D.3.2.7. Mobility needs and gaps in Region of Istria

WP3 Understanding mobility needs and trends

A.3.2 Mobility needs and gaps in ICARUS region

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1 Table of Contents

Acronyms

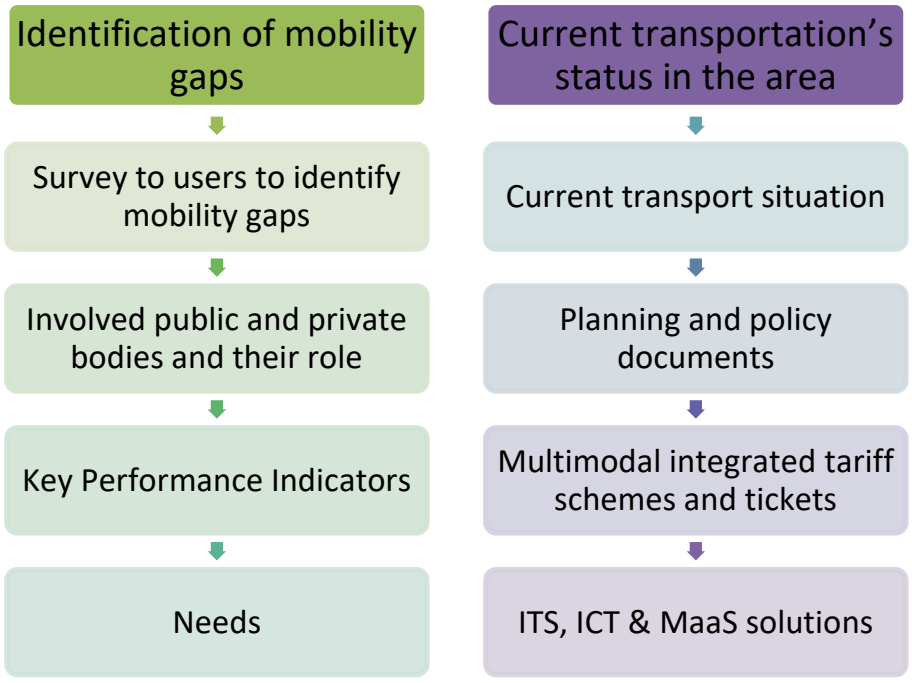
PP	PP Partner
LP	LP Lead Partner
SC	SC Steering Committee
TMB	TMB Technical Management Board
FM	FM Financial Manager
PC	PC Project coordinator
PM	PM Project manager

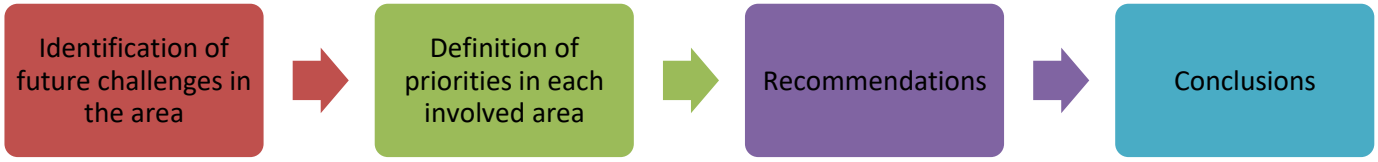
2 Introduction

WP3 “Understanding mobility needs and trends” is essential to provide the knowledge and the background required by the other work packages.

This document follows the methodology elaborated within document D.3.2.1. Methodology for the identification of needs and gaps on ICT, Mobility services and behavioural change and desk work carried out by ITL, ARAP, VIU and CEI (A.3.1.) is taken into account.

Istrian development agency as one of the partners will coordinate activities and pilot actions in Istria region and this report will follow the structure below:





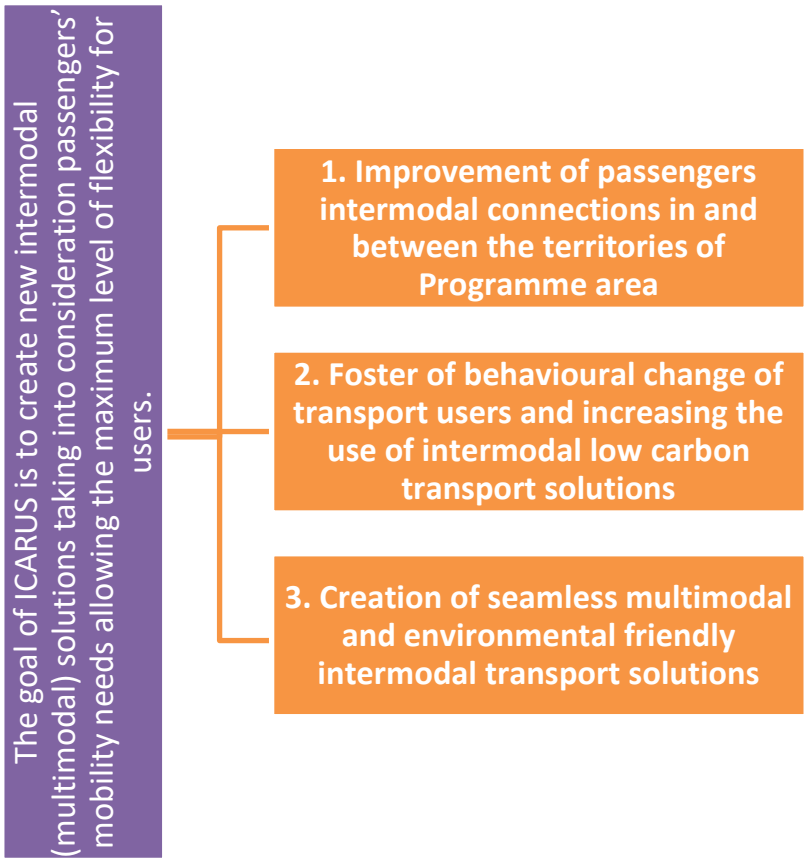
The contents of this report will also underpin the reasons to implement the pilot activities and case studies, which will be developed in WP4.

Desk research about mobility needs and pilot action in programme area and Istria region:

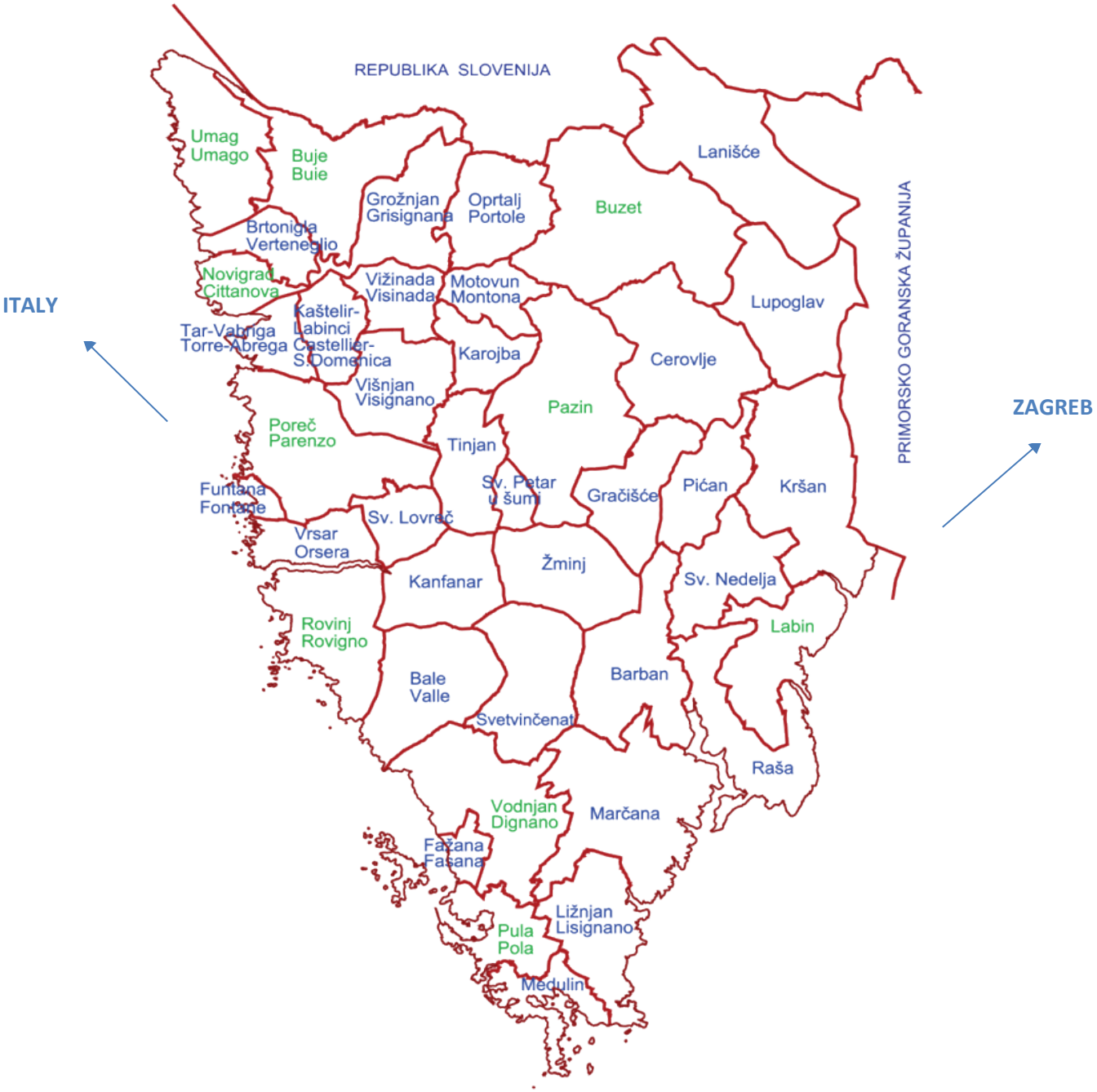
Studies state quite confidently that, globally, demand for mobility will continue to grow over the next three decades. We must therefore be able to respond to the increasing mobility needs of people and goods and stay competitive, while answering to the emission reduction challenge in the transport sector.

There are three primary ways to go towards emissions reduction:

- *Avoid* (i.e. avoid travel, or avoid traveling alone in your car and thus inefficiently)
- *Shift* (i.e. shift to more environmentally friendly modes)
- *Improve* (i.e. improve energy efficiency of transport modes and vehicle technology)



State of the art:



Connection between bussiness hubs in Europe, primarily in Italy, Austria, Germany, UK, Serbia, and BiH is weak because there is lack of frequent and accessible flights and train

connections. Reaching Zagreb from Pula remains a matter of almost 3 hours. While it is true that Istria has some of the infrastructure (Istarski ipsilon highway in great condition, local airport close to the center of Pula), actual connections are not great. Airline travel to and from Pula airport is tailored to seasonal holiday travel, and not to the year-round regional and international business travel needed by many ICT companies. In winter, international flights to Pula airport are few or non-existent, so business travelers use Venice, Zagreb, Trieste or Ljubljana airports. Train lines – commonly used in Western and Central Europe for affordable and convenient business travel – are not available. Public transportation in Istrian towns does not exist outside of Pula.

This analysies will take into account identification of needs regarding the following connections in Istrian region:

Local connections	Regional connections	National connections	International connections
public transport exists only in Pula	bus	bus	plane
	train	train	bus
	bike	ferry/boat	ferry/boat
	road		train

3 Identification of mobility gaps

3.1 Survey to users to identify mobility gaps

The main objective of the survey (Deliverable 3.2.2. produced by KIP) is to identify mobility gaps and usage of public transport in the catchment area.

Survey is structured into 3 main sections:

- Respondents personal characteristics
- Current mobility options and habits
- Mobility gaps and needs.

It is a simple questionnaire which covers the 3 sections to collect realistic data on mobility habits and bottlenecks in each project region.

Survey coprehends opinions of **general public** and **transport experts** as well.

General public refers to all public transport users or even the groups of people which do not use public transport in order to acquire as much as possible feedback on the mobility gaps in each of the covered project regions and areas.

Transport experts are all major experts in the public transportation field such as public institutions, policy makers, scientific and research institutions etc. which will are defined by IDA who draw a list of experts to be reached before the collection of their opinions.

Survey translated in croatian language was sent to public authorities and representatives in Istria region area and it was spread through their web sites and other communication channels in order to recieve different group feedbacks.

Also, during the ***Start up academy (2019)***, IDA representatives shared the survey with all participants in Istrian cities.

Link to oficial IDA website where is shared information:

https://ida.hr/hr/tn/novosti-481/detail/2193/prijevozne-navike-u-istri-provedba-ankete/

3.2 Involved public and private bodies and their role

For the first step of project implementation, IDA organised meeting with potential stakeholders and big number of municipalities, cities and departments in the region expressed their interest. Roles and involved representatives are described in the table and general conclusion is that meetings will be held on regular basis in order to gather relevant informations, discuss current and potential needs and to identify potential actions and challenges.

Type of stakeholder	Stakeholders and brief description	Role in implementation plan
Public authority/ decision makers	***Regional authority*** *Istrian region – Department for sustainable development* *Istrian region – Department for tourism* ***Local authority*** *Barban municipality* *Lupoglav municipality* *Lanišće municpality* *Poreč municipality* ***Rovinj and Kanfanar*** *Medulin* *City of Pazin* *Cerovlje municipality*	***Istrian region*** ➢ *contribution with relevant informations according to identified needs: modernisation of Istrian railways* ➢ *integrated passenger transport* ➢ *information for bike share systems* ➢ *infrastracture investment* ➢ *interes in train/bike connection* ***Barban municipality*** ➢ *bike share development* ➢ *cyclotouristic offer development* ***Lupoglav*** ➢ *central Istria tourism development* ➢ *important train station in Istria* ***Lanišće*** ➢ *sustainable development of tourism and following activities* ➢ *diversivication od cyclotouristic offer and investment in cycling infrastructure* ***Poreč*** ➢ *SUMP and SEP development* ➢ *contributioin with new ideas based on mobility needs* ***Rovinj and Kanfanar*** ➢ ***high importance role according to development of new cycling route which will connect hinterland – coast area in Istria*** ***Medulin*** ➢ *interes in cycling infrastructure* ***Pazin*** ➢ *contribution with measures identified with local strategies: intermodality increase* ➢ *investment in cycling infrastructure* ➢ *bike share development* ***Cerovlje*** ➢ *investment in improvement or enlargement of local srvices for rural area which include free time (Cerovlje is one of the node of Istrian railway)*
Private operators	• *Pepeks d.o.o.* • *FILS d.o.o.* • *BRIONI d.o.o.* • *ARRIVA* • *FLIXBUS* • *Ati d.o.o.* • *Črnja tours d.o.o.*	➢ *to be established communication with private and public transport providers*

	• *Penta d.o..o.* • *Pula promet d.o.o.*	
Citizen/Customs	• *TW project initiative*	➢ *presentation of developed project (tram in Pula)*
Others	*Tourist board Central Istria* *IRTA* *Porth authorities (Pula, Poreč, Rovinj, Umag-Novigrad, Rabac)*	➢ *contribution with relevant informations according to cyclists, bike sharing development,...* ➢ *information for cross- border and maritime transport*

3.3 Key Performance Indicators

Based on conducted surveys, but also on the strategic goals and measures defined throughout regional and local transport masterplans, the key performance indicators should allow each region to benchmark and evaluate current transport situation related to:

- Implemented measures and implemented new services
- Situation with effective PT services and appealing and comfortable PT vehicles
- Situation of stops/stations on territory, real time information application, number of interchanged nodes.

In order to achieve specific ICARUS project goals (ICT/MaaS, behavioural change, intermodal mobility) and in line with identified needs and gaps in Istria region (higher demand for bike routes, better intercity connections, revitalization of Istrian railways, promotion of energy efficient modes of transport) below are listed KPI that should allow following of the progress in the specific area.

ORGANIZATIONAL AND TECHNOLOGICAL KPI's

- Number of the mobile apps that support MaaS intercity commuting within the region (City or County)
- Number of the mobile apps that support MaaS cross border (Croatia-Italy) commuting
- Number of applications that promote intermodality (e.g. proposing optimal routes for travelers combining train, bikes, PT and other)
- Number of the locations where passengers can access the PT schedule (e.g. on the stations, google, transport apps.)
- Number of the locations where passengers can assess optimal transport modes (e.g. info points, info kiosk)
- Number of the ticketomats that support sales of the tickets for the PT (busses and trains)
- Number of the PT services that can be utilized using single card (e.g. smart card)

- Number of the ITS services utilized in city/region (e.g. smart traffic light, smart parking, smart highway, PT information system,…)
- Number of the applications that allow PT ticket purchase
- Number of the documents/studies promoting new and clean technologies in the transport

INFRASTRUCTURE KPI

- Number of trains that allow traveling with bikes
- Number of the regional intercity bus lines
- Number of the inner-city bus lines
- Number of new ecologically acceptable PT vehicles
- Number of the new PT stations
- Number of new public bicycle stations
- Number of new public bicycles
- Number of the new electric bicycles
- Number of the new public electric bicycles stations
- Number of the park and ride locations
- Number of intermodal points/terminals (PT, boats/ferries, bike stations, taxi stations, train stations,…)
- Number of PT ticket sales points
- Number of the new bicycle lines/routes (in the cities and outside of the cities)

3.4 Needs

Based on surveys D.3.2.2., in following chapter will be analysed needs expressed by target groups.

1. **Who was the target group and why?**

General public

It is important to get information from different areas in Istrian region to get the picture about real needs according to mobility of locals so answers from general public (surveys shared onlian, on Startup academy in Istria) were analysed to get wider pictures and needs in urban area as much as in rural areas.

Transport experts

Based on their answers it is given relevant information about inquiris, possibilities for implementation with the main focus on “service development based on demand” so survey was shared between Istrian region relevant departments, port authorities and other managing authorities.

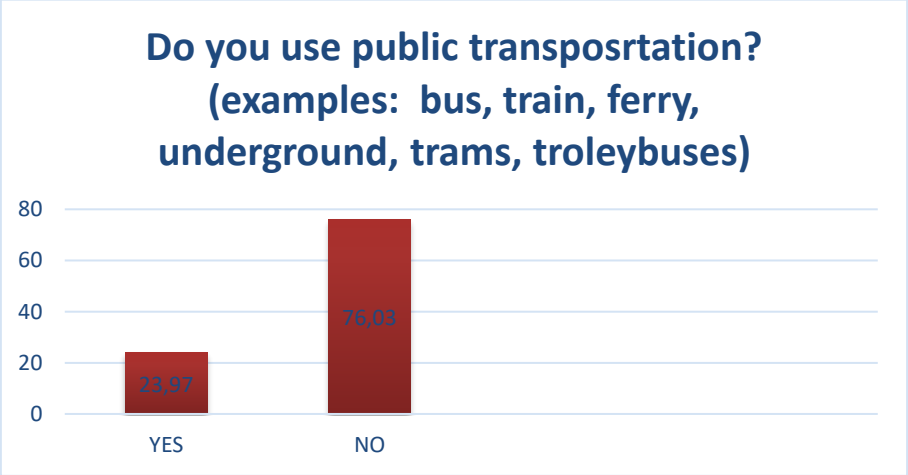
Public authorities

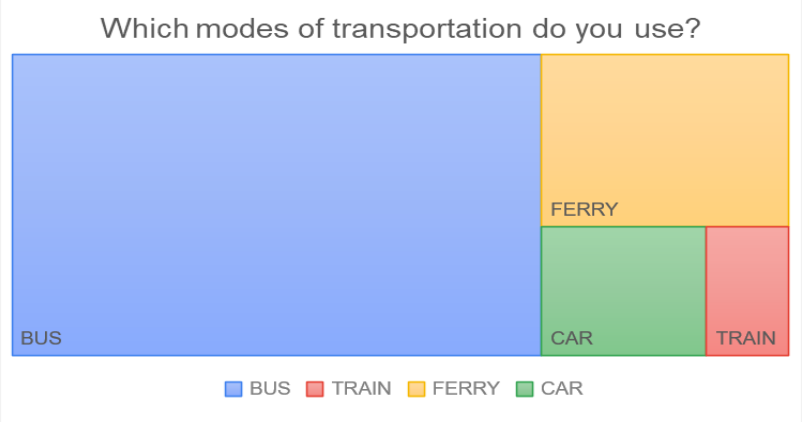
Input given by public authorities gives the feedback according to already developed strategies and action plans in local aread so it's also important to gather all those informations for regional planning and analysing so IDA shared survey between QPM participants.

