D.4.1.1. COST-EFFECTIVE ANALYSIS OF THE PRESENT INTERMODAL MARITIME TRANSPORT SOLUTIONS

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This Report has been prepared for the Ministry of Regional Development and European Union Funds for the purpose of preparing the Cost-effectiveness analysis of current multimodal maritime transport solutions within the MIMOSA project. The assessment of the sufficiency of the aspects reviewed and usefulness of the Report is the responsibility of the Ministry of Regional Development and European Union Funds only.

This Report has been prepared on the basis of requirements, guidelines, instructions and information provided by the Ministry of Regional Development and European Union Funds. We have not been instructed to and we have not performed independent assessment of provided information or assessed adequacy and suitability of requirements and guidelines from Ministry of Regional Development and European Union Funds. As a result, the Report should not be considered or interpreted as an independent opinion of EY.

This Report has been constructed based on information available during the 21 July 2021 to 26 November 2021. Material events may have occurred since then which are not reflected in the Report. Projections used in the Report are based on a number of assumptions, which might differ from actual situation in the future and could have a substantial impact on the Report. The outcomes of our work may have been different if other assumptions would have been used.

Our work was not performed in accordance with generally accepted auditing, review, or other assurance standards in Croatia and accordingly does not express any form of assurance. We have not performed any procedures to detect fraud or illegal acts or to test compliance in our work. Further, we have not performed audit or any other verification or assurance procedures.

The Report has been prepared on the assumption that should the users of the Study have any doubts, they will request appropriate explanations from EY.

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List of abbreviations

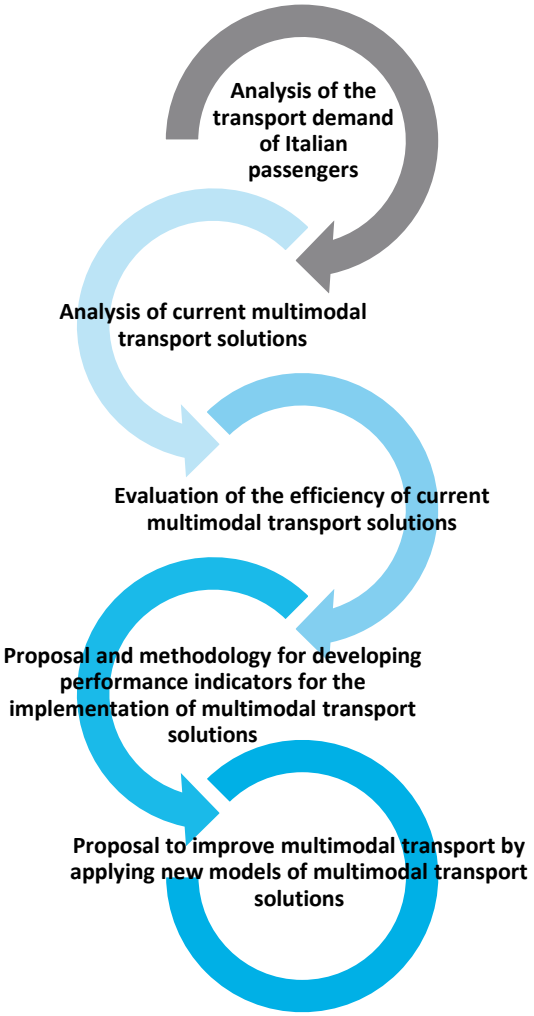
AVL	Automatic vehicle locating
CBS	Central Bureau of Statistics
CNTB	Croatian National Tourist Board
Croatia	The Republic of Croatia
EU	European union
EY	Ernst & Young Savjetovanje d.o.o.
GDP	Gross domestic product
GIS	Geographic information system
GO	The general objectives
MCA	Multicriteria analysis
MIMOSA project	Maritime and Multimodal Sustainable Passenger Transport Solution and Service
MRDEUF	Ministry of Regional Development and European Union Funds
MSTI	Ministry of the Sea, Transport, and Infrastructure
Multimodal Analysis	Cost effectiveness analysis of the present intermodal maritime transport solutions within the MIMOSA project
PD	Procurement Documentation
PESTLE	Analysis of political, economic, social, technological, legal, and environmental aspects
SO	The specific objectives
The Client	The Ministry of Regional Development and European Union Funds, the Directorate for Islands, the Sector for Programming, Planning and Evaluation of Island Development Policy
The Contract	The contract on services for the preparation of Multimodal Analysis
The Report	Third Report

1 Executive summary

Maritime and Multimodal Sustainable Passenger Transport Solution and Services - MIMOSA is a strategic project that was launched within the cross-border cooperation program INTERREG VA Italy - Croatia 2014 - 2020.

The goal of the MIMOSA project is to improve the offer of sustainable multimodal solutions as well as passenger transport services, using means of transport with lower CO_2 emissions. Also, the MIMOSA project encourages sustainable passenger mobility throughout the program area while reducing the negative effects of transport on the environment. The MIMOSA project aims to change the current state of the transport system in which cross-border and regional transport connections are mostly based on road transport, seeking to solve the problem of low connectivity between Italy and Croatia by providing a wider range of services to citizens and tourists.

The Ministry of Regional Development and European Union Funds, the Directorate for Islands, the Sector for Programming, Planning and Evaluation of Island Development Policy is one of the project partners in the MIMOSA project and is in charge of developing efficiency analyses of current multimodal maritime transport solutions.



The purpose of the Performance Analysis of current multimodal maritime transport solutions within the MIMOSA project is the future implementation of new transport services through the development of multimodal transport solutions with emphasis on the application of new technologies and renewable energy sources.

The aim of the Analysis is to determine the effectiveness of existing maritime multimodal solutions and contribute to better and more efficient connection of Croatian islands with the mainland and with other islands and islands with each other, considering environmental protection and transition to alternative modes of transport using multimodal transport solutions. For this purpose, as part of the Analysis, activities were carried out, the summary of which is presented below.

Activity 1. Analysis of the transport demand of Italian passengers

As part of this activity, an analysis of the transport demand of Italian passengers who stayed in Croatia in the period from 2010 to 2021 was made, i.e., in the period before the Covid-19 pandemic (2010-2019) and during the Covid-19 pandemic (2020-2021), to gain a clear insight into the factors affecting the transport demand of Italian passengers.

Public available data, obtained with methods of secondary research (i.e., desk research), showed that annually about 1.100.000 Italian tourists visit Croatia, which is about 8 % of the total number of arrivals of all tourists. Of the total number of Italian tourists, about 82 % stay on the mainland, while the remaining 18 % stay on the Croatian islands, and the largest number of arrivals of Italian tourists record islands of Krk, Pag and Rab. Based on the analysis, it was determined that the islands in the northern Adriatic are more visited than the islands in Dalmatia, which is correlated with the proximity of Croatia and Italy in the northern Adriatic. In addition, the islands of Lošinj and Pag have direct maritime routes with Italy, which also indicates the impact of the quality of transport connections and the number of tourist arrivals. Furthermore, the analysis of the mode of transport that Italian tourists use concluded that the favourable geo-traffic relationship between Italy and Croatia in the context of maritime transport is not sufficiently used because about 86 % of Italian tourists use cars to come to Croatia and move within it, while maritime transport was only used by 3,6 % of Italian tourists who travel to Croatia.

The primary research was conducted in the period from 16 August 2021 to 13 September 2021 by surveying relevant tourist institutions/agencies in Croatia and Italy and by surveying Italian tourists in five Croatian seaports. The results of the survey of tourist institutions/agencies indicate that the proximity of Croatia, natural beauty, and the gastronomic offer are the main reasons for the arrival

of Italian tourists in the Republic of Croatia. On the other hand, tourist institutions/agencies think that tourists are inadequately repelled by the current state of maritime transport in the covered area. Deficiencies are mainly related to poor connections between islands and islands and the mainland, inadequate information for tourists, high prices of maritime transport and *on demand* transport at the local level. The results of the survey indicate a satisfactory familiarity of tourist institutions/agencies with the concept of multimodality and a certain share encourages users to use such a mode of transport. However, to increase the number of passengers in a multimodal transport system, its systematic development is necessary.

The Covid-19 pandemic has had a strong negative impact on tourism activities. In 2020, the number of arrivals of Italian tourists decreased by 79,5 % compared to 2019. The results of the questionnaire indicate that as many as 80 % of respondents have changed their travel habits and that during the Covid-19 pandemic period they avoided mass passenger transport systems and preferred to travel by car.

Activity 2. Analysis of current multimodal transport solutions

As part of this activity, based on secondary research, an analysis of the existing offer of maritime, bus, bicycle and taxi transport for Croatian islands connected by sea (ferry, ship, and high-speed line) with the mainland was made to enable an overview of existing multimodal transport solutions.

Croatian islands are connected to the mainland with 60 maritime lines. On average, each island from the first group of islands (more than 5.000 inhabitants) is served with 24 departures per week, from the second group of islands (between 500 and 5.000 inhabitants) with 60 departures per week, while islands from the third group of islands (less than 500 inhabitants) are served with an average of 129 departures per week. The highest average weekly number of departures have islands Pelješac with 235 departures, Korčula with 221 departures and Ugljan with 156 departures, and the smallest the island of Vela Srakane with five departures and the islands of Obonjan and Biševo with four departures. The number of departures varies significantly depending on the number of inhabitants on the island and the distance of the island from the mainland. The analysis of the demographic coverage of the islands by maritime transport showed that 20 islands have a complete demographic coverage of seaports, and these are, typically, smaller islands with the exception of the island of Rab. The islands of Vis and Hvar have extremely good demographic coverage, while the islands Mljet with 23 %, Šolta with 20 % and Čiovo with 18 % have the lowest level of demographic coverage of all the islands. By analysing maritime traffic between Italy and Croatia, it was determined that, according to the data from 2021, nine international maritime lines operated on the Italy-Croatia route. Due to the consequences of the Covid-19 pandemic, the international maritime lines Zadar - Ancona, Umag - Venice, Rovinj - Trieste and Poreč - Trieste were cancelled.

The existence and quality of public passenger transport services on islands varies from island to island. Thus, the bus public transport system is represented on larger islands, more precisely on 19

islands, taxi transport on 19 islands, boat taxi transport on 45 islands, public bicycle systems on 16 islands and electric scooter systems on 16 islands. On the positive side, the development and implementation of a public bicycle system and public electric scooters on the islands is gradually growing and occupies an important place in addressing traffic congestion and traffic connectivity. Increasing the offer of public bicycle and public electric scooter services in the areas of seaports would significantly improve and increase the offer of multimodality to all users.

The analysis of the harmonization of regular bus transport and regular maritime transport in the coverage area established that only 17 % of bus departures/arrivals are harmonized with departures/arrivals of maritime lines.

In conclusion, the analysis found that travel in Croatia cannot be adequately realized within the integrated transport system because it is not sufficiently developed. Multimodal traffic in the coverage area is realized exclusively by ferry travel, through 62 ferry ports that enable the combination of road and maritime transport. The multimodality of other modes of transport is realized exclusively unplanned.

In addition to quantitative and qualitative analysis of the existing transport offer and the level of multimodality, cartographic representations of the state of multimodal transport solutions in the scope of Multimodality Analysis using Geographic Information Systems (hereinafter: GIS) were made. All seaports served by regular maritime passenger transport in Croatia and seaports in Italy that have a transport connection with Croatia are shown.

Activity 3. Evaluation of the efficiency of current multimodal transport solutions

As part of this activity, an analysis of the political, economic, social, technological, legal, and environmental aspects (PESTLE) of the current state of multimodal transport in coverage area was made. The key factors of the external environment that have a direct or indirect impact on the development of a multimodal transport system with an emphasis on maritime transport in Croatia have been identified.

PESTLE analysis showed that the membership of the Republic of Croatia in the European Union and the availability of EU funds has or may have a positive impact on the development of multimodality. On the other hand, project implementation is difficult due to complicate administrative processes of many local self-government units. From an economic point of view, positive circumstances in the external environment have been identified, which are manifested through GDP growth before the Covid-19 pandemic and a decrease in the unemployment rate.

Also, the trend of economic recovery from the consequences of the pandemic is visible. However, the negative impact on improving the connectivity of Croatian islands and the development and implementation of multimodal maritime solutions from an economic point of view is reflected in the challenges posed by lower cost-effectiveness of maritime than road transport for the development of multimodal transport.

The social context of multimodality development is challenging due to negative demographic trends caused by negative natural and spatial migrations, especially on islands. However, better connectivity of islands can contribute to reducing negative demographic trends, especially in the context of reducing spatial migration from islands and rural settlements to larger cities.

Furthermore, multimodal transport solutions, due to the increasing development of technology, have good preconditions for future development. The development of technology has the potential to enable the process of transport organization, more efficient and cost-optimal means of transport, a better system of pre-travel, travel, and post-passenger information, etc. It is important to consider environmental factors, i.e., the necessary improvement of conventional technologies with the aim of reducing negative environmental impacts. This is also supported by strategic documents at European and national level which emphasize the importance of developing multimodality and an integrated transport system, in particular with regard to reducing traffic congestion and environmental pollution.

In addition to the PESTLE analysis, this activity defines the efficiency indicators of current multimodal transport solutions to assess the effectiveness of existing multimodal transport solutions. The efficiency indicators included in the calculation of the efficiency assessment of current multimodal transport solutions are:

- number of bus lines per island,
- number of seaports to which the island is connected by sea transport (direct lines),
- international shipping lines to Italy,
- demographic coverage,
- number of inhabitants on the maritime lines with which the island is connected,
- the ratio of the number of maritime lines and the population density of the island,
- average number of sea departures per week per island,
- average number of departures/arrivals of bus lines on the island,
- availability of the bus service of regular passenger transport on the island,
- availability of taxi service for passengers on the island,
- availability of boat-taxi transport service for passengers on the island,
- existence of a bicycle/scooter rental system on the island,
- the level of compliance of maritime and bus lines on the island,
- the existence of a ferry port on the island,
- existence of a bicycle/scooter rental system in the port.

By evaluating the indicators, it was determined that the average assessment of the current state of multimodality is 3,4 points out of a maximum of 10 points, which quantitatively proves the unsatisfactory state of existing multimodal transport solutions. The island of Pag was rated the best with a score of 6,96, and the island of Vele Srakane was rated the worst with a score of 1,6.

Activity 4. Proposal and methodology for developing performance indicators for the implementation of multimodal transport solutions

As part of this activity, a structured database was created that shows the data collected through Activities 1, 2 and 3 in a way that allows regular annual data updates.

In addition to the database, a list of potential indicators of the effectiveness of the implementation of multimodal transport solutions has been developed and a methodology for monitoring the development of multimodal transport solutions in the coverage area has been proposed. The methodology for evaluating, calculating, and monitoring the indicators of multimodal transport solutions is also presented in the database developed as part of this activity, and the proposed indicators of the effectiveness of the implementation of multimodal transport solutions are:

- the existence of a ferry port on the island,
- development of cycling infrastructure on the island [km/km^2],
- average number of departures of maritime transport lines per week per island,
- number of international maritime lines to Italy,
- number of departures on international maritime routes per island,
- establishment of a car sharing system in the port on alternative fuels,
- establishment of an integrated travel card on the island,
- establishment of a bicycle/scooter rental system in the port area,
- the average number of daily bus departures on the island,
- the level of compliance of maritime and bus lines on the island,
- implementation of the promotion of the multimodality system on the island,
- the number of lines on which alternative-powered ships operate,
- cost-effectiveness of multimodal transport.

Activity 5. Proposal to improve multimodal transport by applying new models of multimodal transport solutions

To provide a broader insight into the development possibilities of a multimodal transport system to ideate potential solutions that can be implemented in the coverage area, as a part of this activity an analysis was conducted and catalog of good practice examples of multimodal transport solutions from Europe and the world, including maritime transport was developed. Based on the analysed examples, it can be seen that the use of an integrated tariff system with timetable harmonization is presented as the most important element in establishing a quality multimodal transport system. In tourist-active areas, the use of subscription cards for tourists has become more frequent, through which users are provided with an unlimited public transport service with additional benefits within the tourist offers.

Based on the catalogue of good practice and local development potentials, proposals have been made to improve passenger transport in the scope of the Analysis by applying multimodal transport solutions for the short, medium, and long term. Suggestions for improvement relate to:

- **In the short term:**
  - Development of a modern real-time passenger information system,
  - Development of a modern ticket collection system in public passenger transport *(e-ticketing*),
  - Promotion and visibility of multimodal transport solutions,
  - Development of a system for monitoring and evaluating the effectiveness of the implementation of multimodal transport solutions,
  - Supplementation of the strategic and spatial planning documents at the levels of local self-government units,
  - Implementation of the system of benefits for the use of maritime transport on the route Croatia - Italy.
- **Medium term:**
  - Implementation and development of public micromobility systems (public bicycles, scooters, etc.),
  - Organization and coordination of existing sea and bus public transport lines,
  - Implementation of new communal bus transport lines at the levels of local self-government units or islands with alternative fuel vehicles,
  - Implementation of new maritime lines to connect islands and mainland and islands with each other,
  - Establishment of *on demand* transport,
  - Establishment of new international shipping lines with Italy,
  - Development of cycling infrastructure on the islands,
  - Development of car sharing systems on islands with an emphasis on alternative fuel vehicles.
- **Long term:**
  - Establishment of integrated passenger transport - formation of a tariff union and transport administration,
  - Construction of intermodal passenger terminals,
  - Development of existing and construction of new seaports,
  - Modernization of the maritime transport fleet with alternative propulsion ships - autonomous vehicles.

Consequently, four pilot projects have been proposed to improve multimodal transport by applying new models/solutions for three groups of islands depending on the population:

- **Pilot project for the first group of islands (up to 500 inhabitants):**
  - Establishment of a public bicycle system around seaports and other main points of interest in the island of Zlarin.

- **Pilot project for II. group of islands (from 500 to 5.000 inhabitants):**
  - Establishment of a public bus transport system with alternative propulsion vehicles on the island of Cres.
- **Pilot projects for III. group of islands (more than 5.000 inhabitants):**
  - Construction of a Park & Ride terminal around seaports, which allows users to park vehicles for a long time and use maritime transport in the price of a parking ticket on the island of Brač.
  - Establishment of an international maritime line between the III. group of islands and Italy, i.e., the introduction of the international line Korčula - Pescara.

The emphasis of the proposed pilot projects is on the implementation of transport solutions including means of transport with lower CO_2 emissions. Pilot projects can be implemented on other Croatian islands, depending on the groups or population.

With the aim of successful further development of a sustainable and multimodal transport system within the MIMOSA project, it is proposed to systematically approach the promotion of implementation of multimodal transport solutions, communication with relevant stakeholders, revision of spatial planning documentation, development of sustainable mobility plans at local levels and continuous implementation of planning and monitoring activities.

2 Introduction

2.1 Background of the analysis of the efficiency of current multimodal maritime transport solutions

Maritime and Multimodal Sustainable Passenger Transport Solution and Services - MIMOSA (hereinafter: the MIMOSA project) is a strategic project launched within the cross-border cooperation program INTERREG V-A Italy - Croatia 2014 - 2020.

The INTERREG program is an instrument for the implementation of cohesion policy within the Member States of the European Union and, among other things, helps the development of maritime transport with the aim of sustainable tourism and better spatial distribution of visitors in the region. This program includes four priority axes and seven specific objectives, of which the fourth priority axis relates to maritime transport and includes Specific Objective 4.1: Improving the quality, safety and environmental sustainability of maritime and coastal transport services and nodes by supporting a multimodal transport system within the program area. The INTERREG program area covers an area of 85.000 km², has a population of about 12.5 million and includes the following NUTS 3 regions:

- Croatian counties: Istria, Primorje-Gorski Kotar, Lika-Senj, Zadar, Šibenik-Knin, Split-Dalmatia, Dubrovnik-Neretva and Karlovac counties;
- Italian provinces: Teramo, Pescara, Chieti (Abruzzo), Campobasso (Molise), Brindisi, Lecce, Foggia, Bari, Barletta-Andria-Trani (Puglia), Venezia, Padua, Rovigo (Veneto), Pordenone, Udine, Gorizia, Trieste (Friuli Venezia Giulia), Ferrara, Ravenna, Forlì-Cesena, Rimini (Emilia Romagna), Pesaro e Urbino, Ancona, Macerata, Ascoli Piceno, Fermo (Marche).

The goal of the MIMOSA project is to improve the offer of multimodal sustainable solutions as well as passenger transport services, using means of transport with lower CO_2 emissions. Also, the MIMOSA project encourages sustainable passenger mobility throughout the program area while reducing the negative effects of transport on the environment. The MIMOSA project aims to change the current state of the transport system in which cross-border and regional transport connections are mostly based on road transport, seeking to solve the problem of low connectivity between Italy and Croatia by providing a wider range of services to citizens and tourists.

A multimodal transport system is a form of integration of different transport subsystems that allow the user to travel easily, reliably, and efficiently from source to destination through different, but harmonized, modes of transport. Consequently, it can be said that a multimodal system integrates road, rail, maritime, air transport and micromobility systems to create an integrated travel solution within a functional area. At the same time, when integrating different modes of transport, it is not necessary that all modes of transport function under the same governance, but mutual organization and cooperation of governances is necessary.

The estimated duration of the MIMOSA project is from January 1st, 2020 to December 31st, 2022, and the total value of the project is 7.140.000,00 EUR. The project is implemented in partnership between the main actors in Italy and Croatia (a total of 19 project partners).

The Ministry of Regional Development and European Union Funds (hereinafter: MRDEUF), the Directorate for Islands, the Sector for Programming, Planning and Evaluation of Island Development Policy (hereinafter: The Client) is one of the project partners in the MIMOSA project and as a part of the work package 4. "Analysis of new pilot solutions for sustainable mobility" is in charge of preparation of an analysis of the effectiveness of current multimodal maritime transport solutions.

2.2 Purpose and goal of analysis of efficiency of current multimodal maritime transport solutions

In accordance with the goals and scope of the MIMOSA project, the Client is obliged to provide an overview and evaluation of the effectiveness of current multimodal maritime transport solutions for passenger transport between Italy and Croatia, i.e., to provide a basis for developing ideas, strategic planning, and decision-making regarding the improvement of multimodal transport solutions for passenger transport in low-carbon vehicles.

With the aim of efficient and high-quality analysis, MRDEUF conducted the procurement process for the development of efficiency analysis of current multimodal maritime transport solutions within the MIMOSA project (hereinafter: Multimodality Analysis). The contract on services for the preparation of Multimodal Analysis (hereinafter: the Contract) was concluded on July 21, 2021 between MRDEUF and Ernst & Young Savjetovanje d.o.o. (hereinafter: EY).

The purpose of the Multimodality Analysis is the future implementation of new transport services by developing multimodal transport solutions with an emphasis on the application of new technologies and the use of renewable energy sources that will consequently affect the achievement of results and general purpose of the MIMOSA project.

The aim of the Multimodality Analysis is to determine the effectiveness of existing maritime multimodal solutions and contribute to better and more efficient connection of Croatian islands with the mainland and with other islands, considering environmental protection and transition to alternative modes of transport using multimodal transport solutions. To achieve the goal, it is necessary to:

- explore the habits and behaviour of Italian travellers,
- determine the current state of multimodal transport solutions,
- determine the effectiveness of existing multimodal transport solutions,
- develop effectiveness indicators of the implementation of multimodal transport solutions,

- explore the possibilities of applying new or improving current transport solutions in multimodal transport by applying new technologies, with the use of renewable energy sources,
- propose pilot projects that could be replicated to other Croatian islands.

Therefore, the purpose of the Contract is to provide support to the Client in fulfilling the obligations of the Client as a project partner in the MIMOSA project within the work package 4. by implementing the following activities:

- Activity 1. Analysis of the transport demand of Italian passengers,
- Activity 2. Analysis of current multimodal transport solutions,
- Activity 3. Evaluation of the efficiency of current multimodal transport solutions,
- Activity 4. Proposal and methodology for developing performance indicators for the implementation of multimodal transport solutions,
- Activity 5. Proposal to improve multimodal transport by applying new models of multimodal transport solutions.

3 Description of the analysis of cost-effectiveness structure and expected results of the Analysis

3.1 The scope of Multimodality Analysis

The scope of the Multimodality Analysis includes the territory of seven regional self-government units in the Republic of Croatia:

- Istria County,
- Primorje-Gorski Kotar county,
- Lika-Senj County,
- Zadar County,
- Šibenik-Knin County,
- Split-Dalmatia County and
- Dubrovnik-Neretva County.

3.2 An overview of the structure of activities and tasks within each activity

For the purpose of Multimodality Analysis, five activities will be performed:

- Activity 1. Analysis of the transport demand of Italian passengers,
- Activity 2. Analysis of current multimodal transport solutions,
- Activity 3. Evaluation of the efficiency of current multimodal transport solutions,
- Activity 4. Proposal and methodology for developing performance indicators for the implementation of multimodal transport solutions,
- Activity 5. Proposal to improve multimodal transport by applying new models of multimodal transport solutions.

As part of each activity, the tasks defined in the procurement documentation, i.e., the Job Description within the PD, will be performed, as stated below.

Activity 1. Analysis of the transport demand of Italian passengers

The purpose of the implementation of Activity 1 is to provide an understanding of the existing habits of Italian tourists traveling to Croatia, related to modes of transport to enable a reasonable

assessment of the effectiveness of existing multimodal transport solutions considering existing needs.

The aim of Activity 1 is to make an analysis of the transport demand of Italian passengers who have stayed and intend to stay in Croatia, in the area covered by the Multimodality Analysis in the period before the Covid-19 pandemic (from January 1st 2010 to December 31st 2019) and in the period during the Covid-19 pandemic (January 1st, 2020 to September 30th, 2021).

Activity 1 contains the following tasks:

- Task 1.1. Collection, processing, and analysis of data on the transport demand of Italian passengers staying in Croatia (Covid-19 period);
- Task 1.2. Survey (interviewing) of relevant tourist institutions/agencies on previous experiences of Italian passengers regarding the habits of using transport;
- Task 1.3. Collection, processing and analysis of data on the transport demand of Italian passengers staying in Croatia (Covid-19 period);
- Task 1.4. Field research on the habits and behaviours of Italian tourists who stayed in Croatia during their trip in the Covid-19 period;
- Task 1.5. Preparation of a comprehensive analysis of activities 1.

Activity 2. Analysis of current multimodal transport solutions

The purpose of the implementation of Activity 2 is to determine the level of maritime transport offer with emphasis on multimodal transport solutions and their development trend, to enable a reasonable assessment of the effectiveness of existing multimodal transport solutions considering the existing maritime transport offer.

The aim of Activity 2 is to make a statistical and graphical analysis of current multimodal transport solutions which contains an overview (mapping) of existing multimodal transport solutions, including a review of planned directions of development of multimodal transport solutions developed in strategic and/or spatial planning documents of the Republic of Croatia.

