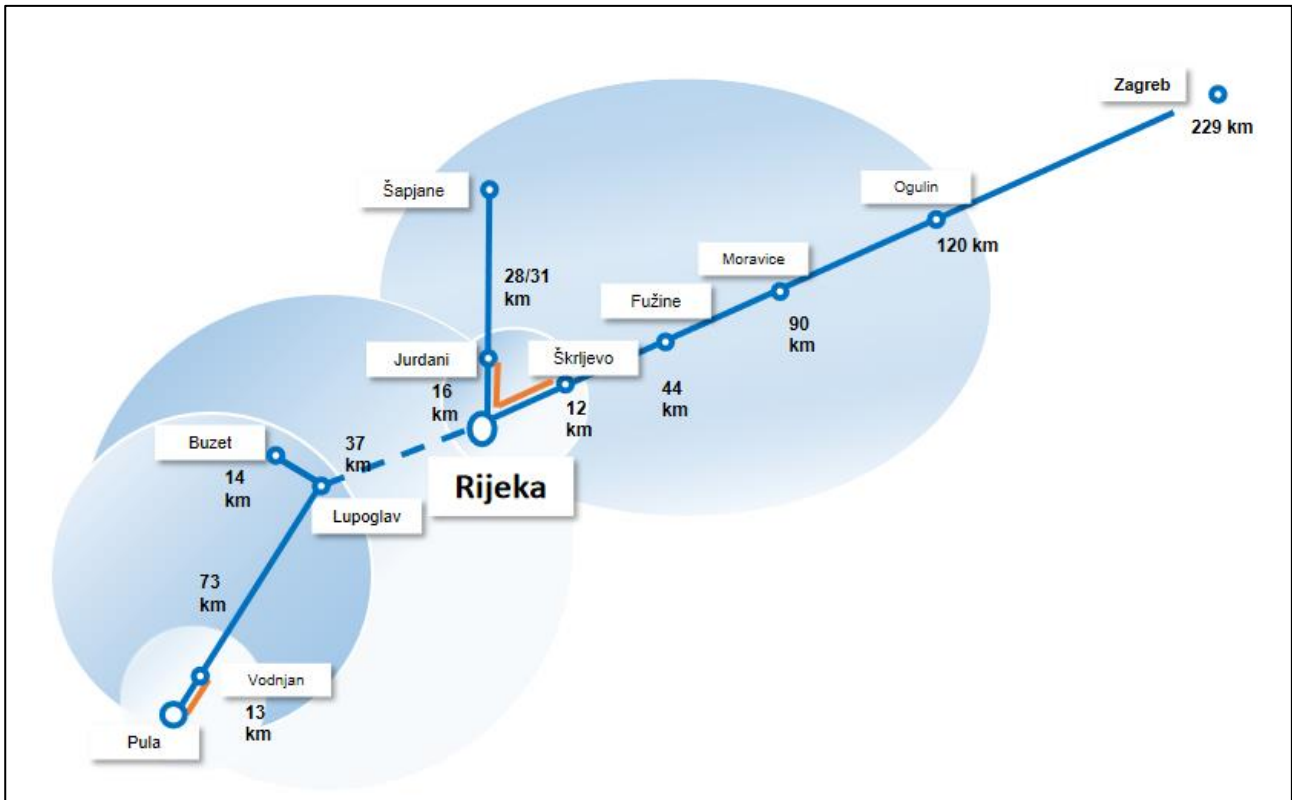


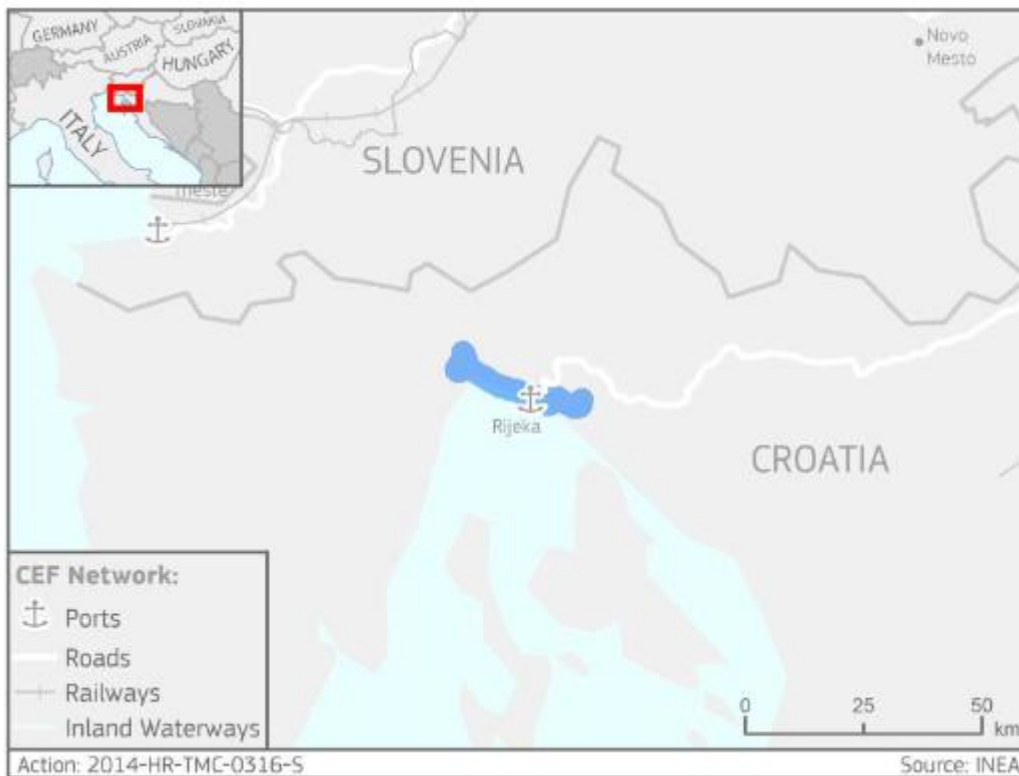
Figure 19. Railway Route Zagreb - Rijeka- hub Rijeka – State border Slovenia

Within the framework of the Study<sup>11</sup> and according to project “Preparation for construction of a second track, upgrade and modernisation of the Škrlevo-Rijeka-Jurdani railway section”<sup>12</sup> under the CEF programme that covers the upgrading of the Škrlevo-Rijeka-Jurdani railway section, a current bottleneck on the Croatian part of the Mediterranean corridor will be resolved. The project action includes several activities, from the preparation of the feasibility study to the finalisation of the final design, including preliminary design, cost-benefit analysis and environmental impact assessment. This will pave the way to the construction of a second track and to the upgrade of the Škrlevo-Rijeka-Jurdani section, including the deployment of new signalling and interlocking equipment on the Jurdani-Šapjane section, and the reconstruction of Permani stop and Šapjane station. In the long run, the project will better connect Rijeka with Croatia's inland and the entire European transport system, thus stimulating economic and employment growth. It will also reduce congestion and pollution through shift from road to rail (marked orange in Fig. 19).

<sup>11</sup> FS-CONCEPTUAL SOLUTION FOR THE CONSTRUCTION OF THE SECOND RAILWAY TRACK, AND THE RECONSTRUCTION OF THE STATIONS AND STOPS

<https://www.hzinfra.hr/wp-content/uploads/2016/10/Knjiga-A.2..pdf>

<sup>12</sup> 2014-HR-TMC-0316-S; <https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/2014-hr-tmc-0316-s>