2. **How many surveys and interviews were made?**
   - ✓ 122 online collected surveys (general public)
   - ✓ 20 participants on QPM held in Pula after the networking with METRO project also co-financed by interreg Italy – Croatia
   - ✓ 10 surveys from transport experts

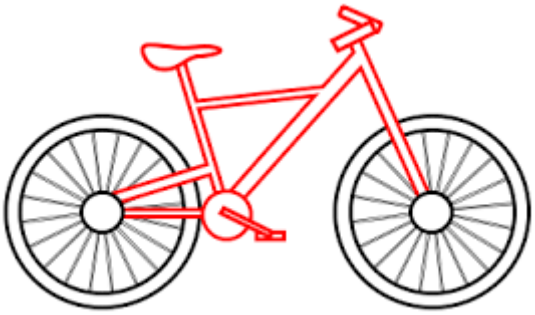
3. **What are the main outcomes and results of the surveys?**

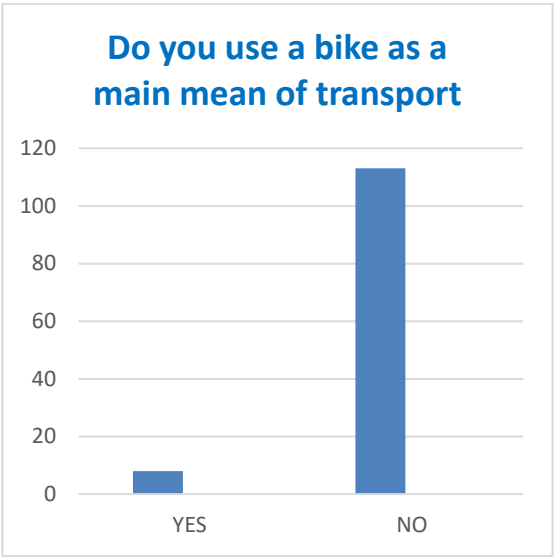
General public results:

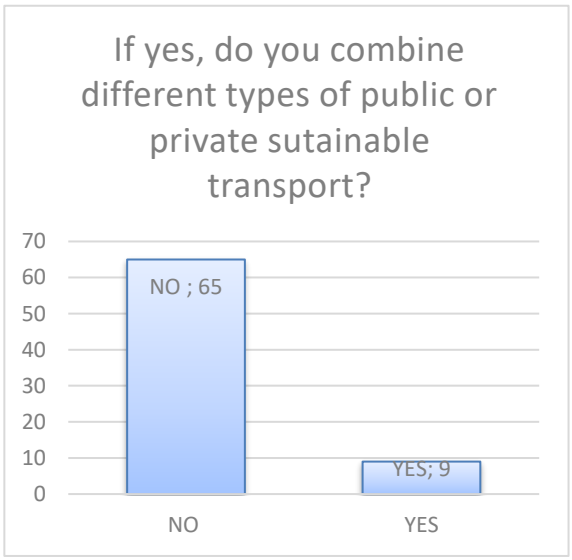


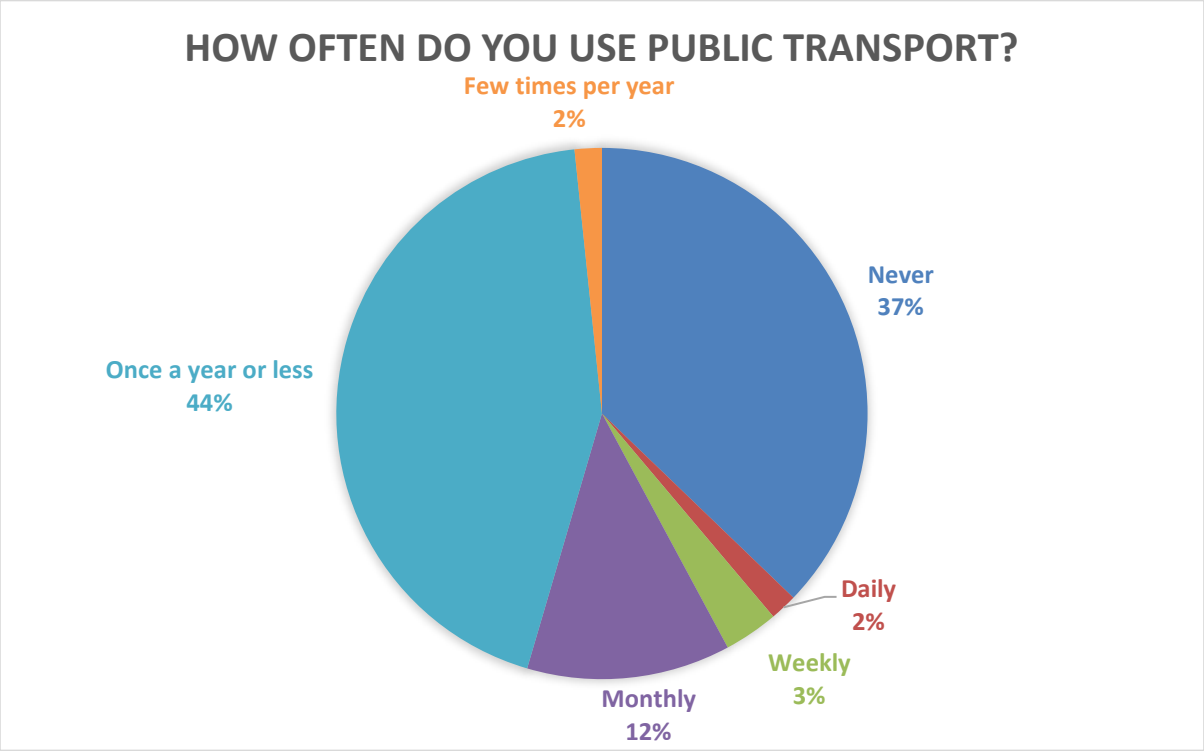


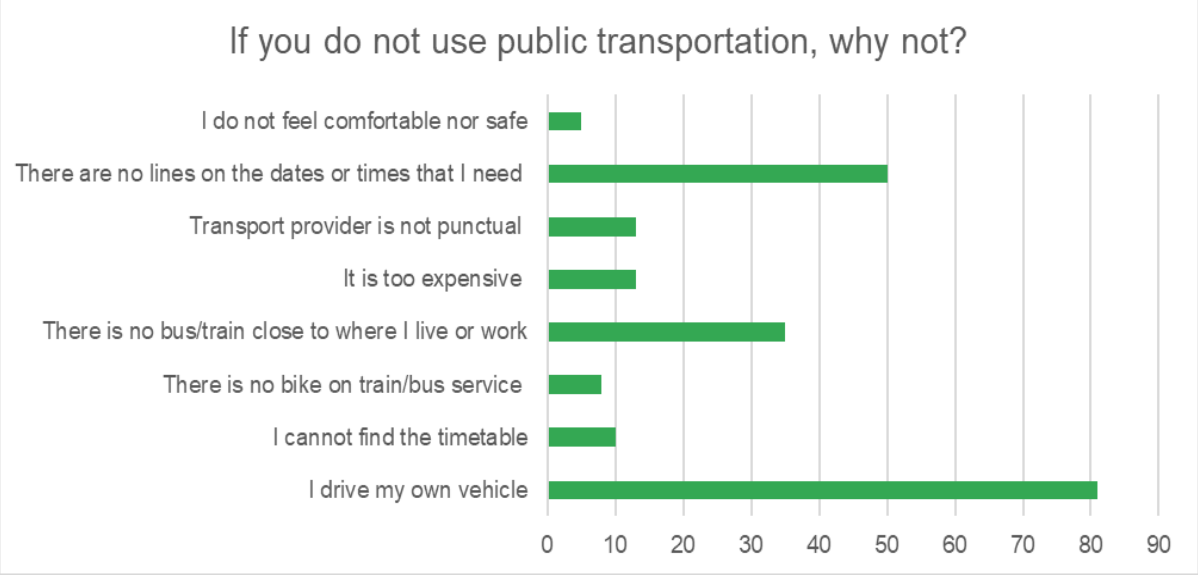
One of the answers from Novigrad is: „*There is no public transport, and intercity connections are weak*“ .








HOW OFTEN DO YOU USE PUBLIC TRANSPORT?
Few times per year
2%
Never
37%
Once a year or less
44%
Daily
2%
Weekly
3%
Monthly
12%


If you do not use public transportation, why not?
I do not feel comfortable nor safe
There are no lines on the dates or times that I need
Transport provider is not punctual
It is too expensive
There is no bus/train close to where I live or work
There is no bike on train/bus service
I cannot find the timetable
I drive my own vehicle
0
10
20
30
40
50
60
70
80
90

Other responses:

Bus trasport lasts too long

Train line is not well promoted and it is not reliable

I either walk or drive my own car

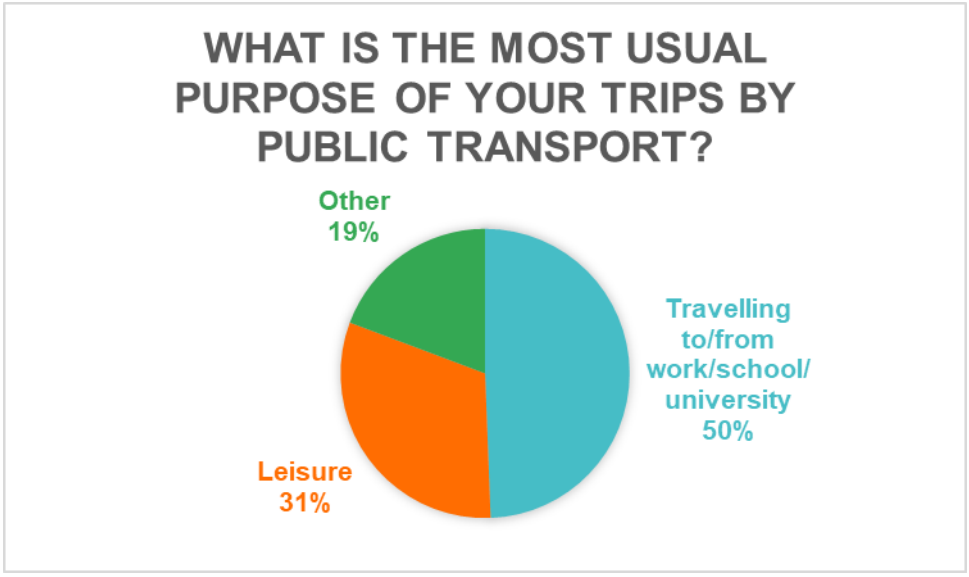
There is no enough bus lines, no maritime connection (and there is a need for Rovinj, Poreč, Umag, islands, Italy, ...).The railway is not functional.

In the area where I live, there is no public transport.

Novigrad does not have a public transport, and considering my current place of residence, I don't even need it. If there were regular intercity lines (Poreč, Umag, Pula, Kopar, etc.), I would be very happy to use them instead of my own car.

I walk.

My municipality does not have public transport, only for students.



Other responses:

Visiting events and educations organised outside Pula

Only in emergency, depending of the moment when I need it

Only in need

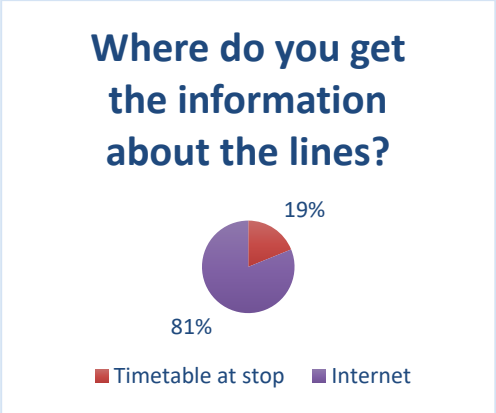
Going to the doctor

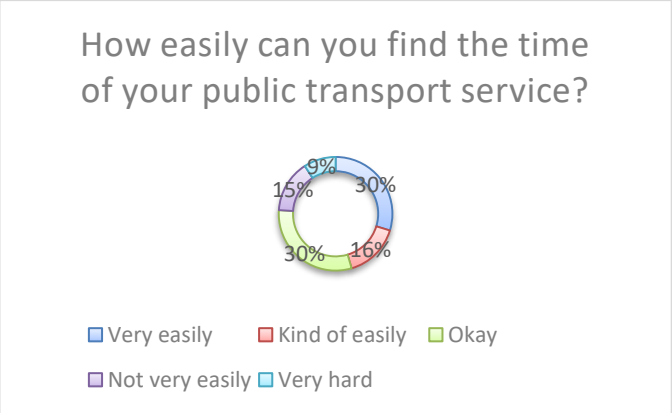
Only with organised transport (bussiness and sport)

I use it only when I don't have my own car

Education

I use it in other cities because in my PT doesn't exist





Do you have any other comments about the timetable information?

Not enough lines

It doesn't exist

Sometimes there is no timetable on the stop, or there is no updated information on the internet

There should be application where all PT providers are connected

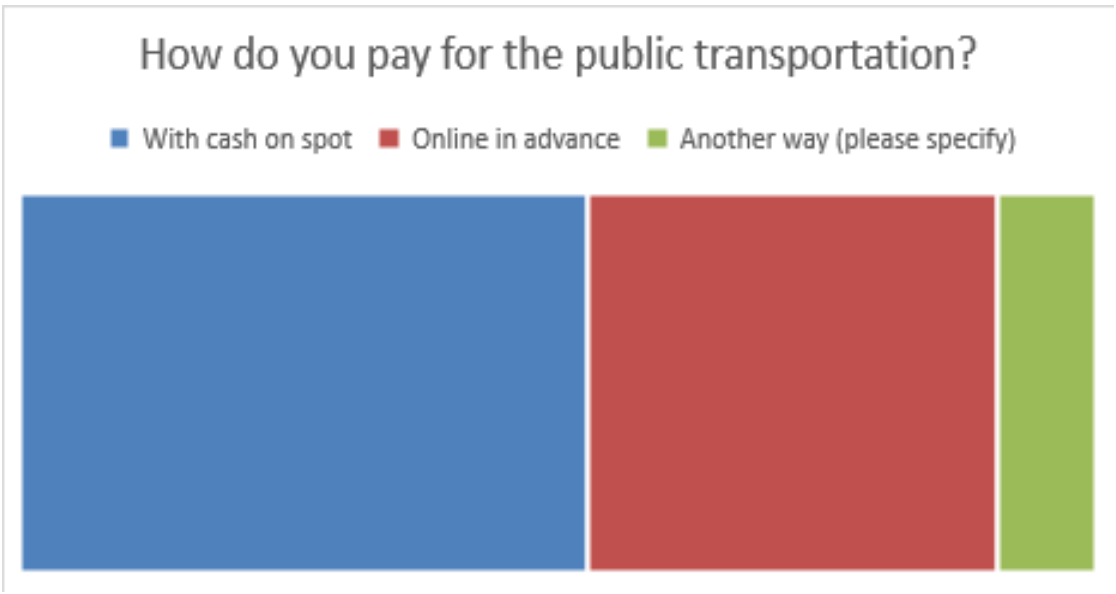
Timetable should be easy to find and updated

The line Umag - Novigrad is unfortunately cancelled

There is no adequate bus lines even from Buje to Pula

PT infractructure in Istrian region is not good. Traffic network is undeveloped (for bikes, intercity PT)

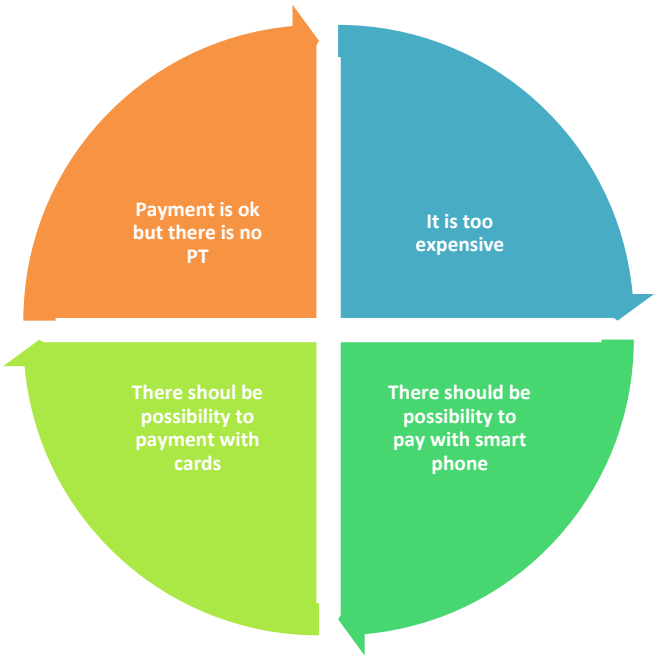
Informations are not unified, so you need to check all transport providers separatly. For example, Flixbus doesn't exist in Novigrad, and some of them which drive on relation between Umag and Poreč, don't even stop in Novigrad

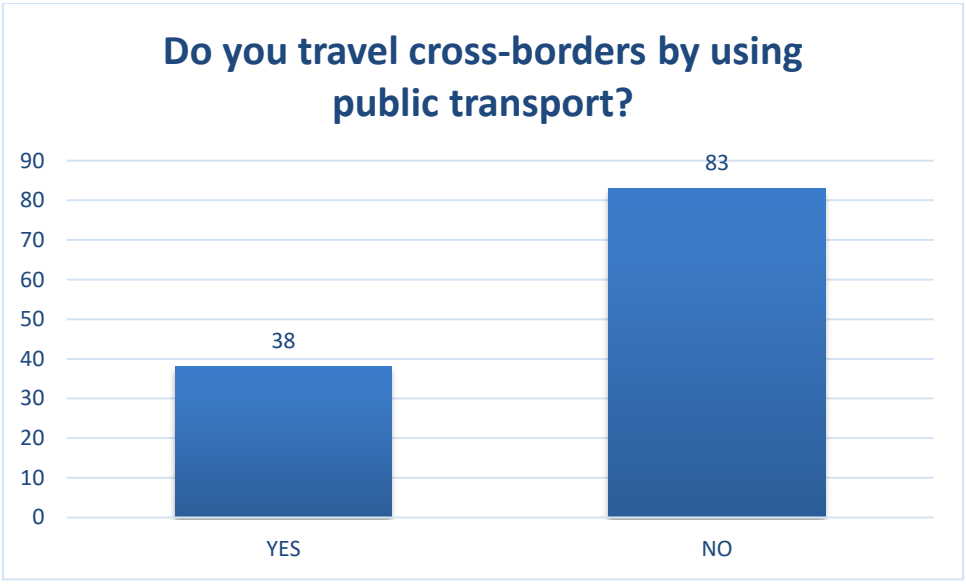


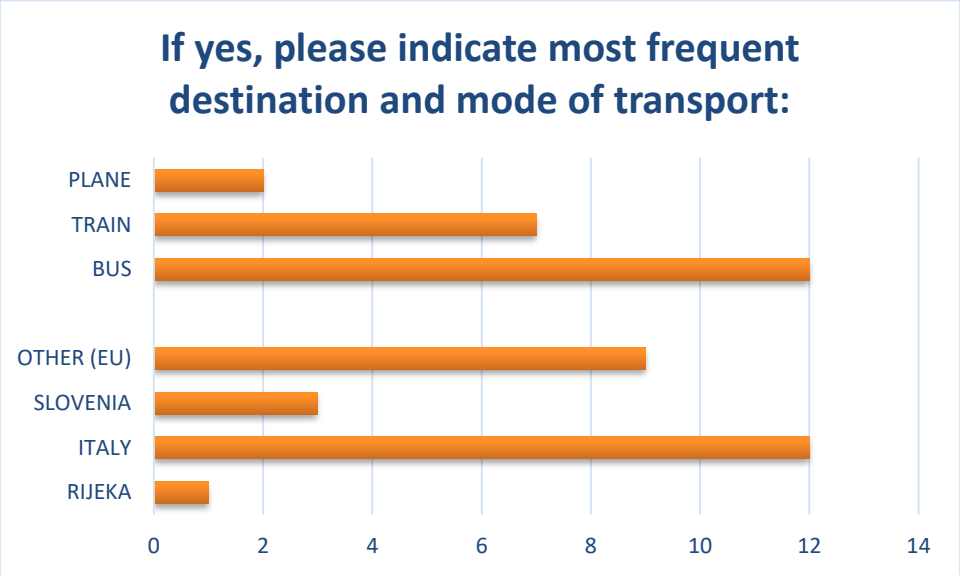
Other responses:

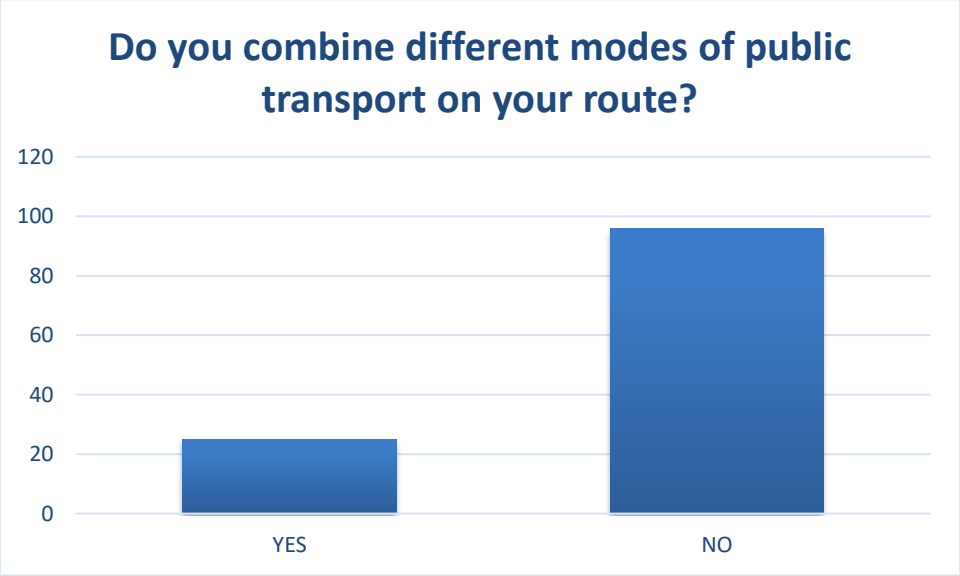
contactless value card

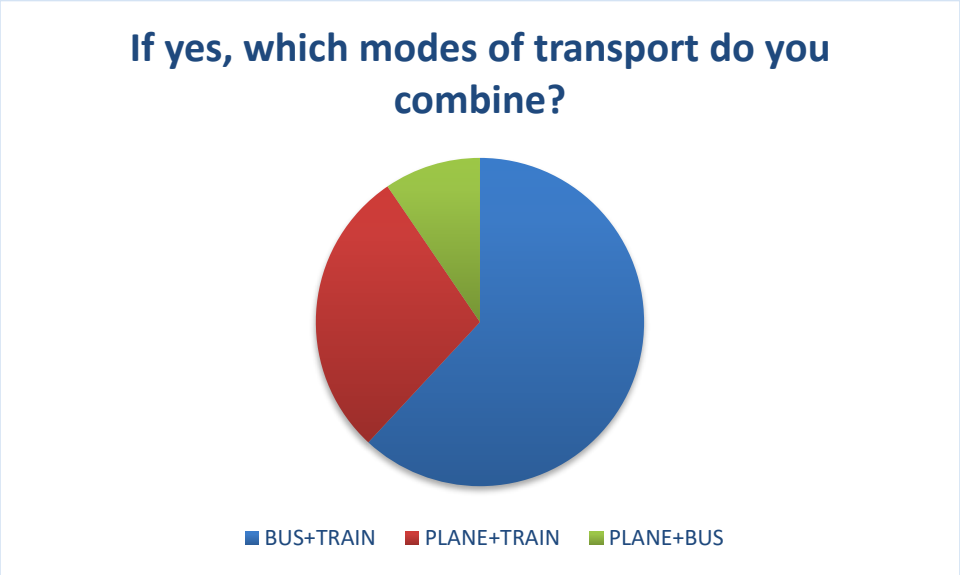
Do you have any further comments about the payment of your transport services?