Activity 2 includes the following tasks:

- Task 2.1. Make an analysis of the current situation accompanied by a database for each island connected by liner shipping (ferry, ship and high-speed line) with the mainland;
- Task 2.2. Make a cartographic presentation of the situation/analysis of multimodal solutions;
- Task 2.3. Make cartographic representations of multimodal traffic solutions of coastal counties.

Activity 3. Evaluation of the efficiency of current multimodal transport solutions

The purpose of the implementation of Activity 3 is, based on the results of Activities 1 and 2, to provide a sound and unambiguous assessment of the effectiveness of existing multimodal transport solutions to ensure long-term evaluation activities to improve the efficiency of multimodal solutions and determine the preconditions for further development of multimodality.

The aim of Activity 3 is to present and explain the effectiveness of current multimodal transport solutions in the form of assessment of the situation, assessment of development opportunities and assessment of the effectiveness of the development of multimodal transport solutions.

Activity 3 includes the following tasks:

- Task 3.1. Development of PESTLE analysis of multimodal transport;
- Task 3.2. Evaluation of the effectiveness of current multimodal transport solutions.

Activity 4. Proposal and methodology for developing performance indicators for the implementation of multimodal transport solutions

The purpose of the implementation of Activity 4 is to provide a transparent and sound methodology for assessing the effectiveness of existing multimodal transport solutions to ensure long-term implementation of evaluation activities to improve the efficiency of multimodal solutions and identify preconditions for further development of multimodality in the coverage area.

The aim of Activity 4 is to create a systematized database with data structured at a level not higher than local self-government units, with consolidated data of multimodality analysis that enables regular annual updating of data, proposal, and methodology for developing performance indicators for multimodal solutions.

Activity 4 includes the following tasks:

- Task 4.1. Create a database;
- Task 4.2. Develop a proposal for the effectiveness indicators of the implementation of multimodal transport solutions that include maritime transport.

Activity 5. Proposal to improve multimodal transport by applying new models of multimodal transport solutions

The purpose of Activity 5 is to provide the Client with a basis for the idea and development of new models of multimodal transport solutions that will ensure the application of new technologies and the use of renewable energy sources in the short term (one to three years), medium term (four to seven years) and long term (eight to ten years or more).

The goal of Activity 5 is to make proposals for improving the application of new models of multimodal transport solutions with the use of renewable energy sources.

Activity 5 includes the following tasks:

- Task 5.1. Develop a catalogue of good practice examples in multimodal transport solutions that include maritime transport;
- Task 5.2. Make a proposal to improve passenger transport in the area covered by Multimodality Analysis using new technologies of multimodal transport solutions with the use of renewable energy sources;
- Task 5.3. Propose three pilot projects to improve the application of new models/solutions of multimodal transport for the three Croatian islands with the use of new technologies using means of transport with lower CO_2 emissions.

3.3 Expected results of activities

In accordance with the job description and the previously described structure of the Analysis, the following results of the analysis by activities are expected:

Expected results of Activity 1.

- a unified analysis of transport demand of Italian passenger and current multimodal transport solutions;
- conducted a survey (interviewing) of relevant tourism institutions/agencies;
- conducted field research on the habits and behaviour of Italian travellers who arrived/stayed in Croatia;
- a unified analysis of transport demand of Italian passengers.

Expected results of Activity 2.

- conducted the conclusion of the analysis of the state and trends of transport solutions/possibilities for each island that is connected by a sea line (ferry, ship and high-speed line) with the mainland;
- created a database related to transport solutions related to each island connected by a sea line (ferry, ship and high-speed line) with the mainland;
- made at least one cartographic presentation of the situation/analysis of multimodal transport solutions at the scope level of Multimodality Analysis;
- made seven cartographic representations of the situation/analysis of multimodal maritime transport solutions at the level of counties of the Republic of Croatia which are in the scope of Multimodality Analysis.

Expected results of Activity 3.

- conducted PESTLE analysis of multimodal transport solutions;
- assessed the effectiveness of current multimodal transport solutions.

Expected results of Activity 4.

- created a structured database with consolidated data from previous activities;
- created a proposal for the methodology of evaluation and calculation of efficiency indicators for the implementation of multimodal transport solutions.

Expected results of Activity 5.

- developed a catalogue of good practice examples;
- developed a solution for the proposal to improve transport connections by applying new models of multimodal transport solutions in the area covered by the Cost-effectiveness Analysis;
- developed proposals for three pilot projects to improve multimodal transport by applying new models/solutions.

3.4 Implementation of the cost-effectiveness analysis method for the purpose of Multimodal Analysis

Cost-effectiveness analysis, as described in European Commission Guidelines Evalsed Sourcebook: Method and Techniques[1], is a method that can help ensure efficient investment of resources in sectors where the direct benefits of these investments are difficult to assess. The subject analysis is a tool for monitoring the effectiveness of various activities and selecting the optimal variant of the proposed project solutions and is used when it is impossible to accurately determine the financial value in monetary terms due to strong external influencing factors. Based on the cost-effectiveness analysis, it is possible to determine the effectiveness of the chosen direction of development or proposed improvement measures. Based on the cost-effectiveness analysis, it is possible to determine the effectiveness of the chosen direction of development or proposed improvement measures.

[1] European Commission, Evalsed Sourcebook: Method and Techniques, available at: https://ec.europa.eu/regional_policy/sources/docgener/evaluation/guide/evaluation_sourcebook.pdf

In the case of multiple parameters of different values, a more sophisticated version of cost-effectiveness analysis can be used that includes weights to measure the importance of different parameters.

Taking into account the scope of the Multimodality Analysis, the application of the cost-effectiveness analysis method is adjusted to the activities and expected results of activities, the specifics of the subject of the Analysis since the subject of the Analysis covers all multimodal transport solutions in the entire coastal area of Croatia. Accordingly, for the purpose of quality preparation of the Multimodality Analysis, for the assessment of the current situation and for the evaluation of future development, where applicable, a multicriteria analysis was used as an alternative to the classical cost-effectiveness analysis.

Accordingly, multicriteria analysis was used in sections 6.2. *Evaluation of the effectiveness of current multimodal transport solutions* and 7.2. *Development of proposals for efficiency indicators for the implementation of multimodal transport solutions, including maritime transport*. A detailed description of the methodology can be found within the mentioned chapters.

4 Analysis of the transport demand of Italian passengers

4.1 Analysis of the transport demand of Italian passengers staying in Croatia in the period from 2010 to 2020

4.1.1 Task description

As part of Task 1.3. Collection, processing, and analysis of data on the transport demand of Italian passengers staying in Croatia (Covid-19 period), an analysis of the transport demand of Italian passengers staying in Croatia during the Covid-19 pandemic period (from January 1st, 2020 to August 31st, 2021) according to available quantitative data. The data analysis is presented as a supplement to Task 1.1. The purpose of the analysis is to provide an understanding of the existing habits of Italian tourists traveling to Croatia related to modes of transport, in order to establish the demand for transport in order to create a sound assessment of the effectiveness of existing multimodal transport solutions in future activities.

Transport demand represents the size of user requests for a passenger transport service on a route. It is the basic factor and quantitative indicator that influences and according to which the structure and number of transport entities are dimensioned, that is, according to which the transport offer is formed. Transport demand is measured in the number of passengers carried on a route or at the level of an area, depending on the point of view from which it is observed. The size of transport demand depends on demographic, economic and spatial factors and on the quality and availability of transport supply.

Accordingly, in order to gain a clear insight into the factors affecting the transport demand of Italian passengers, an analysis of historical data for the period before and during the Covid-19 pandemic was conducted.

Analysis of historical data for the period before the Covid-19 virus pandemic includes the following items:

- analysis of the number and trend of total tourist arrivals in the Republic of Croatia (hereinafter: Croatia),
- analysis of the number and trend of arrivals of Italian tourists in Croatia,
- analysis of the number of total tourist arrivals on the largest Croatian islands,
- analysis of the number of arrivals of Italian tourists on Croatian islands and comparison with the number of inhabitants on the islands,
- analysis of the ratio of the number of Italian tourists staying on the island and the mainland,
- analysis of the main motives for the arrival of Italian tourists in Croatia and comparison with tourists from other countries,

- analysis of the modes of transport of Italian tourists to Croatia and comparison with the modes of transport of tourists from other countries,
- analysis of the trend in the number of transported passengers in maritime transport in the territory of Croatia,
- analysis of international passenger traffic in maritime transport between Italy and Croatia,
- analysis of the modes of transport of Italian tourists in Croatia and comparison with the modes of transport of tourists from other countries
- analysis of Italian tourists' satisfaction with the elements of the transport offer in the Croatian territory and comparison of tourists' satisfaction from other countries with the transport offer.

Analysis of data during the Covid-19 pandemic includes items for which data were publicly available in the reference period (2020 – 2021):

- analysis of the number of total tourist arrivals in the Republic of Croatia (hereinafter: Croatia),
- analysis of the number of arrivals of Italian tourists in Croatia
- analysis of the number of total tourist arrivals on the largest Croatian islands,
- analysis of the number of arrivals of Italian tourists on Croatian islands and comparison with the number of inhabitants on the islands,
- analysis of the ratio of the number of Italian tourists staying on the island and the mainland,
- analysis of the trend in the number of transported passengers in maritime transport in the territory of Croatia,
- analysis of international passenger traffic in maritime transport between Italy and Croatia.

4.1.2 Methodology

Task 1.3. methodology is based on the methods of secondary research in which data were collected on the transport demand of Italian passengers who stayed in Croatia in the ten-year period before the Covid-19 pandemic (2010 – 2019) and during the Covid-19 pandemic (2020 – 2021). Data collection was performed using the desk-research method.

For the period before the Covid-19 pandemic (2010 – 2019), the following publicly available data sources were used:

- Croatian Bureau of Statistics (hereinafter: CBS), PS AXIS database, available on: Statistical databases (https://www.dzs.hr/hrv/system/stat_databases.htm),

- Attitudes and consumption of tourists in Croatia, TOMAS research (years 2010, 2014, 2017, 2019), available on: Institute of Tourism (http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/),
- Tourism in figures (2012 – 2019), Croatian National Tourist Board, available on: Tourism in figures (https://www.htz.hr/hr-HR/informacije-o-trzistima/analize-s-podrucja-turizma/turizam-u-brojkama),
- National Bureau of Statistics Italy (database), available on: ISTAT Database (https://www.istat.it/it/dati-analisi-e-prodotti/banche-dati/statbase).

For the period during Covid-19 pandemic (2020 – 2021), the following publicly available data sources were used:

- Croatian Bureau of Statistics (hereinafter: CBS), PS AXIS database, available on: Statistical databases (https://www.dzs.hr/hrv/system/stat_databases.htm),
- Tourism in figures (2020), Croatian National Tourist Board, available on: Tourism in figures: Turizam u brojkama (https://www.htz.hr/hr-HR/informacije-o-trzistima/analize-s-podrucja-turizma/turizam-u-brojkama),
- Ministry of Tourism and Sports, MINTS, July, January - July (2020), available on: Statistics (https://mint.gov.hr/pristup-informacijama/dokumenti-80/statistika-11514/11514),
- Profile of the emitting market Italy (2021), Croatian National Tourist Board, available on: Profil emitivnog tržišta Italija (https://www.htz.hr/hr-HR/informacije-o-trzistima/profili-trzista).

The collected data were then analysed, sorted, and statistically processed in *MS Excel*. Descriptive statistics were used for the analysis, which includes the organization of the collected data and their summary description using numerical and graphical representations. According to the needs of the analysis, average values, medial values, minimum and maximum values, and standard deviation of the data range were calculated. The analysis shows the comparative values between the selective data of Italian tourists and overall tourist trends, as well as the historical trends of indicators on the transport demand of Italian and other passengers/tourists who stayed in Croatia in the period before and during the Covid-19 pandemic.

Considering the lack of historical data relevant for conducting the analysis within the entire reference period during Covid-19 pandemic, the analysis was conducted for the period in which the data exist.

The results of statistical processing and data analysis are presented below. In addition, for easier comparison of data and better insight into the analysis, data for the period of the Covid-19 pandemic are presented as a supplement to the analysis for the period before the Covid-19 pandemic virus (2010 – 2019).

4.1.3 Results

For easier review, the presentation of the results is structured according to the following chapters:

- Statistical analysis of tourist arrivals of all tourists and Italian tourists in Croatia,
- Statistical analysis of the mode of transport of all tourists and Italian tourists in Croatia,
- Synthesis of results.

4.1.3.1 *Statistical analysis of tourist arrivals of all tourists and Italian tourists in Croatia*

The analysis of tourist arrivals of all tourists and Italian tourists in the Republic of Croatia was conducted according to the data of the Central Bureau of Statistics (PC AXIS database)[2] and has been described separately for the period before the pandemic and during the Covid-19 pandemic[3].

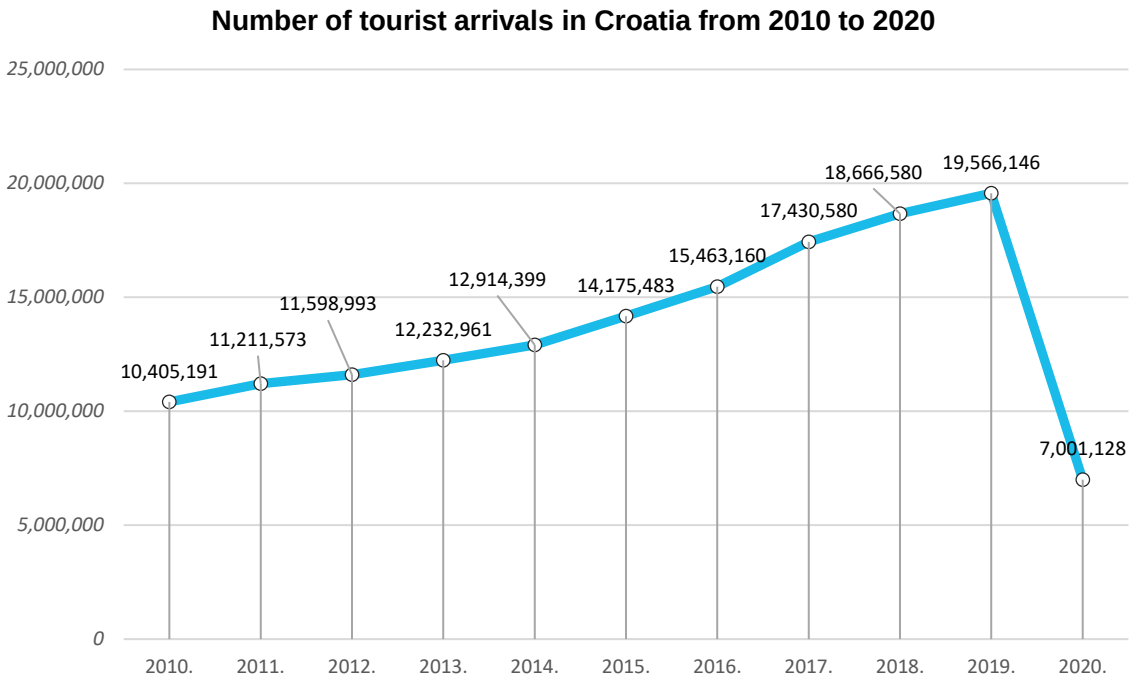
By analysing the data on the number of arrivals of Italian passengers for the period 2010-2019, according to the Central Bureau of Statistics data (PC AXIS database)[4], it was found that Italian tourists in the Republic of Croatia make an average of 1.080.515 arrivals per year, which is about 8 % of the total number of arrivals of all tourists. The highest number of arrivals of Italian tourists in the observed period from 2010 to 2019 was recorded in 2019 (1.206.946 arrivals), and the lowest in 2013 (953.665 arrivals). The analysis of trends in accordance with the annual values of the number of arrivals in the period from 2010 to 2019, determined an average annual growth trend of 2,17 %. In 2019, the number of arrivals of Italian passengers increased by 18,52 % compared to the base year, 2010.

The analysis of data on the number of tourist arrivals in Croatia in the Covid-19 period showed a decrease in the number of arrivals by 64,2 % in 2020 compared to 2019 (Graph 1). Also, the number of arrivals of Italian tourists in 2020 compared to 2019 decreased by 79,5 % (Graph 2).

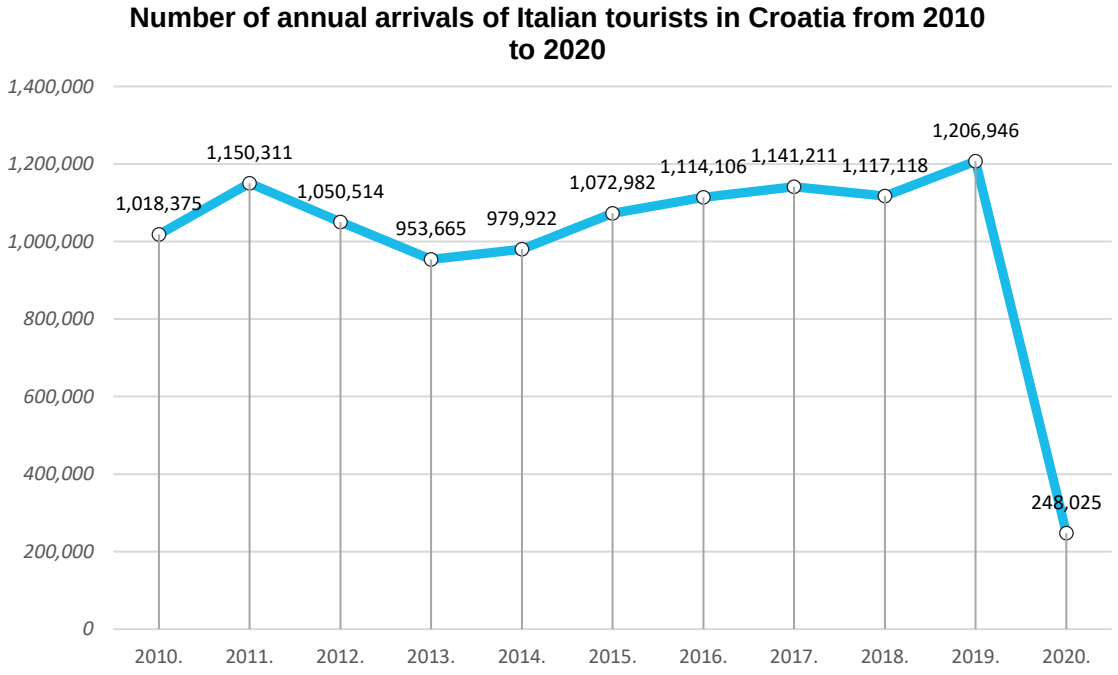
[2] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

[3] Data for 2021 are available until July, so it was not taken into account in the calculation.

[4] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm



Graph 1 Number of tourist arrivals in Croatia from 2010 to 2020 *[Source: CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*



Graph 2 Number of arrivals of Italian tourists in Croatia from 2010 to 2020 *[Source: CBS, PC AXIS database*

(https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]

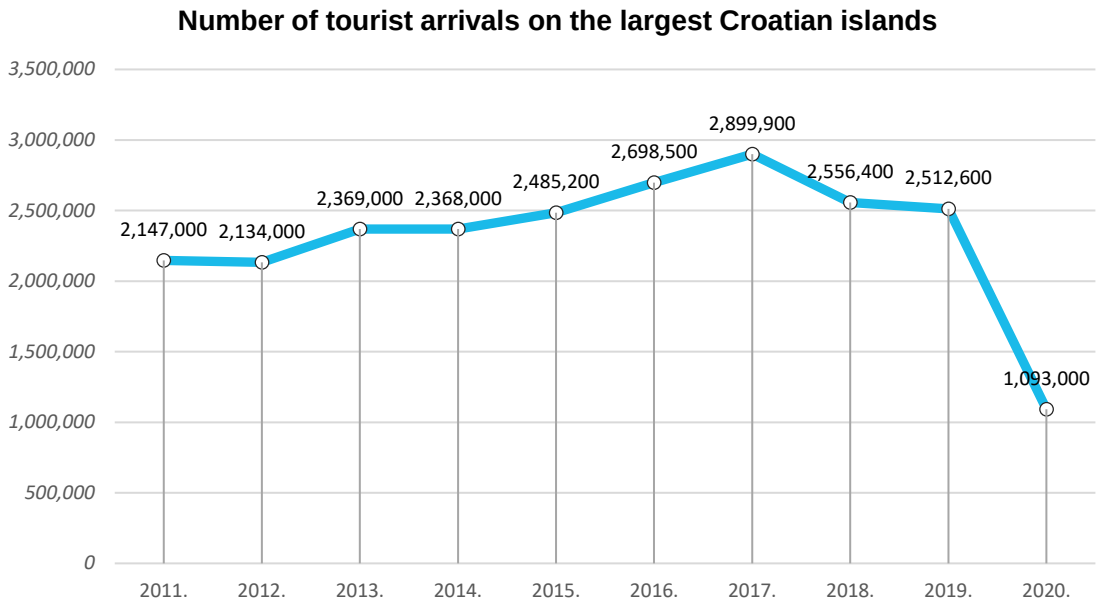
By analysing the number of arrivals to the islands, regardless of the country of arrival, according to the data of the Croatian National Tourist Board from the document "Tourism in Figures" for the period from 2011 to 2019[5] it was found that the 17 largest Croatian islands [6]are visited by an average of about 2.500.000 tourists a year. Of the total number of tourist arrivals in the territory of the Republic of Croatia, the largest Croatian islands account for about 17,5 % of arrivals. The analysis of annual data showed that the lowest number of arrivals on the islands in question was recorded in 2012, and the highest in 2017. From the base year 2011 to 2019, the total number of tourist arrivals on the largest Croatian islands increased by 17,03 %. Despite the downward trend since 2017, the annual growth trend is 2,2 %

If the annual trend of the number of tourist arrivals on the largest Croatian islands is compared with the trend of the total number of tourist arrivals in Croatia, the total number of arrivals in Croatia (annual growth trend in the period from 2010 to 2019 is 7,5 %) increases more than the number of arrivals on the largest Croatian islands (annual growth trend in the period from 2011 to 2019 is 2,2 %). The reason for this may be the uneven growth of the tourist offer on the mainland and islands, inadequate transport connections of the islands and insufficient promotion of island destinations.

If the period of the Covid-19 pandemic is examined, a significant decline in the number of tourist arrivals on the largest Croatian islands is evident. In 2020, 1.093.000 arrivals were recorded, or as much as 56,5 % less than in 2019 (Graph 3).

[5] Croatian National Tourist Board, Tourism in figures (2012 – 2019), available on: https://www.dzs.hr/hrv/system/stat_databases.htm

[6] Lastovo, Šolta, Dugi otok, Mljet, Pašman, Ugljan, Vis, Vir, Murter, Cres, Brač, Korčula, Rab, Hvar, Lošinj, Pag, Krk



Graph 3 Number of tourist arrivals on the largest Croatian islands *[Source: Croatian National Tourist Board, Tourism in figures (2012 – 2019), (https://www.htz.hr/hr-HR/informacije-o-trzistima/analize-s-podrucja-turizma/turizam-u-brojkama), analysed by EY]*

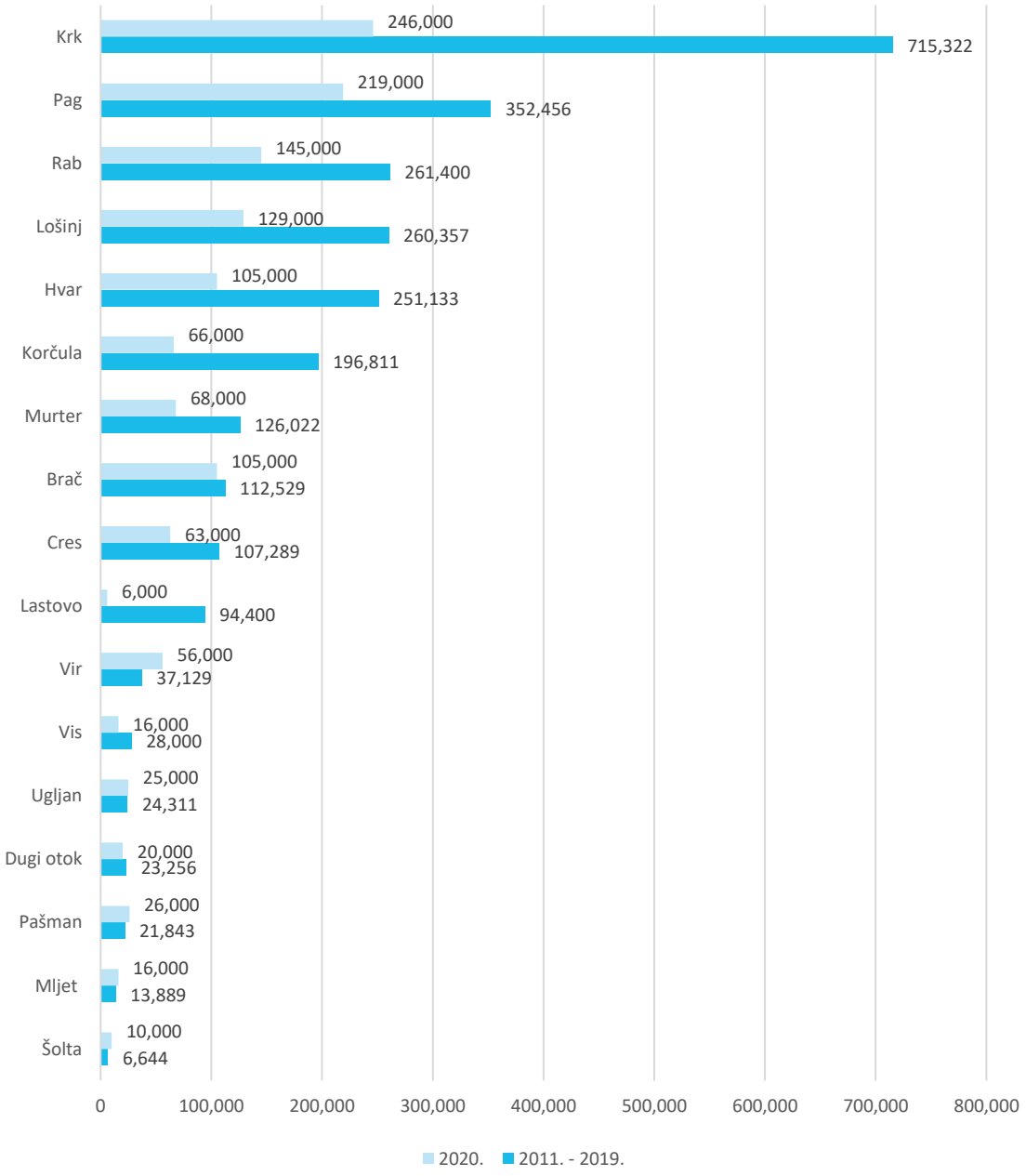
By analysing the average total number of tourist arrivals on the largest Croatian islands per year in the period from 2011 to 2019, it was determined that the most visited island is Krk with an average of 715.322 recorded arrivals per year. It is followed by the island of Pag with as much as 45 % fewer arrivals, or an average of 354.044 tourist arrivals per year. The island of Lastovo has the lowest number of tourist arrivals with an average of 6.644 arrivals per year.