*Figure 20. Preparation for construction of second track, upgrade, and modernisation on the Škrljevo-Rijeka-Jurdani railway section (Source: [https://trimis.ec.europa.eu/sites/default/files/project/documents/fiche\\_2014-hr-tmc-0316-s\\_final.pdf](https://trimis.ec.europa.eu/sites/default/files/project/documents/fiche_2014-hr-tmc-0316-s_final.pdf))*

Mentioned architectural conceptual solution is a part of reconstruction of existing and construction of new official buildings and landscaping of railway stations and access points and requires further analysis. By analysing the current conditions of existing stations and stops, necessary data for suburban traffic is defined. All gathered elements are preconditions for additional modernization and construction of the second gauge. FS for construction of second gauge also contains modernization of 11 existing official facilities, 6 stations and 5 stops on the route Škrljevo-Rijeka-Šapjane. At this route, second gauge would be added alongside the existing one, except on one part where route has to be slightly changed due to tunnel Rukavac reconstruction in length of 493 m and construction of new tunnel line Rukavac in length of 920 m. Projected train speed for the entire route would be 80 km/h and the entire route also needs new noise protection fences. Alongside the whole route, all stations should be equipped with new electronic signalling devices and remote controlling systems. Passenger information distribution system is envisaged and also a possibility for ticket devices as sales channels.