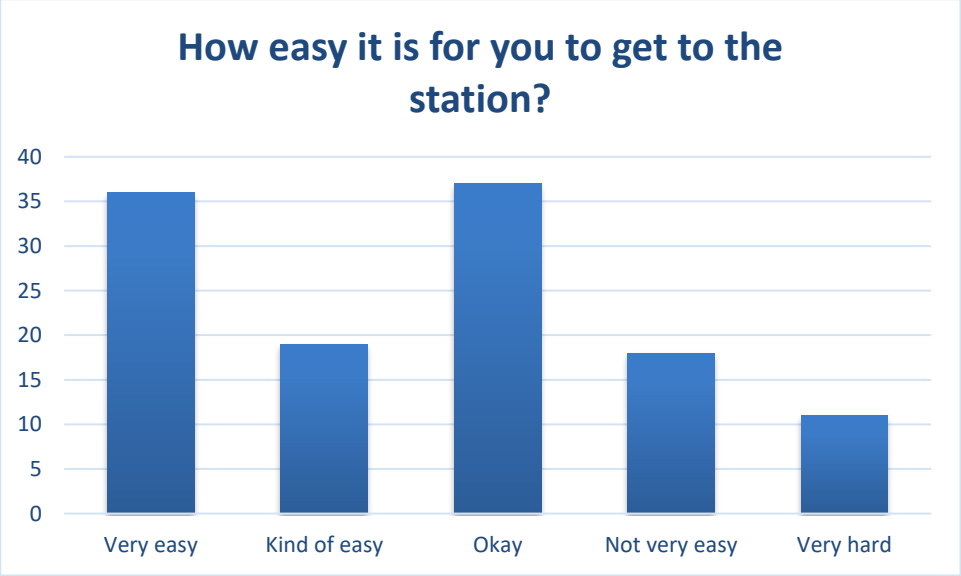


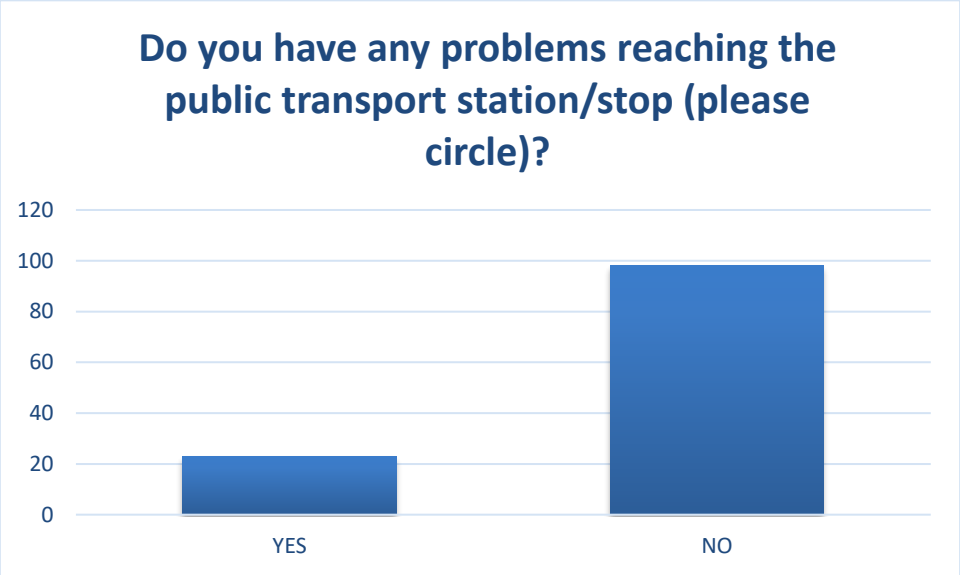



If yes, please indicate most frequent destination and mode of transport:
PLANE
TRAIN
BUS
OTHER (EU)
SLOVENIA
ITALY
RIJEKA
0
2
4
6
8
10
12
14


Do you combine different modes of public transport on your route?
120
100
80
60
40
20
0
YES
NO


If yes, which modes of transport do you combine?
BUS+TRAIN
PLANE+TRAIN
PLANE+BUS


How easy it is for you to get to the station?
40
35
30
25
20
15
10
5
0
Very easy
Kind of easy
Okay
Not very easy
Very hard



If yes, can you identify the issues?

There are no early morning lines

It is too far away from my work place

Big distance

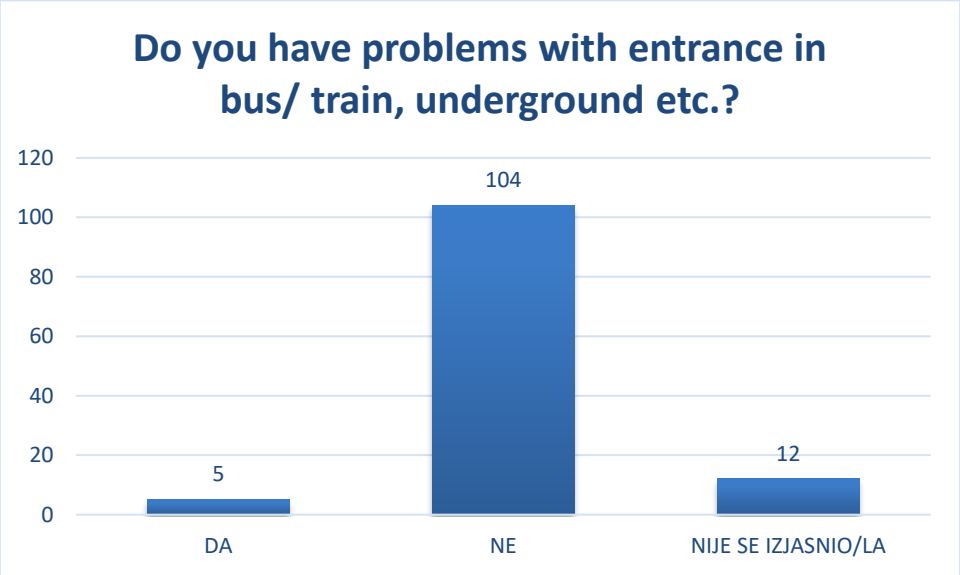
PT doesn't exist

Bus station is 5 km distant and there is no other PT to reach it

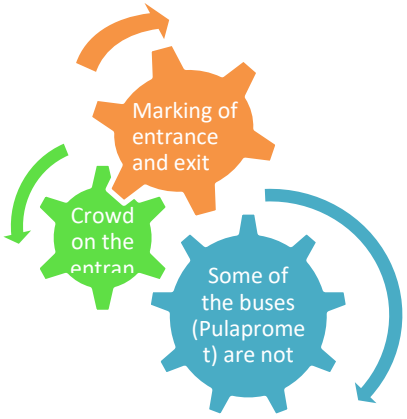
Local and intercity lines anre not connected

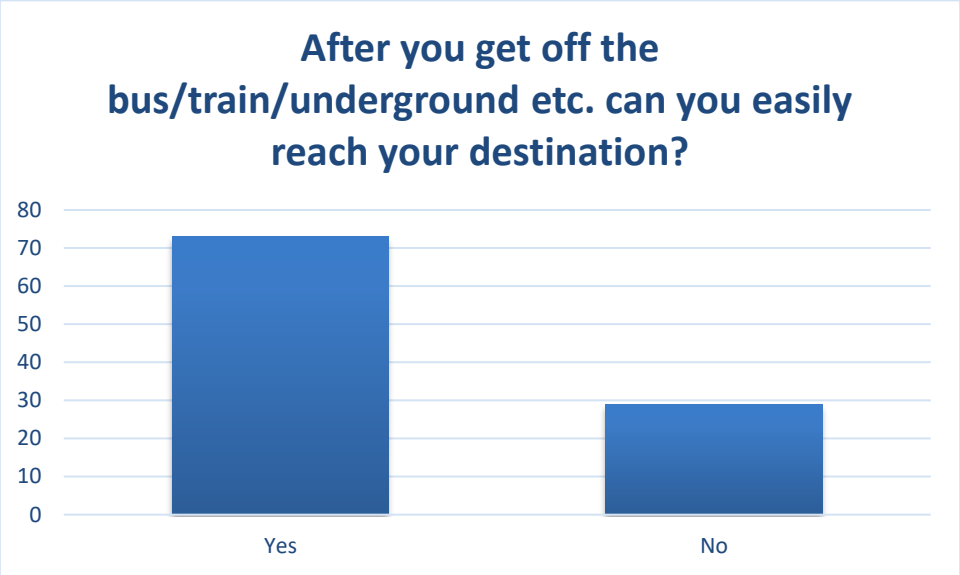
There in a need for intervention in Poreč main bus station and lines

To small number of lines from Novigrad



If yes, can you please specify the problems?

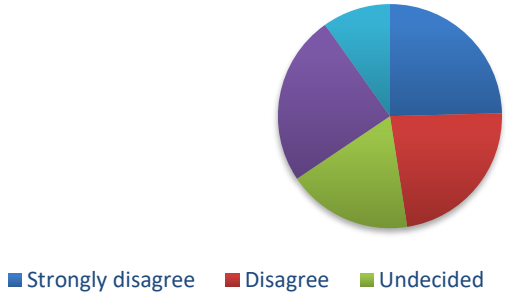




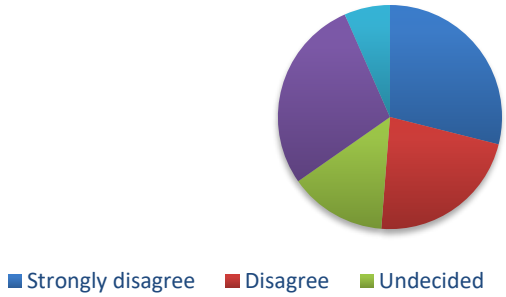
Do you have any other comments about getting where you want to go after getting off the public transportation?

- PT stops are too distant from destination
- Sometimes you need to take taxi because everything is not connected
- I use applications rome2rio and google maps
- Between train station in Buzet and main bus station distance is 5 km and they are not connected
- On arrival station should be more informations about further links and PT
- Railway infrastructure in Istrian region is not used as much as bus lines. Bus stations are not in well condition.
- Taxi is to expensive and the shuttle bus to the airport doesn't drive enough frequently

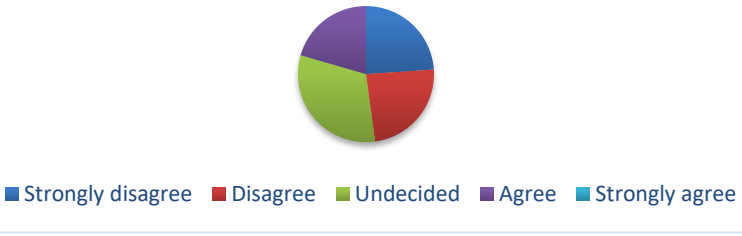
Are you satisfied with the following features of public transportation in your town/region? Purchase of tickets is easy and user-friendly.



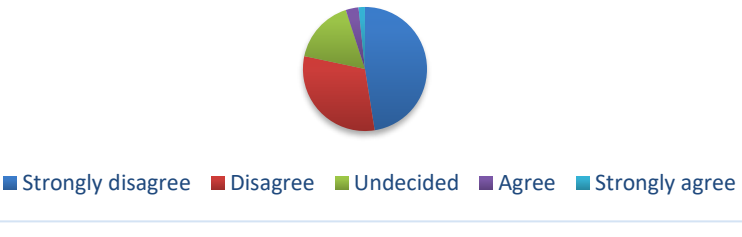
Are you satisfied with the following features of public transportation in your town/region? Information on timetables is easily reachable.



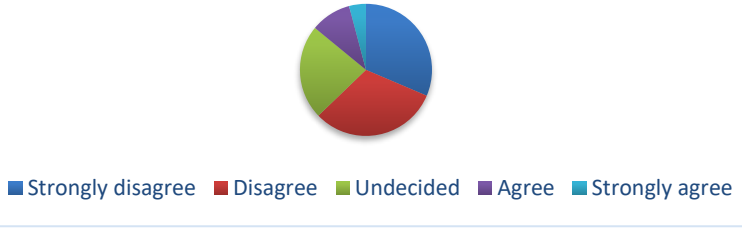
Are you satisfied with the following features of public transportation in your town/region? Service is punctual.



Are you satisfied with the following features of public transportation in your town/region? Connections are frequent and sufficient.



Are you satisfied with the following features of public transportation in your town/region? Cross-border connections are available and…



Do you want to say anything else about your experience of using public transportation? What improvements would make the usage of public transportation easier and more acceptable for you personally?

- There is a need for higher frequency of buses and trains and better cycling infrastructure
- Possibility to buy same ticket for different trasport modes
- Connections with Istria and islands are weak esspecially with Krk where is airport
- This season we had a lot of inquiries about cyclists transport from Rovinj to Pula and from Fažana to Pula and Medulin
- More frequent city bus in evening hours and night bus lines are needed
- More bus stops and cheaper prices
- Better connection of Pula with other cities
- Construction and modernisation of railway infrastructure in the region
- People should use PT more often, but there should be established regular timetable. Railways should be modernized and connection in Croatia should be improved
- PT in Istrian region is weak or it doesn't exist. Buses connecting differnet places are inadequate
- Trains are old, unreliable and expensice. You are forced to hacve your own car.
- Intercity connection in Istrian region is weak
- There is a need for ticket machine and timetable information
- In Buzet there is weak bus transport and train station is far away from city center
- Train to Ljubljana is missing
- "More frequent lines from Pula to Lupoglav with possibility to connection with other places so that this train can be part of the future. Use EU funds as much as you can to revitalize train and bus lines"
- Need for train from buzet to Rijeka and Zagreb, more frequent timetable and better connections to Slovenia and Italy
- Better railway connections would increase mobility
- Modernisation of railway infrastructure
- Better bus lines
- Bus stations reconstruntion with better services
- Intercity connections are weak and outside the season is impossible to move without own vehicle.
- Bus stations are distant and elderly can't walk
- Big suburb areas in Istria should have local transport to city center and main stations
- There is a need for local PT, smaller buses modeled on exampels like in Rimini

Transport experts results (10 surveys):

Which modes of transportation are available in your region?

Do you know of any incentives for the usage of public transportation in your region/country? Can you please specify which ones?

Some of the answers:

- *City of Poreč procured electric buses*
- *Incentives for the transportation of primary and secondary school students by cities, municipalities and counties*

Do you know of any management plans/policy documents supporting the usage of public transport? If yes, can you please specify which ones?

Some of the answers:

- *Incentives of the Ministry of the Sea which supports connecting coast with islands*

In your opinion what are the 3 main mobility gaps preventing the more extensive usage of public transportation in your region? Please explain.

Some of the answers:

- *expensive tickets that do not match the current quality of public transport*
- *lack of incentives to increase use of public transport*
- *insufficient information*

Public authorities results (10 surveys):

Which modes of transportation are available in your region?

Do you know of any performed surveys indicating the usage of public transport in your region and/or defined bottlenecks in public transport? If yes, can you please indicate which ones?

Some of the answers:

- *Research carried out to develop the "Master Plan for the Development of the Transport System of the Functional Region of the Northern Adriatic (Istrian, Primorsko - Goranska County and Ličko-Senjska County)"*

Do you know of any incentives for the usage of public transportation in your region/country? Can you please specify which ones?

Some of the answers:

- *Incentives for the transportation of primary and secondary school students by cities, municipalities and counties*

Do you know of any management plans/policy documents supporting the usage of public transport? If yes, can you please specify which ones?

Some of the answers:

- *Strategy for Transport Development of the Republic of Croatia (2017 - 2030)*
- *Master Plan for the Development of the Transport System of the Functional Region of the Northern Adriatic (Istrian, Primorsko - Goranska County and Ličko-Senjska County)*

Do you know of any existing regional/cross-border multimodal integrated tariff schemes and tickets? If yes, can you please specify which ones?

Some of the answers:

- *The Railway Association has developed a study for the project "Integrated public transport of passengers in Varaždin, Međimurje and Koprivnica-Križevci counties", which would integrate all forms of public transport of passengers in the territory of these three counties. The estimated value of the project is 80-100 million €. The implementation of the project would bring multiple benefits for the population and the economy.*

What is the status of ITS, ICT and Maas Solutions in your region? Are there any past studies?

Some of the answers:

- *All of the above is known only theoretically and all the advantages are known, but in the practice of our region there is no concrete application of these systems:*

- ITS (Intelligent transportation system) –

City of Pula and Pulapromet implemented the project (2003.) of smart card use in public transport with possible smart solutions. In that way they became know how city for all other transport providers in their and wider sorrunding. That system was upgraded constantly and the last payment system upgrade started in 2019.

- ICT (Information and Communication Technologies) for transport - does not exist;

- MaaS (Mobility as a Service, as an integration of different forms of transport services into a single mobility service, available on request) - does not exist.

In your opinion what are the 3 main mobility gaps preventing the more extensive usage of public transportation in your region? Please explain.

Some of the answers:

- *Long-lasting railway infrastructure which does not allow for higher train speeds (speeds of 50-60 km / h are allowed in some parts of the line, and maximum 80 km / h are allowed). No major investment in railway infrastructure, ie increasing the possible speed to min. 160 km / h, on the Pula-Buzet line, it is difficult to join the EU network of high-speed passenger lines (Pula-Trieste, Pula-Ljubljana, Pula-Zagreb).*

- *Lack of connection between the Istrian and Croatian railways, that is, the tunnel through Učka-Ćićarija, which is not built, for which the journey takes too long, for example, on the route Pula-Zagreb (almost 10 hours, and by bus about 3 hours).*

- *Insufficient number of scheduled regular services, which do not have enough passengers, and therefore cannot be profitable. The population mainly travels by car to work, creating traffic jams and pollution in cities.*

In your opinion, what improvements would make the usage of public transportation easier and more acceptable?

Some of the answers:

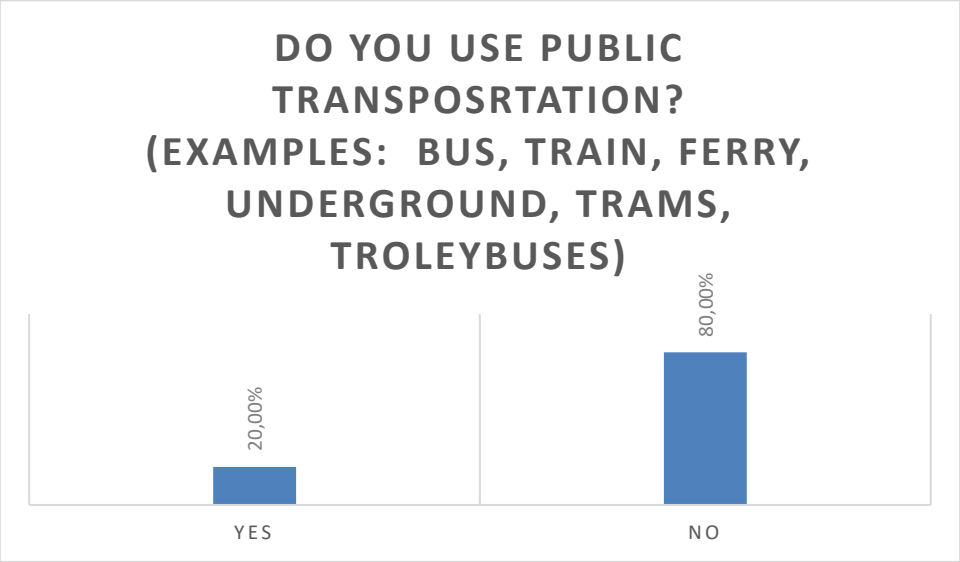
- *Improvement of railway infrastructure to make more use of trains and to enable integrated passenger transport (integrated rail and road transport with a single map).*

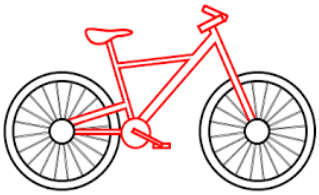
- *Construction of large parking lots for passenger cars at the entrances to the city, and appropriate public transport from such parking lots to certain business or commercial locations in the city.*

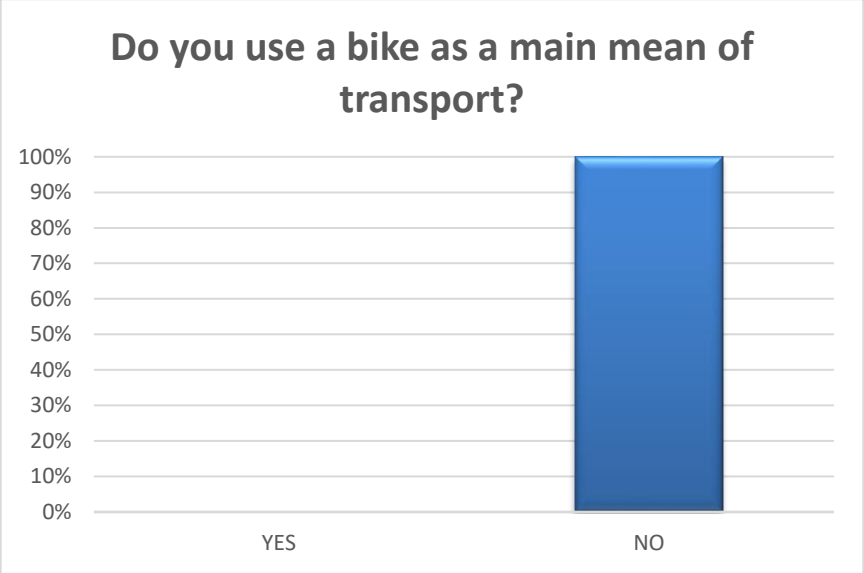
- *State co-financing of appropriate regional public passenger transport services, and complementarity with micro or communal transport, in areas without organized regular transport.*