In the period of the Covid-19 pandemic, the island of Krk still records the largest number of tourist arrivals (246.000), which is about 70 % less than the average from 2011 to 2019, i.e., in the period before the pandemic. The island of Pag in 2020 recorded 219.000 arrivals, which is 38 % less than in the period before the pandemic, and the island of Rab recorded 145.000 arrivals, which is 45 % less than in the period before the pandemic. In 2020, the lowest number of tourist arrivals was recorded on the island of Lastovo (6.000), as much as 93,6 % less than the average number of tourist arrivals in the period from 2011 to 2019.

Comparing the data from the period from 2011 to 2019, the average reduction in the number of tourist arrivals on the largest Croatian islands in 2020 is 56,5 %.

The islands of Vir, Ugljan, Pašman, Mljet and Šolta recorded an increase in the number of tourist arrivals during the Covid-19 pandemic (Graph 4).

Average annual number of tourist arrivals on the largest Croatian islands in the period 2011 - 2019 and number of arrivals in 2020 (Covid-19 period)

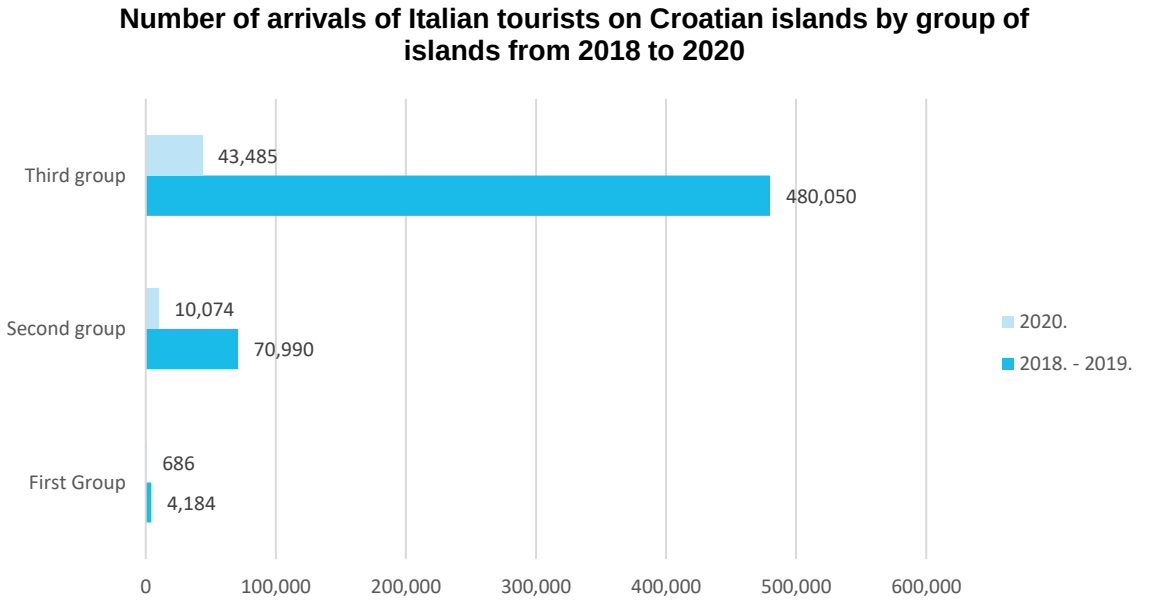


Graph 4 Average annual number of tourist arrivals on the largest Croatian islands from 2011 to 2020 *[Source: CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

Analysis of a segmented statistical sample of the number of Italian tourists staying on Croatian islands was conducted for the period before Covid-19 pandemic, i.e., 2018 and 2019, and for the period during Covid-19 pandemic (2020). Data for previous years are not available and therefore it was not possible to conduct an analysis for the entire reference period (2010 – 2019).

In 2018, according to the CBS data (PX AXIS database)[7], **221.880 Italian tourists stayed on the Croatian islands, and in 2019 about 1,6 % more, i.e., 225.567 Italian tourists.** If we take into account the share of the number of Italian tourists according to the group of islands, i.e., the number of inhabitants on the island, we come to the data that the islands of the first group (less than 500 inhabitants) record 0,8 % of the total number of Italian tourists. The islands of the second group (between 500 and 5.000 inhabitants) account for 12,8 % of the total number of Italian tourists on the islands, and the islands of the third group (more than 5.000 inhabitants) account for 86,5 % of Italian tourists on the islands.

If the year 2020 is reviewed, compared to 2018 and 2019, a decrease in the number of arrivals of Italian tourists can be seen: by 83,6 % on the islands of the first group, a decrease in arrivals of 85,8 % on the islands of the second group and a decrease in arrivals of 90,9 % to third group of islands (Graph 5).



Graph 5 Number of arrivals of Italian tourists on Croatian islands by group of islands from 2018 to 2020 *[Source: CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

[7] CBS, PC AXIS database, available on: (https://www.dzs.hr/hrv/system/stat_databases.htm)

An overview of the annual number of Italian tourists on the Croatian islands and the ratio of the number of Italian tourists and the number of local population can be seen on the Graph 6 and Graph 7. The period before the Covid-19 pandemic and the period after the pandemic are analysed separately below.

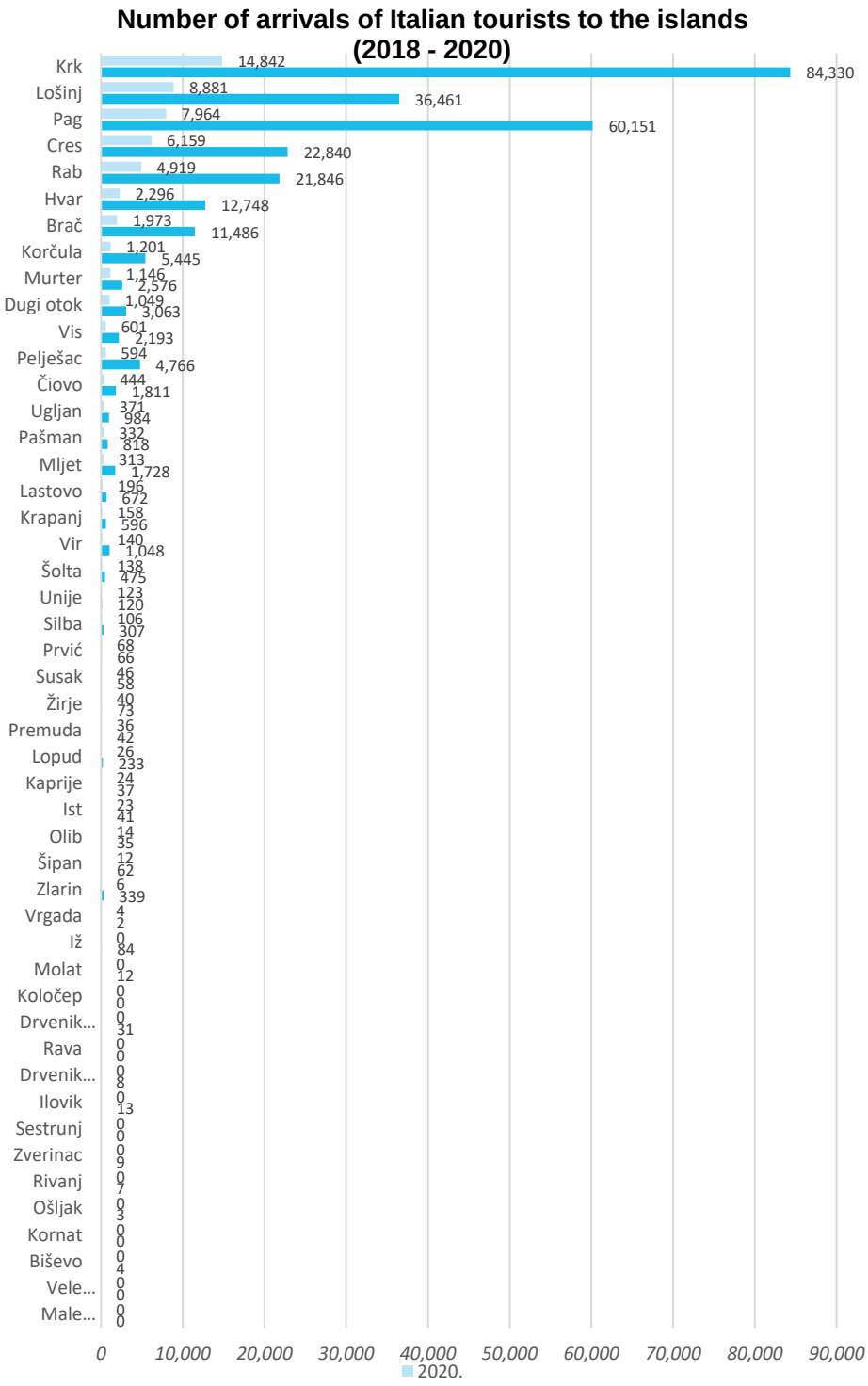
In a period before Covid-19 pandemic, the largest number of Italian tourists annually stay on the islands of Krk (84.330), Pag (60.151), Lošinj (36.461), Cres (22.840) and Rab (21.846). For a more authoritative analysis, the stated values are the average of arrivals in 2018 and 2019 because no significant deviations in the number of arrivals between those two years were found.

If the number of Italian tourists in relation to the number of local population on the island is taken into account, it was found that 12 islands [8] record a higher number of arrivals of Italian tourists than the local population. By far the highest value have the islands of Cres with 7,42 and Pag with 6,64 Italian tourists per capita, followed by the islands of Lošinj with 4,81, Krk with 4,35, Krapanj with 3,5 and Rab with 2,34 Italian tourists per one local resident of the island.

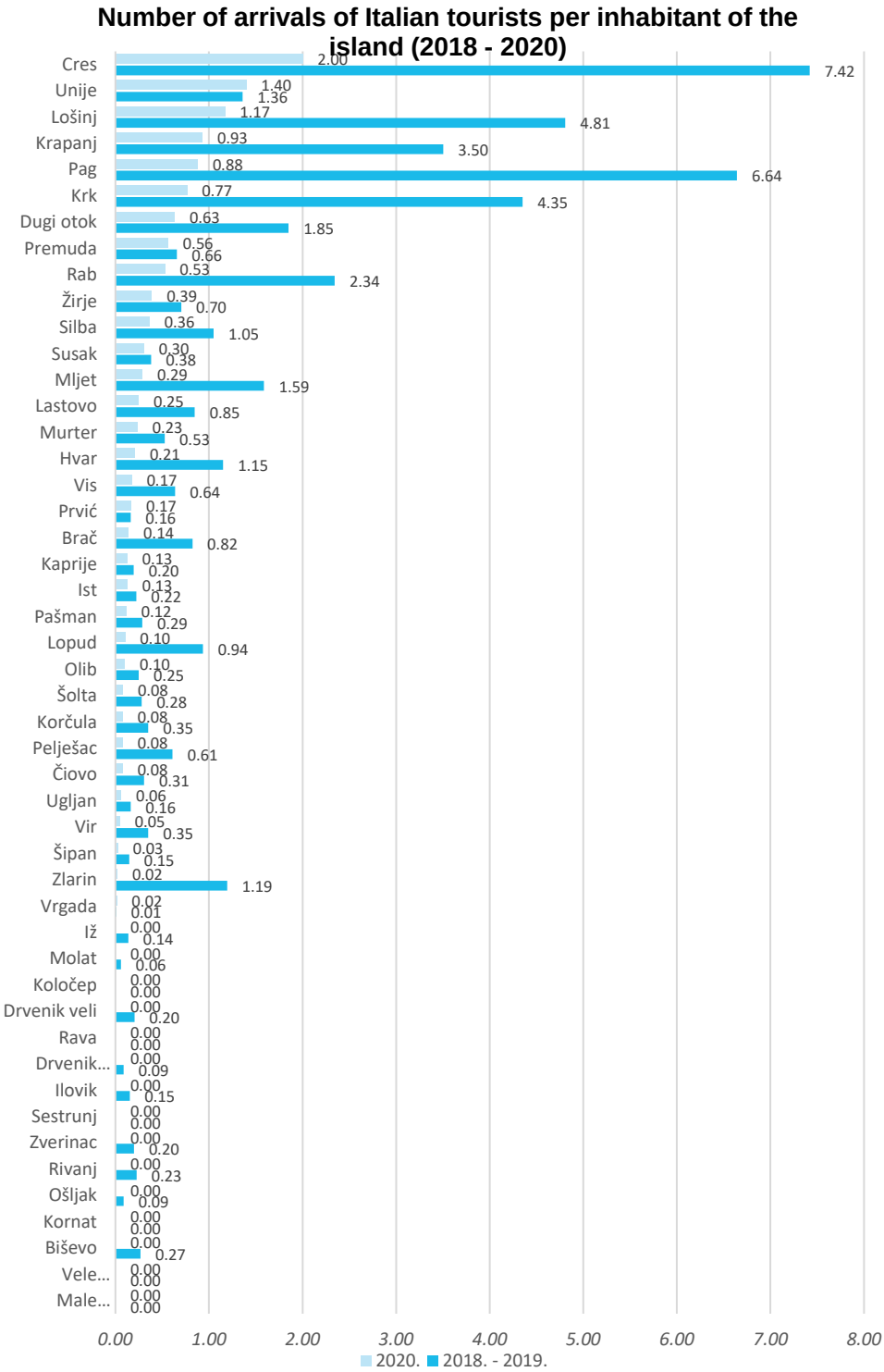
Accordingly, although larger islands generally have more tourist arrivals, no stronger correlation has been found between the number of inhabitants on the island and the number of arrivals of Italian tourists.

Analysing the number of arrivals of Italian tourists on Croatian islands in 2020, the island of Krk still records the highest number of arrivals (14.842 – 82,4 % less than the average in 2018 and 2019). It is followed by Lošinj (8.881 arrivals – 7,6 % less than the average in 2018 and 2019) and Pag (7.964 arrivals – 86,7 % less than the average in 2018 and 2019). The number of Italian tourists in relation to the number of local population on the island records significant differences compared to 2018 and 2019. In 2020, only the islands of Cres (2.00), Unije (1.40) and Lošinj (1.17) recorded a higher number of arrivals of Italian tourists than the local population.

[8] Cres, Pag, Lošinj, Krk, Krapanj, Rab, Dugi otok, Mljet, Unije, Zlarin, Hvar, Silba



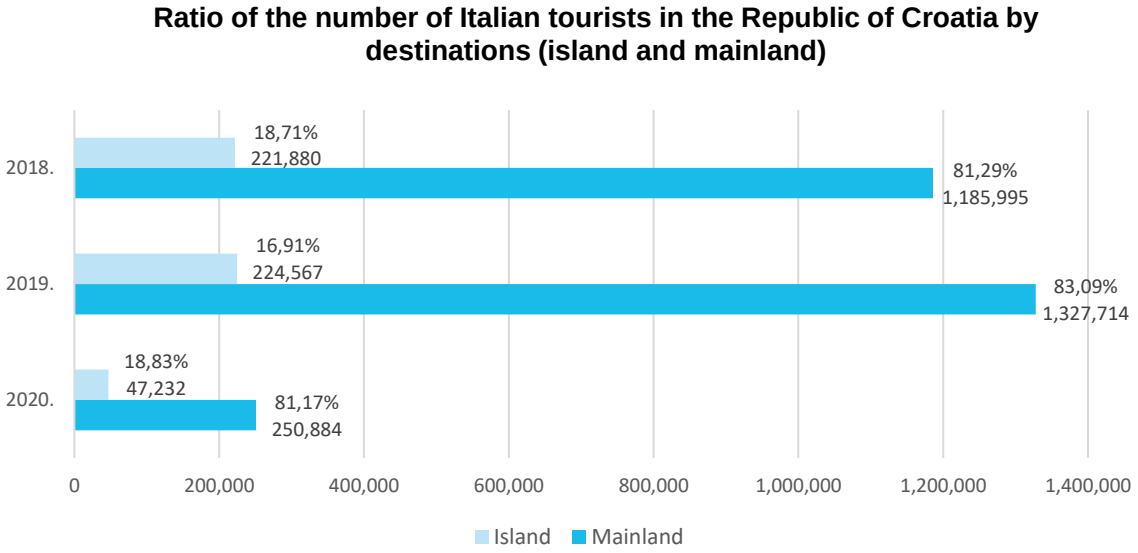
Graph 6 Number of arrivals of Italian tourists on Croatian islands (2018 - 2020) *[Source: CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*



Graph 7 Number of arrivals of Italian tourists per inhabitant of the island (2018 – 2020) *[Source: CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

Of the total number of Italian tourists in Croatia in 2018 and 2019, it was determined that in 2018 18,71 % of Italian tourists stayed on the islands, and 81,29 % on the mainland, while on the mainland in 2019 it was 16,99 % of Italian tourists stayed on the islands and 83,01 % on the mainland (Graph 8).

The ratio of the number of Italian tourists in Croatia to destinations did not change in 2020. More Italian tourists still stayed on the mainland, i.e., 81,17 %, while 18,83 % stayed on the islands.

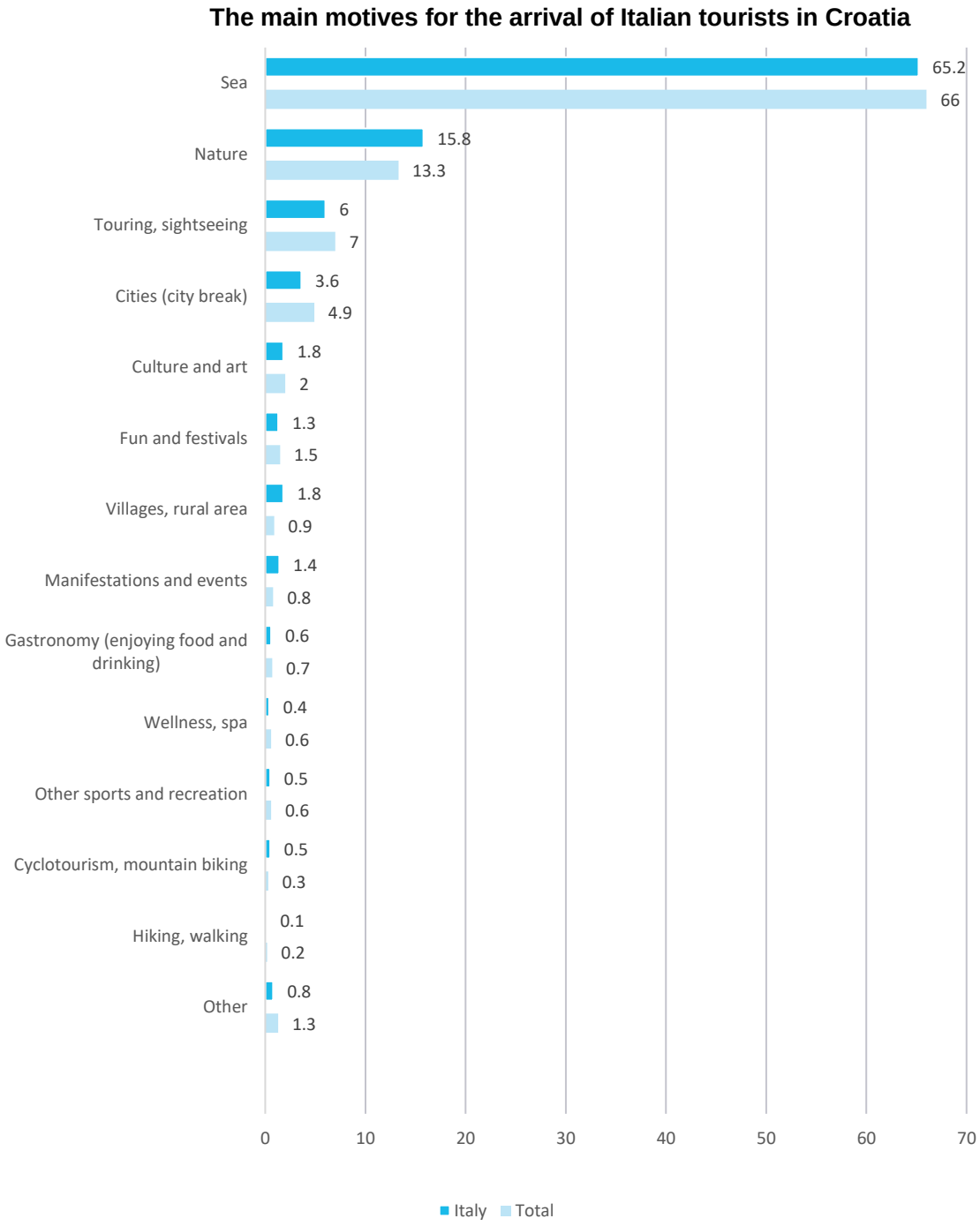


Graph 8 Ratio of mumber of Italian tourists in Croatia by destinations (island and mainland) *[Source: CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

The analysis of the main motives for the arrival of Italian tourists in Croatia was conducted based on data from "Attitudes and consumption of tourists in Croatia", TOMAS research from 2019[9]. The main motive for the arrival of Italian tourists, as with other tourists, is **the sea** with 65,2 % response rate. This is followed by **nature** with a rate of 15,8 %, **sightseeing** with 6 % and city tours with 3,6 % response rate. Italian tourists chose cycling and mountain biking as their main motives in 0,5 % of cases. Graph 9 shows the main motives for the arrival of Italian tourists and the average answers on the motives for the arrivals of all foreign tourists in total.

[9] Institute of Tourism, Attitudes and consumption of tourists in Croatia, TOMAS research (2019), available on: http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/

Since the TOMAS research "Attitudes and consumption of tourists in Croatia" was conducted in 2019, there is no knowledge about the motives for the arrival of Italian tourists in 2020, while the motives for arrival in 2021 are described in subchapter *4.2. Analysis of field research on the habits and behaviours of Italian travellers who stayed in Croatia during the Covid-19 period*.



Graph 9 The main motives for the arrival of Italian tourists in Croatia (in %) *[Source: TOMAS research, 2019 (http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/), analysed by EY]*

4.1.3.2 *Statistical analysis of the mode of transport of all tourists and Italian tourists in Croatia*

The analysis of means of transport used by Italian tourists to travel to the Republic of Croatia (hereinafter: Croatia) in the period before the Covid-19 pandemic was conducted based on data from the document "Attitudes and consumption of tourists in Croatia", TOMAS research (2010, 2014, 2017, 2019)[10]. The analysis established that, in the period from 2010 to 2019, **traveling by car was the most common way to travel to Croatia.** On average, as many as 86 % of Italian tourists travel to Croatia by car, while the average for total tourist arrivals is 78 %. Overall, the least represented mode of transport is a yacht or sailboat and some other types of transport. If we look at all tourist arrivals, the use of passenger cars is declining, and the use of air passenger transport is growing significantly.

Data for the period of the Covid-19 virus pandemic (2021) on modes of transport are described and graphically presented within Chapter *4.2. Analysis of field research on the habits and behaviours of Italian travellers who stayed in Croatia during the Covid-19 period.*

Compared to tourists from other countries, a relatively large number of Italian tourists come to Croatia by boat. The reason for this is the *transport-spatial* relationship between Croatia and Italy, which is extremely favourable in the aspect of maritime transport. On average, about 3,6 % of Italian tourists use maritime transport to come to Croatia, while the average for total arrivals of tourist is 0,68 %.

The analysis of trends of transportation modes used by Italian tourists for arrival in Croatia from 2010, 2014, 2017 and 2019 determined an average annual decline in the use of passenger cars of 0,24 %, while the use of maritime transport recorded an annual decline of 24,96 %. The reason for this decline in the representation of maritime transport, along with the simultaneous growth of passengers in maritime transport, may be the difference between the data source and the calculation methodology. Namely, the prevalence of transport use was investigated in TOMAS surveys on a certain sample of respondents, and the number of passengers in maritime transport is in the CBS databases and includes all passengers and travel, i.e., the sample is many times larger. Also, given that the representation of the mode of transport is shown in percentages, and the number of passengers in absolute values, it is possible that in general the number of trips increases,

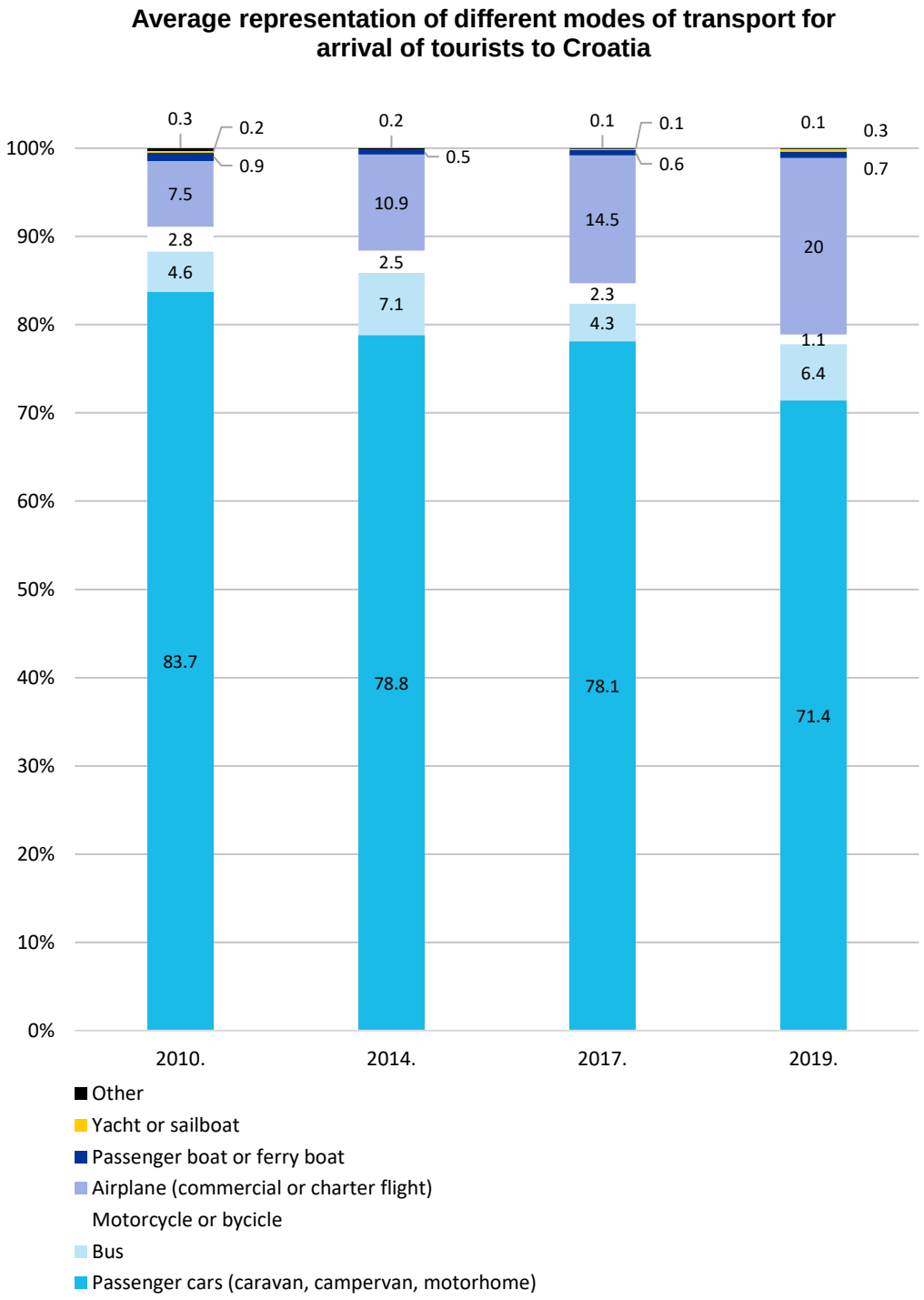
[10] Institute of Tourism, Attitudes and consumption of tourists in Croatia, TOMAS research 2019 (2010, 2014, 2017, 2019), available on: http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/

but the representation of maritime transport decreases due to the greater attractiveness of other forms of transport. In total tourist trends, the use of passenger cars recorded an annual decline of about 5,11 % (Graph 10 and Graph 11).