Summarizing all gathered information and documentation as well as survey results, this study shows potential measures, opportunities, possibilities as well as difficulties in researched area, not only for

local population but also for tourists and foreign citizens, coming primarily from Slovenia and Italy, as well as wider.

### Potential:

- In Primorje-Gorski Kotar County there are 296,195 inhabitants, and in the City of Rijeka 128,624 inhabitants (CBS, 2011)
- The city of Rijeka has 11 faculties, a University and one higher education institution
- There are 21 high schools and 4 student dorms

### Opportunities:

- Integration with other modes of transport will achieve multiple benefits for the population, companies, City and County
- Construction and arrangement of common terminals would mean division of investment among stakeholders and optimization of public space usage
- Integration would improve the organization of timetables and vehicle modifications travel and ensuring better mobility of the population
- Achieving savings in travel time and ensuring better mobility of the population

### Possibilities for region:

- Integrated public passenger transport (joint ticket, tariff, timetable)
- Combined passenger transport (arrival by car / bus / bicycle and transfer to train)
- Increased employment through tourism-related opportunities
- Economic growth on a smaller scale
- More quality lives
- Positive social changes
- Reduced climate impact
- Local policy decisions influenced

### Traffic difficulties:

- Traffic congestions on current roads
- Congestions in rush hours causes difficult daily migrations
- Reduced life quality of general population
- Increased level of CO2 congestions

In order to create integrated public transport in Rijeka hub area and towards Slovenian border, it will be necessary to conduct activities which are specified as recommendations in two different phases:

**1st Phase** is addressing railway operator HŽPP. Railway operator should be an idea launcher for introducing integrated public passenger transport. Remained bus operators and individual transport should rely on railway system. Integration considers creating joint tariff schemes and tickets, joining incomes, harmonized timetables and joint information system. Base for creating integrated public passenger transport in Rijeka are longitudinal lines East-West, going through

city centre. Also, joint tickets on monthly or yearly basis should be available for students and workers as well as for retirees and for several zones alongside railway track. Zones should be:

- 1st zone: Sušak Pećine, Krnjevo and Opatija-Matulji
- 2nd zone: Škrljevo, Meja, Rukavac, Jušići, Jurdanii Permani
- 3rd zone: Melnice, Plase, Brgudi Šapjane (State border SLO)
- 4th zone: Zlobin, Drivenik, Liči Fužine

**2nd Phase** is considering:

- construction of second railway track from station Škrljevo to station Jurani
- reconstruction of existing stations and stops
- construction of new stations
- construction of parking places for private cars and bicycles
- assuring rolling stock with high level of availability, comfort and safety
- better compatibility between transport offers and passenger needs
- achieving optimal travelling time.

General objectives for the Rijeka railway hub and railway operator are:

- ensuring quality service (increasing passenger comfort and satisfaction and traffic reliability)
- reasonable price of services (reducing total costs of citizens)
- rationality of the railway system
- relieving city roads
- product fully adapted to the needs of daily migrants
- increasing passenger numbers
- reducing pollution and other negative consequences of road transport.

With raising passenger needs and taking into consideration all difficulties within transport system, railway operator can expect decline in user number unless all necessary changes and recommendations are carried out. Connections to Slovenia and Italy should be established again. The new rail connection with Istria and further construction of the railway to Koper and Trieste are important for the Pan-European V transport corridor evaluation, linking three largest North Adriatic Ports. For the development of the Rijeka transport junction, in addition to the new railway through the Učka tunnel, the construction of a new high-efficiency Rijeka-Zagreb railway line is of great importance.

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