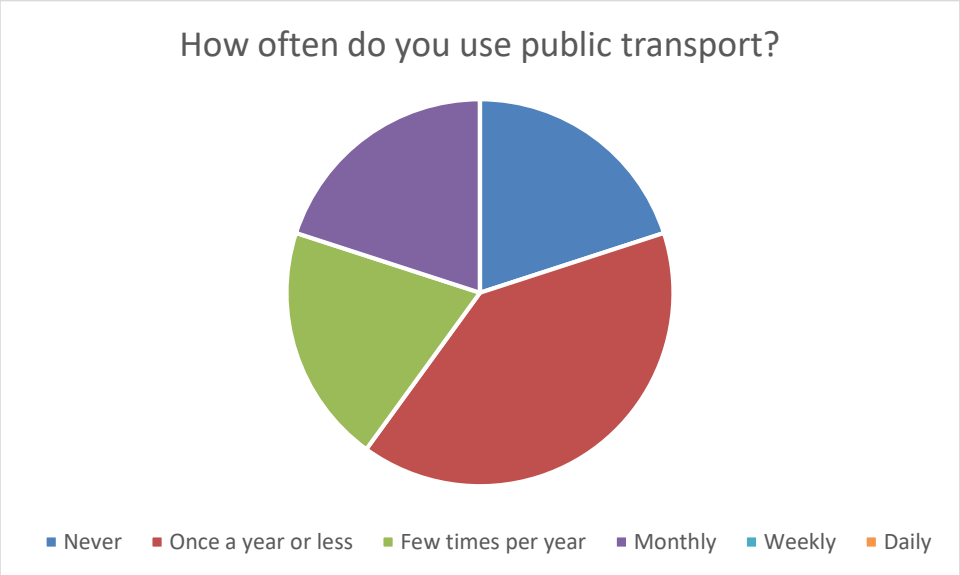
QPM results

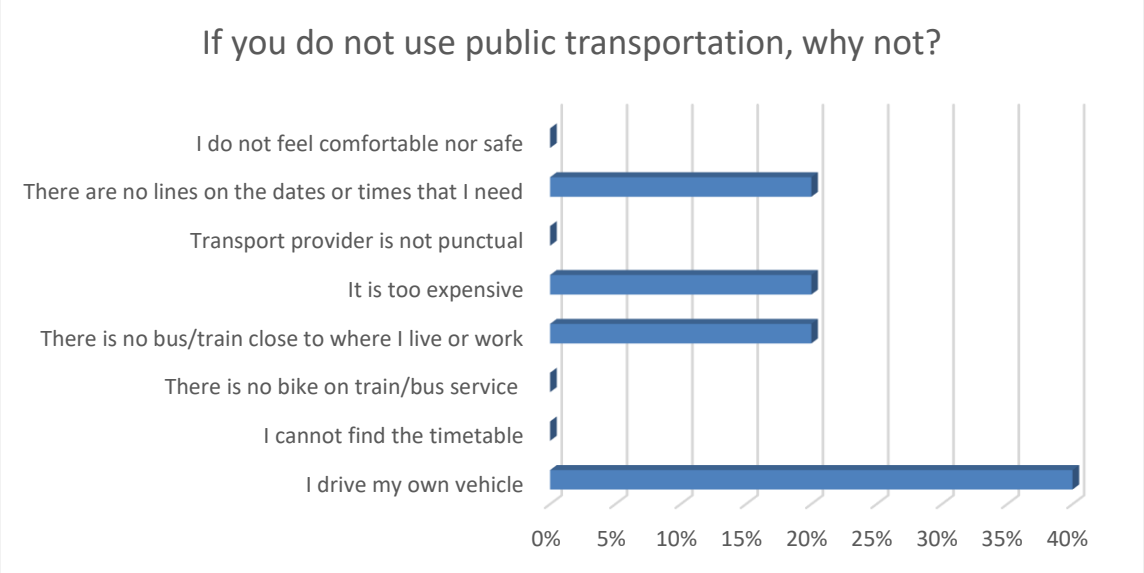
- 20 participants on QPM held in Pula after the networking with METRO project also co-financed by interreg Italy – Croatia


DO YOU USE PUBLIC TRANSPOSRTATION? (EXAMPLES: BUS, TRAIN, FERRY, UNDERGROUND, TRAMS, TROLEYBUSES)
20,00%
80,00%
YES
NO




Do you use a bike as a main mean of transport?
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
YES
NO


How often do you use public transport?
Never
Once a year or less
Few times per year
Monthly
Weekly
Daily

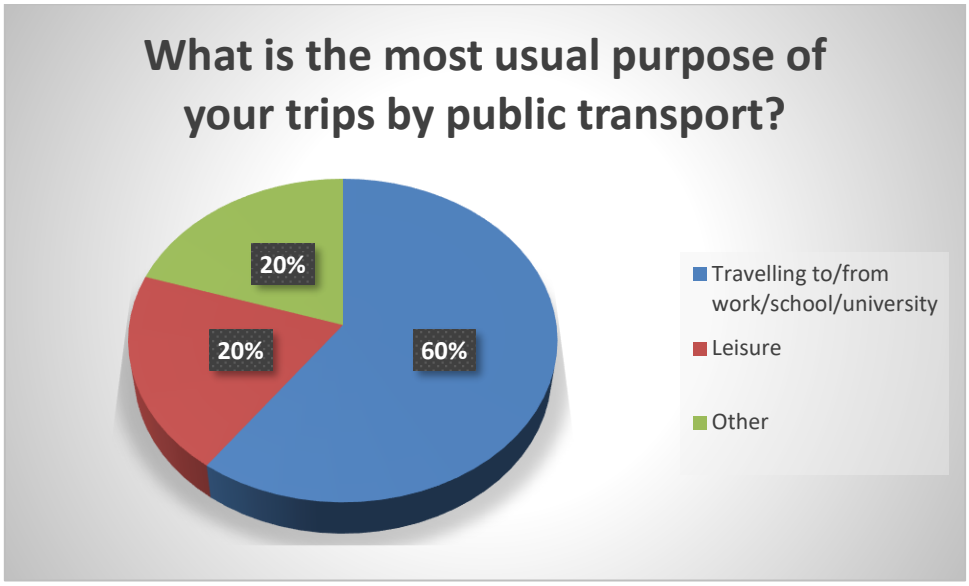

If you do not use public transportation, why not?
I do not feel comfortable nor safe
There are no lines on the dates or times that I need
Transport provider is not punctual
It is too expensive
There is no bus/train close to where I live or work
There is no bike on train/bus service
I cannot find the timetable
I drive my own vehicle
0%
5%
10%
15%
20%
25%
30%
35%
40%

Other responses:

Bus trasport lasts too long

There is no bus station near my workplace.

I walk.

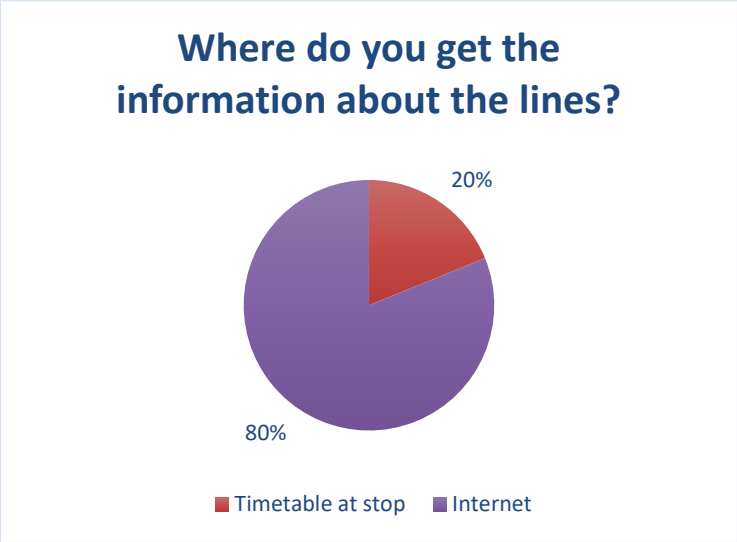


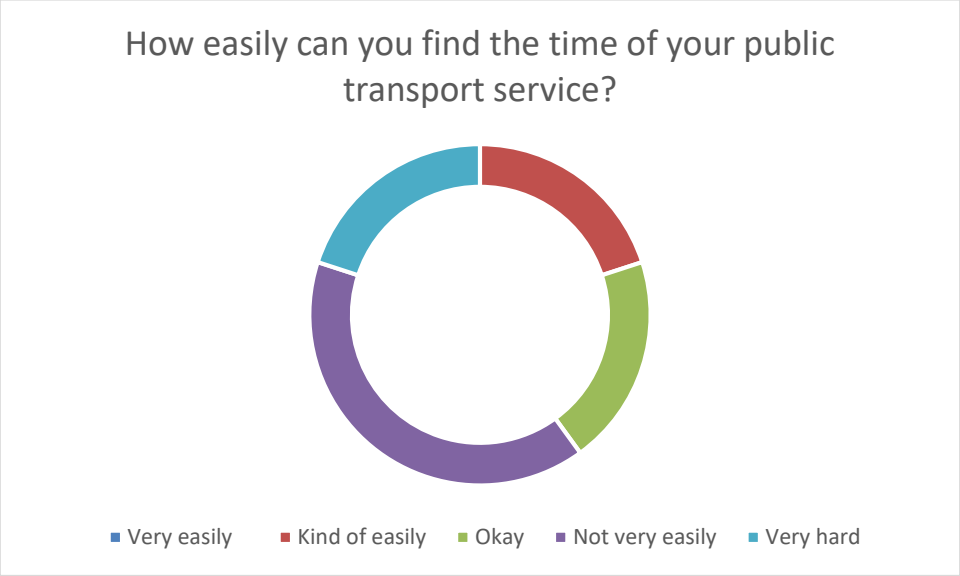
Other responses:

Bussines meeting

Only in need

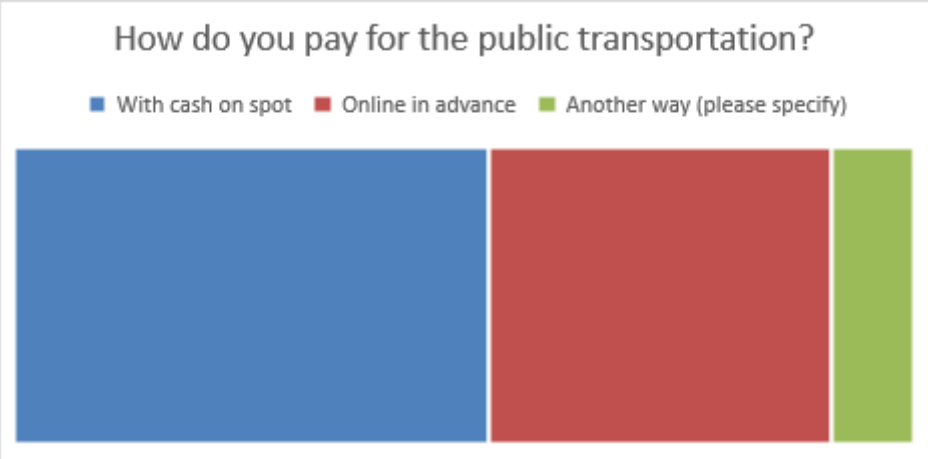
I use it only when I don't have





Do you have any other comments about the timetable information?

The buses are often late in touristic season months.

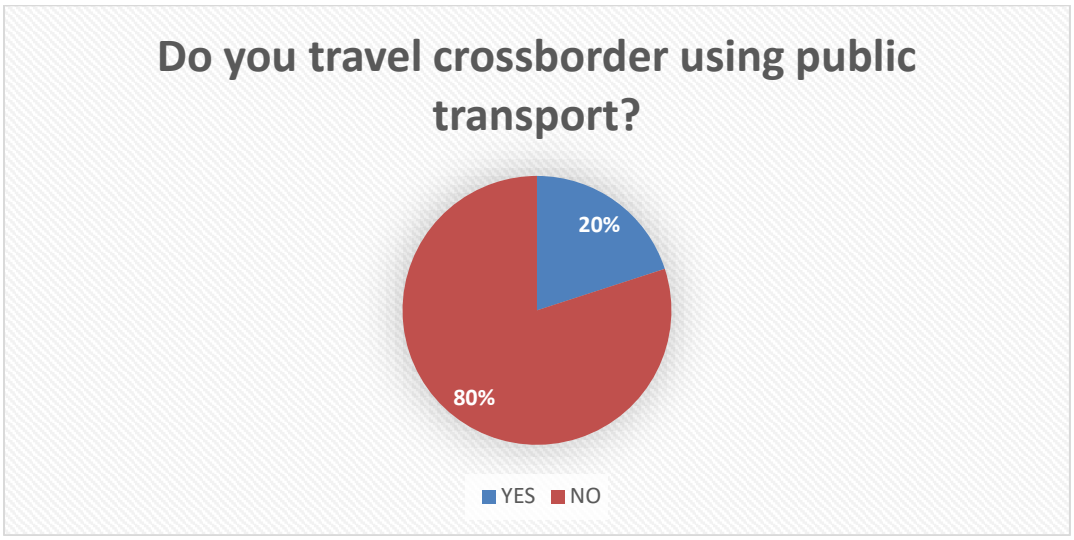


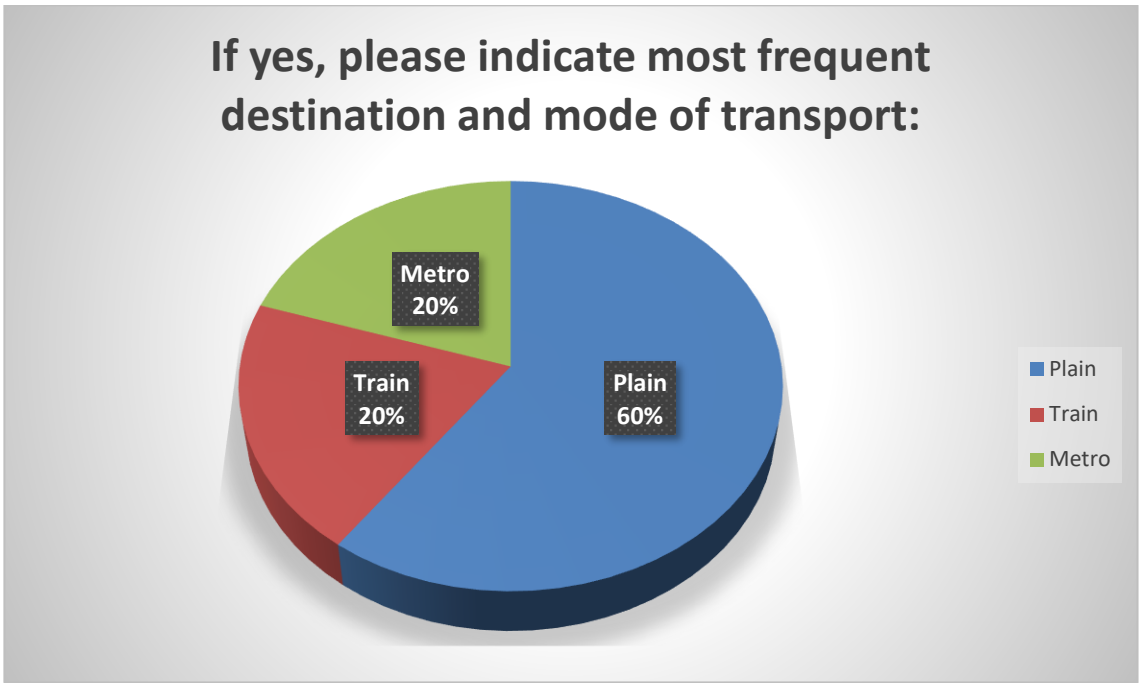
Other responses:

I'm subscribed

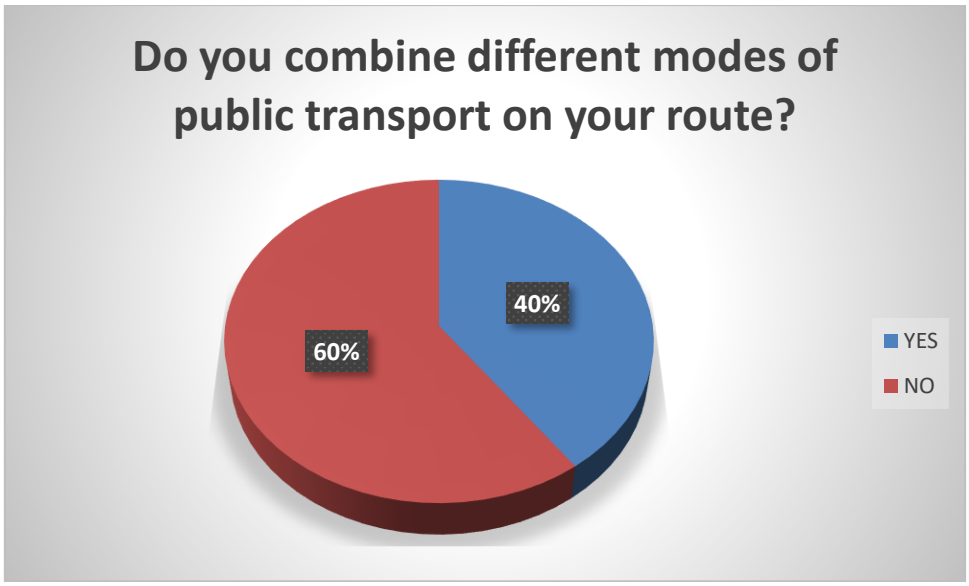
Do you have any further comments about the payment of your transport services?

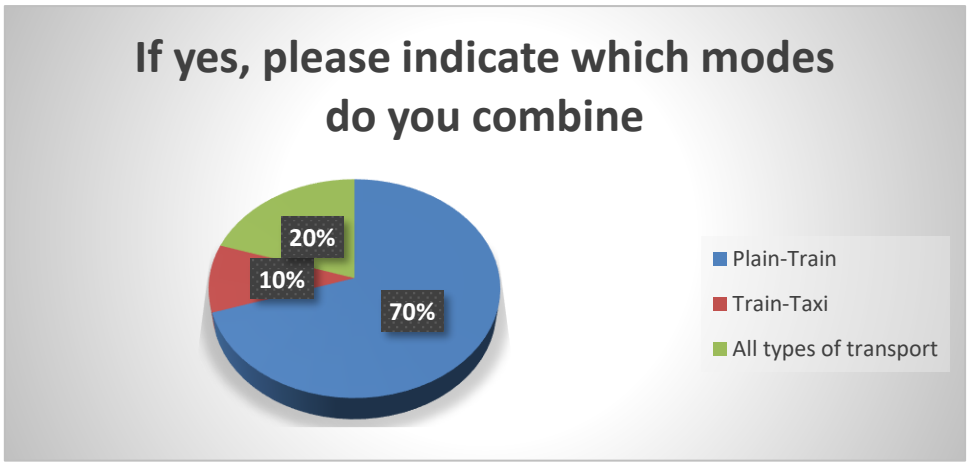
There should be possibility to pay with cards

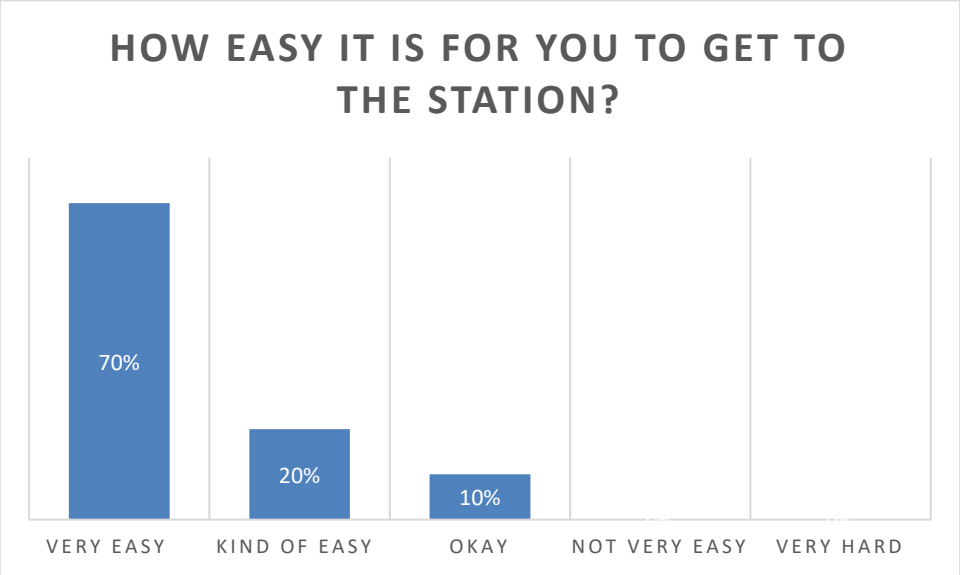


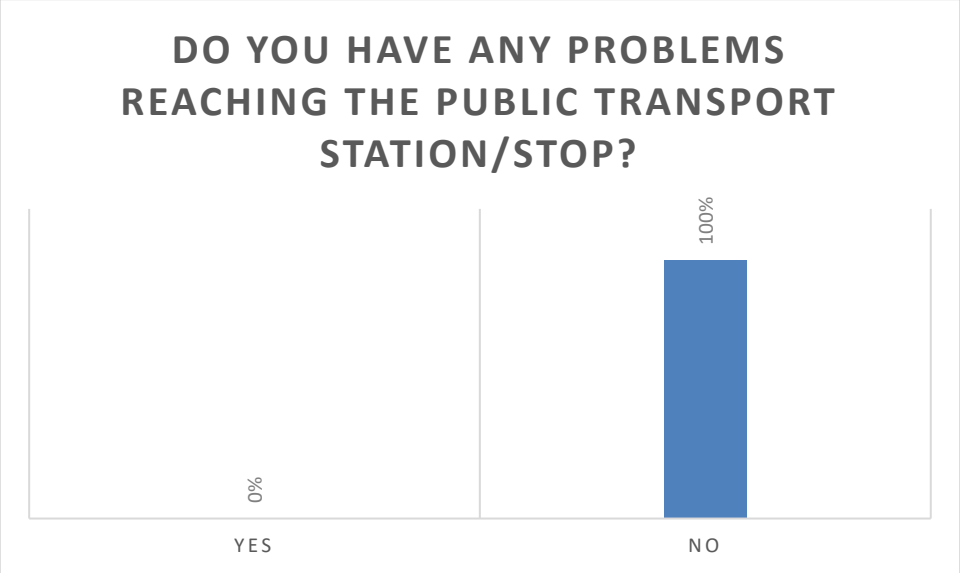


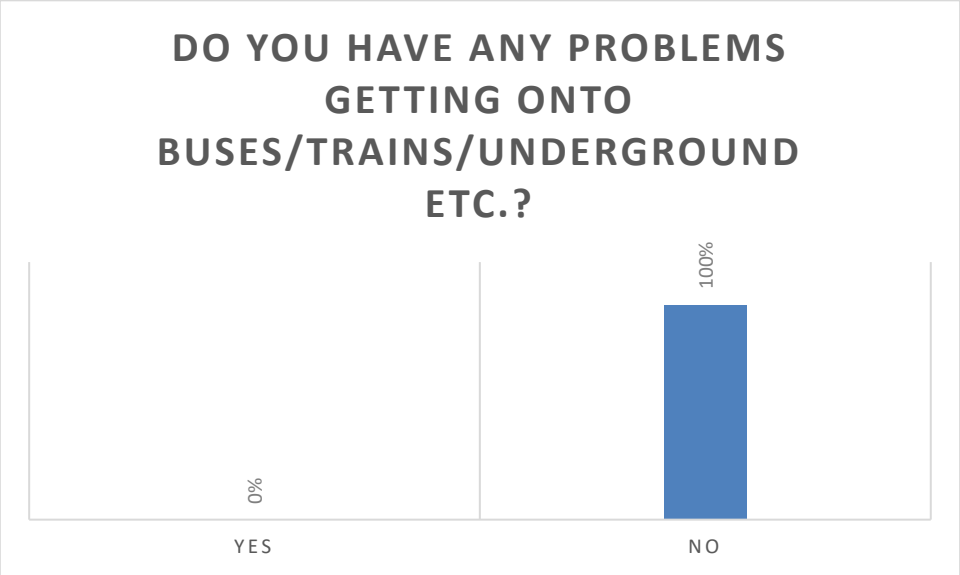
Destinations: EU (Holand, Italy, Germany)