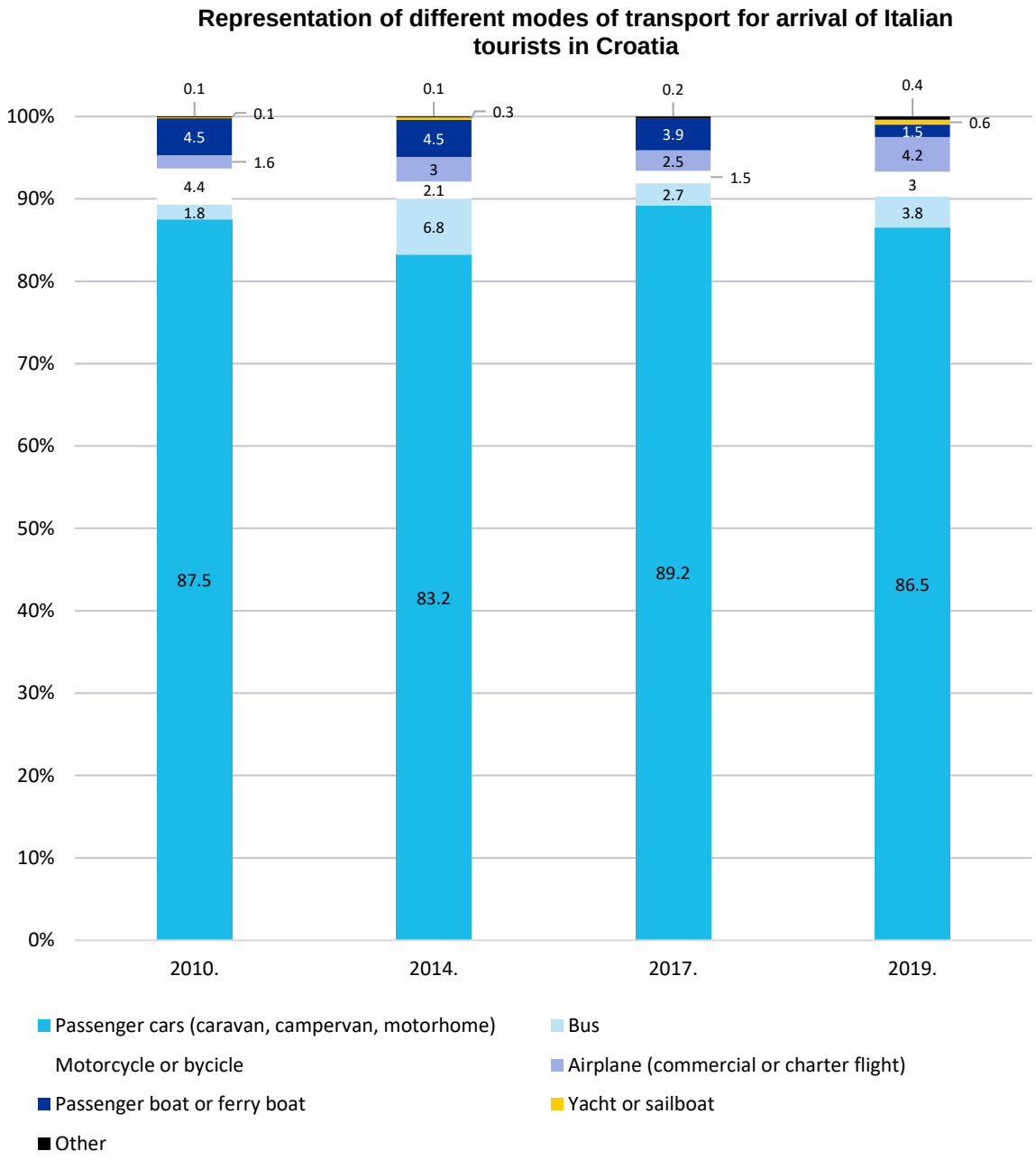
Additionally, according to the CNTB[11], Issue market profile, Italy 2021 (https://www.htz.hr/hr-HR/informacije-o-trzistima/profili-trzista) states that in the summer of 2020 the share of car use increased (69,8 %) due to fear of infection with Covid-19 virus, as well as due to the large number of cancelled flights.

> The Covid-19 virus affected, in addition to a limited number of trips, the modes of transport during the trip, which, according to currently available information, caused an increase in the use of passenger cars for their own safety and preventive protection against possible infection.

[11] CNTB, Issuing Market Profile Italy (2021), available on: https://www.htz.hr/hr-HR/informacije-o-trzistima/profili-trzista



Graph 10 Average representation of different modes of transport for the arrival of tourists in Croatia (all tourists) (in %) *[Source: Attitudes and consumption of tourists in Croatia - TOMAS 2019 (2010, 2014, 2017, 2019), (http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/), analysed by EY]*



Graph 11 Representation of different modes of transport for the arrival of Italian tourists in Croatia *[Source: Attitudes and consumption of tourists in Croatia - TOMAS 2019. (2010, 2014, 2017, 2019), (http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/), analysed by EY]*

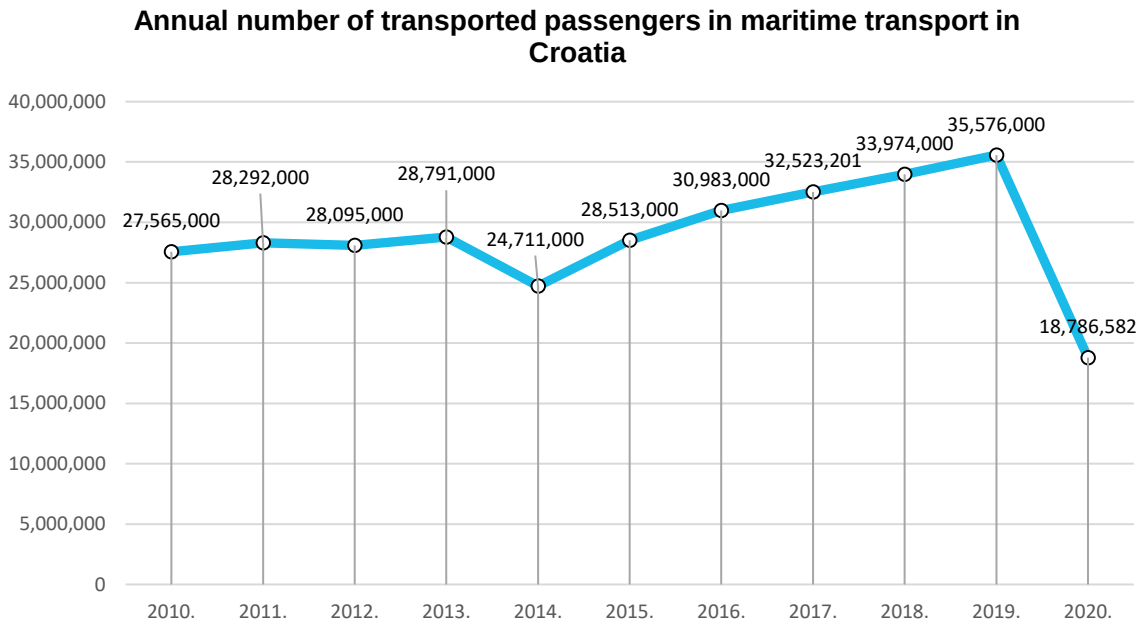
Analysis of the number of passengers transported by boat (number of embarked and disembarked passengers) for the period of the Covid-19 pandemic, contains data for year 2020. Data for 2021 are not publicly available at the time of the analysis. In addition, data for the period before the Covid-

19 pandemic (2010 – 2019) are presented for easier comparison of data and clearer overall analysis. The data obtained on the analysis are shown on Graph 12, and it was performed based on CBS data (PC AXIS database)[12].

Observing the period before the Covid-19 pandemic, 35.576.000 passengers were transported by maritime transport in Croatia in 2019, of which 1.845.000 passengers were in international traffic. The share of the number of passengers in international traffic on the Croatian territory is 6,43 % in relation to the total number of transported passengers. In the base year 2010, 27.565.000 passengers were transported, which is 29,06 % less than in 2019. The fewest passengers were transported by sea transport in 2014. However, since that year, a stable trend of increasing the number of passengers transported by sea transport has been established. In the period from 2010 to 2019, an increase trend of 3,23 % per year was established.

During the Covid-19 pandemic (2020), 18.786.582 passengers were transported by maritime transport in Croatia, i.e., 47,19 % less than in 2019. The share of the number of passengers in international traffic is only 0,22 % in relation to the total number of transported passengers in the same year, which with the decrease in the total number of transported passengers is the expected result considering the travel restriction measures in force at that time.

[12] CBS, PC AXIS database, available on: (https://www.dzs.hr/hrv/system/stat_databases.htm)



Graph 12 Annual number of transported passengers in maritime transport in Croatia *[Source: DZS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

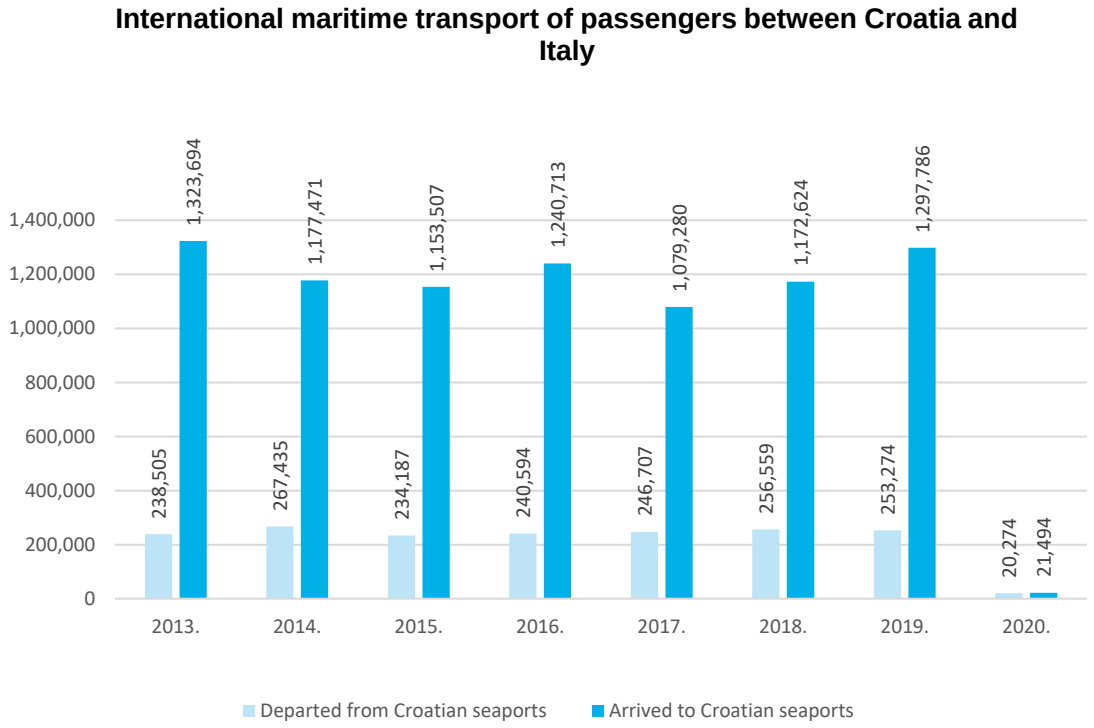
In order to analyse in more detail the demand in maritime transport by destination, the international traffic in Croatian seaports was analysed (based on the country of embarkation and disembarkation) for the period before the Covid-19 pandemic (2013 - 2019) and for the period during the Covid-19 pandemic. The results are shown on Graph 13.

The number of passengers between Italy and Croatia makes up about 85 % of the total number of passengers transported in international maritime transport in Croatia in the period before Covid-19 pandemic (2013 – 2019). Within the remaining 15 % of the number of passengers transported in international maritime transport, Spain, the United Kingdom and Greece are in the lead, along with many other countries with a smaller share. With analysis of available CBS data (PC AXIS database)[13] for the period from 2013 to 2019, a trend in the number of passengers in maritime transport between Croatia and Italy was determined. In the base year 2013, 238.505 passengers were recorded who travelled from Croatian ports to Italy and 1.323.694 passengers who arrived from Italy

During the Covid-19 pandemic, there is a decline in international passenger traffic of 98,34 % compared to 2019. In 2020, a total of 42.076 passengers were recorded in international traffic, of which 99,27 % of passengers were transported between Italy and Croatia.

[13] CBS, PC AXIS database, available on: (https://www.dzs.hr/hrv/system/stat_databases.htm)

to Croatia. In 2019, there were 253.274 passengers who travelled from Croatian ports to Italy and 1.297.786 passengers who arrived from Italy to Croatia. This resulted in an increase of 6,19 % in the number of passengers traveling from Croatian ports to Italy and a decrease of 1,96 % in the number of passengers arriving in Croatia from Italy. The trend of the number of passengers on the route between Italy and Croatia records an average annual increase of 0,18 %.



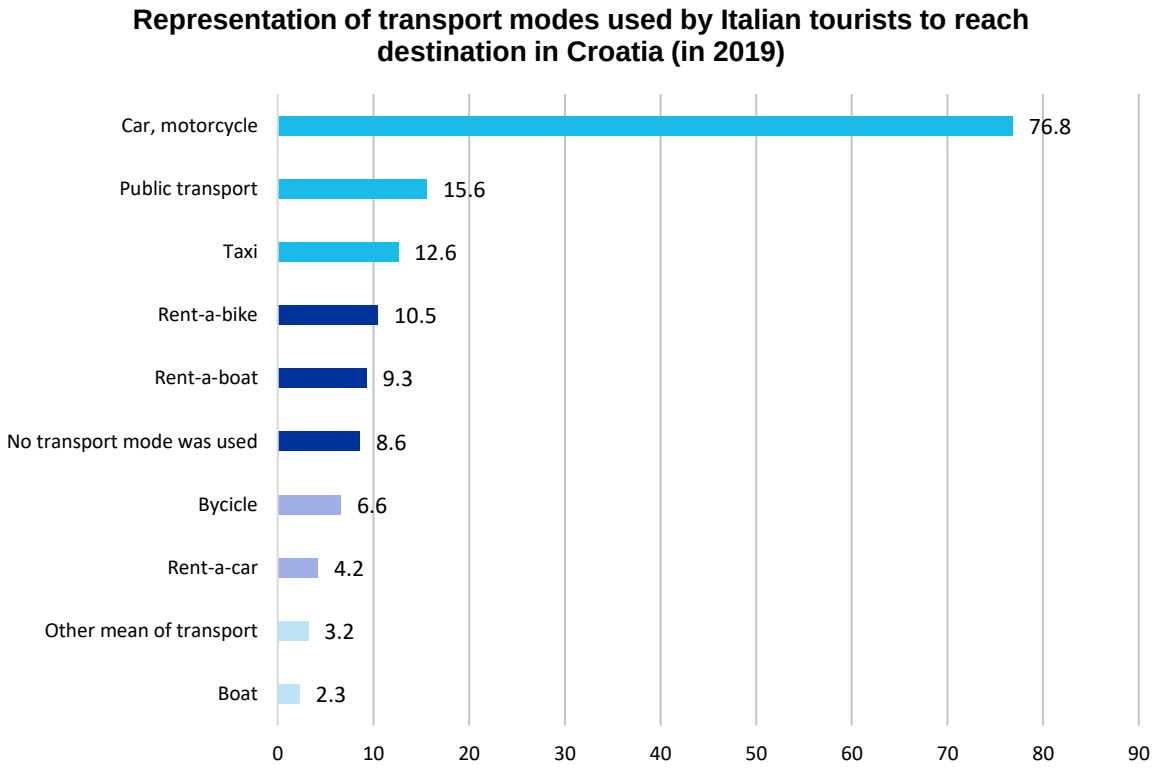
Graph 13 International passenger traffic in maritime transport between Italy and Croatia *[Source: CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

By analysing the mode of transport used by Italian tourists to reach destinations within Croatia, according to the TOMAS survey (Attitudes and consumption of tourists in Croatia - TOMAS 2019)[14], it was found that Italian tourists mostly use car (76,8 %) to get to destinations in Croatia, next is local public transport (15,6 %), taxi transport (12,6 %), rented bicycle (10,5 %) and chartered boat (9,3 %) (Graph 14)[15].

[14] Institute of Tourism, Attitudes and consumption of tourists in Croatia, TOMAS research (2019)., available on: http://www.iztzg.hr/hr/projekti/tomas-istrazivanja

[15] The amount of the share exceeds 100% because the collection of data by the respondents made it possible to choose more than one mode of transport.

Data on modes of transport during the Covid-19 virus pandemic period are described and graphically presented within Chapter 4.2. *Analysis of field research on the habits and behaviours of Italian travellers who stayed in Croatia during the Covid-19 period.*



Graph 14 Representation of the transport mode of Italian tourists to reach destinations in Croatia (in 2019) (in %) *[Source: Survey on attitudes and expenditures of tourists in Croatia - TOMAS 2019., (http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/), analysed by EY]*

By comparing the transport mode usage with other foreign tourists, it was found that Italian tourists use a personal vehicle (16 % more) and a rented bicycle (0,8 % more) more than average tourist. Other modes of transport, Italian tourists use less than the average tourists from other countries for about 4 %.

To gain a better insight into the habits and desires of Italian tourists in the context of transport, an analysis of the satisfaction of the elements of the transport offer was conducted. The analysis was conducted based on TOMAS survey data from 2019[16]. In the present research, all elements of the

[16] Institute of Tourism, Attitudes and consumption of tourists in Croatia, TOMAS research (2019), available on: http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/

tourist offer were analysed, but considering the purpose of this report, for the purposes of this analysis, only those elements that have points of contact with the transport system were considered. Accordingly, the degree of satisfaction for the following elements was analysed:

- Possibility of quality movement on foot in the destination,
- Hiking trails,
- Traffic availability of the destination,
- Bicycle paths and routes,
- Local public transport,
- Traffic in the place (parking system).

The results of the analysis related to the pre-Covid-19 period (2019) are shown in the Table 1, while data relating to the period during the Covid-19 virus pandemic (2020-2021) at the time of the Analysis are not publicly available.

Table 1 Level of satisfaction with the elements of the transport offer of Italian tourists and the average values of tourists from other countries

Elements of offer	Satisfaction of Italian tourists (%)	Average satisfaction of all tourists (%)
Traffic availability of the destination	77,6	72,7
Hiking trails	70,4	65,2
Quality of local transport	58,5	61,3
Bicycle paths and routes	59,6	57,5
Organization of traffic on the destination (parking, pedestrian zones, traffic management)	56,1	54,8

[Source: Attitudes and expenditures of tourists in Croatia - TOMAS 2019., (http://www.iztzg.hr/hr/projekti/tomas-istrazivanja/), analysed by EY]

4.1.3.3 *Synthesis of results*

	Period before Covid-19 pandemic	Period during Covid-19 pandemic
Number of arrivals of Italian tourists to Croatia from 2011 to 2019	▶ Italian tourists in Croatia make an average of 1.080.515 arrivals per year, which is about 8 % of the total number of arrivals of all tourists, ▶ The highest number of arrivals was recorded in 2019 (1.206.946 arrivals) and the lowest in 2013 (953.665 arrivals), ▶ From 2011 to 2019, an average annual growth trend of 2,17 % was determined.	▶ Decrease in arrivals of all tourists to Croatia by 64,2 % compared to 2019, ▶ Decrease in the number of arrivals of Italian tourists to Croatia in 2020 by 79,5 % compared to 2019.
Number of tourist arrivals on the biggest Croatian islands from 2011 to 2019	▶ 17 biggest Croatian islands are visited by average of 2.500.000 tourists a year, ▶ Of the total number of tourist arrivals in Croatia, the largest Croatian islands account for about 17,5 % of arrivals, ▶ From 2011 to 2019, a positive trend of an average of 2,2 % increase per year was established, ▶ The island of Krk is the most visited island, and Lastovo is the least visited island.	▶ Compared to 2019, the 17 largest Croatian islands were visited by 1.093.000 tourists, ▶ Vir, Ugljan, Pašman, Mljet and Šolta record an increase in the number of arrivals compared to the period before the pandemic, ▶ The islands of Lošinj, Cres, Vis, and Dugi otok did not record the arrival of tourists during the Covid-19 pandemic.
Number of arrivals of Italian tourists on Croatian islands by group of islands in 2018 and 2019	▶ In 2018, 275.539 Italian tourists stayed on the Croatian islands, ▶ In 2019 about 1,6 % more Italian tourists stayed on the Croatian islands compared to 2018, ▶ The Group I islands (up to 500 inhabitants) record 0,8 % of the total number of arrivals of Italian tourists on islands, ▶ The Group II islands (from	▶ In 2020, 83,6 % fewer Italian tourists stayed on Group I islands (up to 500 inhabitants) compared to 2018 and 2019, ▶ The Group II islands (from 500 to 5.000 inhabitants) recorded a decrease of 85,8 % compared to 2018 and 2019, ▶ The Group III islands (more than 5.000 inhabitants) recorded a decrease in arrivals of 90,9 % compared to 2018 and 2019.

	500 to 5.000 inhabitants) record 12,8 % of the total number of arrivals of Italian tourists on islands, ▶ The Group III islands (more than 5,000 inhabitants) record 86,5 % of the total number of arrivals of Italian tourists on islands.	
Annual number of Italian tourists on Croatian islands and the ratio of the number of Italian tourists and the number of local population	▶ 12 Croatian islands record a higher number of annual arrivals of Italian tourists than number of local population, ▶ The largest number of arrivals of Italian tourists per local inhabitant of the island have: ▶ Cres (value: 7,42), ▶ Pag (value: 6,64), ▶ Lošinj (value: 4,81), ▶ Krk (value: 4,35), ▶ Krapanj (value: 3,5), ▶ Rab (value: 2,34).	▶ Three Croatian islands record a higher number of annual arrivals of Italian tourists than the local population: ▶ Cres (value: 2,00), ▶ Unije (value: 1,40), ▶ Lošinj (value: 1,17).
Ratio of the number of Italian tourists in Croatia to destinations (island and mainland)	▶ In 2018, 18,71 % of Italian tourists stayed on the islands, and 81,29 % on the mainland, ▶ In 2018, 16,99 % of Italian tourists stayed on the islands, and 83,01 % on the mainland.	▶ In 2020, 18,83 % of Italian tourists stayed on the islands and 81,17 % on the mainland.
The main motives for the arrival of Italian tourists in Croatia	▶ 65,2 % sea, ▶ 15,8 nature, ▶ 6 % sightseeing, ▶ 3,6 % city tour, ▶ 0,5 % cycling and mountain biking, ▶ 8,1 other.	▶ The analysis of the main motives for the arrival of Italian tourists in Croatia in 2021 is described and graphically presented in Chapter *4.2. Field research on the habits and behaviours of Italian travellers who stayed in Croatia.*
Statistical analysis of transport modes	▶ Traveling by car is the most common way for tourists to travel to Croatia,	▶ The data for the period during Covid-19 pandemic (2021) is described and graphically

	▶ 86 % of Italian tourists travel to Croatia by passenger cars (car, caravan, campervan, motorhome), ▶ 78 % of all tourists travel to Croatia by passenger cars (car, caravan, campervan, motorhome), ▶ About 3,6 % of Italian tourists use maritime transport to travel to Croatia, ▶ The average of all touristic arrivals to Croatia by maritime transport is 0,7 %, ▶ The trend of the representation of the mode of transport of Italian tourists for arrival in Croatia (2010, 2014, 2017, 2019) records an annual decrease in the use of cars (0,24 %) and a decrease in the use of maritime transport (24,96 %).	presented in Chapter *4.2. Field research on the habits and behaviours of Italian travellers who stayed in Croatia*.
Analysis of annual data on the number of passengers transported by boat	▶ Compared to 2019, in 2010, 29,6 % less passengers were transported (27.565.000 passengers), ▶ 6,43 % of passengers is carried in international maritime transport, ▶ There is a growth trend of 3,23 % in the number of passengers carried from 2010 to 2019.	▶ 47,19 % less transported passengers compared to 2019, ▶ 0,22 % of transported passengers in international maritime transport.
International passenger traffic in maritime transport between Italy and Croatia	▶ 85 % of the total number of transported passengers in international maritime transport in Croatia is the number of passengers between Italy and Croatia, ▶ Annual increase in the number of passengers on the route between Italy and Croatia is 0,18 %.	▶ A decrease of 98,34 % of the international number of passengers compared to 2019, ▶ 42.076 of all passengers in international traffic were recorded in 2020, of which 99,27 % were passengers transported between Italy and Croatia.