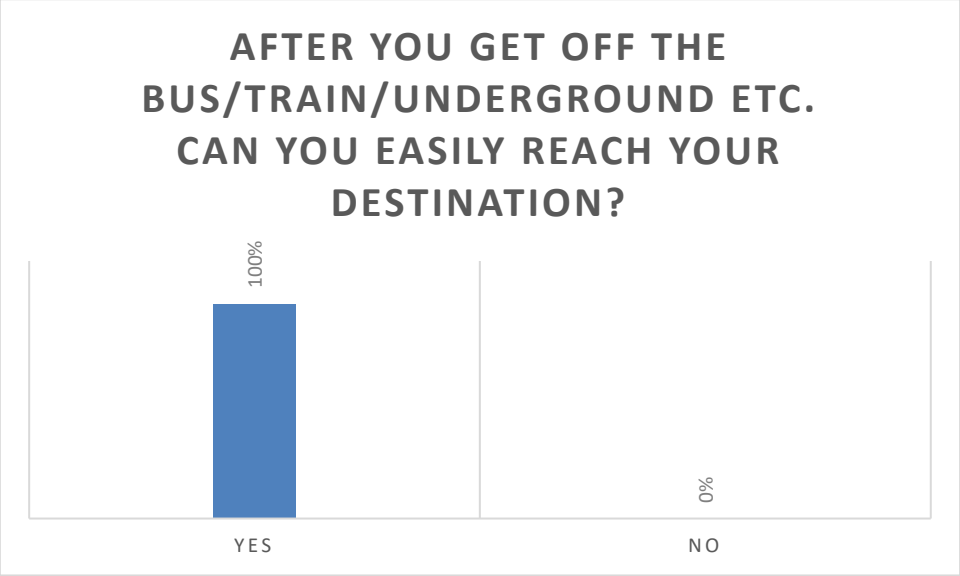

Do you combine different modes of public transport on your route?
40%
60%
YES
NO


If yes, please indicate which modes do you combine
20%
10%
70%
Plain-Train
Train-Taxi
All types of transport

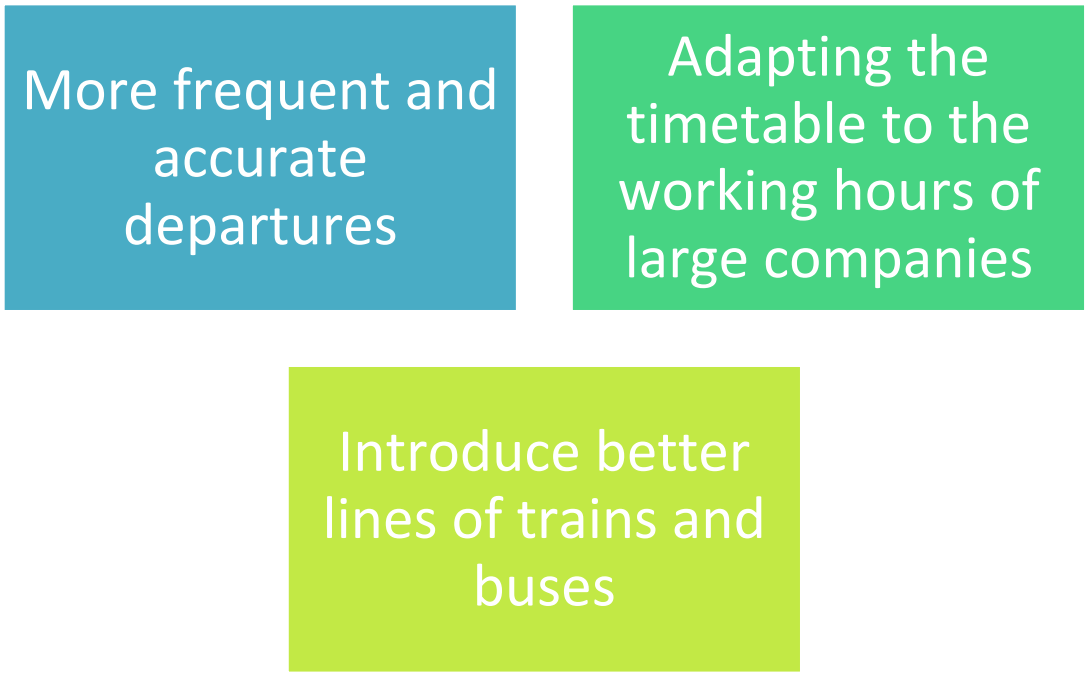

HOW EASY IT IS FOR YOU TO GET TO THE STATION?
70%
20%
10%
VERY EASY
KIND OF EASY
OKAY
NOT VERY EASY
VERY HARD


DO YOU HAVE ANY PROBLEMS REACHING THE PUBLIC TRANSPORT STATION/STOP?
0%
100%
YES
NO





- **Do you want to say anything else about your experience of using public transportation? What improvements would make the usage of public transportation easier and more acceptable for you personally?**



4. What needs emerged by the surveys?

According to analysies of implemented surveys, there were emerged different needs, ones that are already known but also some that wouldn't come into consideration if there wasn't a survey.

Needs can be structured in according to ICARUS project goals:

ICT/MaaS

Younger population and tourists are looking for alternative solutions for getting from A to B especially if they could get the information on their smartphones. Even the cycling is popular during the summer season, there is a need for investment in adequate infrastructure. For the past years, bike sharing is being developed in Istria within the city centers but in order to enable reaching other cities, places and areas, e-bikes could be connected with other modes of transport. For the larger number of users there is a need for all informations in one place.

Behavioral change

Reasonable prices, harmonized timetable and new solutions would encourage behavioral change. In that case, also promotional activities and events are indicated as a need.

Intermodal mobility

Most of respondents were not aware of this kind of solutions but, according to responses, if intermodal solutions were available, most of them would use them.

Are some areas more critical than others?

Rural areas are the most critical because they are long distance areas of each city and/or municipality center and most of the Istria region is rural area without PT.

Current transportation's status in the area

Overview of current status regarding passengers' multimodal transportation in Istrian region

1. Describe the reasons behind this situation, what is the starting point and what are the reasons lagging behind bottle neck identification.

Rail infrastructure is not on the satisfactory level. It's important to highlight that the railway network is not connected - the problem of the railway connection of the territory of Istria with the rest of the Republic of Croatia which runs across the territory of the Republic of Slovenia. Public transport of passengers in the North Adriatic (which includes Istria region) functional region is established by road, rail, sea and air:

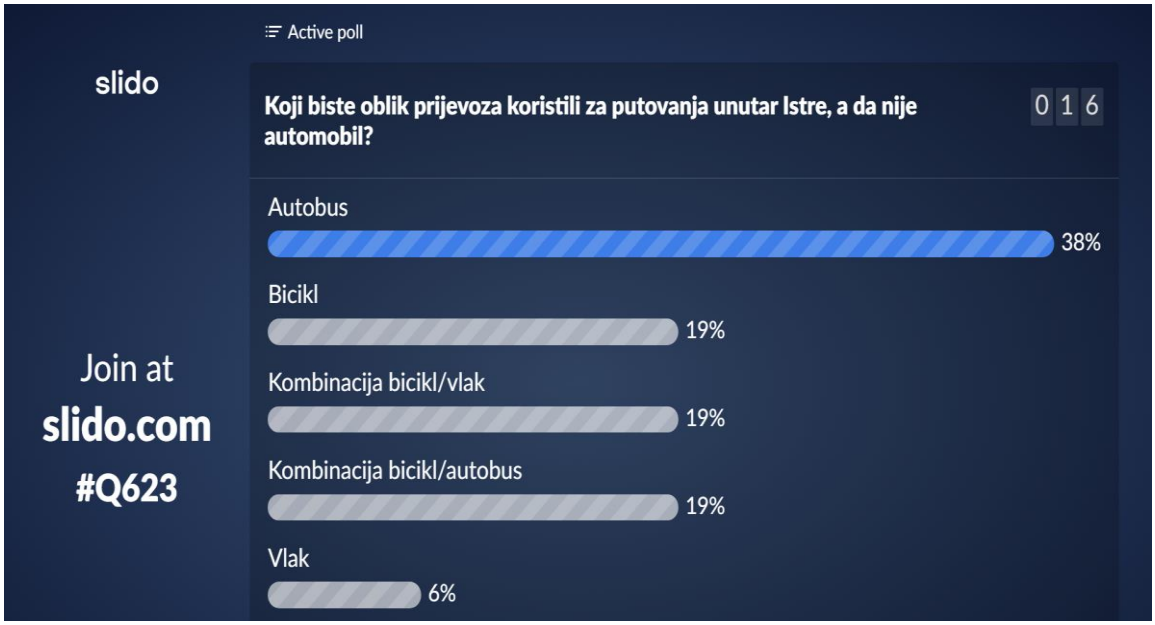
- ✓ The urban passenger transport system has been established in the city of Pula with 8 city lines and 5 suburban lines.

In the County of Istria, the highest number of passengers are at the stations in Pazin, Rovinj, Umag, Poreč and Buje. In Pula, in public transport, the highest number of passengers is at the points Zagrebačka street, Giardini and Istarska street. The most loaded departures are those from 7 to 8 h and from 11 to 12 h. The busiest city line in Pula is Line 1 (Bus Station – Stoja), and the busiest departure is the one at 7:30 am. There are 2441 passengers on this route daily. About 670 passengers travel by rail, with the largest number recorded in Kanfanar, Pazin and Lupoglav.

2. Summarize addressed issues and general goals supporting desk research.

Adressed issues are based on desk research, surveys and also online surveys implemented during Startup academy in December/2020 in Istrian region cities:

Source: TOMAS 2017, Institut za turizam (Institute for tourism)



As presented in above pictures and in line with ICARUS goals addressed issues and general goals are following:

1. ICT/MaaS

- ICT and MaaS are not developed as they could be and according to its potential. Multimodal transport also is not developed in Istrian region but there is a possibility to establish it especially when analysing bus/train and bike transport.

2. Behavioral change

- population in Istria is mostly using their own vehicle and tourists when arriving in Istrian region (54% of them) arrive with the car and 84% in total arrive by road transport.

- reasons why people don't use public transport is that it doesn't exist (only in Pula) and timetables between different modes of transport are not harmonized

- the other issue is that demand for public transport is much higher during the season

- Istrian region rural areas take big surfaces so the distance between rural areas and centers are big for smaller number of people

3. Intermodal mobility

- the main focus for intermodal mobility is on bikes and trains because cycling tourism in Istria has a big potential for development not only for tourist but also for local citizens

- better promotion of intermodal solutions would raise awareness of its helathy and environmental benefits

4 Current transport situation

Analysis of the current situation on accessibility to transport network.

1. Major rail or non-rail transportation services

Source: https://www.hzinfra.hr
(Croatian railway network with train stations and stands)

2. Public transport services linking major hub with regional cities and areas of attraction

Pula hop on – hop off

(https://www.pulainfo.hr/where/pula-city-tour-hop-hop-off)

Poreč:

Within EU project, City of Poreč-Parenzo will have mini electric bus in order to decrease traffic jams and relief of infrastructure, especially during summer period of the year.

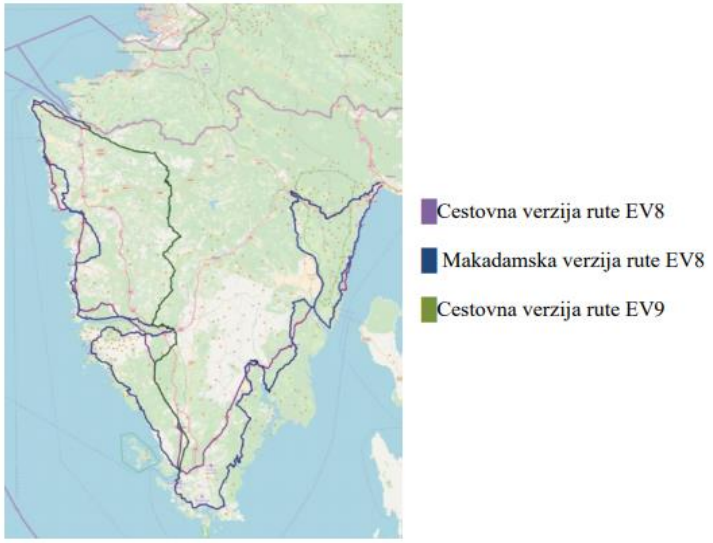
3. Define wider public transport or para-transit services linking the stations of various modes

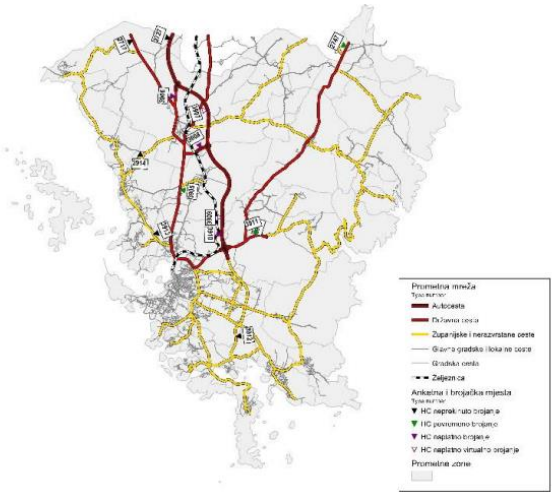
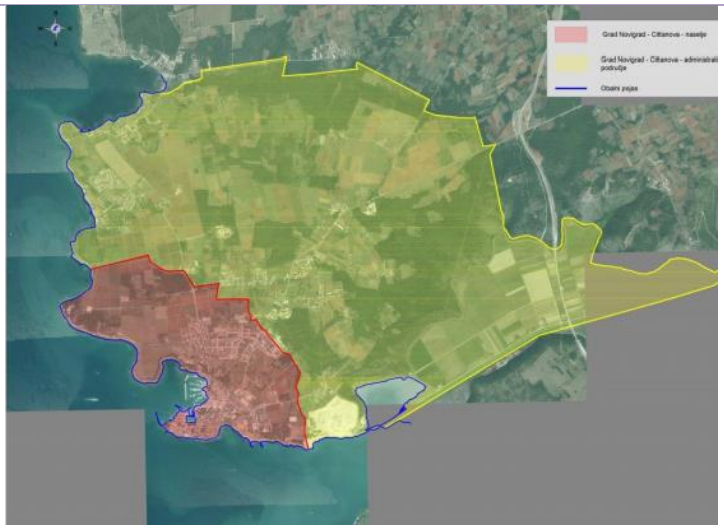
	BUS	BIKE	PLANE	TRAIN	BOAT
Pula https://www.pulainfo.hr/hr/where-to-go/prijevoz	Pula promet – gradski autobusi https://www.flixbus.hr/tvrtka/o-nama https://www.flixbus.hr/tvrtka/press/objave-za-medije/flixbus-integriran-u-google-karte https://www.pulainfo.hr/hr/where/autobus	Javni gradski bickli – Bičikleta	zračna luka Pula https://airport-pula.hr/info-za-putnike/shuttle-bus/	željeznički kolodvor Pula	https://catamaran-line.hr/pula-unije-susak-mali-losinj-ilovik-silba-zadar-plovidbeni-red/
Pazin https://www.central-istria.com/hr/informacije-information/prijevoz-transport		Pazin sport d.o.o. -upravitelj sustavom javnih gradskih bicikli https://authentic-istria.com/hr/bikes/all/all/trails/all/all/all/pois/all/coord/13.4349060058593 75/45.07400551292483/14.4648742672 67578127/45.42544355958045/zoom/11		željeznički kolodvor Pazin	
Rovinj https://www.rovinj-rovigno.hr/komunalni-sustav/gradski-promet/javni-lokalni-linijski-prijevoz/ https://www.inforovinj.com/hrv/rovinj/info/prijevoz.asp					Rovinj - Venice: May - September (daily) Rovinj - Trieste: June – August (3 times per week) Rovinj - Cesenatico: July - August (2 times per week) The schedule changes from year to year

Buzet	http://www.volte.hr/prijevoz-volte.html		http://www.autobusni-kolodvor.com/buzet_6_28.aspx https://vollo.hr/autobus/kolodvor/autobusni-kolodvor-buzet/ https://www.samoborcek.hr/ak-buzet/	Željeznički kolodvor Buzet	
Vodnjan	http://pulapromet.com/wp-content/uploads/2019/09/linija-22-1.pdf https://www.arriva.com.hr/hr-hr/istra/vodnjan			http://www.hzpp.hr/izmjene-u-voznom-redu-2	
Labin	https://www.rabac-labin.com/hr/8-vozni-red-lokalnog-autobusa				https://www.rabac-labin.com/hr/47-trajekt-brestova-porozina
Rabac					http://lu-rabac.hr/dokumenti/projekti/
Poreč	http://www.porec.hr/prva.aspx?stranica=1187&pid=&j=CRO https://www.arriva.com.hr/hr-hr/istra/porec	https://www.porecbikeshare.com/hr/			http://www.porec-port.com/
Umag	https://www.buscroatia.com/hr/autobusni-kolodvor-umag/ http://www.autobusni-kolodvor.com/umag_6_335.aspx	https://www.youtube.com/watch?v=yTCiXaTQh6g http://www.umag.hr/hr/novosti/pet-bike-punktova-u-cilju-podizanja-kvalitete-biciklizma-u-umagu			https://luun.hr/
Novigrad					https://luun.hr/

4.1 Planning and policy documents

1. What are the main reference planning documents for public transportation in the area? Summarize and report them. If more, please describe them and explain how they interact with each other.

Master Plan For Developing The Traffic System Of The Functional Region Of Northern Adriatic **(2018.)**		link
Operational Plan for Development Of Cycle Tourism of Istria County for the Period from 2019 to 2025	 Izvor: Smjernice za unaprjeđenje cestovnih biciklističkih prometnica u Istri, IRTA, 2017.	link

SUMP – (Pula – Pola) **(2019.)**		**link**
SUMP – (Novigrad) **(2013.)**		**link**
Local plan of sustainable mobility **(Umag)**	**Umag local sustainable mobility plan** Transport infrastructure of city of Umag is defined with spatial plan while Transport study of sustainable modes of transport and Local sustainable mobility plan are elanorated in order to promote sustainable mobility and increase of life quality and better transport efficiency (within IPA Adriatic – project ADRIA.MOVE.IT!) Mobility needs on the area of City of Umag are: - congestion of the city center by private vehicles - lack of an organized parking system on the edges of the city and connections from such parking lots to city center and other points of interest	

	- lack of bike lanes in the city center area - lack of additional facilities for cyclists - insufficient safety of cyclists - lack of public transport of passengers (except tourist train) - poorly organized public intercity transport - unused public transport of passengers by sea - lack of organization in delivery transport	
SECAP	Sustainable energy and climate action plans (Buzet, Labin, Pazin Poreč, Pula, Rovinj) developed within Life SEC Adapt project /LIFE programme)	**link**

SUMP, SEAP and SECAPs are plans with defined measures on local or regional area with the purpose of achievent of sustainable goals in mobility, climate and energy sector. When planning, they should interact on each other taking into cosideration already defined strategies and action plans.

4.2 Multimodal integrated tariff schemes and tickets

It is not yet developed.

4.3 ITS, ICT & MaaS solutions

The City of Pula has defined throughout its recently developed and approved sustainable urban mobility plan (SUMP) its aim to implement ITS that should improve mobility in the City assuring that appropriate information are collected and timely shared with all transport participants in the City of Pula. Overall ITS should help all parties that travel throughout Pula to do it in the most efficient way, combining different means of transport (car, public transport, bicycles, train,…) and doing it in the most efficient way. Also, ITS and various ICT solutions that enable ITS to function properly should support energy efficient use of transport which should have positive environmental impacts. Having in mind all above positive effects of the ITS, City of Pula has started certain pilot activities with specific traffic lights but also has a plan to develop overall ITS study that should help them to develop overall ITS and also to apply for the EU funds for the implementation of the ITS in the City of Pula.

MaaS (ITL desk work D.3.1.1)

MaaS is the integration of various forms of transport services into a single mobility service accessible on demand. As described by Deloitte in its review “The rise of mobility as a service”, MaaS relies on a digital platform that integrates end-to-end trip planning, booking, electronic ticketing, and payment services across all modes of transportation, public or private. Rather than having to locate, book, and pay for each mode of transportation separately, MaaS platforms let users plan and book door-to-door trips using a single app, moving us toward a more user-centered mobility paradigm (Deloitte, 2017). It is therefore pretty clear the bond between MaaS and ICT:

MaaS is a data-driven, user-centered paradigm powered by the growth of smartphones; it requires high levels of connectivity, secure, dynamic, up-to-date information on travel options, schedules, and updates, and cashless payment systems. These services all refer to Information and Communication Technologies (ICT), as technology is behind their management, maintenance and improvement. ICT is what makes MaaS possible and is the key to its diffusion and improvement.

MaaS is considered to be both a physical service provision and a medium/digital platform for accessing this service. Its so-called ecosystem is made of agents (including vendors, transit agencies, other government stakeholders and consumers) and attributes (i.e. types of services or functionalities available and the technologies that enable these to be consumed) (Falconer, Zhou, & Felder, 2018).