Representation of the mode of transport of Italian tourists within Croatia	▶ 76,8 % car, ▶ 15,6 % local public transport, ▶ 12, 6 % taxi, ▶ 10,5 % rent-a-bike, ▶ 9,3 % rented boat, ▶ Italian tourists use 16 % more passenger cars and 0,8 % more bicycles compared to other tourists, while they use other transport modes about 4 % less than tourists from other countries.	▶ The analysis of the modes of transport used for the arrival of Italian tourists in Croatia in 2021 is described and graphically presented in Chapter *4.2. Field research on the habits and behaviours of Italian travellers who stayed in Croatia.*
Level of satisfaction for the elements of the traffic offer among Italian tourists	▶ Italian tourists are the least satisfied with stationary traffic (parking lots, pedestrian zones, traffic management, etc.), ▶ They are most satisfied with the traffic accessibility of the destination.	▶ At the time of writing and conducting the Analysis, data on the degree of satisfaction for traffic supply elements among Italian tourists are not publicly available.

[Source: EY]

4.1.4 Concluding remarks

In the pre-Covid-19 period, the number of tourist arrivals in the Republic of Croatia, both to the mainland and to the Croatian islands, is constantly growing from year to year. However, there is a clear deviation in annual growth trends, i.e., the annual number of arrivals of Italian tourists is not growing with the same intensity as the total number of tourist arrivals. The reason for this may be national strategic decisions and the action of Italian tourism policy (encouragement of domestic tourism), but also the lack of quality transport connections between Croatia and Italy.

An analysis of the arrivals of Italian tourists to Croatian islands found that the islands in the northern Adriatic are more visited than the islands in Dalmatia. One of the reasons for this is the proximity of the destination and the higher level of traffic offer between Istria, Primorje and Italy. The correlation between the number of tourist arrivals and the maritime offer is visible for the islands of Lošinj and Pag, which have the largest share of Italian tourist arrivals in the total number of tourist arrivals, and are the only islands directly connected to Italy by ferry.

Although the geo-transport relationship between Italy and Croatia is extremely favourable in the context of maritime transport, it has not been sufficiently used in the function of connecting the two countries. All international maritime lines in Croatia are connected exclusively to Italy, which is evident from the data that indicate that Italian tourists use maritime transport to come to Croatia

much more than tourists from other countries. However, most of the passengers that come from Italian seaports to Croatian seaports in international maritime transport, according to the methodology of data processing by the CBS, refers to cruises and not to liner shipping. Consequently, interest in the tourist visit of Italian tourists exists, but is not adequately accompanied by the offer of liner and regular maritime transport.

Most Italian tourists come to Croatia by car (more than the average tourist from other countries), although the trip by car is far less direct than traveling by ship, especially for the southern part of Italy. Also, the personal car is mostly used for the movement of tourists within Croatia. This is partly due to the lack of long-distance transport offer (cross-border), as well as local transport offer (public transport, bicycle, etc.). Namely, if a passenger, due to inadequate alternatives, is forced to travel to his destination by car, there is a high probability that he will use that car for travel in the destination area as well. Therefore, by improving the transport offer in the function of cross-border transport connections, the pressure of road traffic at the local level is reduced.

The Covid-19 pandemic has had a strong impact on social, economic and tourism trends. This is evident in the data that indicate large declines in the number of tourist arrivals. The reason for this is that, due to the implementation of restrictive measures, the number of overall trips decreased, which was reflected in the decline in the total number of tourist arrivals. Also, due to the above reasons and due to the emergence of isolating social habits, the share of car use during travel increased, while the share of travel in mass public transport (maritime transport, bus, train, etc.) decreased.

4.2 Analysis of previous experiences of relevant tourist institutions/agencies regarding the habits of Italian passengers regarding the usage of transport

4.2.1 Task description

As part of Task 1.2. Survey (interviewing) of relevant tourist institutions/agencies on previous experiences of Italian passengers regarding the habits of using transport, an analysis of the experiences of tourist institutions/agencies on the habits of using transport by Italian passengers was made.

The aim of the analysis is to identify the shortcomings of the current maritime transport system and gain a broader insight, from the perspective of tourism service providers, into the characteristics of transport demand through previous experiences and habits of Italian passengers related to transport use.

To gain a clear insight into the previous experiences and habits of Italian passengers related to the use of transport, as part of this task, an analysis of relevant data obtained from tourist institutions/agencies was conducted, which included the following:

- the most common reasons for Italian tourists to travel to Croatia,
- the most common destinations for Italian travellers in Croatia,
- which means of transport are most often used by Italian passengers traveling to Croatia according to the experiences of relevant tourist institutions/agencies,
- what are the experiences of Italian passengers traveling to Croatia on transport services, with an emphasis on maritime transport, in both countries,
- how much the relevant tourist institutions/agencies are aware of the possibilities of multimodal transport,
- proposals for improving the multimodal mode of transport between Italy and Croatia.

4.2.2 Methodology

The data on the previous experiences of Italian passengers regarding the habits of using transport were conducted by method of primary research. The primary research within this task was conducted by questioning tourist institutions/agencies in Croatia and Italy that have at least three years of experience with tourist services.

Two methods were used to gather information on the experience of Italian travellers:

a) a survey obtaining information on the experience and habits of Italian passengers, as well as an assessment of their transport via a questionnaire distributed to respondents via e-mail;

b) a structured interview through which data is collected by interviewing the respondents; Interviews were conducted by telephone and using online platforms to hold conference calls.

The primary survey was conducted in the period from August 16, 2021 to September 13, 2021. To ensure as many answers as possible during the period of significant workload of the subjects that were surveyed under this task, all subjects from the sample were provided with an electronic questionnaire, and offered various options for completing the questionnaire, i.e., personally completing, and sending the completed questionnaire via Google forms or answer questions from questionnaires over the phone or online conference call platforms.

The sample of Croatian tourist agencies that are suitable for conducting primary research was defined based on data from the Croatian Chamber of Economy submitted by the Client on August 16th, 2021. According to the described procedure, in seven counties in the area covered by the Multimodality Analysis, a total of 569 travel agencies met this condition.

The sample of Italian travel agencies that are suitable for conducting primary research is defined based on the data available on the official website of the Croatian National Tourist Board[17] on which the list of travel agencies that provide travel services to Croatia was published.

Based on these data, for the purpose of defining the sample, travel agencies which are in the Italian regions located in the INTERREG VA Italy-Croatia 2014-2020 program area were considered. By checking the websites of individual travel agencies, only travel agencies that meet the requirement of at least three years of providing tourism services were considered. Finally, 18 active travel agencies were defined, to which a questionnaire was sent by e-mail.

The sample of tourist boards in the Republic of Croatia that are suitable for conducting primary research is defined based on data available on the CNTB website[18] where the list of tourist boards in the territory of the Republic of Croatia was published. Based on the available data, the tourist boards located in seven counties in the coverage area were considered. It was determined that a total of 161 tourist boards operate in the coverage area.

The survey questionnaire contained the following questions:

1. What are the most common destination trips of Italian travellers in Croatia? – rank at least the three most common destinations
2. According to your knowledge and/or information available to you, which means of transport are most used by Italian travellers traveling to Croatia?
3. What are the feedback experiences of Italian travellers traveling to Croatia on transportation services, with an emphasis on maritime transport, in both countries? (0 – bad experience, 5 – great experience)
4. How familiar is your tourist institution/agency with the possibilities of combining different modes of transportation from the seaport to the final destination for the tourists' needs?
5. Indicate which possibilities of combining different modes of transportation are you familiar with?
6. Comment on the quality of transportation in the destination area.
7. What are your suggestions for a possible improvement regarding the connection of maritime transport with other modes of passenger transport, which are primarily related to Italian travellers traveling to Croatian islands?

[17] CNTB, Issue Market Profile - Issue 2021 - Italy, available on: https://www.htz.hr/sites/default/files/2021-01/Italija_profil_2020_0.pdf

[18] CNTB, List of tourist boards, available on: https://www.htz.hr/hr-HR/opce-informacije/turisticke-zajednice

8. What are the most common reasons for Italian travellers to travel to Croatia?

The questionnaire was prepared and distributed in Croatian to entities in Croatia. To achieve a higher response rate by Italian travel agencies, a questionnaire was prepared and submitted in English and Italian.

The collected data were then sorted and statistically processed in *MS Excel* and analysed. Descriptive statistics were used for the analysis, which includes the organization of the collected data and their summary description using numerical and graphical representations.

The analysis of responses was conducted based on selective and summarized data of all surveyed subjects.

The results of statistical processing and data analysis are presented below.

4.2.3 Results

A total of 51 responses were collected by conducting a survey of a sample of Croatian and Italian tourist agencies and a sample of Croatian tourist boards, which is in line with the planned response rate. The number of answers depending on the subject of the survey is as follows:

- Travel agencies in Croatia - 24 answers from 569 sent questionnaires (4 %),
- Travel agencies in Italy - 3 answers out of 18 sent questionnaires (16 %),
- Tourist boards in Croatia - 24 answers from 161 sent questionnaires (15 %).

The results presented below reflect the experiences of travel agencies and associations that responded to the submitted questionnaire in some of the possible ways described within the methodology of this task.

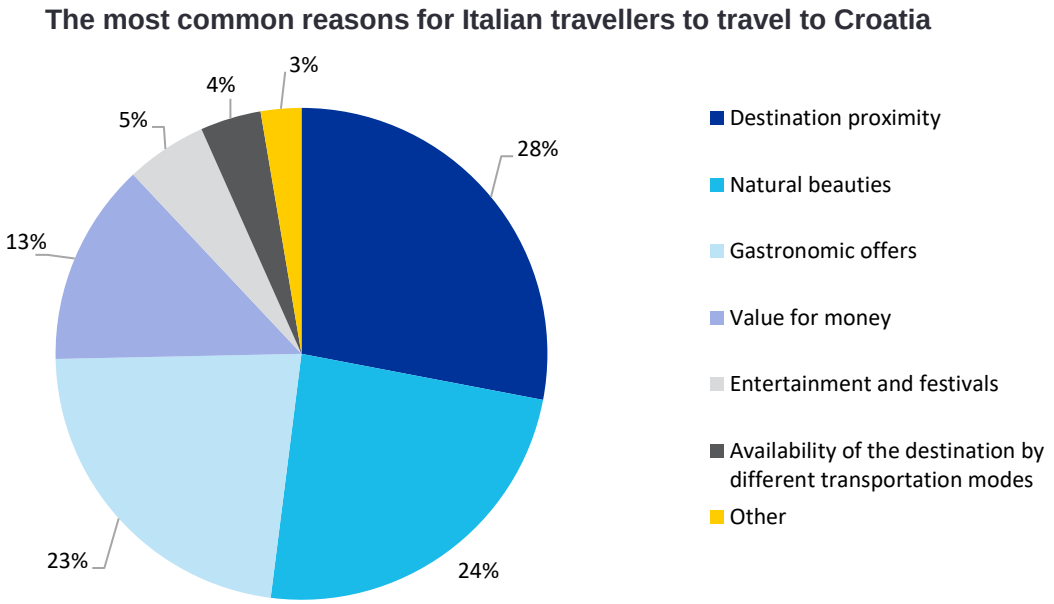
For easier review, the presentation of results is structured according to the following chapters:

- Analysis of the results obtained by surveying travel agencies in the Republic of Croatia,
- Analysis of the results obtained by surveying tourist boards in the Republic of Croatia,
- Analysis of the results obtained by surveying travel agencies in Italy,
- Synthesis of results.

4.2.3.1 *Analysis of the results obtained by surveying travel agencies in the Republic of Croatia*

As the most common reason for Italian travellers to travel to Croatia, travel agencies cite the proximity of the destination, natural beauties, and gastronomic offer. Other common reasons for the arrival of Italian tourists are the value they receive for the money invested, entertainment and festivals, and the availability of the destination by different transportation modes. Other reasons for

the travel of Italian tourists to Croatia according to the observed sample make up a share of 3 %, which can be seen in the Graph 15.



Graph 15 The most common reasons for Italian travellers to travel to Croatia according to the survey results filled out by travel agencies in Croatia *[Source: EY]*

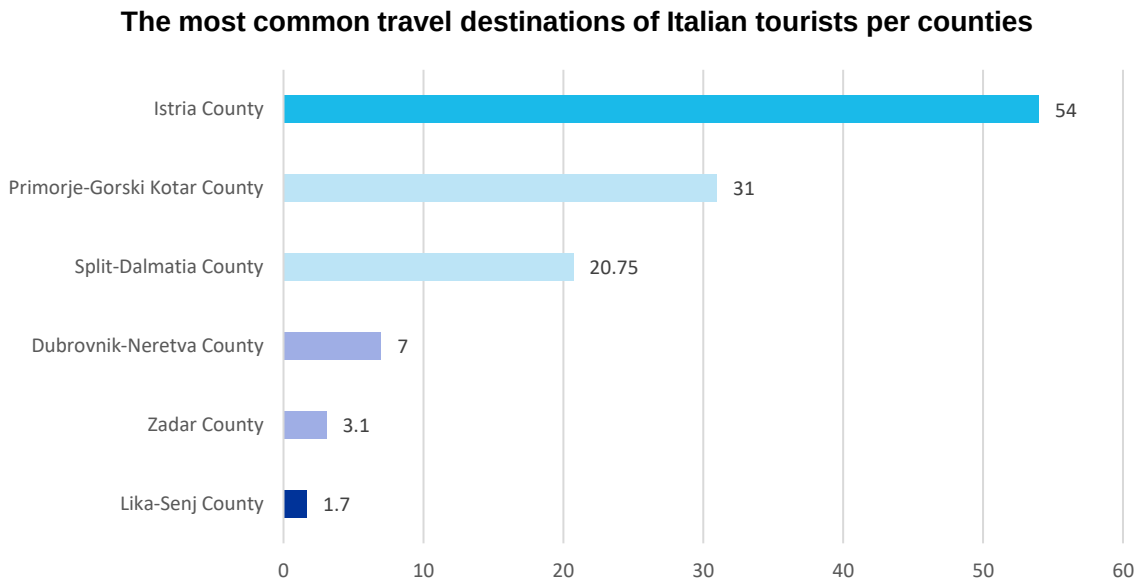
The analysis of the most common destination trips of Italian tourists was carried out by scoring the received responses, and the scoring methodology itself is described below. Given that it was necessary to rank at least three travel destinations, each was awarded a certain number of points as follows:

- 2 points – travel destination of the first choice,
- 1,5 points – travel destination of second choice,
- 1 point – travel destination of the third choice,
- 0,5 points - travel destination of the fourth choice,
- 0,2 points – travel destination of the fifth choice,
- 0,1 points – travel destination of the sixth choice,
- 0,05 points – travel destination of the seventh choice.

Furthermore, the number of responses of all listed destinations was summarized and weighed according to the scoring system to define the ranking number of destinations. The responses

received on the most common travel destinations of Italian tourists by travel agencies were summarized by counties.

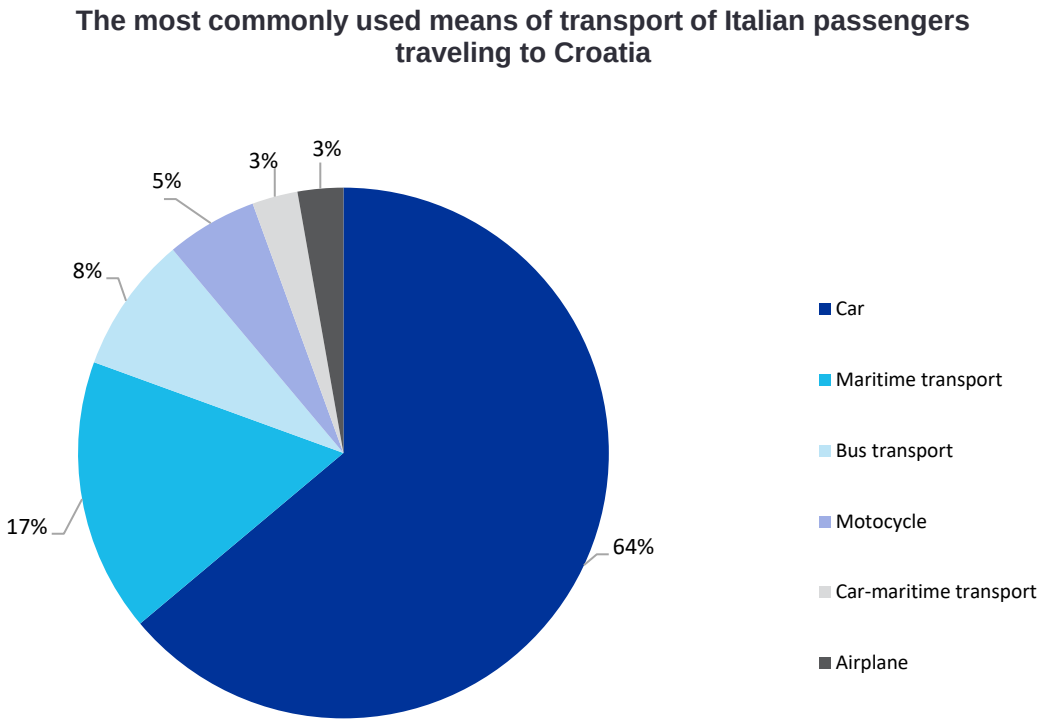
Graph 16 shows the most common destinations of Italian travellers based on counties. Istria is in first place with a total of 54 points, followed by the Primorje-Gorski Kotar County with 31 points. Lika-Senj County was the least visited with a total of 1,7 points.



Graph 16 The most common travel destinations of Italian tourists per counties according to survey results sent to travel agencies in the Republic of Croatia (number of points) *[Source: EY]*

The analysis of the most common means of transport of Italian passengers traveling to Croatia is expressed through the analysis of the transport frequency by car, bus, motorcycle, airplane, maritime transport, and combined transport (car-maritime transport).

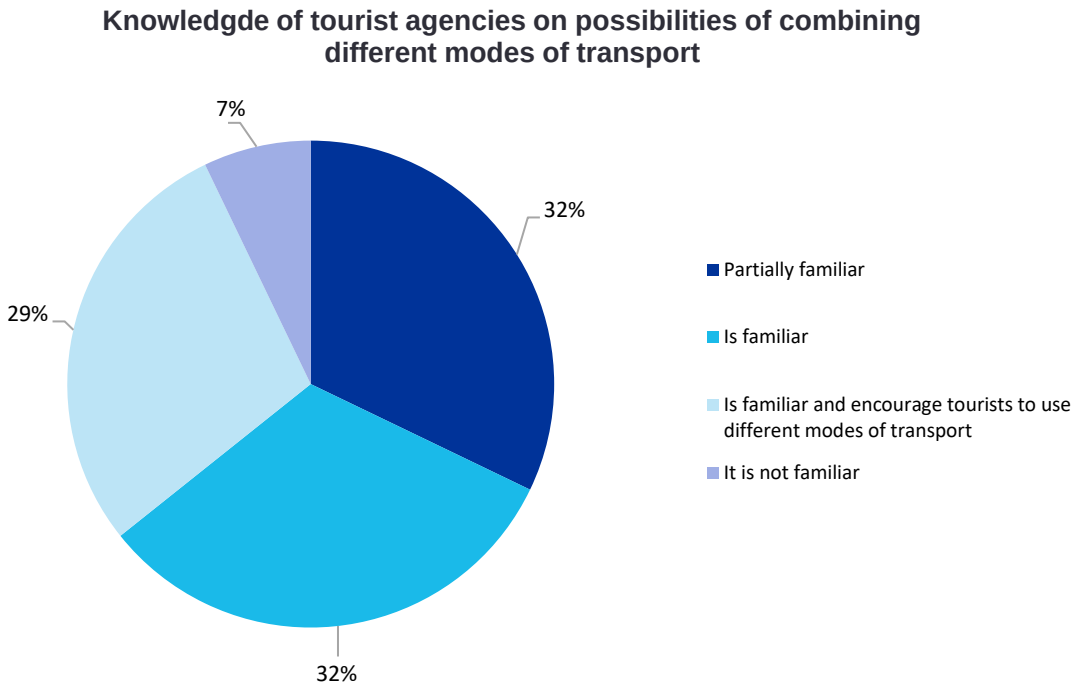
According to travel agencies, the car is the most common mean of transport used by Italian travellers when traveling to Croatia (23 answers). Maritime transport is the second most common way of coming to Croatia (6 answers), while bus transport is the third most used mean of transport (3 answers). According to the results of the research, motorcycles, airplanes, and combined transport are less frequently used means of transport when traveling, which can be seen in the Graph 17. The answers are given according to the statistical data processed in the previous task on the means of transport which Italian tourists use when traveling to Croatia.



Graph 17 The most used means of transport of Italian passengers traveling to Croatia according to the results of questionnaires sent to travel agencies in the Republic of Croatia *[Source: EY]*

Information on the satisfaction of Italian passengers with maritime transport in Croatia and Italy was collected through an evaluation system. Grades ranged from 0 - "bad experience" to 5 - "great experience". The average assessment of the level of satisfaction with the use of maritime transport in the Republic of Croatia is 3,5, while for maritime transport in Italy it is 3,54. **These results indicate that travel agencies consider maritime transport to be at an acceptable level in both countries with sufficient room for possible future development.**

The analysis of the level of information on the concept of multimodality, i.e., combined transport, found that 32 % of travel agencies are familiar with the concept, while 29 % of travel agencies even encourage tourists to use this type of travel. 32 % of respondents are only partially familiar with the concept of multimodality, and 7 % of respondents are not familiar with combining different modes of transport and have never encountered the concept of multimodality. The results of the query on this question are visible in the Graph 18.



Graph 18 Knowledge of tourist agencies on the possibilities of combining different modes of transport according to the results of the survey *[Source: EY]*

The combinations of different modes of transport that travel agencies are familiar with are:

- Maritime transport - bus,
- Maritime transport - transfers/taxi/rent a car,
- Train - sea transport - bus,
- Airplane - rent a car.

Only half of the travel agencies that answered the question about the quality of transport (19 answers) in the destination area consider that the transport in the destination area is satisfactory. For the rest of the respondents, the greatest dissatisfaction is focused on poor transport connections in the destination area, which imposes the need for the development and introduction of new lines of maritime and bus passenger transport. The shortcomings of the transport system stand out in smaller settlements and cities. Large cities have enough public transport lines, but the connection of large cities with smaller settlements/cities does not have a sufficient level of frequency, while in some, public transport does not even exist. An additional shortcoming of the transport system is manifested in the poor inter-island connection as well as the connection between the island and the mainland. In some destinations on the islands, after the end of the tourist season, the number of maritime lines decreases, which also reduces the quality of life of the island population. The taxi

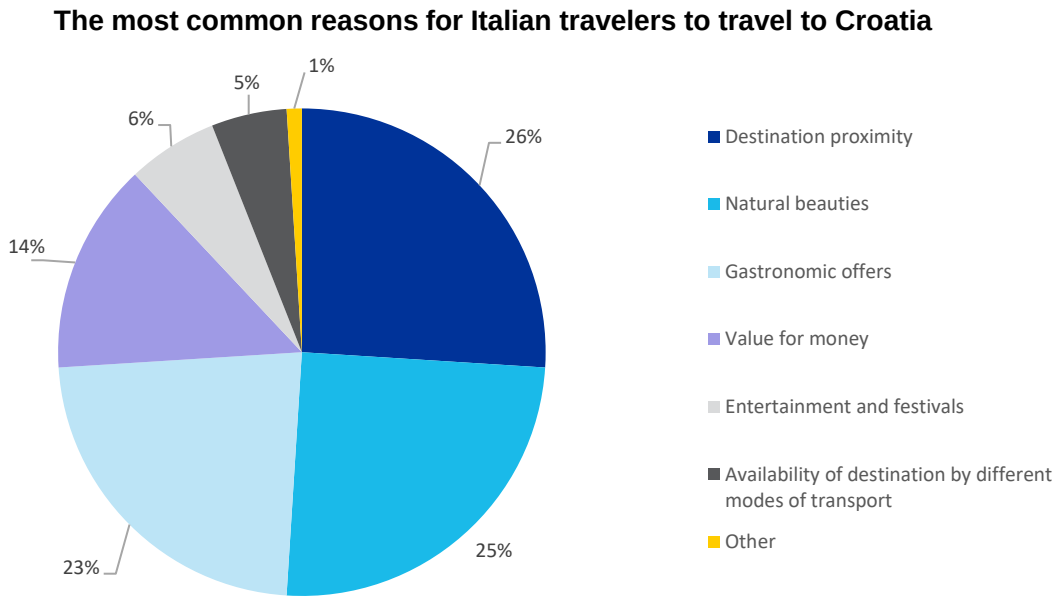
service, which is available in areas without public transport, is unaffordable and this is another reason, the respondents point out, why tourists do not visit certain destinations.

A total of 17 travel agencies have given proposals for possible improvements in connecting maritime transport with other forms of passenger transport, which primarily relate to Italian passengers traveling to Croatian islands. Proposals for improvement are based on the development and introduction of new maritime lines and the development of public passenger transport. One of the respondents' suggestions is to reduce the price of maritime transport and increase the number of departures of maritime lines with an emphasis on the island of Hvar. Additionally, some suggestions for the improvement are more frequent lines between the mainland and the islands, the islands with each other and Italy and Croatia. Also, one of the proposals is the introduction of integrated transport, i.e., the development of a system of integrated tickets for maritime transport and public transport.

Another proposal for improvement that is emphasized is the synchronization of timetables for maritime transport and public transport, to enable tourists to arrive at the seaport to their final destination without waiting too long for another type of transport.

4.2.3.2 *Analysis of the results obtained by surveying tourist boards in the Republic of Croatia*

The proximity of the destination (26 %), natural beauty (25%) and gastronomic offer (23 %) stand out as the reason for the most frequent trips of Italian travellers to Croatia. Other common reasons for coming are the value they get for the money invested, parties and festivals, and the availability of the destination by different modes of transportation. Other reasons for traveling according to the observed sample make up a share of 1 %, which can be seen in the Graph 19.



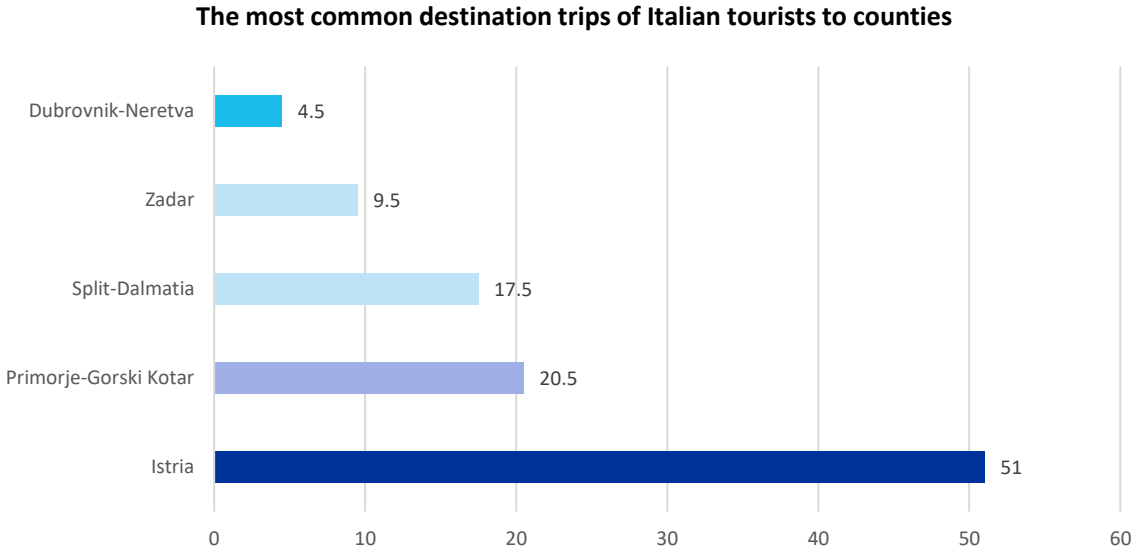
Graph 19 The most common reasons for Italian travellers to travel to Croatia according to the results of survey questionnaires filled out by tourist boards in Croatia *[Source: EY]*

The analysis of the most common destination trips was performed by scoring the responses received, and the scoring methodology itself is described below. Given that it was necessary to rank at least three travel destinations, each was awarded a certain number of points as follows:

- 2 points – first choice travel destination,
- 1,5 points – second choice travel destination,
- 1 point – third choice travel destination,
- 0,5 points – fourth choice travel destination.

Furthermore, the number of responses of all listed destinations was summarized and weighed according to the scoring system to define the ranking of destinations by the number of visits. The responses received on the most common travel destinations of Italian tourists by tourist boards are summarized by counties.

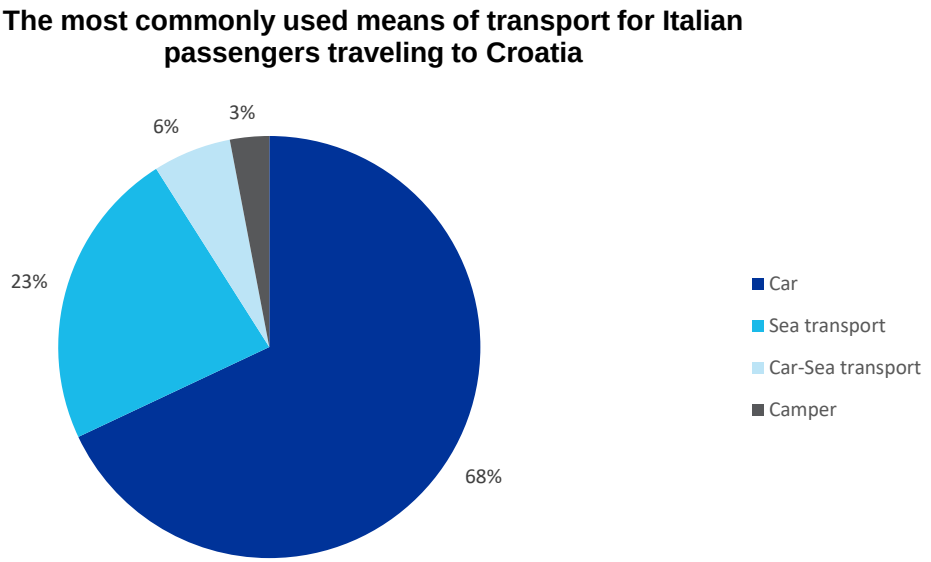
Graph 20 shows the most common destination trips of Italian travellers to counties. Istria County is the most visited county with a total of 51 points, followed by Primorje-Gorski Kotar County (20,5 points) and Split-Dalmatia County (17,5 points). According to the results of the research, the least visited is the Primorje-Gorski Kotar County with 7 points.



Graph 20 The most frequent destination trips of Italian tourists to counties according to the results of the survey questionnaire sent to tourist boards in the Republic of Croatia (in the number of points earned) *[Source: EY]*

The analysis of the most frequently used means of transport of Italian passengers traveling to Croatia is expressed through transport by car, camper, sea transport and combined transport (car-sea transport).

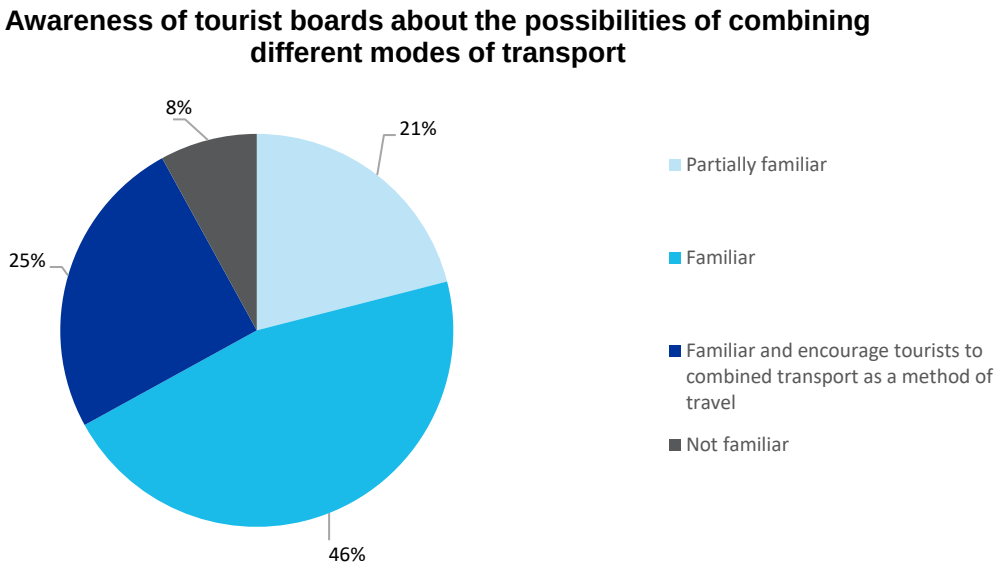
According to the results of the research, the most frequently used means of transport for Italian passengers is exclusively a car (23 answers), followed by maritime transport (8 answers). In addition, the use of combined transport and campers is a less common way of traveling with Italian passengers, which can be seen in the Graph 21.



Graph 21 The most common mode of transport of Italian passengers traveling to Croatia according to the results of survey questionnaires sent to tourist boards in the Republic of Croatia *[Source: EY]*

Information on maritime transport satisfaction in Croatia and Italy was collected through an evaluation system. Grades ranged from 0 - "bad experience" to 5 - "great experience". The average assessment of the level of satisfaction with the use of maritime transport in Croatia is 3,17, while that for maritime transport in Italy is 3,35. The results of the research indicate that maritime transport is at an acceptable level in both countries.

The results on awareness of tourist boards about combined transport, i.e., "multimodality" are shown in Graph 22. A total of 46 % of tourist boards are familiar with combined transport, and 25 % of them encourage tourists to use this method of travel. 21 % of respondents are only partially familiar, while 7 % are unfamiliar with combining different modes of transport and have never encountered the concept of multimodality.



Graph 22 Awareness of tourist boards of the Republic of Croatia about the possibilities of combining different modes of transport according to the results of the survey questionnaire *[Source: EY]*

Combinations of different modes of transportation that tourist boards are familiar with:

- Sea transport – bus,
- Sea transport – car,
- Sea transport – taxi/rent a car/transfers/taxi boat,
- Bicycle – sea transport/bus,
- Car – train – sea transport,
- Public transport – sea transport
- Airplane – bus.

Looking at a total of 23 received answers to the question about the quality of transport in the destination area, it is concluded that most respondents characterize it as unsatisfactory. Public transport (bus/rail) is characterized as poorly represented for tourists, but also the local population. The shortcomings of maritime transport are manifested in the insufficient number of ship and ferry lines and poor connections with Italy. In the case of road transport, the shortcomings are manifested in the congestion of roads and delays in public transport during the tourist season, and in addition to the poor maintenance of roads. Also, respondents state that the islands are not sufficiently connected to Italy.

A total of 21 tourist boards made proposals on possible improvements in connecting maritime transport with other forms of passenger transport, which primarily relate to Italian passengers

traveling to Croatian islands. Suggestions for improvement are based on the development and introduction of new maritime lines. Some of the proposals for the introduction of new maritime lines are Zadar - Ancona, which was abolished during the Covid-19 virus pandemic, and additionally Zadar - Venice or Zadar - Trieste. Also, as a proposal, the introduction of fast catamaran lines is highlighted, but also lines with ships that can board cars with an emphasis on shorter travel times. Namely, the respondents point out that the long travel time (12 hours) rejects passengers, and an additional reason is the price of the trip, which increases due to the included night. Tourist boards also emphasize the need to harmonize timetables for sea routes and public transport, the introduction of more frequent shipping lines and the direct connection of Italy with the Croatian islands.

4.2.3.3 *Analysis of the results obtained by surveying travel agencies in Italy*

According to the results of survey responses of travel agencies in Italy, the main reasons for the travel of Italian travellers are, according to the results received, the proximity of the destination and natural beauty, followed by gastronomic offer and value for money.

Mali Lošinj, Split and Plitvice Lakes are mentioned as destinations of the first choice. The second choice of the most common destination are Novalja, Zadar and the Dalmatian coast and islands, and the third choice are Rovinj and Dubrovnik.

The most used means of travel according to the answers received are car (2 answers), sea transport (2 answers), and air transport (1 answer). Information on maritime transport satisfaction in Croatia and Italy was collected through an evaluation system. Grades ranged from 0 - “bad experience” to 5 - “great experience“. An average score of 3,6 indicates that maritime transport is at an acceptable level in both countries, which means that according to the respondents, Italian passengers are relatively satisfied with the maritime transport service.

Italian travel agencies are mostly familiar with the possibilities of combining different modes of transport, and the combinations they are familiar with are bicycle - boat - bicycle, sea transport - taxi/bus/rent a car.

The quality of transport in the destination area was assessed by only one travel agency as medium. Respondents' suggestions for a possible improvement in the connection of maritime transport with other forms of passenger transport, which primarily relate to Italian passengers traveling to Croatian islands, are very similar to the answers of respondents in Croatia. Italian respondents state that it is necessary to introduce a more frequent number of lines from Italy to the Croatian islands as well as to increase the number of lines with fast ships. Additionally, one of the proposals is based on the introduction of a maritime line departing from Trieste. These results are shown in the Table 2.

Table 2 Results obtained by surveying travel agencies in Italy

Research categories	Research results (Travel agencies in Italy)
Reasons for Italian travellers to travel to Croatia.	Destination proximity (3)
	Natural beauties (3)
	Gastronomic offer (2)
	Value for money (1)
The most common destination trips of Italian travellers in Croatia.	1. Mali Lošinj, 2. Novalja, 3. Rovinj
	1. Split, 2. Zadar, 3. Rovinj
	1. Plitvice Lakes, 2. Dalmatian coast and islands, 3. Dubrovnik
Means of transport that are most often used by Italian travellers when traveling to Croatia.	Car (2)
	Sea transport (2)
	Airplane (1)
Awareness of institutions/agencies about the possibilities of combining different modes of transport from the seaport to the final destination.	It is familiar and encourages tourists to combine different modes of transport.
	It is familiar.
	It is partially familiar.
Feedback experiences of Italian passengers traveling to Croatia on transport services, with an emphasis on maritime transport in Italy.	Average grade: 3,6
Feedback experiences of Italian passengers traveling to Croatia on transport services, with emphasis on maritime transport in Croatia.	Average grade: 3,6
Possibilities of combining different modes of transport with which travel agencies in Italy are familiar.	Bicycle-ship-bicycle.
	Sea transport – taxi/bus.
	Sea transport -bus lines/rent a car.
Quality of transport in the destination area.	Medium.
Suggestions for possible improvement of connecting maritime transport with other forms of passenger transport, which primarily relate to Italian passengers traveling to Croatian islands.	Increase transport by fast boats from the Italian to the Croatian side, because crossing the Adriatic Sea in 3 hours is a unique experience.
	Faster and more frequent lines to all islands.
	Maritime line departing from Trieste.
	Destination proximity (3)

The most common reasons for Italian travellers to travel to Croatia.	Natural beauties (3)
	Gastronomic offer (2)
	Value for money (1)

[Source: Responses to questionnaires sent to travel agencies in Italy, analysed by EY]

4.2.4 Concluding remarks

The results of relevant tourist agencies and associations' opinions and attitudes research in the Republic of Croatia and Italy indicate that the proximity of Croatia is one of the main reasons for the arrival of Italian tourists. Natural beauties and gastronomic offer are only in the second and third place of the main reasons for visiting Croatia. Given that the proximity of the destination is the main reason for the arrival of Italian tourists, the great potential for growth in the number of arrivals of Italian tourists is in the development of maritime transport, which bridges the Adriatic and which further, in terms of transport, brings Italy and Croatia closer.

According to the results of the primary research, the County of Istria is the most visited area of Italian tourists in the Republic of Croatia. Then follow the Primorje-Gorski Kotar and Split-Dalmatia counties with a slightly higher attendance rate, and Lika-Senj and Dubrovnik-Neretva counties, according to tourist institutions/agencies, are the least visited by Italian tourists. It is important to note that the results of the survey reflect the respondents' opinions and are not necessarily correlated with actual statistics.

Most travel agencies/associations state that, to their knowledge, Italian tourists travel to Croatia mostly by car. Maritime transport, in their opinion, after cars, is the second most represented means of transport for Italian tourists to travel to Croatia.

Travel agencies/associations are mostly familiar with the concept of multimodality, i.e., different possibilities of combining means of transport when traveling, and some respondents even encourage tourists to use it. Of the combinations of different modes of transport, respondents are most familiar with the combinations of maritime transport and buses, maritime transport and on-call transport, train, maritime transport and buses, and bicycle and maritime transport.

According to tourist agencies/associations, the biggest shortcomings in the current state of maritime transport in the area covered are poor connections between islands and islands and the mainland, poor tourists' awareness, high prices of maritime transport and transport on call at the local level.

In addition to the above, the surveyed travel agencies/associations to improve the quality of maritime transport emphasize the introduction of a larger number of maritime lines in Croatia and international maritime lines with Italy. The need for direct connections between Italy and the Croatian islands is also emphasized, as well as the need to harmonize maritime transport timetables, especially ferry and public transport to develop integrated transport in order to increase the number of passengers and tourist arrivals.

4.2.4.1 *Synthesis of results*

	Tourist agencies in Croatia	Tourist associations in Croatia	Tourist agencies in Italy
The most common destinations	▶ Most visited areas: Istria County (45,94 %) and Primorje-Gorski Kotar County (26,37 %),	▶ Most visited areas: Istria County (49,51 %) and Primorje-Gorski Kotar County (19,90 %),	▶ First choice of the most common destination: Mali Lošinj, Split and Plitvice Lakes.
The most common means of transport to Croatia	▶ Car 64 %, ▶ Sea transport 17 %, ▶ Bus 8 %, ▶ Motorcycle 5 %, ▶ Car-sea transport 3 %, ▶ Airplane 3 %.	▶ Car 68 %, ▶ Sea transport 23 %, ▶ Car-sea transport 6 %, ▶ Camper 3 %.	▶ Cars (2 answers), ▶ Sea transport (2 answers), ▶ Airplane (1 answer).
Feedback related to maritime transport in Croatia	▶ Grade 3,50.	▶ Grade 3,17.	▶ Grade 3,6.
Feedback related to maritime transport in Italy	▶ Grade 3,54.	▶ Grade 3,35.	▶ Grade 3,6.
Knowledge of combined modes of transport from the seaport to the final destination	▶ Familiar 32 %, ▶ Partially familiar 32 %, ▶ Familiar and encourages tourists to use combined transport 29 %, ▶ Not familiar 7 %.	▶ Familiar 46 %, ▶ Partially familiar 21 %, ▶ Familiar and encourages tourists to use combined transport 25 %, ▶ Not familiar 8 %.	▶ Familiar and encourages tourists to use combined transport (1 answer), ▶ Familiar (1 answer), ▶ Partially familiar (1 answer).
Possibilities of combining different modes of transport with which the institutions are familiar	▶ Sea transport-bus, ▶ Sea transport-transfers/taxi/rent a car, ▶ Train-sea transport-bus, ▶ Airplane-rent a car.	▶ Sea transport-bus, ▶ Sea transport-car, ▶ Sea transport-taxi/rent a car/transfers, ▶ Bicycle-sea transport-bus, ▶ Car-train-sea transport, ▶ Public transport-sea transport, ▶ Airplane-bus.	▶ Bicycle – ship–bicycle, ▶ Sea transport–taxi/bus, ▶ Sea transport–bus transport/rent a car.
Quality of transport in the destination area	▶ Undeveloped or poorly developed public transport, ▶ Poor connection to islands, ▶ Unacceptable prices for transport on call, ▶ Zadar County poorly connected to Italy, ▶ Congestion in road traffic.	▶ Poorly developed public transport, ▶ High sea transport prices, ▶ Insufficient number of ship and ferry lines, ▶ Poor connection to Italy, ▶ Congestion in road traffic.	▶ Medium.
Suggestions for improving the connection of maritime transport with other forms of passenger transport	▶ Reduction of prices in sea transport, ▶ Development of sea transport connections between islands and the mainland, ▶ More frequent sea transport (introduction of more shipping lines), ▶ Introduction of a larger number of shipping between Croatia and Italy.	▶ Introduction of a larger number of high-speed catamaran lines, ▶ Introduction of a larger number of maritime lines between Croatia and Italy, ▶ Connect Italy directly to the islands, ▶ Development of public passenger transport.	▶ Introduction of a larger number of shipping lines, ▶ Connect Italy directly to the islands, ▶ Introduction of a shipping line from Trieste.
The most common reasons for traveling by Italian travellers	▶ Destination proximity 28 %,	▶ Destination proximity 26 %,	▶ Destination proximity (3 answers),

- Natural beauties 24 %,
- Gastronomic offer 23 %,
- Value for money 13 %.

- Natural beauties 25 %,
- Gastronomic offer 23 %,
- Value for money 14 %.

- Natural beauties (3 answers),
- Gastronomic offer (2 answers),
- Value for money (1 answer).

4.3 Analysis of field research on habits and behaviours of Italian travellers who stayed in Croatia during their trip in Covid-19 period

4.3.1 Task description

As part of Task 1.4. Field research on the habits and behaviours of Italian tourists who stayed in Croatia during their trip in the Covid-19 period, during the peak of the tourist season in 2021, a field analysis was conducted in Croatian seaports. The analysis examined experiences of Italian tourists on habits and behaviour related to the use of means of transport to travel to and within Croatia in the Covid-19 period.

To gain more detailed insight into the Covid-19 period to improve existing shortcomings related to the mode of transport, with analysis it was necessary to determine the habits and experiences of Italian tourists related to travel to and within Croatia.

To gain a clear insight into the previous experiences and habits of Italian tourists related to the use of transport, as part of this task, a field research was conducted at Croatian seaports, which included the following:

- the most common reasons for Italian tourists to travel to Croatia,
- the most often used means of transport by Italian tourists traveling to Croatia to reach the port,
- the most often used means of transport by Italian tourists to travel from a port in Croatia to a destination on the island,
- the most used means of transport by Italian tourists to move within the island,
- feedback experiences of Italian passengers traveling to Croatia related to transport services,
- information on whether public transport habits have changed during the Covid-19 pandemic.

4.3.2 Methodology

The data on previous experiences of Italian tourists related to the habits of using transport was collected by primary research. The primary research within this task was conducted by interrogating Italian tourists arriving at seaports in Croatia in the period from 16 August 2021 to 23 August 2021.

To collect information on the previous experience of Italian tourists, the method of surveying (interviewing) was used, which includes collecting information on the experience and habits of Italian tourists, as well as assessing their transportation through a

questionnaire. The survey was conducted in seaports during the embarkation and disembarkation of Italian passengers.

In order to determine the relevant ports where the research needs to be conducted, a detailed analysis of itineraries and timetables of international routes was conducted based on publicly available data on the maritime carriers' websites.[19] In accordance with the results of the analysis of the traffic supply of relevant maritime lines, the primary research was conducted in the following seaports:

- Split,
- Dubrovnik,
- Zadar,
- Mali Lošinj,
- Rovinj.

Prior to the field survey of Italian passengers in seaports was conducted, EY, with the support of the MRDEUF, sought the consent of all previously mentioned port authorities.

The data used to define the survey sample are based on CBS and CNTB statistics on the number of Italian tourists coming to Croatia and the TOMAS survey, which provides data on the modal distribution of Italian passenger transport on arrival in Croatia. The data sources used are listed in the Initial Report.

To calculate the required sample of respondents, 2019 was taken as the relevant year, considering that during 2020 the number of all tourists dropped significantly due to the Covid-19 pandemic. Based on data from 2019, the total number of Italian tourists that arrived to Croatia was 1.175.095. Of this number, only 3,4 % of Italian tourists used the boat as a mean of transport to arrive to Croatia. Therefore, in 2019, 42.302 Italian tourists arrived in Croatia by boat as a mean of transport. To calculate the required sample, the online tool raosoft.com was used, a specialized and frequently used tool for calculating sample size in the survey process.[20] Based on the number of Italian tourists who used the boat as a mean of transport to come to Croatia and considering the level of reliability of 90 % and an acceptable statistical error of 5,8 %, the required sample of 201 respondents for valid results was obtained. The research collected a significantly larger number of responses than the planned sample, i.e., a total of 300 responses were collected.

The survey questionnaire contained the following questions:

[19] Jadrolinija, available on: https://www.jadrolinija.hr/; SNAV, available at: https://www.snav.it/; Adriatic Lines, available at: https://adriatic-lines.com/; Gommo Viaggi: available at: https://www.gomoviaggi.com/traghetti-croazia-pesaro-cesenatico-lussino-novalja-rab-rovigno-pola/

[20] Available on: http://www.raosoft.com/samplesize.html

1. What means of transport did you use to get to the port? (it's possible to circle more answers)
2. Are you planning to travel, or have you already travelled to any of the Croatian islands during your stay?
3. What means of transport do you use or plan to use to get to the islands? (it's possible to circle more answers)
4. In your opinion, what would make your arrival on the island easier or more pleasant?
5. What means of transport do you use or plan to use to get from the port on the island to your destination on the island? – also applies to travel from a destination on the island to a port of boarding on the island.
6. On the island, during your stay, which modes of transport would be suitable for you? (which you do not use now)
7. If you have visited any of the Croatian islands so far, rate the quality of the offer of different modes of transport on the island (0 – Extremely bad, 5 – Excellent)
8. How has the Covid-19 virus pandemic affected your behaviour and travel-related habits?
9. How much did the Covid-19 virus pandemic affect your public transportation avoidance? (0 – No impact, 5 – Strong impact)
10. What is your main motive for traveling to Croatia?

To achieve a higher response rate, the questionnaire was prepared in Italian and English.

The collected data were then sorted and statistically processed in *MS Excel* and analysed. Descriptive statistics were used for the analysis, which includes the organization of the collected data and their summary description using numerical and graphical representations.

The results of statistical processing and data analysis are presented below.

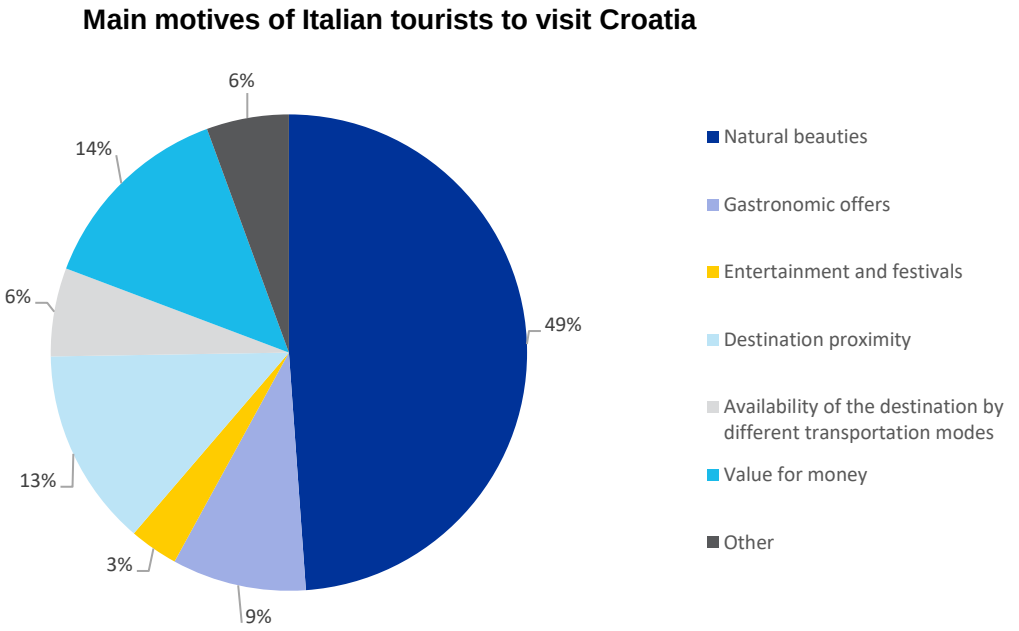
4.3.3 Results

A total of 300 responses were collected through field research, which is significantly above the planned response rate. The number of answers, depending on the place of the survey, is given below:

- Port of Rovinj – 42 answers (14 %),
- Port of Mali Lošinj – 56 answers (19 %),
- Port of Zadar – 82 answers (27 %),
- Port of Split – 73 answers (24 %),
- Port of Dubrovnik – 47 answers (16 %).

The results presented below reflect the experiences of Italian tourists who responded to the survey questionnaire and do not necessarily reflect the attitude of the entire population.