In particular, four components characterize MaaS (Costantini, 2017):

(1) Infrastructure. There has to be an interconnected physical infrastructure enabling transfers between different transportation services. Moreover, a high level of connectivity is required. Indeed, since users gain access to the system through an app, a widespread use of smartphones is required.(2): Data Providers. Customers plan their trip selecting the route among different travel options thanks to the huge amount of data crowdsourced and real-time updated from public operators and other providers.

(3) Transport Operators. Transport operators are incumbent players in MaaS, yet their lack of flexibility has driven the growth of private providers offering specific services (e.g. carpooling).

(4) Trusted mobility advisors. As an intermediary, MaaS provides information, reservation, assistance and, in the near future, payment. This operator controls data and processes and, by that, is the main figure in the process.

The concept of MaaS is a natural consequence of current trends: people want cities to become more livable and less vehicle-centered, in other words they want them to become smart cities as previously described. As urban density continues to grow, MaaS provides an alternative way to move more people and goods in a way that is faster, cleaner, and less expensive than current options. In addition to that, consumers have increasingly embraced new mobility options and apps over the last decade, and journey planning apps helping users to identify and compare different modal options for getting to their destinations, have become commonplace. The natural next step will therefore be to bring all these options together on a common platform.

Also for MaaS, future projections show a massive increase of its market size; in the European Union, the MaaS market size in 2017 was estimated to be equal to 25 billion dollars, increasing to 198 billion dollars in 2025 and 451 billion dollars in 2030.

MaaS platforms represent the technological realization of the concept of ecosystem paradigm for the transportation sector. The optimal solution for the mobility panorama is the one that shows all the stakeholders perfectly integrated among themselves to create a strong value network, which aims at maximizing the satisfaction of the epicenter (represented by the costumer). Therefore, the scope of the MaaS systems is the possibility of fostering all the virtuous cycle that can be

created among the different players. The value chain around the passengers are no more perfectly distinguished but instead they are mixed together to convey to the user a seamless experience. In the long term, the user satisfaction will reward the most effective ecosystems, also leveraging network effects: passengers will increasingly look for customized and flexible mobility solutions. At the same time they become active and directly interact with the other actors of the system to have an efficient, effective and interactive experience. Thus, to better understand the mechanism of the industry and how to innovate it, it is fundamental to study the relationships among the relevant stakeholders and between mobility players and users.

5 Identification of future challenges in the area

Demand for mobility will continue to grow over the next three decades. We must therefore be able to respond to the increasing mobility needs of people and goods to stay competitive, while answering to the emission reduction challenge in the transport sector.

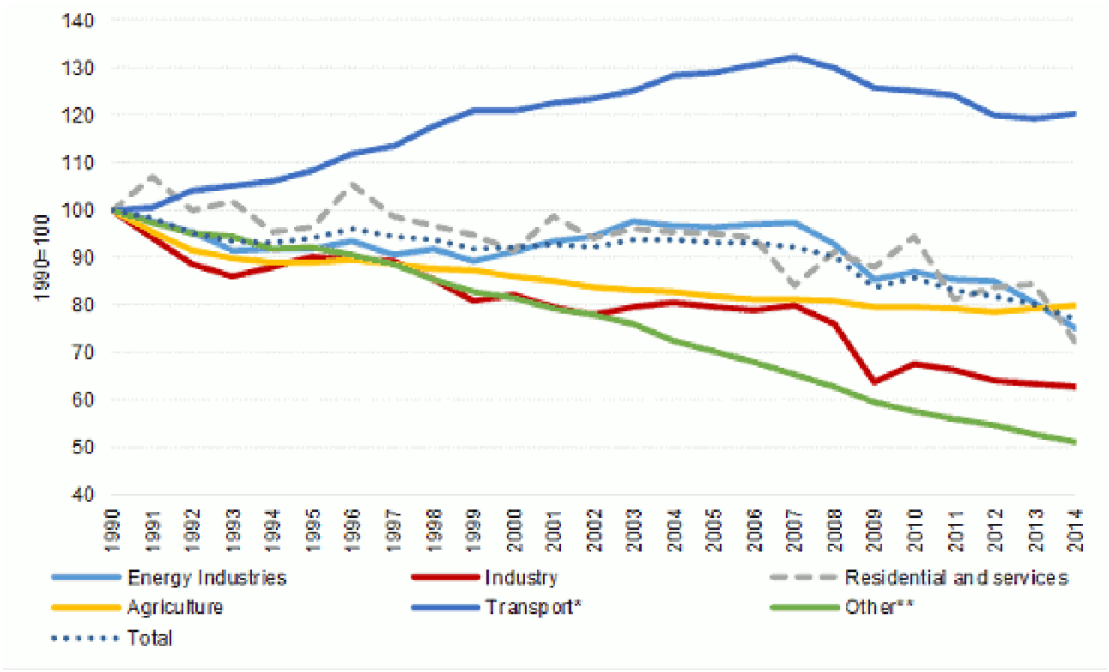


Figure 1 GHG Emission by sector over time, Source: EEA

COVID - 19 IMPACT ON MOBILITY

On March 11, 2020, the World Health Organization (WHO) has declared COVID-19 a global pandemic. Many countries have closed their borders and imposed curfews – resulting in sharp reductions in transport demand also on regional and continental level. It is highly likely that the corona virus outbreak will have longer-term **impacts to our individual behavior** and lifestyle, the way we work, consume and **travel**. Public transport but also shared mobility services are on the one hand vectors for distribution of the virus. On the other hand, they are severely impacted by travel bans and individual concerns in order to avoid public gatherings leading to reduced travel and transport demand.

Need for Coordinated Response

In order to ensure a systematically coordinated response and effective implementation of measures by public transport companies and authorities, contagious virus or pandemic response plans shall form the basis for action and measure implementation. In addition, all measures taken by governmental agencies and public transport companies in order to ensure safety of staff and

passengers as well as countering a further spread of COVID-19 shall be based on comprehensive impact assessments. Social, environmental and climate as well as economic impacts of measures shall be taken into account.

Mobility as a service

MaaS Global is in the business of moving people around and when people are not moving, they are seeing their sales drop to a fraction of what they were. For any business this is the definition of a crisis, and for this business too, although as a startup, its effects are different than they would be for an established business.

The central idea of MaaS is a promise that it will get you where you need to go, but how they get you there is not fixed. At a time of an emergency or a disruption, the need for alternative modalities and maybe new alternative packages is accentuated.

Electric bicycles, electric scooters, and other personal electric vehicles have long been touted for their economic and environmental benefits. But now we're seeing how these types of vehicles are being effectively employed as one more option to defend commuters from contracting and/or spreading coronavirus.

One of the biggest underlying factors leading to the rapid spread of coronavirus around the world has been the virus' ability to spread among people packed in close quarters, often days before symptoms emerge. Thus, it has become a common recommendation to avoid packed public spaces such as overloaded city buses and subway cars. While many commuters had already sworn off such forms of public transportation years ago after discovering the benefits of electric bicycles, e-scooters, and other micromobility options, other travelers fearing the spread of coronavirus are just now discovering these convenient transportation alternatives.

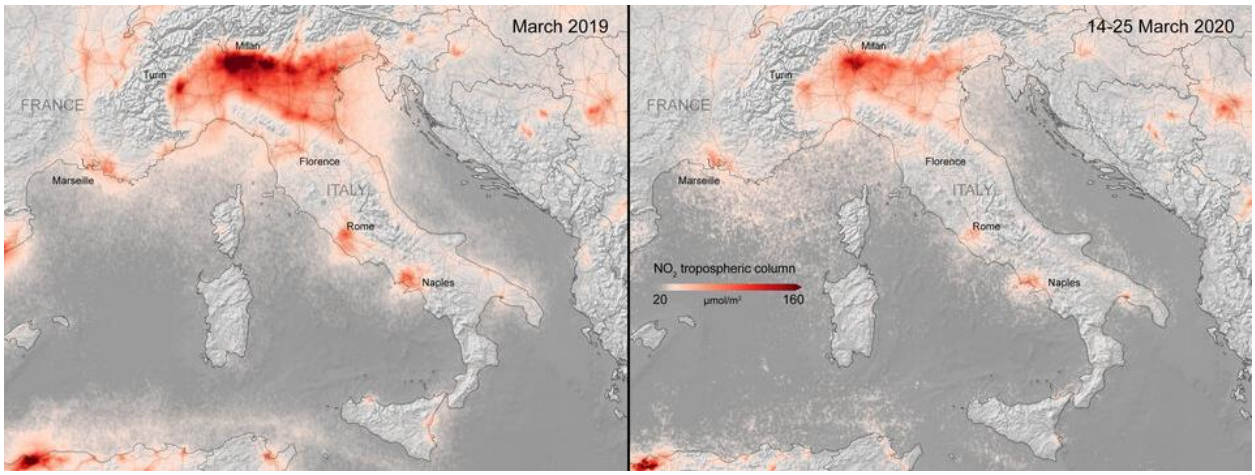
The COVID-19 virus pandemic has hit the world at a scale, pace and intensity like few events in living memory. Industries and governments have all been hit in one way or another, mostly for worse not better. One of the most dramatic changes has been in the transport section, with an almost overnight, unprecedented reduction in travel. At present, most countries are in some form of lockdown, with journeys severely restricted and reduced to essential trips only. In order to thrive – not just survive – in a new world already awakening from the COVID-19 nightmare, it will be important to better understand the opportunities available for MaaS, for it to be a key societal building block in the future.

This crisis has not simply meant a shut down of people travelling entirely. Rather, there are examples of individuals and companies using alternative forms of transport that they would previously not have considered. In the future, a willingness to look at alternatives may well increase.

Mobility-as-a-Service can provide unique value in a new world of social distancing, increased working from home, changed transport assets and commuters turning to increasingly varied and disparate transportation options.

Covid impact on mobility in Istria Region

As in the rest of the world, the County of Istria will also experience the effects of the Covid-19 virus, both negative in terms of economic crises and positive in terms of increasing use of alternative, eco-friendly transportation options such as bicycles, especially in the suburbs and cities. Another positive thing this virus has given us is that we have much cleaner and healthier air during lockdown.



https://www.sciencealert.com/europe-is-now-experiencing-the-same-drop-in-pollution-as-china-thanks-to-the-lockdown

When the virus hit Italy, the Region of Istria was most at risk of infection in Croatia because Italy is near the Region and there is a lot of people that daily crosses the border in order to go to work in Italy. As so, Istria County was among the first regions in Croatia to introduce virus protection measures. One of the measure was also the abolition of public transport which ultimately resulted in an increase in the use of bicycles as a major means of transportation in cities. As the most of County is currently working from home, we can see only a few cars in our cities through the day and all the roads are empty. There have been reports that more and more people are cycling and some bicycle shops, although closed, are seeing progress as more and more people are looking for alternatives to public transportation and are interested in buying a bike.

Although this virus will have many negative effects on economic indicators and society as a whole, it will still be possible to learn something from this situation - that we are not stronger than nature, that we have to protect the environment in which we live and can not pollute it. Now people will certainly think more about this topic and hopefully there will be a **change in behavior** in terms of transportation.

6 Definition of priorities in each involved area

It is therefore quite clear that environmental concerns and priorities represent the biggest limit for robust projections as well as the major driver for investing in the transportation sector; however, it is not the only one. There are indeed other very important drivers that lead to the innovation of this industry, some of which are reported in the following list (D.3.1.1., ITL)::

- People health
- Reduction of congestion
- Reduction of noise
- Improvement of passengers' wellness (convenience, comfort, etc.)
- Cutting of future maintenance costs
- Optimization of spaces and resources
- Minimization of accidents and thus safety improvement
- Improvement of accessibility

All these drivers are at the basis of a new concept of mobility: the Smart Mobility, highly technological, citizen friendly and with a low environmental impact. Smart mobility means technology, new transport infrastructures (parking lots, charging stations, road signs, vehicles) and new solutions for the mobility of vehicles (new mobility) and passengers. By switching to this new concept of smart mobility, we move towards the development of smart cities, made of a set of urban planning strategies aimed at improving the quality of life.

Priorities in Istrian region follow already defined KPIs in section 3.2. and also can take into consideration resultes of implemented surveys.

Safety and intercity connections are on the top of priorities especially when it is discussed about bicycle routes and lines. For example, the main reason why Rovinj – Kanfanar railway is being reconstructed is because that was the best way to redirect cyclists from the road.

Rehabilitation and conversion of railway lines (current state of the art)

Rehabilitation and conversion of railway lines (current state of the art)

It is important to gather and engage stakeholders from different areas and public authority representatives through QPMs also in order to better plan next steps and in order to take into consideration or develop documentation.

7 Recommendations

PILOT IN ISTRIA

In order to achieve 3 ICARUS goals (ICT/MaaS, behavioural change, intermodal mobility) and in line with identified needs and gaps in Istria region (higher demand for bike routes, better intercity connections, revitalisation of istrian railways, promotion of energy efficient modes of transport) it is recommended to implement it as following:

1. ICT/MaaS

- identify examples and possible IT solutions (challenges, needs, measures) in Istria county

2. Beahavioural change

- promotion of new bike route (Kanfar – Rovinj) which connects hinterland and coast and which is connected with istrian railway. From train station in Kanfanar there is a possibility to go in direction of Pula (coast) or Buzet, Lupoglav (hinterland). In orger to enable bike transport IDA will implement pilot activity which includes bike/train combination transport

Pazin (hinterland) bike share system (10 min walking from train station):

3. Intermodal mobility

- within this pilot intermodality will be promoted (bike and train) and safety goals will be achieved becaude cyclists will use more the new route than road

Source: Studio KAPPO d.o.o., Reconstruction of existing railway Kanfanar – Rovinj into a bike route, 2019.

<u>These steps are already covered by following documents:</u>

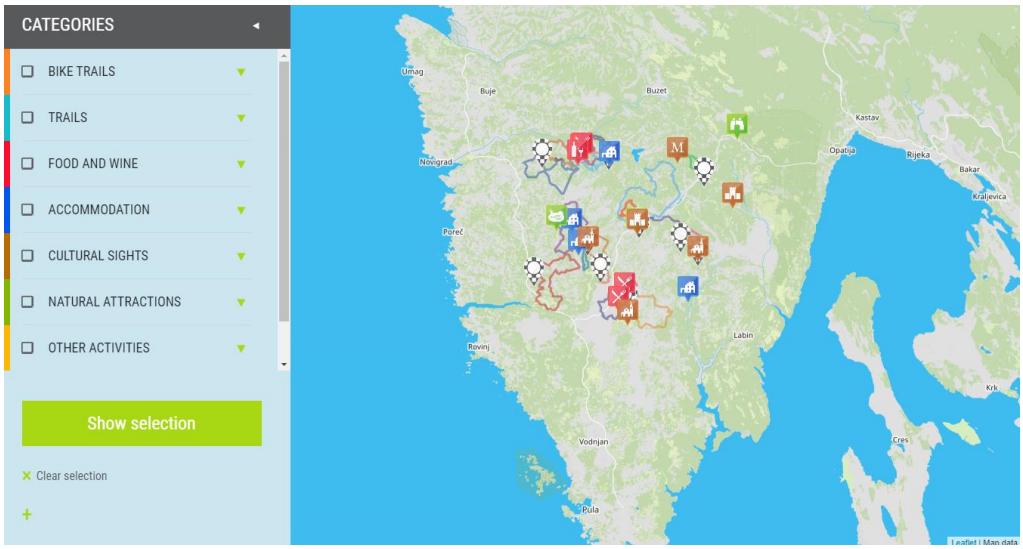
1. Master Plan For Developing The Traffic System Of The Functional Region Of Northern Adriatic (2018.)
2. Operational Plan for Development Of Cycle Tourism of Istria County for the Period from 2019 to 2025

<u>Other necessary steps to improve the state of play, based on the previous chapters:</u>

- regular stakeholders gathering and meetings in order to stay updated with local and regional needs and challenges
- identification of seasonality of mobility needs

<u>A set of measures to improve the situation</u>

- bike share system development
- raising awareness activities
- development of transparent (GIS or similar) map of all regional modes of transport, facilities and connections
- upgrade of existing map authentic Istria developed within Interreg project Insights



Source: https://authentic-istria.com

As the Istrian region is hardly working on development of IT sector but also on the digitalisation process, sharing mobility represents an answer on connecting mobility, digitalisation and enterpreneurship. In Europe, car sharing increased in the last years (from less than 1 million users in 2011 to a projection of 15 million users in 2020).

Public transport will not be able to accommodate the need for mobility and flexibility of modern users. So, even though private vehicles are still widely used, next to public transportations there is a new wave of mobility modes growing and they belong to the sharing mobility, a socio-economic phenomenon that affects the transport sector both on the demand and the supply side. On the demand side, sharing mobility demonstrates a transformation of individuals' behaviour, as they tend to prefer temporary access to mobility services rather than using their own means of transport. On the supply side, this phenomenon consists in the affirmation and diffusion of mobility services that use digital technologies to facilitate the sharing of vehicles and/or journeys, creating scalable, interactive and more efficient services.

Sharing mobility means bike sharing, car sharing, scooter sharing, but it also means carpooling, a mobility service based on the shared use of private vehicles between individuals who have to travel the same route, or part of it, and on-demand services.

MaaS platforms integrate also different mobility services, and mobility hubs are physical exchange platforms that facilitate the integration of different shared mobility systems.

Micromobility

However, there are also areas of low passengers' demand where regular bus services are not considered financially viable, such as the rural or peri-urban areas. These areas can today be reached by the so-called demand-responsive transport (DRT), a form of transport where vehicles alter their routes based on particular transport demand rather than using a fixed route or timetable.

These vehicles typically pick-up and drop-off passengers in locations according to passengers needs and can include taxis, buses or other vehicles. In the past, it has been used primarily for its social benefits, increasing opportunities for people with limited mobility, or those who are socially marginalized. However, DRT can also have significant environmental benefits through reducing the number of private vehicles on the road, and by supporting multimodal transport in cities, acting as the first/last mile solution for linking communities with broader transport networks (Interreg Europe, 2018).

All these new modes of transport can be offered either by private or public actors, and they can be incumbents or startups. It is worth considering that these different groups of players can have some peculiarities that affect their relationships, therefore they can cooperate but occasionally be competitors.(ICARUS, D.3.1.1)

8 Conclusions

In the area of urban transport, the emphasis is placed on the problem of traffic jams on the roads in the centers of major cities and tourist destinations and on parking. Upgrading the network and increasing capacity should be accompanied by improvements to the public passenger transport (PPP) system, pedestrian and bicycle path systems, etc.

Keeping in mind the pilot action that will be performed by IDA, some of the interchange nodes will be more visible and what is more important it can be useful for better understanding and dealing with passenger needs.

Interchange node in Kanfanar (bike/train connection from hinterland to coast)

The technological advancements and innovations thrown up a range of new mobility options within the 4th industrial revolution.

These major technological developments include big data, Artificial Intelligence (AI), the Internet of Things (IoT) and the emergence of new forms of energy. Internet of Things technologies are significantly influencing the future of mobility as they introduce a new, continuous communication channel between mobility stakeholders, increasing the ability to capture and share data. Also, the production on a massive scale of new, compact forms of energy, will allow for economies of scale and extended journey range, which will drive the adoption of electric mobility solutions.

This pilot action will be the first step for further promotion of istrian railways and their high potential for modernisation. It can enable gathering of all relevant stakeholders and dealing with existings needs and challenges in the region.

Also, it is in line with different plans and documents and its implementation will enable to reach ICARUS goals and open new opportunities for follow up projects.

D.3.2.7. Mobility needs and gaps in Primorsko-Goranska County

WP3 Understanding mobility needs and trends

A.3.2 Mobility needs and gaps in ICARUS region

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1 Table of Contents

Acronyms

PP	PP Partner
LP	LP Lead Partner
SC	SC Steering Committee
TMB	TMB Technical Management Board
FM	FM Financial Manager
PC	PC Project coordinator
PM	PM Project manager

2 Introduction

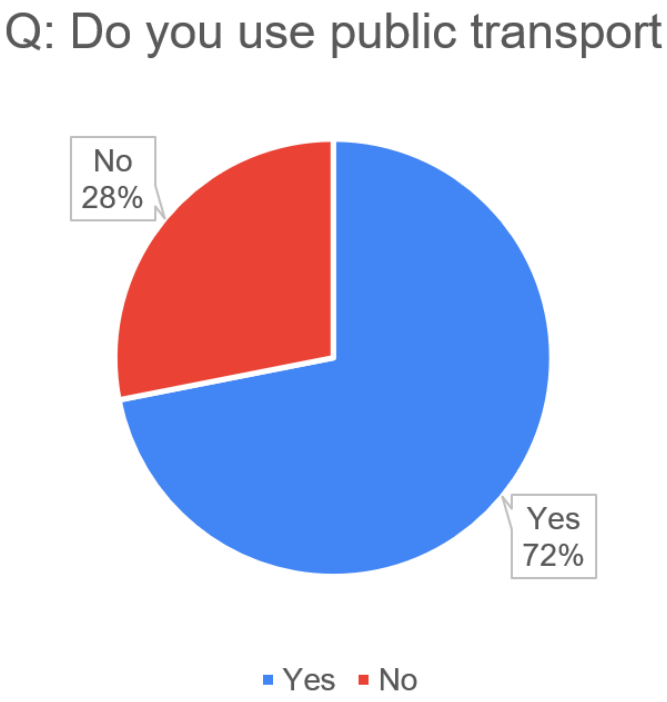
The public transport system in Primorje-Gorski Kotar County, and indeed Croatia for the most part is not integrated, except for a few examples of cooperation which enable usage of public transport through two or more different transport modes. A large percentage of the population currently prefers using their own private vehicles over public transport for a variety of reasons, which have been pointed out in the answers of the Mobility Needs and Gaps survey. New investments and offers are being made in order to create the behavioural change from using cars to using public transport.

This document will elaborate on the current transport situation in Primorje-Gorski Kotar County, the multimodal tariffs, schemes and tickets currently available, as well as policy and planning document which will have an impact on how the transport situation develops in the following years. In accordance to the available documentation, an estimation of future challenges in the region will be presented along with the definition of priorities in the area and possible recommendation for the recognized challenges.