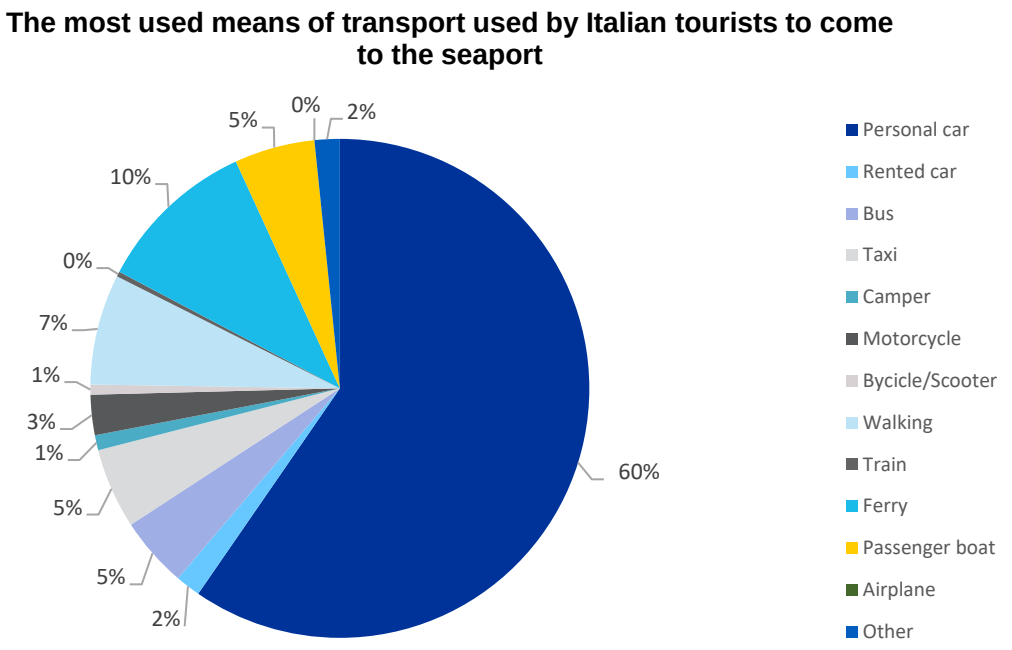
As the most common reason for traveling to Croatia, Italian tourists state natural beauty (236 answers – 49 %), the value they receive for the money invested (66 answers – 14 %) and the proximity of the destination (65 answers – 13 %). The next most common reasons for the arrival of Italian tourists are the gastronomic offer, the availability of the destination by various modes of transport and entertainment and festivals. Other reasons for the travel of Italian tourists to Croatia according to the observed sample make up a share of 6 %, which can be seen in the Graph 23.



Graph 23 Main motives for Italian travellers to visit Croatia according to the results of questionnaires filled out by Italian tourists *[Source: EY]*

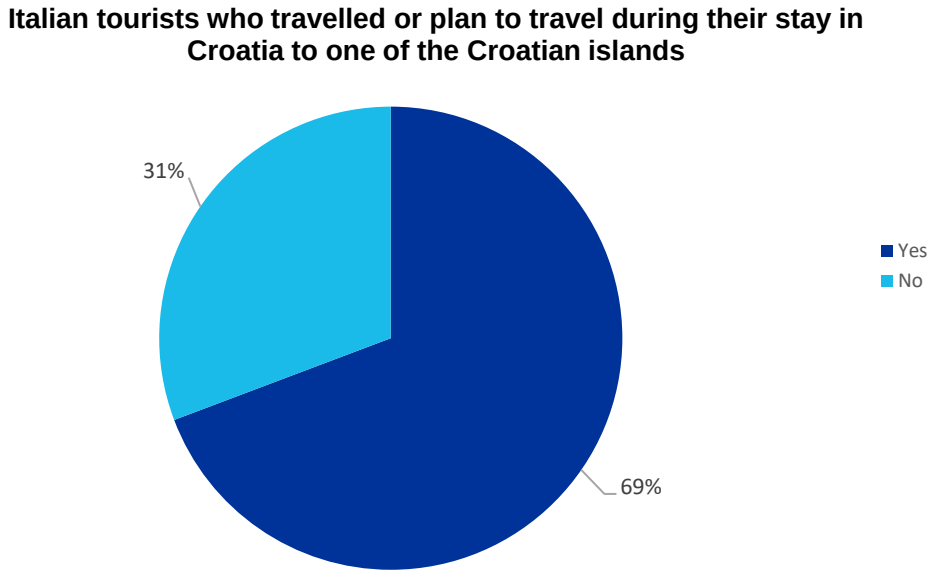
The survey on the most common means of transport of Italian tourists to get to the port was expressed through the frequency of responses on modes of transport.

The results show that the passenger car is the most common means of transport used by Italian passengers when arriving at the port (183 answers – 60 %). Maritime transport is represented in a total of 15 % of responses, which includes the ferry, which is the second most common way to get to the port (32 responses – 10 %) and the passenger boat (16 responses – 5 %). Walking is the third most common way to get to the seaport (22 answers – 7 %). Bus and taxi are represented in 5 % of responses. Airplane, train, camper, and bicycle/scooter are less frequently used means of transport when traveling to the port, which can be seen in the Graph 24.



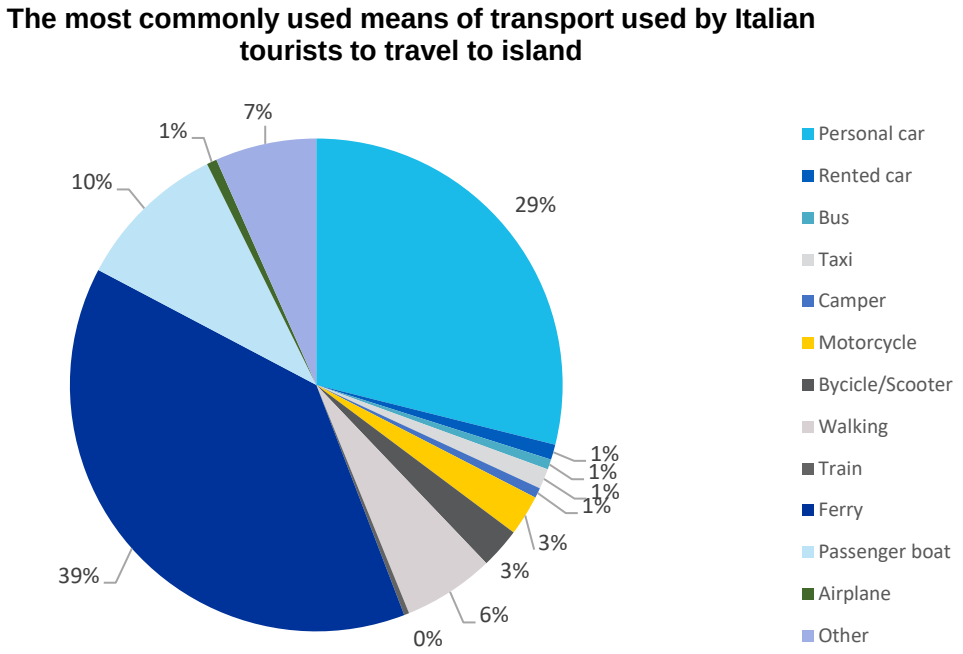
Graph 24 The most used means of transport for the arrival of Italian tourists to the port according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

In addition, the results of the research indicate that 69 % of respondents plan to travel or have travelled to one of the Croatian islands during their stay in Croatia (Graph 25).



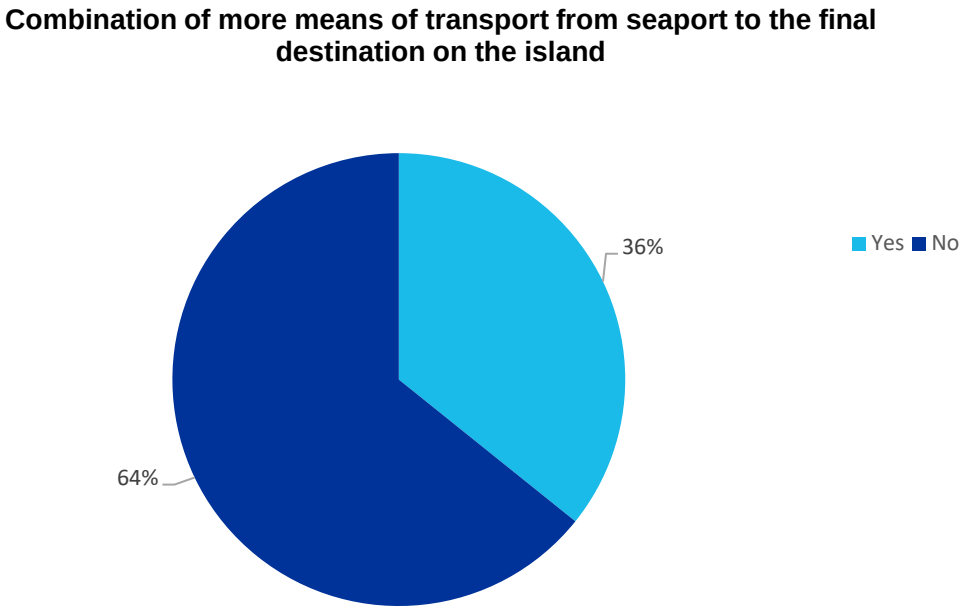
Graph 25 Share of Italian tourists who travelled or plan to travel during their stay in Croatia to one of the Croatian islands according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

A research of means of transport used by Italian tourists from the seaport to the island found that the ferry (116 answers – 39 %) and car (87 answers – 29 %) are the most used means of transport from the port to the island, while the passenger ship is in third place (30 answers – 10 %). To get to the island, 20 Italian tourists, or 7 %, use other means of transport that were not among the offered answers, which mainly refers to a private boat or sailboat. The least represented means of transport for travel from port to island are train, airplane, bus, and camper with two answers for each means of transport (Graph 26).



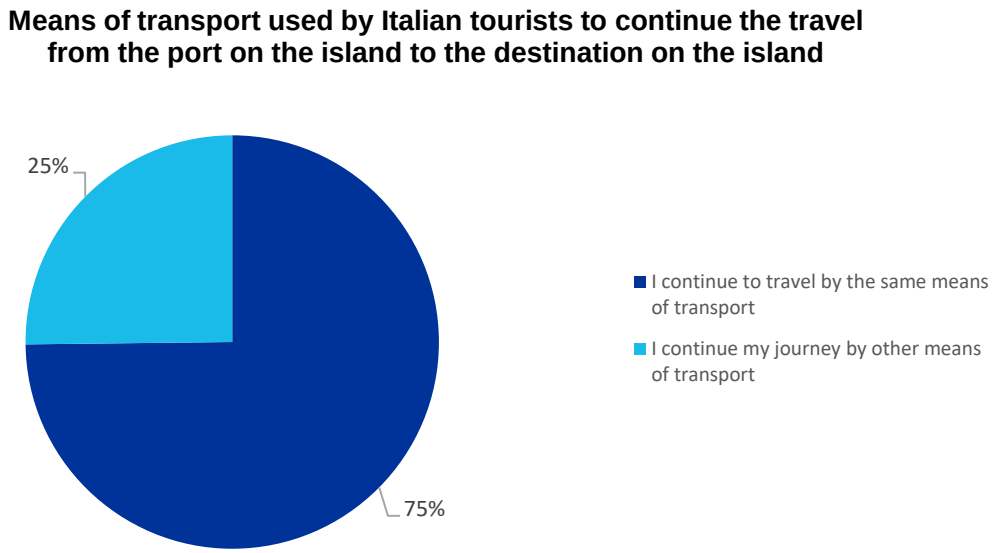
Graph 26 The most used means of transport for Italian tourists to travel from port to island according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

The survey found that only 36 % of Italian tourists use multiple modes of transport for transport from the port on the island to the destination on the island and vice versa (Graph 27).



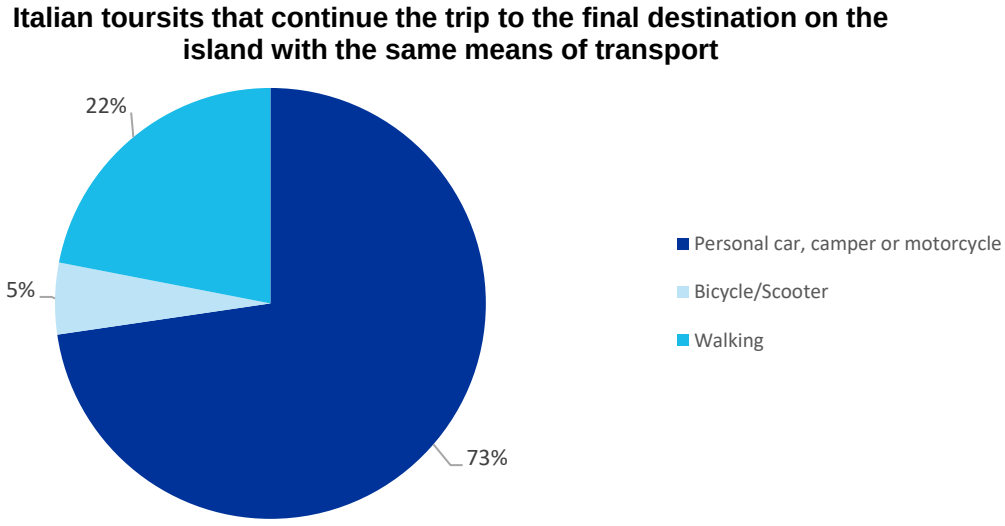
Graph 27 Combination of more modes of transport from the seaport to the destination on the island according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

As shown in the Graph 28, as many as 75 % of Italian tourists continue their journey from the port on the island to the final destination on the island with the same means of transport that they used to arrive on the island, and this means of transport mainly refers to a car as shown in the Graph 29.



Graph 28 Means of transport used by Italian tourists to continue the travel from the port on the island to the destination on the island according to the results of a questionnaire completed by Italian tourists *[Source: EY]*

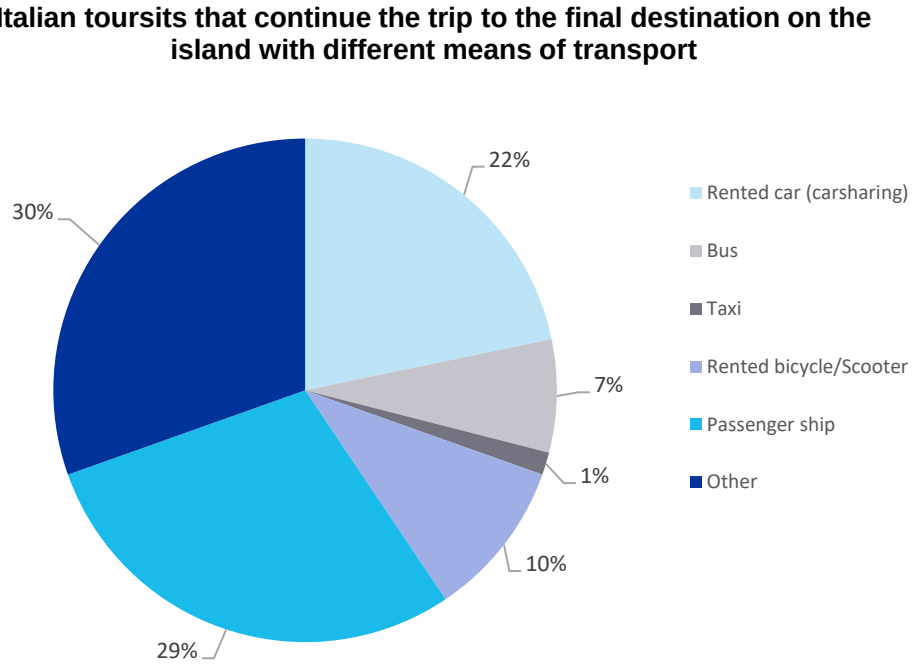
Italian passengers who continue their journey from the port of disembarkation on the island to the final destination on the island by the same means of transport mostly use a personal vehicle, i.e., car, camper, motorcycle (73 %). Walking is the second most common answer with 22 % of responses, and the smallest number of Italian tourists (5 %) continue the journey by bicycle/scooter with which they boarded the boat (Graph 29).



Graph 29 Means of transport used by Italian passengers when traveling by the same means of transport from the port of disembarkation on the island to the final destination on the island according to the results of a questionnaire filled

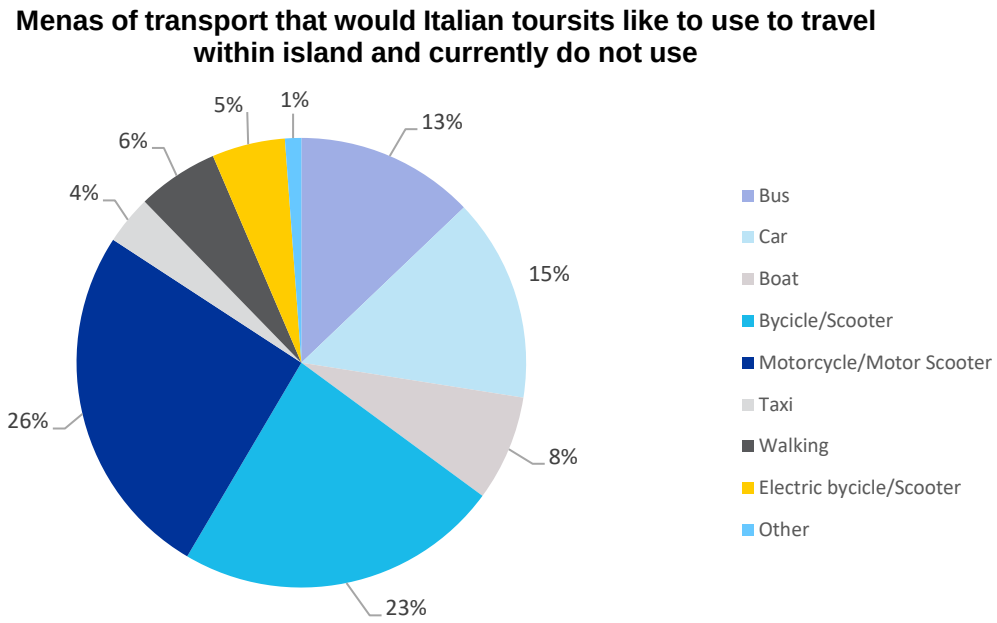
out by Italian tourists *[Source: EY]*

When using another means of transport from the port of disembarkation on the island to the final destination on the island, according to the survey results, respondents most often use a passenger boat (29 %) and a rented car (22 %). The least used means of transport for travel from the port on the island to the destination on the island are bus (7 %) and taxi service (1 %), which may be due to insufficient quality of public transport system on the islands and high cost of taxi transport (Graph 30).



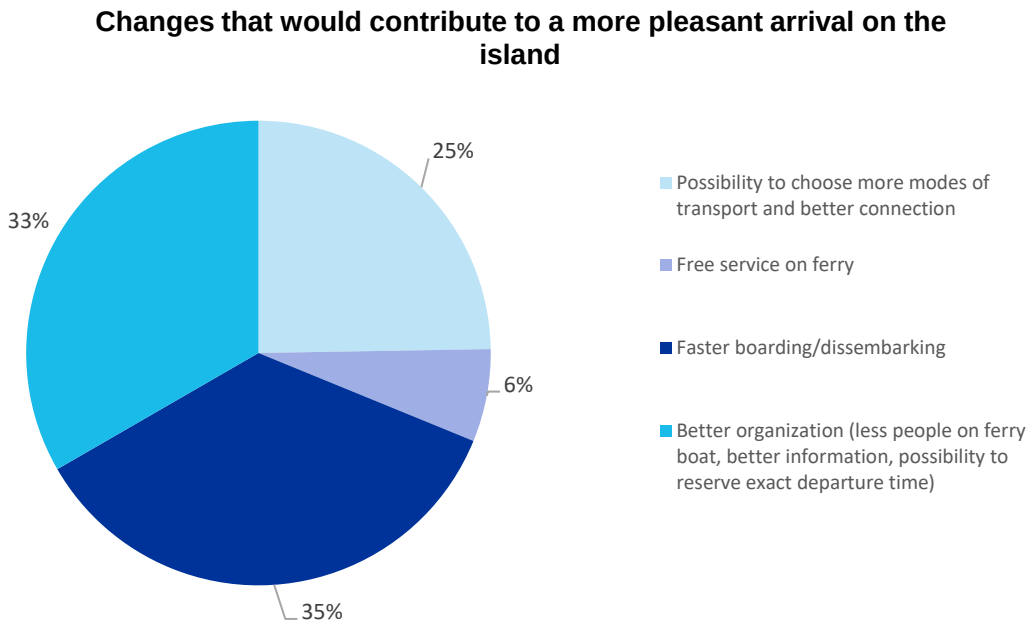
Graph 30 Means of transport used by Italian passengers when traveling by other means of transport from the port of disembarkation on the island to the final destination on the island according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

When asked about the preferred means of transport for travelling within the island, as many as 54 % of the answers were directed to micro-means of transport. Motorcycle/motor scooter (26 %), bicycle/scooter (23 %) and electric bicycles (5 %) are the means of transport that the respondents prefer the most for the purpose of transport within the island, and which they do not use now. They are followed by car (15 %), bus (13 %) and boat (8 %). Also, 6 % of Italian tourists consider walking as the preferred way to move within the island, which they do not use now. The least number of respondents would use the taxi service (4 %) and other modes of transport (1 %), which can be seen from the Graph 31.



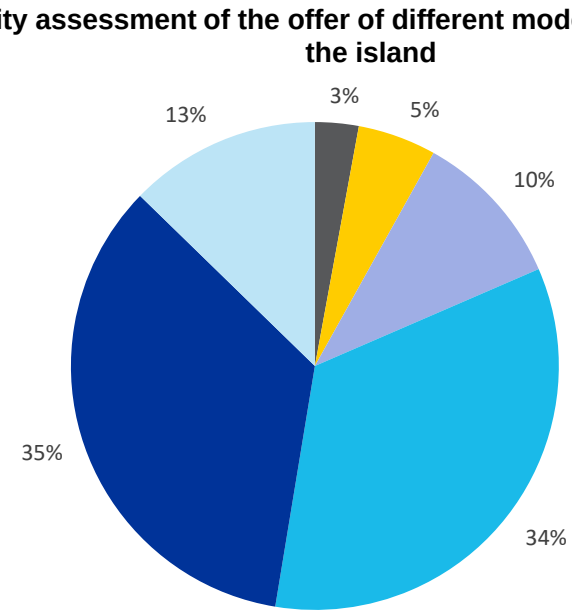
Graph 31 Means of transport that would Italian tourists like to use to travel within the island and currently do not use
[Source: EY]

According to the survey, changes that would make it easier and more pleasant for Italian tourists to come to the island are faster boarding/disembarking (33 answers - or 35 %) and better organization of transport, i.e., better information, possibility of booking tickets, punctuality of schedules (31 answer – 33 %). 25 % of respondents believe that the possibility of choosing more different means of transport and better connection of the island with the surrounding area would contribute to a more pleasant arrival on the island, while 6 % of respondents believe that free services on ferry would contribute to a more pleasant arrival on the island (Graph 32).



Graph 32 Changes that would contribute to a more pleasant arrival on the island according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

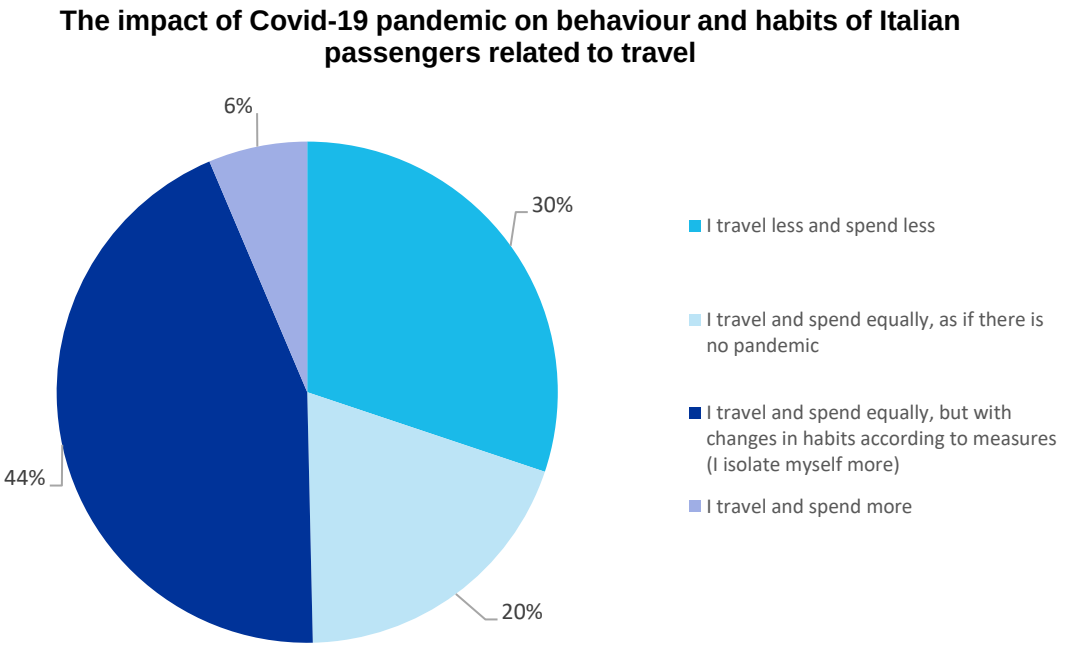
Information on the satisfaction of Italian passengers with the quality of the offer of different modes of transport on the island was collected by evaluating the quality of the offer. Grades ranged from 0 - "extremely bad" to 5 - "excellent". The quality of the offer of different modes of transport on the island was rated 5 - "excellent" by 13 % of respondents, while only 3 % of them rated it 0 - "extremely poor". Grade 4 (35 %) has the largest share, followed by grade 3 (34 %). The average rating of the level of satisfaction with the quality of the offer of different modes of transport on the island is 3,30 (Graph 33).



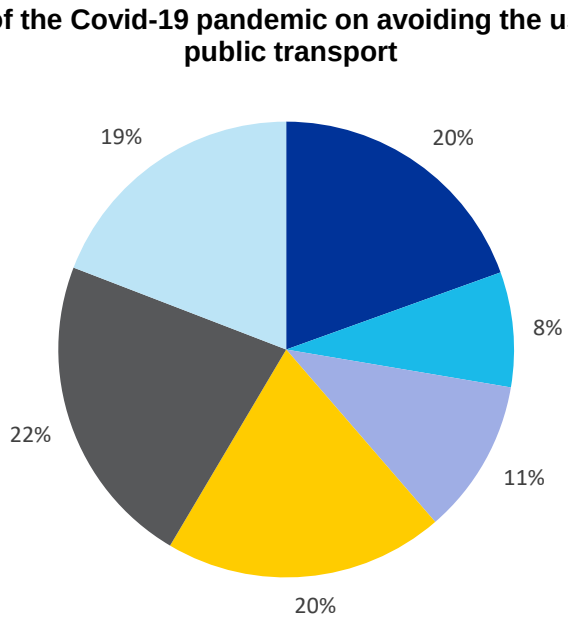
Graph 33 Quality assessment of the offer of different modes of transport on the island according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

The results of research on the impact of the Covid-19 pandemic on the behaviour and habits of Italian tourists related to travel are shown in the Graph 34. A total of 44 % of respondents travel and spend equally, but with changes in habits in accordance with epidemiological measures, and only 6 % of respondents travel and spend more. 30 % of respondents travel less and spend less, and 20 % of respondents spend and travel the same.