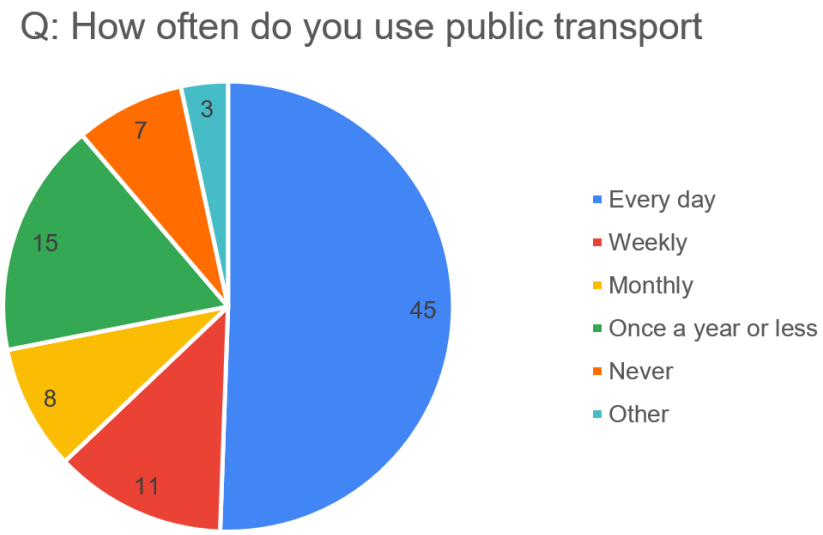
3 Identification of mobility gaps

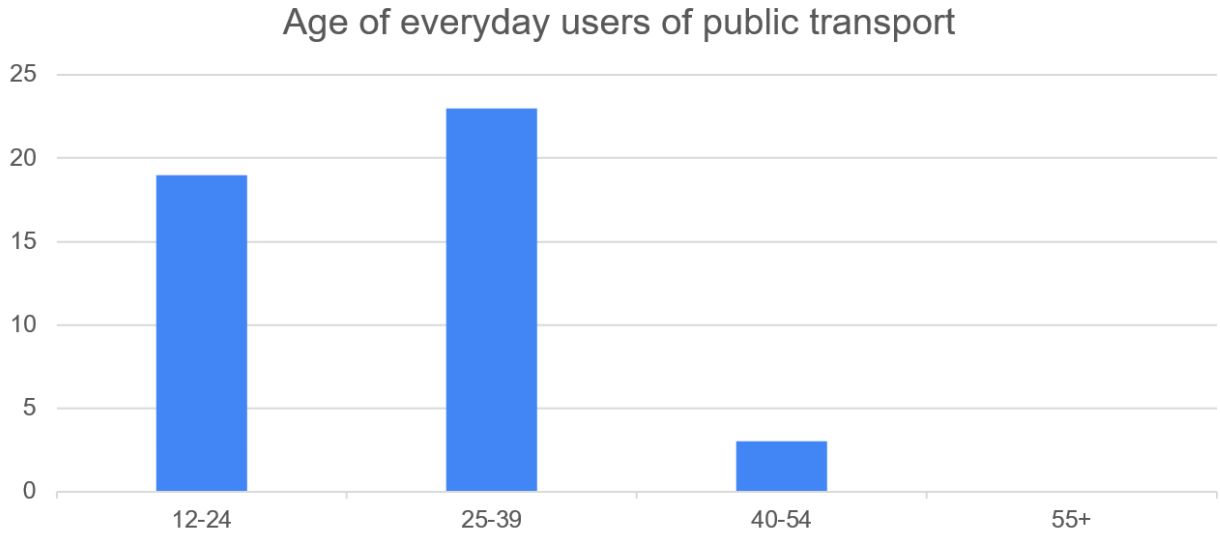
3.1 Survey to users to identify mobility gaps

The survey conducted on the general population in Primorje Gorski Kotar County was filled out by 90 citizens of different age groups from the Primorje Gorski Kotar county, mostly by citizens of the city of Rijeka. By analysing the results, we can come to the conclusion that most respondents are users of local buses.



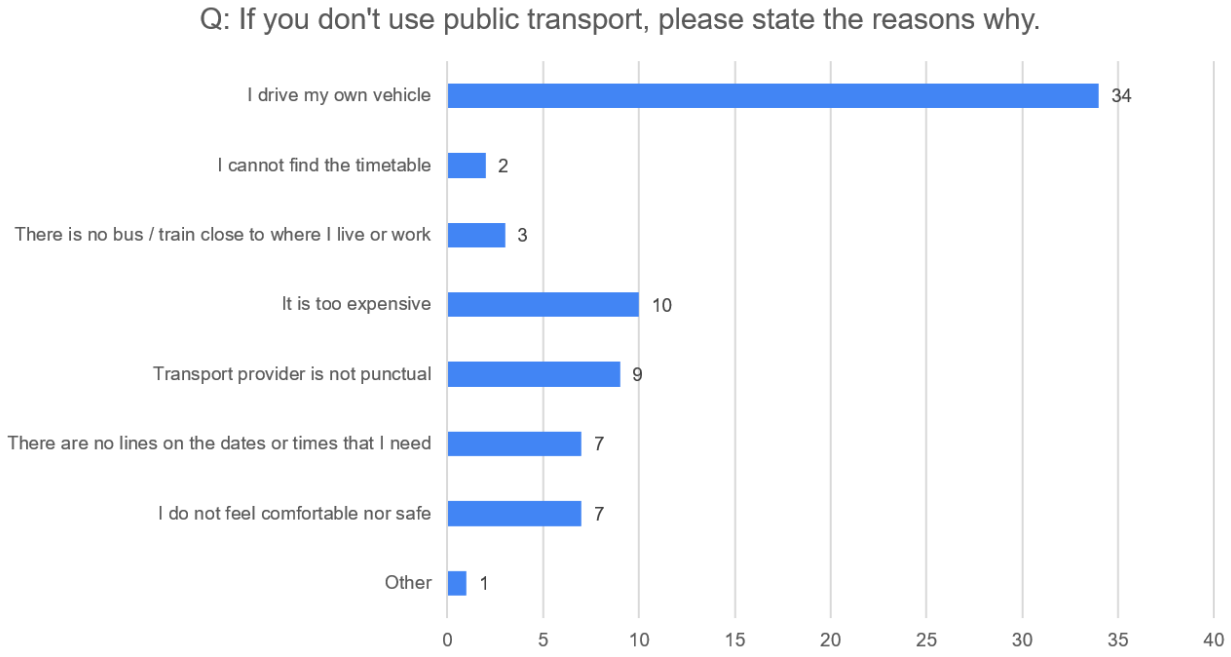
64 out of 90 people answered that they use or have used public transport. The frequency of usage mostly ranges from everyday users to monthly / few times a year users. The people who answered that they don't use public transport either don't use it at all, or use it infrequently, i.e. once a year or less. Out of the 64 users of public transport, 45 are daily users and 11 are weekly users.





The younger audience uses public transport a lot more often as can be seen in the graph above. The main purpose for using public transport is going to school, college or work. The three most common ways to purchase tickets for public transport are online, monthly subscription ticket and with cash when entering the vehicle. City public transport is used more than public transport in rural and suburban areas, and therefore there are less bus lines in those areas. The most

common complaint is about city public transport buses being too crowded. The majority of the users think that getting the information about lines and purchasing tickets is simple, but they also consider that the transport provider is not precise, and that that the transport provider doesn't offer a sufficient amount of lines, hence busses run less often and are more crowded. Another common complaint was that the busses are frequently running late, and a lot of the older busses are in bad condition, making rides uncomfortable, some cases even report rain leaking inside the bus during bad weather conditions. 34 out of 90 people stated that they rarely use public transport because they prefer using their private car. Most of the surveyed audience doesn't use public transport when travelling abroad. Another common point is that almost none of them use a bicycle their main mode of transport, only one respondent from Krk uses the bicycle regularly. For the city of Rijeka, it is difficult to use a bicycle as the primary transport option because of the lack of bicycle tracks and most importantly, lots of changes in elevation, making the difficult uphill and downhill riding more common than riding on level terrain. All of this brings us to the conclusion that passengers would enjoy and use public transport more if the providers offered a more precise service and a more comfortable journey.



As shown in the graph above, 34 out of 90 surveyed individuals list using private vehicles, either because of preference or necessity, rather than using public transport. Personal vehicles offer comfort, convenience, flexibility and a sense of safety, which are all reasons why public transport is used less, and why a large percentage of people use cars over public transport.

3.2 Key Performance Indicators

Based on the answers of the collected mobility needs and gaps survey, the identification of some of the key performance indicators was done. The first group of key performance indicators are for measuring the user satisfaction with the current public transport options. This allows us to learn about the overall satisfaction of the user, which improvements does the user suggest to increase the level of satisfaction and which faults are the most responsible for lowering the satisfaction rate. The greatest amount of knowledge about the possible improvements to public transport as well as current negative faults which turn potential users away from public transport, is gained through the descriptive answers, especially on the last question which allows the individual to

express their experience with public transport and suggest improvements which they consider important.

The second group of key performance indicators consists of improving the image of public transport and making public transport something the individual would prefer using on a daily basis, possibly by introducing new routes and offers which benefit the users greatly. Intermodal transport systems have the potential to significantly reduce each individual's carbon footprint. This can be accomplished through the usage of multiple greener modes of transport, such as combining cycling/walking with public transport and changing the behaviour towards reducing the usage of private cars. Cycling and walking are particularly effective means of mobility on shorter routes and in urban areas. The city of Rijeka in general is not very suitable for cycling because of the amount of elevation changes, which results in lots of uphill cycling. The city center and the area around it are flat and could be well-suited to cyclists, but the lack of cycle lanes makes cycling more difficult. The areas in which cycling can be easily realised are the pedestrian zones in the city core and the pier Molo Longo. Cycling in smaller towns and villages across the county can be accomplished depending on similar factors that are present in the city of Rijeka, such as elevation changes causing difficult uphill cycling, lack of cycling paths and using pedestrian zones to cycle.

3.3 Needs

Three main measures have been recognized as necessary and those are: improving passenger intermodality; improving passenger transport service quality; and improving the general public's views on public transport.

By implementing the first measure, each transport mode will be used to its potential, and the sustainability of the transport system can be ensured. First steps towards introducing high quality intermodal transport have been taken by introducing the option of train transport from Šapjane to Fužine combined with city bus transport in Rijeka. In order to create truly relevant public transport experinces for users, more combined transport options similar to this one will need to be introduced, especially on the regional level, enabling faster and higher quality transport in the City of Rijeka, the cities and towns of Primorje-Gorski Kotar county, as well as better connections with other counties.

The second and third measure are intertwined, which means by bringing the public transport service quality to a higher level, the general opinion of the public will shift and they will stop perceiving the city buses as the tardy, imprecise, unreliable, uncomfortable and inferior mode of transport. Along with the upgrade to the service quality, public transport should be promoted as safe and environmentally friendly means of transport, which will help encourage demand.

3.4 Involved public and private bodies and their role

Type of stakeholder	*Stakeholders and brief description*	*Role in implementation plan*
Public Transport	• *HŽPP* • *Arriva* • *Autotrolej*	*Promotion of their lines and more knowledge about passenger needs;* *Share knowledge about PT options and new services*
University / Higher education	• *Veleučilište u Rijeci – Prometni odjel* • *Pomorski fakultet u Rijeci*	*Gaining and sharing knowledge about passenger needs and possible public transport solutions*
Regional authority	• *PGŽ, Upravni odjel za pomorsko dobro, promet i veze*	*Promotion of public transport options, gaining knowledge about passenger needs;* *Offering possible solutions for encountered problems and sharing knowledge about policy measures*
Shipping company / Maritime transport, shipbuilding and transport	• *Jadrolinija* • *Rapska plovidba* • *Lošinjska plovidba – Holding*	*Sharing knowledge about passenger needs and possible solutions*
Croatian Shipowners' Association	• *CSA Mare Nostrum*	*Gaining and sharing knowledge about possible public transport options, knowledge about passenger needs and possible solutions*

4 Current transportation's status in the area

4.1 Current transport situation

Primorje-Gorski Kotar County covers an area of 3.588km^2 which is 6,34% of Croatian territory, and has a population of around 296 000, which is around 6,91% of the total Croatian population, making it the 5th most populated county in Croatia. The city of Rijeka is the regional center. It has a population of around 128 000, which makes it the 3rd largest city in Croatia.[1,2] The transport infrastructure system consists of all transport branches interconnected with the aim of providing a safe, efficient and competitive unique function of the provision of transport services. The traffic system of Primorje-Gorski Kotar County is structured into the Rijeka Traffic Node and a series of traffic routes. The Rijeka traffic hub consists of: Rijeka port terminal; Rijeka railway junction; and Rijeka road junction. The traffic system of the wider area of the City of Rijeka (Rijeka traffic junction) consists of: Line transport corridors and Passenger and freight terminals of road, rail, sea and air traffic. In the Primorje-Gorski Kotar County, the public bus and suburban public bus transport systems are organized by Autotrolej in the city of Rijeka and its surrounding settlements.[6,9]

The TEN-T Mediterranean corridor passes through the county, combining components of all transport modes – road, rail and maritime modes, and connects them to major traffic hubs. In rail transport, the backbone of the Rijeka traffic junction consists of railway lines of significance for international traffic on the Vb branch of the Pan-European Corridor, from the state border with Hungary, and towards Botovo - Koprivnica - Zagreb - Rijeka – Šapjane, Primorje-Gorski Kotar county has 31 official train stops for reception and dispatch of passengers. There were 23 trains operating in the Primorje-Gorski Kotar County on a daily basis in 2017. That number may have changed since then thanks to the recent ITS innovation by Autotrolej and HŽ - The system of integrated passenger transport which is now operational and includes train transport from Šapjane in the west, to Fužine in the east, as well as a large number of city and suburban buses. The integration is being implemented through a unique monthly subscription card for transport by both train and city buses. According to the Croatian Bureau of Statistics, the number of passenger

departures in Rijeka's railway transport has been dropping from 2012 to 2017, and has only recently recovered. The number of departures dropped steadily each year from 130.361 in 2011 to 73.115 in 2017, and has recovered to 120.097 in 2018. [2,4,8,9]

Table 1: Railway traffic – Departures of passengers from 2011 to 2018

Year	Departures in Rijeka	Departures in Croatia
2011	130.361	13.501.299
2012	123.672	14.224.479
2013	94.729	13.245.067
2014	81.321	12.562.968
2015	78.835	13.196.792
2016	76.303	13.505.677
2017	73.115	13.179.063
2018	120.097	13.338.035

Source: dzs.hr

In the area of Rijeka road junction, the final motorway network is not fully defined, all three motorway corridors end at the Rijeka bypass, that is, the express road outside the toll system, which is extremely busy and does not have the possibility of profile expansion. It is necessary to define a definitive network of motorways and expressways taking into account the interconnection of motorways and expressways in a hierarchical sense, as well as the way of managing traffic flows with respect to the travel destinations - remote (interregional), regional and local and their interconnectedness. The existing traffic image of the city is outlined primarily in the network of roads and highways ending at the Rijeka bypass, integrating traffic from the Adriatic longitudinal, consisting of:

- part of the A7 motorway from Rupa to Matulji, express road D8 / E65 from Matulji junction to Orehovica and Sv. Kuzam and the state road D8 / E65 to Zadar, Split and Dubrovnik,

- traffic of the Istrian axis A8 Kanfanar - tunnel Učka - Matulji,
- traffic of the motorway A6 (A1) Rijeka - Zagreb.[1,3,6,8]

The concept described in the Integral study of space and transport in Primorje-Gorski Kotar county and the city of Rijeka projects the Rijeka road junction with the displacement of the A7 and A8 highway corridors into the hinterland, and with the completion of the construction of express roads to the Opatija Riviera and Krk as an enabler of high quality connectivity of the whole area and its smooth development, especially with regard to the development of tourism and the port of Rijeka. The Rijeka Bypass would take on the role of a high-speed city road with the possibility of interpolating new hubs to better connect the city network. The road network in the inner-city area must primarily satisfy the role of city functioning in all segments of urban life, both present and future. The city center itself is intensely attracting traffic primarily for business reasons. The Croatian Bureau of Statistics lists Primorje-Gorski Kotar as the county with the 3rd largest number of registered road motor vehicles in the Republic of Croatia with 170.352 total registered vehicles in 2018.[1,9]

Table 2: Number of registered road motor vehicles in 2018

Type of vehicle	Registered vehicles in Primorje-Gorski Kotar	Registered vehicles in Croatia
Passenger cars	136.278	1.666.413
Mopeds	8.102	83.362
Motorcycles	8.659	73.997
Buses and coaches	472	5.877
Lorries	13.113	169.175
Road tractors	946	12.229
Special purpose vehicles	904	13.548
Agricultural tractors	1.878	123.461
Total	170.352	2.148.062

Source: dzs.hr

The port of Rijeka is the largest port in Croatia, and its impact is immediate on all traffic modalities. The Port of Rijeka Authority, with its development plans, affirms the role of the port of Rijeka, the largest port on the eastern Adriatic coast. The existing spatial-technical conception of the maritime and port system of Primorje-Gorski Kotar County is mainly concentrated around Rijeka, which is part of the urban whole of the city. The port of Rijeka is, however, primarily a cargo port, and the passenger traffic of the port of Rijeka focuses on long-haul passenger shipping lines that connect Rijeka with Split and Dubrovnik, as well as lines which connect the PGŽ coast with the islands. Along with the four larger islands (Krk, Cres, Lošinj and Rab), a few of the smaller islands are also connected to the coast through maritime transport. These islands include Vele Srakane, Male Srakane, Sussak, Unije and Ilovik. From the traffic point of view, these islands have their internal transport systems and are connected to the mainland by sea. Connecting the island to the mainland is a fundamental form of territorial integration. “The integration of the space is directly related to the openness of the County space. Connecting the island to the periphery is a necessity and necessity imposed by the economic orientation, based on the openness of the area. The openness of space experiences its meaning and justification in the integration with the periphery, which is realized through important local, regional, European and world transport corridors and connections on land, sea and in the air.”[12] The passenger port of Rijeka spatially occupies the central part of the port and is located in the city center. During the summer season, a large number of tourist boats / sailing ships come to the port, to which the port of Rijeka is the starting port for cruises around the Adriatic. An additional advantage of the passenger port is the close proximity to the train and bus stations. In addition to the Port of Rijeka in Primorje-Gorski Kotar County area, there are 55 sea ports open for public traffic, 5 of which (Mali Losinj, Merag, Misnjak, Porozina and Valbiska) are of county importance, while the other 50 ports are of local importance, positioned in the centers of their cities and municipalities, which all together create the so-called. "Blue Highway". The public passenger transport in maritime transport focuses on connecting the islands to the mainland. Public maritime transport in the North Adriatic is provided through 6 state ferry lines, 3 state express lines and 3 shipping lines. Public transport is entirely carried out using vessels from the national fleet. The quality of the transport service depends mainly on the age and features of the vessel that determine the quality level of the transport service. According to

the analysis conducted in the Integral study of space and transport in Primorje-Gorski Kotar county and the city of Rijeka, passenger traffic in the Primorje-Gorski Kotar county showed stable growth on most Ro-Ro passenger lines and increased interest in the use of HSC ships. [1,10,12]

Rijeka and Mali Lošinj airports are used for regular international and domestic air traffic (network, charter and low-cost airlines), as well as for irregular air traffic especially during the tourist season (summer, part of spring and autumn). There are regular flights to major neighbouring airports and international hubs such as Paris, Frankfurt, Vienna, Munich and London. Rijeka Airport is predominantly of international character, while Mali Lošinj Airport is of local character. [1]

Table 3: Airport traffic from January to October 2019

Month	Airport passengers in Rijeka	Airport passengers in Mali Lošinj	Airport passengers in Croatia
January 2019	1.835	3	257.219
February 2019	1.515	7	251.797
March 2019	2.088	77	345,674
April 2019	7.584	129	755.657
May 2019	17.103	212	1.115.680
June 2019	30.502	523	1,556.373
July 2019	41.026	758	1.974.671
August 2019	45.853	1.122	1.951.147
September 2019	30.551	411	1.494.392
October 2019	16.296	72	1.016.220
Total	194.353	3.314	10.718.830

Source: dzs.hr

In addition to those 2 main airports, the following approved airports are also in use: Grobnik Airport; Rijeka-Port Rijeka Airport (on the water); Mali Lošinj Airport (on the water); Rab Airport

(on the water). According to the Master Plan for the development of the transport system of the North Adriatic functional region, existing airports meet the needs of the functional region, so the planning and construction of new airports is not necessary, but technical, technological and security improvements, extensions and upgrades of new areas of existing airports and airports are necessary. [1,8]

The inter-county public transport connection is based primarily on the system of public transportation of passengers by bus. Other forms of traffic have very little representation. Inter-county bus lines connect the counties well; rail lines connect the counties extremely poorly; maritime lines are incomplete and incompatible with bus lines; Rab is well connected with the mainland from the direction of Zagreb, Rijeka and Istria, and disconnected from the direction of Dalmatia. The system of urban passenger transport has been established in the wider area of the city of Rijeka. There are 18 city and 31 suburban bus lines in the city of Rijeka. The status of ticketing IT systems in public transit is not at the level of developed European countries, but there have been some positive developments in this area. As part of public transport, modern ticketing systems have been used, and passenger information systems, passenger counting systems and the like have begun to develop. This trend needs to be continued as this increases the quality and competitiveness of public transport in relation to the personal automobile. [1,10]

Today it can be said that the City of Rijeka, the City of Opatija, the City of Crikvenica, the City of Krk, the City of Kastav, the Municipality of Čavle, the Municipality of Omišalj, the Municipality of Viškovo and others are co-owners of several companies, but also participants in the implementation of joint projects. This cooperation is not always easy because it is about achieving local goals that are not the same for each participant. However, joint efforts to find a common development concept, despite local boundaries and legal competences, give special weight to a compromise solution that supports regional development. [1,9]

4.2 Planning and policy documents

There are several important planning documents for the regional level and one made just for the city of Rijeka. These documents are: Master plan for the development of the transport system of the North Adriatic functional region; Integral study of space and transport in Primorje-Gorski Kotar county and the city of Rijeka; Transport Development Strategy of the Republic of Croatia 2017-2030; Primorje-Gorski Kotar County Development Strategy 2016 – 2020; and City of Rijeka Development Strategy 2014 – 2020.

The main objective of the Master Plan is to achieve an efficient and sustainable transport system in accordance with the needs of the economy and the inhabitants of the North Adriatic. The development of the transport system in Croatia is extremely important for economic and social growth, as well as for international connectivity. A transport system consisting of transport infrastructure and organization is an instrument of regional development that drives the exchange of goods and better accessibility to all economic, health, tourism and other facilities.[8]

The main goal of the Integral study of space and transport in Primorje-Gorski Kotar county and the city of Rijeka is to connect the entire transport system, which includes both public and individual, road and rail, air, maritime and pipeline transport. The study proposes strategic, long-term road and railway routes and facilities, as well as short-term necessary interventions for upgrading and reconstructing of existing road and railway network and road facilities. It also contains a proposal of necessary changes to the spatial planning documentation based on the analysis of the existing situation. The study contains Spatial engineering study recommendations which include information on traffic-geographical significance of major road and rail routes, ports and air terminals as well as the necessary measures for the development of the spatial transport system.[1]

The Transport Development Strategy for the Republic of Croatia points out the importance of the transport infrastructure development for economic and social development, facilitating the flow of goods, as well as the access of people to employment, health, education and recreation. In order

to develop this strategy, 6 sector subcommittees were organized for developing concepts of sector strategies for rail, road, maritime, inland waterways, air transport and for the first time on the level of national strategic transport planning, sector for urban, suburban and regional mobility. The objectives of the Transport Development Strategy are: assessing and defining the future measures in the transport sector related to international and national transport in all transport segments independent from the funding source; providing the framework for the development of interventions and defining the interfaces to other strategijes or assessments; taking into account European strategies and requirements; identifying the need for further data collection/generation and defining the consecutive steps to be taken for future revisions of the strategy. [10]

The spatial plan of the Primorje-Gorski Kotar county's main principles are defined by strategic documents, starting points and goals of the plan. Those principles include: Regional concept; open space; space as a resource; polycentrism; interactivity; and sustainable growth. This Plan sets out the following basic development goals in the County: To qualitatively evaluate the geo-strategic position and natural resources of the County through emphasized maritime orientation and construction of the missing infrastructure; Provide the preconditions for a high growth rate of the economy that guarantees balanced and sustainable development throughout the County and increase the overall level of development; Increase people's standard, employment and quality of life, and establish an economic and demographic balance of growth and development; Develop a quality transport system that meets the needs of transport connectivity at all levels (region, country, EU), integrating all transport branches; Develop water supply systems and especially drainage systems; Build a comprehensive county waste management system; Provide spatial planning prerequisites to meet the basic needs of the population by relying on their own resources and resources in conditions that can trigger the end of the era of cheap energy and fossil fuels and / or climate change; To preserve the biodiversity of ecosystems in the terrestrial and submarine parts of the County, especially areas rich in plant and animal species. The basic goals of spatial development are implemented by the spatial plans of the municipality or city.[7]

The three main goals of the Primorje-Gorski Kotar County Development strategy are: 1) Developing a competitive and sustainable economy; 2) Strengthening of regional capacities and uniformed growth; 3) Human resources development and quality of life enhancement. One of the three main goals of the Development strategy is related to traffic and transport – “Developing a competitive and sustainable economy”. Priority 1.5. of the aforementioned strategic goal focuses on the development of key economic activities which includes developments in the transport sector, the most important of which is the development of the Rijeka traffic hub as a transnational transport hub.[6]

The three main goals of the City of Rijeka Development strategy are: 1) Position Rijeka globally by developing Rijeka’s traffic route; 2) Develop a competitive economy on the basis of a knowledge-based society and new technologies; 3) Ensure the dignity of all citizens by enhancing social inclusion and developing projects of common interest. “Position Rijeka globally by developing Rijeka’s traffic route” is the strategic goal related to traffic and transport. The three priorities of the aforementioned strategic goal are: 1) Development of Rijeka’s traffic route; 2) Logistics connection of entrepreneurs within the Rijeka traffic route; 3) Integration function of transport systems.[9]

4.3 Multimodal integrated tariff schemes and tickets

The spatial plan of the Primorje-Gorski Kotar county has set up a spatial-traffic model of the hub type as an intermodally defined transport network in the function of economic development. The Rijeka traffic junction is a priority for the road junction, the Rijeka railway junction and the Rijeka port terminal, which does not exclude other traffic branches. [7]

An excellent recent example of integrated passenger transport is the joint system made by HŽ Passenger Transport and Autotrolej that has been put into operation. The system combines city bus and train transport. Trains transport passengers from Šapjane in the west, to Fužine in the east, with passengers using a unique monthly subscription card for transport. The joint monthly ticket of HZPP - KD Autotrolej is valid from September 1, 2018, and the joint ticket enables

transport within 4 HŽPP zones by train (40km further from Rijeka) and the first bus zone (the city of Rijeka) for Autotrolej buses. In addition to the monthly ticket, single ride tickets are also available for both train and bus rides. The desire of both HŽ Passenger Transport and Autotrolej is to encourage an increase in the number of trips by public transport, which will lead to a decrease in the number of passenger cars on the roads, an increase in road safety and a reduction in exhaust gases. Full implementation of the integrated passenger transport system is expected after the construction of the second railway track from Škrljevo to Jurdan. HZ Passenger Transport's and Autotrolej's plan is to open additional railway stops by the end of the year and, in accordance with the needs of the users, to start further adjustments to the timetable of both trains and buses, so that the meaning of integrated transport is complete.[4,5]

Other than that, an absence of an integrated tariff system is noticeable. This results in intermodal public transport being more expensive and more difficult to organize, as the much simpler option is to use a private car, which a high percentage of people are doing, both in the results of our survey and the data available on the Croatian Bureau of Statistics' website.

The Project for the construction of the second railway track is an ongoing project and is one of the most important public transport plans for Primorje-Gorski Kotar county. The project includes the reconstruction of the existing terminal stations and railway stations on the railway line section Škrljevo - Rijeka - Šapjane and the construction of new railway stations for use in urban and suburban transport and in doing so, establishing a high-speed city rail in the city of Rijeka. Stations outside the city limits (Jurdani, Škrljevo, along with Matulji, Rukavac and Jušići) will be used as end points. With the introduction of high-speed city rail, the plan is to lessen the amount of traffic congestion, and increase the quality of city public transport. Transportation organized in this way has the significance of suburban transportation. The length of the route within the city limits is approximately 18 km. This project, currently in the documentation preparation stage, involves the reconstruction and renovation of the existing railway section from Škrljevo to Jurdan and the construction of a second track on the Škrljevo - Rijeka - Opatija / Matulji section, with new railway infrastructure subsystems, as well as the reconstruction of six existing railway stations and four

stops and the construction of seven new stops. This construction also fits into the future stages of the construction of the Rijeka junction, which are related to the construction of a new lowland railway from Zagreb to Rijeka and a new railway line from Rijeka to Istria.[9,11]

4.4 ITS, ICT & MaaS solutions

ITS, ICT and MaaS solutions in the County of Primorje and Gorski Kotar are to be tackled within ICARUS project since there is a lack of such solutions. The improvement of quality of public transport is essential to increasing the number of public transport users. This includes adapting the timetables to the needs of the customers; offering more options for both one-time users, as well as monthly subscribers; offering better ride quality, which has been accomplished with the recent purchase of 22 new buses, co-financed by the EU; offering software solutions, such as e-ticketing and timetables being available online. Promoting public transport as a safe, reliable and environmentally-friendly mode of transport encourages further investments as well as raises awareness, which can lead to the increase in demand. Both self-promotion on websites and social media, as well as involving traditional media channels are excellent ways that help achieve those goals.[10]

Passenger information systems are a key communication channel between public service providers and end-users. Modern passenger and driver information systems contain dynamic information which are updated in real-time. By increasing user awareness, these systems also increase user satisfaction, which in turn can help with attracting new users. In the public transport system, it is of utmost importance to increase passenger awareness in order to make public transport easier to use. Each user of public transportation must be provided with accurate, real-time information in a convenient and easy way to facilitate the use of the public transportation system to the fullest extent possible.[10]

5 Identification of future challenges in the area

The Transport Development Strategy of the Republic of Croatia (2017 - 2030) established that public transport in the Republic of Croatia is not currently integrated because there are no harmonized timetables, as well as systems for the sale of unique tickets for various modes of transport. Intermodal terminals, which make it possible to switch between modes of transport, are extremely rare. [7,10]

Coordination of public carriers, infrastructure managers, units of local and regional self-government and state bodies should be strengthened with the aim of achieving better transport connections in the Primorje-Gorski Kotar County area. It is necessary to realistically consider the transportation needs of the Primorje-Gorski Kotar County and the City of Rijeka and jointly create feasible plans with the aim of improving public transport of passengers.[1,2,6]

A current challenge for the City of Rijeka is the high amount of personal vehicles usage (136.278 registered passenger cars in the Primorje-Gorski Kotar county) in road transport which causes both ecological problems as well as traffic congestion, especially in the city center. The city of Rijeka does not have the road infrastructure necessary to be able to deal with such high congestion levels on a daily basis during working hours.

The quality of roads in Rijeka has declined in recent years, with many roads being damaged from extended use, and some which were badly built, requiring repairs in the near future. Most of these roads are located in the city core (first zone of Autotrolej's city bus transport), which means, bus usage combined with the large number of personal vehicles that use the same roads, make this zone's roads the most travelled on in the area.

According to the Master Plan for the development of the transport system of the North Adriatic functional region, one of the biggest problems in the public passenger transport system (especially road transport) is the lack of a single database of transport supply (network of

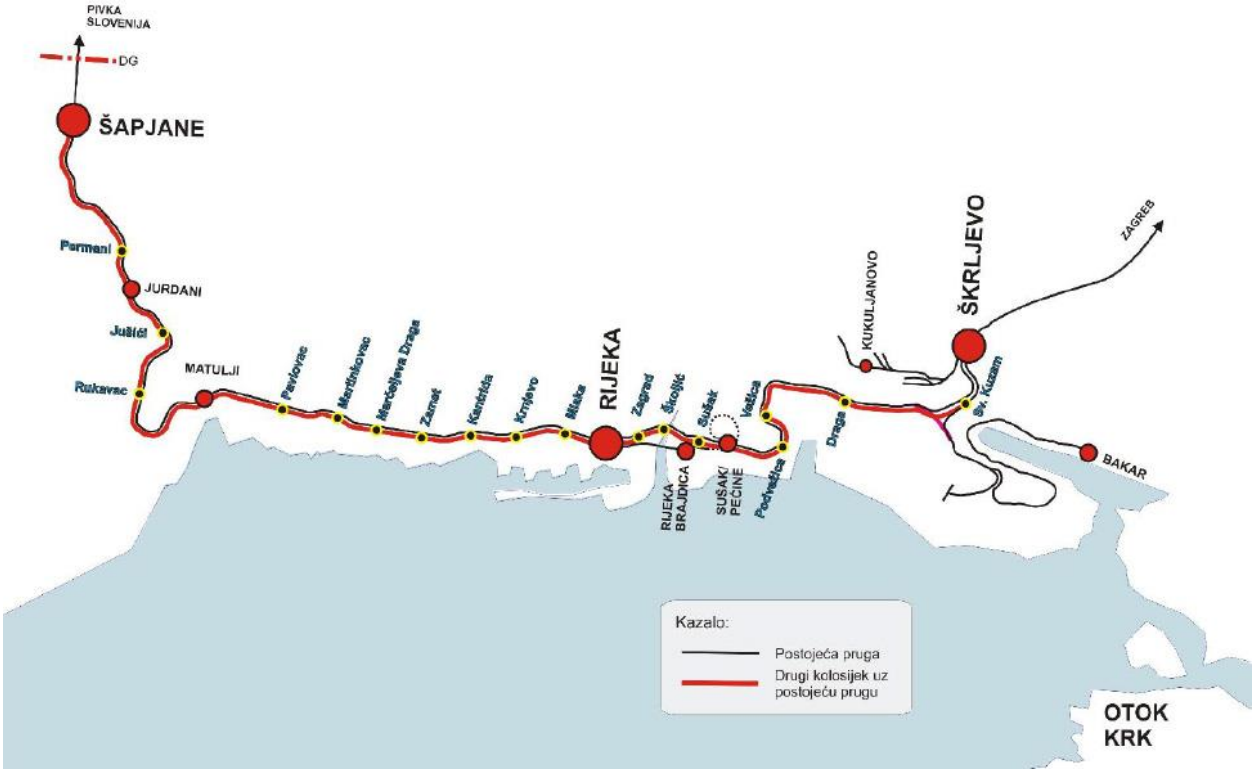
timetables) and transport demand (number of passengers carried and analysis of travel needs). For this reason, no systematic optimization or planning of public transport is possible without conducting complex and comprehensive research. Another problem identified by the Master Plan is the functioning of county and inter-county transport on a purely commercial basis. For this reason, only those lines that have a financial justification are mostly realized. As a result, the situation is that the areas farther from the larger cities are very poorly covered by public transport (both spatially and temporally). In this segment, over a number of years, there has been a "vicious circle" in which there are no bus lines because there are no passengers and no new passengers because there are no bus lines. In this way, residents of more remote areas of major cities are forced to own one or more cars per household, which is neither financially, economically nor environmentally acceptable. [8]

According to the Integral study of space and transport in Primorje-Gorski Kotar county and the city of Rijeka, it is necessary to define a definitive network of motorways and expressways, taking into account the interconnection of motorways and expressways in a hierarchical sense, as well as the way of managing traffic flows with respect to the objectives of travel - remote (interregional), regional and local and their interconnectedness. This can be achieved by designating a new A7 motorway corridor bypassing the city of Rijeka, while maintaining the Rijeka bypass as a distributor of traffic flows between state roads and the motorway network. It is also necessary to designate a new corridor of the A8 motorway on the route from the Učka tunnel to the A7 motorway (Rupa - Rijeka section). The planned motorway network can be divided into the central and eastern part (A7 and A6) and the western part (A8). The central part of the planned motorway network is the planned corridor of the A7 motorway, section Permani - Grobničko polje. The eastern part is the new corridor of the A7 motorway at the junction of the Grobničko polje junction - the A6 motorway - M. Svib junction - Križišće junction. The section Križišće - Žuta Lokva has already been previously defined, passing through the hinterland of Crikvenica, Novi Vinodolski and Senj, and the junction Žuta Lokva connects to the constructed highway A1 Zagreb - Split. The western part is the new corridor of the A8 motorway along the Učka tunnel - Veprinac junction - Jušići junction (existing A7). This corridor establishes the continuity of the motorway network

with the Istrian "Y" which is categorized as a motorway. The study also covers the planned roads of importance for the state, county and City of Rijeka. Planned roads differ according to the degree of preparedness of planning and project documentation. In addition to the new corridors and lanes, it is planned to reconstruct the hubs and upgrade the new hubs on the existing roads.[1]

In accordance with the development plans of the Port of Rijeka and the Strategy for Transport Development of the Republic of Croatia, respectively the development plans of the City of Rijeka and the Primorje-Gorski Kotar county, certain stages of modernization and construction of the Rijeka railway junction have been determined. The modernization and construction of the node is foreseen in four stages. The first phase mainly involves the modernization of existing capacities; The second phase involves the construction of a second track from Opatija/Matulji to Škrljevo. These works also envisage the construction of stops for urban and suburban traffic on that route; The third stage involves the construction of a new lowland railway and a new bridge and railway line to Krk; The fourth stage involves the construction of the Rijeka railway bypass. When determining the stages of construction and modernization of the Rijeka node, care was taken that each of them represents a complete technical and technological unit. It is also taken into account that each phase must be an integral part of the final solution of the node, and that the existing capacities, with the necessary modernization, are used to their maximum capacities, and only after their saturation, begin the construction of new facilities. The construction of these stations is taking place along the entire corridor, and includes the following stations: Pavlovac, Martinkovac, Marčeljeva Draga, Kantrida/Zamet, Krnjevo, Mlaka, Center (railway station), Zagrad, Školjić, Sušak, Pećine, Podvežica, Vežica, Draga and Sveti Kuzam. This project is one of the most important ongoing transport project in the Primorje-Gorski Kotar county and the main goals of the project are the establishment of the second track on the already existing Škrljevo - Rijeka - Opatija / Matulji railway section, the reconstruction and renovation of the existing railway section from Škrljevo to Jurdan and introducing a high-speed rail system in the city of Rijeka. The Rijeka railway junction is part of the TEN-T corridor and the RH2 – Croatian railway corridor, the origin point and the destination of roads and railways which connect Continental Croatia, and thus the entire European transport system to the Adriatic Sea.[1,10,11]

Picture 1: Map of the planned construction of the second track on the Šapjane-Rijeka-Škrljevo section (marked red)



Source: Rijeka.hr

6 Definition of priorities in each involved area

Improving traffic connections is focused on the public transport connections in the general region of the city of Rijeka (including surrounding settlements), and the connections with the surrounding counties. This priority should aim at increasing the share of public transport (city buses) in suburban areas and making the travel from Rijeka to any of the surrounding settlements, and vice versa, more frequent and therefore more accessible.

The purchase of the new buses for the local public transport in the city of Rijeka is a great step towards increasing the quality of transport offered, as well as improving the image of public transport and retiring old buses which are at the end of their lifespan which makes them slow, uncomfortable and prone to malfunctions.

Creating new offers, which can include intermodal passenger transport options, and new routes should be a priority, one that can greatly encourage the behavioural change from using private vehicles to using public transport and active modes of transport, such as the intermodal options – bicycle-bus or bicycle-train.

Enhancing regional train and bus options can be done through measures similar to the ones mentioned above, but implemented on a larger scale / across longer distances. Introducing new routes and offers which include intermodal options and the usage of active modes of transport, the purchase of new equipment (Such as Autotrolej's recent procurement of new buses) all help improve the image of public transport, and with the offering of better quality services, the public may start to shift from using personal cars to more frequently using public transport. The new city buses for Autotrolej, in addition to the gas-powered buses contribute to achieving the "3x20" goals set by the City of Rijeka. Those goals are – reduction of greenhouse gases by 20%; reduction of energy usage by 20%; and increase of energy consumption from renewable sources in total consumption by up to 20%.[9]

7 Recommendations

In order to reduce the representation of passenger cars as the primary choice of the majority of users, resulting in traffic jams, degrading safety in the transport system and negatively impacting the environment, it is necessary to increase the share of public transport in the total traffic structure, and to achieve this, one of the first priorities should be to increase efficiency, and the physical, operational and organizational integration of all modes of transport (rail, bus, maritime, etc.). The establishment of a functional system of integrated public passenger transport will significantly improve the efficiency and attractiveness of public passenger transport, which currently isn't integrated in the area of cities, counties, in the functional region or in the whole territory of the Republic of Croatia. A national study of Integrated passenger transport in the territory of the Republic of Croatia is currently being prepared. This will make public passenger transport more competitive than other modes of transport. Public passenger transport today is mainly based on road transport, which is not environmentally and economically acceptable. There is a possibility of significant integration of rail in public transport of passengers at the national, regional and local level (just as it has recently been done by HZPP and Autotrolej's system which combines city bus and train transport in the wider area of the city of Rijeka and surrounding settlements).[10]

The introduction of passenger information systems plays a key role in increasing the number of users of public transport. The benefits of implementing modern passenger information systems are numerous. One of these benefits is the reduced perception of waiting for a public transport vehicle. The impact of the delay or deviation of arrival in relation to the timetable is thus reduced, since users will have accurate information on the arrival time of the vehicle. This results in an increase in the number of users and an increase in customer satisfaction as it reduces uncertainty and makes public transport a more reliable form of transport. The passenger information system ultimately has the function of providing all the information that the user needs when choosing and planning a trip according to personal preferences or specific criteria, such as choosing the fastest or cheapest route, or preferring a specific mode of travel (train instead of bus etc.)

The Master Plan also suggests improvements to the public transport system (especially in cities with developed public urban transport) that could be achieved by changing the travel cost reimbursement system. In areas where it is possible to easily reach the workplace by public transport, it is suggested that the companies buy their employees a monthly ticket rather than the employee to buy the ticket and receive a cash transfer fee afterwards. This way, people would be encouraged to use public transport, which would partially address urban congestion and have positive environmental effects. It should also be encouraged to go to work with non-motorized forms of transport (bicycle and walking).Cycling as a recreational activity is harder to achieve in the city of Rijeka, because of the amount of elevation changes, but can be accomplished in the city center where the surface is flat, especially through the city core which is a pedestrian zone and the Molo Longo pier where bicycle rentals have been active during spring and summer. The lack of cycle lanes makes cycling more difficult, except in those two areas.[8]

According to the Master Plan, adequate traffic terminals for inter-county public transport will increase the quality of transport service and thus the level of public transport usage. Bus stations in the cities of Primorje-Gorski Kotar County are mostly old and outdated terminals (except for Delnice station). Of the 14 cities in the county, there are only four with categorized bus stops (one B and three C categories). The “Master plan for the development of the transport system of the North Adriatic functional region” states that it is necessary to build a new bus station/intermodal terminal (Žabica) in Rijeka, which would belong in the A category.[8]

8 Conclusions

The transport situation in the Primorje-Gorski Kotar county relies mostly on the Rijeka traffic network hub which includes all transport modes – road, rail and maritime modes and connects them to major traffic hubs. The modal shift in the region is oriented most towards road transport, and road transport is dominated by passenger cars. In the mobility gaps and needs survey, the surveyed individuals stated they prefer the safety, comfort, convenience and flexibility of private cars and those are the reasons why they rarely use public transport. Several important planning and policy documents have been examined, and those are: Master plan for the development of the transport system of the North Adriatic functional region; Integral study of space and transport in Primorje-Gorski Kotar county and the city of Rijeka; Transport Development Strategy of the Republic of Croatia 2017-2030; Primorje-Gorski Kotar County Development Strategy 2016 – 2020; and City of Rijeka Development Strategy 2014 – 2020. Each of these documents contributes to gaining a clearer picture on the current transport situation and how to improve it for the future. The transport system is mostly not integrated, with few stand-out offers that combine different modes of transport, and example of which is the cooperation between HŽPP and Autotrolej, which offer a combined ticket from Šapjane to Fužine, through Rijeka.

The improvement of the quality offered by public transport providers, improving trafic connections, introducing better passenger information systems, purchasing new equipment, as well as creating new routes and offers are crucial in order to present public transport in a brighter light to the public and encourage people to use public transport more frequently.

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