The impact of the Covid-19 pandemic on avoiding mass public passenger transport is shown in the Graph 35. Information was collected by assessing the level of impact, and the grades ranged from 0 - “no impact” to 5 - “strong impact”. Most respondents rated the avoidance of mass public transport with a grade 4 (22 %), followed by grades 3 and 0 with the same share of responses (20 %). Grade 5 has a share of 19 %, Grade 2 has a share of 11 %, while the smallest share of respondents, 8 %, rated the avoidance of mass public transport with grade 1. The average grade of the impact of the Covid-19 pandemic on the avoidance of public transport is 2,74.



Graph 34 The impact of the Covid-19 pandemic on the behaviour and habits of Italian passengers related to travel according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*



Graph 35 The impact of the Covid-19 pandemic on avoiding the use of massive public transport according to the results of a questionnaire filled out by Italian tourists *[Source: EY]*

Synthesis of results

The most common means of transport to the port	▶ Personal car 60 %, ▶ Ferry 10 %, ▶ Walking 7 %, ▶ Bus 5 %, ▶ Taxi 5 %, ▶ Passenger boat 5 %, ▶ Motorcycle 3 %, ▶ Rented car 2 %, ▶ Camper 1 %, ▶ Bicycle/scooter 1 %.
Planned trip to the island during the stay	▶ Yes 69 %, ▶ No 31 %.
The most common means of transportation to get to the island	▶ Ferry 39 % ▶ Personal car 29 %, ▶ Passenger car 10 %, ▶ Other 7 %, ▶ Walking 6 %, ▶ Bicycle/scooter 3 %, ▶ Motorcycle 3 %, ▶ Airplane 1 %, ▶ Rented car 1 %, ▶ Camper 1 %, ▶ Taxi 1 %, ▶ Bus 1 %.
A combination of multiple means of transport to get from the port on the island to the destination on the island	▶ Yes 36 %, ▶ No 64 %.
Means of transport used to travel from the port on the island to the destination on the island	▶ Continues journey with same means of transport 75 % ▶ Continues journey with different means of transport 25 %.
The most common means of transport used to travel from the port on the island to the destination on the island if continuing the journey with the same means of transport	▶ Personal car, camper, motorcycle 73 %, ▶ Walking 22 %, ▶ Bicycle/scooter 5 %.
The most common means of transport used to travel from the port on the island to the destination on the island if continuing the journey	▶ Other 30 %, ▶ Passenger boat 29 %, ▶ Rented car 22 %, ▶ Rented bicycle/scooter 10 %,

with different means of transport	▶ Bus 7 %, ▶ Taxi 1 %.
Preferred means of transport within island but currently not used	▶ Motorcycle/motor scooter 26 %, ▶ Bicycle/scooter 23 %, ▶ Car 15 %, ▶ Bus 13 %, ▶ Boat 8 %, ▶ Walking 6 %, ▶ Electric bicycle/scooter 5 %, ▶ Taxi 4 %, ▶ Other 1 %.
Suggestions to improve the arrival to the island	▶ Faster boarding/disembarking 35 %, ▶ Better organization 33 %, ▶ Possibility of choosing more different means of transport and better connection of the island with the surrounding area 25 %, ▶ Free services on the ferry 6 %.
Evaluation of the quality of the offer of different modes of transport on the island	▶ Average 3,30.
The impact of the Covid - 19 pandemic on habits and behaviour	▶ Travel and spend equally, but with changes in habits in accordance with epidemiological measures 44 %, ▶ Travel and spend less 30 %, ▶ Travel and spend same as before pandemic 20 %, ▶ Travel and spend more 6 %.
The impact of the Covid - 19 pandemic on avoiding mass public transport	▶ Average 2,74.
The most common reasons for Italian tourists to travel to Croatia	▶ Natural beauties 49 %, ▶ Value for money 14 %, ▶ Proximity of the destination 13 %, ▶ Gastronomic offer 9 %, ▶ Availability of the destination by various modes of transport 6 %, ▶ Other 6 %, ▶ Entertainment and festivals 3 %.

4.3.4 Concluding remarks

The results of research on the habits and behaviour of Italian passengers who stayed in Croatia during their journey during the Covid-19 pandemic indicate insufficient development and relevance of multimodal transport in Croatia. Namely, according to the results of surveys, most Italian tourists travel to Croatia solely by car. Related to this, the personal car/ferry is the most common mode of transport to the Croatian islands, and the personal vehicle for transport within the island. Apart from the absence of an alternative mode of transport and branding of Croatia as a car destination, the intensity of car use was also stimulated by the impact of the Covid-19 pandemic and the reduced number of trips in public passenger transport. According to survey results, it is evident that several Italian tourists have changed their travel habits and mode of transport with an emphasis on avoiding the mass passenger transport system.

Most Italian tourists believe that the proximity of the destination is an important factor influencing the choice of Croatia as a tourist destination. Consequently, the further improvement of transport connections, and in particular the improvement of the maritime transport service, could contribute to a greater number of arrivals of Italian tourists.

Given that motorcycles/motor scooters and bicycles/scooters are the preferred modes of transport for Italian tourists within the island, the development of sustainable modes of transport, especially micromobility systems, through the improvement of cycling infrastructure and the implementation of public bicycle/scooter systems could significantly reduce use of cars for transportation within the island.

According to Italian tourists, the biggest shortcomings in the current state of maritime transport in the coverage area are poor organization and long waiting for embarkation/disembarkation, poor connectivity between islands and islands and the mainland, poor tourist information and large crowds on ferries.

In addition to the above, to improve the maritime transport service, it is necessary to implement a quality system of road passenger information, better organization when embarking/disembarking, and the introduction of additional transport capacity to reduce congestion on boats. Moreover, it is necessary to better connect the islands and the mainland and the islands with each other, to increase the spatial accessibility, and thus the availability of tourist facilities. The quality development of a multimodal mode of transport through the integration of various existing and new transport services can increase the attendance and satisfaction of all tourists, including Italians.

5 Analysis of the existing multimodal solutions

5.1 Analysis of the state of the existing transport offer for the Croatian islands connected to the mainland by the shipping lines

Multimodal transport or integrated transport means the movement of transport entities (passengers and goods) from source to destination with several interconnected and coordinated transport entities (means of transport)

5.1.1 Task description

As part of the Task 2.1. Make an analysis of the current situation accompanied by a database for each island connected by liner shipping (ferry, ship and high-speed line) with the mainland, an analysis of the state of existing multimodal transport solutions/possibilities (transport offer) for the Croatian Adriatic with an emphasis on the islands that are connected by sea line to the mainland.

The purpose of the implementation of this task is to create the preconditions for making a substantiated assessment of the efficiency of existing multimodal transport solutions, considering the existing maritime transport offer, as well as other forms of transport.

The task goal is to make a statistical and graphical analysis of current multimodal transport solutions with a clear overview of existing multimodal transport solutions, including a review of planned directions of development elaborated in strategic and/or spatial planning documents of the Republic of Croatia.

To be able to adequately analyse the state of multimodality in the area of Croatian islands, it is necessary to determine the values and state of parameters that are directly related to the context of multimodality. Accordingly, the following was analysed:

- Spatial planning and strategic documents in the field of transport with reference to multimodality, integration and intermobility,
- Itineraries and timetables of national maritime passenger transport lines in the Republic of Croatia,
- Itineraries and timetables of international maritime passenger transport lines in the Republic of Croatia,
- Location of seaports in the Republic of Croatia
- Demographic coverage of seaports in the Republic of Croatia,
- Demographic coverage of maritime lines in the Republic of Croatia,
- Frequency of departures of maritime lines on islands,
- Coefficient of line straightness,

- Itineraries and bus timetables on the islands
- Taxi offer on the islands,
- Micromobility systems on the islands,
- Current state of multimodality on the islands.

5.1.2 Methodology

An analysis of the current state, accompanied by adequate databases that were necessary for conducting the statistical analysis, was made as a part of task 2.1. The analysis includes all Croatian islands that are connected by liner shipping with the mainland or with another island.

Data on existing ferry, ship, high-speed and non-public service lines were collected through the desk research method. Additionally, to determine the quality of existing multimodal transport solutions, an analysis of other transport subsystems in the coverage area was conducted. Accordingly, an analysis of the offer of bus transport on the islands, taxi transport on the islands and an analysis of the micromobility system offers (bicycle and scooter) was carried out.

For this purpose, the following data sources were used:

- Coastal shipping agency, available on: https://agencija-zolpp.hr/linije/,
- Jadrolinija, available on: https://www.jadrolinija.hr/,
- Adriatic lines, available on: https://adriatic-lines.com/en/,
- SNAV, available on: https://www.snav.it/en/orari-e-tratte-2,
- Gomo Viaggi, available on: https://www.gomoviaggi.com/,
- GetByBus, available on: https://www.jadrolinija.hr/,
- Flixbus, available on: https://www.flixbus.hr/
- Arriva, available on: https://www.arriva.com.hr/hr-hr/naslovna,
- Čazmatrans, available on: https://cazmatrans.hr/hr/,
- Liburnija Zadar, available on: https://liburnija-zadar.hr/,
- Autotransport Šibenik, available on: https://atpsi.hr/,
- Split Promet, available on: http://www.promet-split.hr/vozni-red
- Libertas Dubrovnik, available on: https://www.libertasdubrovnik.hr/en/,
- City of Krk, available on: https://www.libertasdubrovnik.hr/en/
- Next bike, available on: https://www.nextbike.hr/hr/zagreb/lokacije/,
- Eco island of Krk, available on: http://www.ekootokkrk.hr/krk-bike,

- Euro Velo, available on: https://en.eurovelo.com/,
- Dash city, available on: https://www.dash.city/.

The methodology of conducting this task includes the use of *MS Excel* software for systematization and statistical analysis of relevant data. Descriptive statistics were used for the analysis, which includes the organization of the collected data and their summary description with the help of numerical and graphical representations. Average values, medial values, minimum and maximum values, and standard deviation of the data range were calculated according to the needs of the analysis.

To determine the horizontal and vertical compliance of the MIMOSA project and the Multimodality Analysis with the objectives defined in the European, national, and local strategic and development plans, strategic documents that have a direct or indirect impact on the development of multimodal transport solutions in the coverage area were analysed.

The analysis of maritime transport includes line routes, timetables, travel speed and demographic coverage of maritime transport on islands and seaports (destinations). The average number of departures on sea lines (number of departures) for each island was calculated. The ratio of the number of departures of maritime lines per island with the number of inhabitants on the island and with the number of arrivals of Italian tourists was determined. Also, the number of departures depending on the days and time of the year was analysed.

The analysis of bus transport on the islands determined the number of bus lines operating on the islands, the number of departures of lines and the number of terminal destinations (destinations) on the island that are served by bus transport. The subject analysis was conducted by collecting and researching publicly available data on itineraries and timetables for bus line transport. The analysis covered only direct lines (without interchanges) that have terminal stops within the island and lines that run between the island and the mainland. Timetable data refer to the period between the end of August and the beginning of September and are subject to change according to the carrier's decisions.

The analysis of taxi transport determined the forms of taxi service and the coverage of taxi service by islands. The analysis of the micromobility system determined the current situation in the offer of public bicycle and electric scooter systems and in the presence of cycling infrastructure on the islands.

In addition, as part of the task, a database was created on the existing traffic offer for each island connected to the mainland by ferry, boat, and high-speed line. The database contains the following data:

- Island name,
- Destination name (settlement/city in which the seaport is located),
- Number of inhabitants on the island,

- Number of inhabitants in the destination (village/town where the seaport is located),
- Number of settlements on the island,
- Demographic coverage of seaports,
- Area of the island,
- Population density of the island,
- The nearest major city on the mainland,
- Air distance to the largest city on the mainland,
- Ferry port in the destination (YES/NO),
- Number of arrivals of Italian tourists per island in 2018,
- Number of arrivals of Italian tourists per island in 2019,
- Number of arrivals of Italian tourists per island in the next years,
- Quality of bicycle connection with the surrounding area,
- Bus line transport to the destination (YES/NO),
- Taxi transport on the island (YES/NO),
- Boat taxi transport on the island (YES/NO),
- Bicycle / scooter rental system in the destination (YES/NO),
- Types of maritime lines serving the island,
- Number of sea lines serving the island,
- Relationship between population and number of sea lines,
- Coefficient of directness of lines per island,
- Number of seaports connected to the island (direct route),
- Number of inhabitants on the direct route.

The database is structured in a way that allows easy understanding and subsequent updating of data and is attached as part of Annex 12.

Results of the analysis conducted within the Task 2.1. are shown below.

5.1.3 Results

For the sake of simpler review, the presentation of results is structured according to the following chapters:

- Analysis of strategic and development documents with an emphasis on multimodality, integration and intermodality,
- Analysis of maritime transport offer in the territory of the Republic of Croatia,
- Analysis of bus transport offer on the islands,
- Analysis of taxi transport offer on the islands,
- Analysis of the bicycle offer in the scope,
- Analysis of electric scooters offer in the scope,
- Analysis of the current state of multimodality on the islands,
- Synthesis of results.

5.1.3.1 *Analysis of the strategic and development documents with an emphasis on multimodality, integration and intermodality*

In order to gain insight into plans to improve multimodality, integration and intermodality of transport in the strategic development of the relevant area, this task presents the results of analysis of the most important strategic and development documents relevant to the scope of Multimodality Analysis. In addition to the analysis of current documents, strategic and development documents were analysed that do not cover the current period, but are relevant to the scope and it is expected that the planned direction of development will be in focus in the next strategic period.

The key findings related to the development of maritime transport and multimodality are synthesized below in the following documents:

- Transport Development Strategy of the Republic of Croatia for the period from 2017 to 2030 (NN 84/2017), available on: https://mmpi.gov.hr/UserDocsImages/arhiva/MMPI%20Strategija%20prometnog%20razvoja%20RH%202017.-2030.-final.pdf,
- National Development Strategy of the Republic of Croatia until 2030 (NN 13/2021), available on: https://narodne-novine.nn.hr/clanci/sluzbeni/2021_02_13_230.html ,
- Master Plan For Developing The Traffic System Of The Functional Region Of Northern Adriatic, available on: https://www2.pgz.hr/doc/dokumenti/2019/Glavni_plan_prometnog_sustava_Sjeverni_Jadran.pdf,
- Traffic master plan of the functional region of Northern Dalmatia, available on: https://www.grad-zadar.hr/repos/doc/Prometni%20masterplan%20FR%20Sjeverna%20Dalmacija.pdf
- Dubrovnik-Neretva County Tourism Development Strategy 2012-2022, available on: https://www.edubrovnik.org/strategije/01_SRTDNZ_za_WEB.pdf.

Strategic and development documents that do not cover the current period:

- Maritime Development Strategy and Integrated Maritime Policy of the Republic of Croatia for the period from 2014 to 2020 (NN 93/2014), available on: https://narodne-novine.nn.hr/clanci/sluzbeni/2014_07_93_1879.html ,
- Master Plan for the Development of the Functional Region of South Dalmatia and Strategic Environmental Assessment of the Plan/Program with Heritage Impact Assessment (HIA) for World Cultural Heritage (WH), 2016, available on: https://www.edubrovnik.org/FRJD_01_c_Glavnog%20plana_01_V12.pdf
- Development Strategy of Primorje-Gorski Kotar County 2016 - 2020, available on: https://zavod.pgz.hr/documents/razvojna_strategija_2016._2020_secured.pdf
- County Development Strategy of the County of Istria until 2020, available on: https://ida.hr/media/filer_public/83/0b/830bc13c-7504-43a5-aab5-cb80b76d5c85/zupanijska_razvojna_strategija_do_2020_godine.pdf
- Draft of County Development Strategy of the Split-Dalmatia County for the period until 2020, available on: http://www.rera.hr/upload/stranice/2021/03/2021-03-22/20/nacrtupanijskerazvojnestrategije.pdf
- County Development Strategy of Zadar County until 2020, available on: https://www.zadarska-zupanija.hr/images/dokumenti/Zupanijska_razvojna_strategija_Zadarske_zupanije_do_2020..pdf
- County Development Strategy of Dubrovnik-Neretva County 2016 - 2020, available on: http://www.edubrovnik.org/wp-content/uploads/2017/01/Z%CC%8CRS-DNZ.pdf
- Master plan of Šibenik-Knin County until 2020, available on: https://sibensko-kninska-zupanija.hr/upload/stranice/2016/07/2016-07-19/214/dokumenti/MPTSKZ.pdf

In addition, the specific objectives, measures, or development priorities to which the MIMOSA project and the Multimodality Analysis contribute are pointed out below.

Transport Development Strategy of the Republic of Croatia for the period from 2017 to 2030

The Transport Development Strategy of the Republic of Croatia for the period from 2017 to 2030 (Official Gazette, No. 131/14) points out that public transport is not integrated because there are no harmonized timetables or systems for selling unique tickets for transport by various forms of transport. The strategy states the basic findings and problems of all types of transport.

Deficiencies in maritime transport are described through hypothesis 2.6.2. as follows:

- *The connection between maritime public transport and local public transport should be more efficient so that passengers can plan their trips more easily,*
- *Access to the islands needs to be improved*

- *There is a privileged passengers category in maritime passenger transport.*

The main findings for intercoastal liner shipping are presented through Hypothesis 2.6.2.:

- *Public transport service in regular coastal passenger transport is characterized as a non-profit business activity,*
- *Short Sea Shipping can hardly compete on routes parallel to road corridors that provide a high level of service,*
- *To succeed, intercoastal shipping must be reliable, faster, and more cost-effective than road transport,*
- *In summer, the possibility of using intercoastal shipping opens up due to traffic congestion of local and state roads,*
- *There is also the potential for intercoastal shipping between Italy and Croatia.*

Additionally, Hypothesis 2.6.6. deals with the issue of ships in public transport and states the following findings:

- *Public transport takes place entirely using vessels from the national fleet,*
- *The average age of the main shipping fleet is 33,15 years, and the average age of the fleet at the state level is 46,2 years (the high average age of ships is affected by the high age of traditional wooden shipbuilding ships)*
- *It is important to adopt measures that will enable the survival and modernization of the Croatian fleet intended for public transport.*

The specific objectives (hereinafter: SO) related to maritime transport, which are in line with the objectives of the MIMOSA project, are listed below.:

- *SO 4. Increase the reliability of maritime transport (public transport and supply chains) in difficult weather conditions,*
- *SO 5. Improve the efficiency and economy of the maritime transport system,*
- *SO 6. Improve the safety of the maritime transport system,*
- *SO 7. Improve the integration of ports into the local transport system (passenger and freight).*

Also, the Strategy sets out measures for each transport sector to achieve the aforementioned specific objectives. Among the measures related to maritime transport, which have a correlation with the MIMOSA project, Measure 6 stands out. This measure is directly related to the improvement of maritime transport in the context of connecting Croatian islands, and is related to the following specific objectives: SO 4, SO 5 and SO 7. The measure presented public liner transport as a key factor in the segment of maritime transport, emphasizing the connection of islands and mainland and the islands themselves. Without public regular transport, the population and development of the island would be endangered, so it is necessary to ensure safety, regularity,

reliability, and comfort, and to coordinate these services with each other and with the integrated transport system on land. It is also stated that it is necessary to adapt or upgrade ports in the function of coastal liner passenger traffic, while accessibility and connectivity with ports need to be improved.

National Development Strategy of the Republic of Croatia until 2030

The analysis of the Strategy shows that the MIMOSA project will contribute to the development direction 4. "Balanced regional development", which includes better connection of islands with centres of economic dynamism, improvement of urban infrastructure and implementation of the concept of "smart cities". The strategic objectives to which the Project contributes are set out below:

- *SO 10. Sustainable mobility means the development of maritime transport, which includes the construction of new ports as well as the reconstruction or relocation of existing ports and ferry ports to increase liner transport capacity and better communication with islands, improve access roads to islands directly connecting ports to coastal liner transport, purchase more environmentally friendly means of transport for maritime transport,*
- *SO 12. The development of assisted areas and areas with developmental peculiarities implies integrated passenger transport, taking into account the connection of isolated areas on the mainland, the connection of islands with the mainland, inter-island connectivity and the need to reduce congestion during major tourist activities.*

Master plan for the development of the transport system of the functional region North Adriatic for the period from 2018 to 2030

The general goal of the Master Plan for Development is to raise an efficient and sustainable transport system that is harmonized with the needs of the economy and the inhabitants of the functional region of the North Adriatic.

The shortcomings identified in the Master Plan are outdated information systems and the lack of available passenger data. It is stated that the systems do not have information on the actual position of the vehicle and possible deviations from the timetable, and as such do not update information on arrival times at stops, which means that end users do not have timely information. These systems are one of the important segments of integrated passenger transport because information on the transport offer must be easily accessible to passengers.

In addition, it is stated that public passenger transport providers should adapt their information and communication solutions in order to comply with Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on a framework for the deployment of intelligent road transport systems and communications with other modes of transport[21], which would ensure compatibility, interoperability, and continuity of implementation and operational use of multimodal pre-travel and

[21] European Parliament and Council, Directive 2010/40 / EU, available on: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0040&from=EN

travel information services at the EU level. It is also stated that it is necessary to consider the integration of multimodal transport in terms of a modernized toll system by introducing a single ticket system and a single information system independent of the transport subsystem.

The specific objectives[22] to which the Project contributes are set out below:

- *SO-PO.5. Improve the efficiency and economy of the maritime transport system,*
- *SO-PO.6. Improve the integration of ports into the local transport system (passenger and freight),*
- *SO-PO.7. Increase the availability of ports for passenger, tourist, and excursion boats,*
- *SO-PO.10. Increase the mobility of the inhabitants of the functional region of the North Adriatic between the mainland and the islands,*
- *SO-PO.12. Provide quality service in maritime public line transport,*
- *SO-JPP.2. Better integrate the international/national transport system into local and regional transport systems (passenger hubs, integrated toll system, etc.),*
- *SO-JPP.4. Increase the attractiveness of public transport by improving management concepts and fleet modernization,*
- *SO-JPP.7. Strengthening mobility by public transport between islands and the mainland,*
- *SO-JPP.9. Significant integration of maritime transport into urban and suburban public passenger transport,*
- *SO-JPP.10. Increasing the share of innovative forms of public transport (bike sharing, car sharing, on-call transport, micro transport...),*
- *SO-JPP.12. Improving tourist mobility by public transport,*
- *SO-UP. 5. Increase the share of sustainable forms of travel in the modal distribution of travel,*
- *SO-B.2. Increase the year-round volume of tourist cycling in the region.*

The development plan prescribes measures whose implementation would enhance the achievement of specific goals. Measures that are in line with the above specific objectives, to which the Project contributes, are listed below:

- *MJ-JPP 19. Launch of an integrated passenger transport system in the functional region area,*
- *MJ-JPP 20. Harmonization of county and inter-county PPT timetables,*
- *MJ-JPP 21. Harmonization of timetables of different forms of transport,*

[22] Primorje-Gorski Kotar County, Master plan for the development of the transport system of the functional region of the North Adriatic, available on: https://www2.pgz.hr/doc/dokumenti/2019/Glavni_plan_prometnog_sustava_Sjeverni_Jadran.pdf

- *MJ-JPP 24. Harmonization of timetables of different forms of transport,*
- *MJ-JPP 36. Harmonization of timetables of different forms of transport.*

Traffic master plan of the functional region Northern Dalmatia for the period from 2018 to 2030

The goal of the Transport Master Plan of the functional region of Northern Dalmatia is to create integrated and intermodal transport systems. The general objectives [23](hereinafter: GO) related to the MIMOSA project are set out below:

- *GO 1b. Improving the efficiency and sustainability of the transport sector,*
- *GO 1c. Increasing the competitiveness of the economy,*
- *GO 1e. Improving the level of transport system management according to the principles of economic and social efficiency,*
- *GO 1f. Increasing the level of intermodality,*
- *GO 2b. Improving the connection of islands and the continental hinterland with the functions of the main gravity centres in the County,*
- *GO 3a. Introduction of an integrated passenger transport system,*
- *GO 3b. Increasing the service quality of PT,*
- *GO 3c. Increasing the passengers information level and the availability of information on public transport among tourists,*
- *GO 4b. Improve the integration of maritime and rail transport into the local and regional transport system (passenger and freight),*
- *GO 5b. Raising the level of efficiency and functionality of the transport system in the tourist season.*

The measures to which the Project contributes, and which are in the Transport Master Plan, are listed below:

- *M-I-5. Construction of bicycle infrastructure,*
- *M-I-8. Implementation of the Park & Ride system,*
- *M-I-14. Construction of information infrastructure for system management and quality information of users,*
- *M-I-19. Development of optimal ways of connecting the mainland and the islands of the Zadar archipelago,*

[23] Available on: https://www.grad-zadar.hr/repos/doc/Prometni%20masterplan%20FR%20Sjeverna%20Dalmacija.pdf

- *M-I-20. Continuation of modernization of the port system of international, national, and county importance,*
- *M-O-1. Introduction of public transport service on request,*
- *M-O-2. Introduction of a common tariff system,*
- *M-O-3. Introduction of an integrated timetable,*
- *M-O-4Introduction of a "car sharing" system,*
- *M-O-5. Further development of public bicycle systems,*
- *M-O-6. Introduction of new ticket sales channels,*
- *M-O-14. Preparation of the Integrated Public Transport of Passengers and Freight Study,*
- *M-U-3. Creating a database essential for the PT development.*

Dubrovnik-Neretva County Tourism Development Strategy 2012-2022

The document identifies an attractive, but relatively dysfunctional and geographically heterogeneous area of Dubrovnik-Neretva County. Insufficient connection with the centre of the county, and negative demographic trends of part of the county (Mljet, Lastovo, Dubrovnik coast, Pelješac and parts of Korčula) indicate possible development initiatives. The document is divided into clusters and projects that need to be implemented to develop the Dubrovnik-Neretva County and increase the quality of life. The project related to public (tourist) transport refers to the public transport system for tourists. The project aims to reduce the use of cars and at the same time enable tourists' mobility within and between clusters. The MIMOSA project contributes to the factor:

- *„Intermodal Transport" which is listed in the Strategy under the" Competitiveness Project - Dubrovnik Cluster", which encourages the connection of maritime transport with maritime, road and air transport.*[24]

Maritime Development Strategy and Integrated Maritime Policy of the Republic of Croatia (2014-2020)

Maritime Development Strategy and Integrated Maritime Policy of the Republic of Croatia (2014-2020)[25] emphasizes the importance of recognizing and strengthening the role of maritime affairs through policies and initiatives for sustainable growth of economic activity at sea and on the coast. In addition, it is stated that it is important to ensure the sustainable development of islands and to prevent further emigration of the island population, emphasizing the importance of coastal liner

[24] Available on: https://www.edubrovnik.org/strategije/01_SRTDNZ_za_WEB.pdf

[25] Available on: https://narodne-novine.nn.hr/clanci/sluzbeni/2014_07_93_1879.html

traffic. The objectives (O) and measures (M) identified in the document that contribute to the implementation of the MIMOSA project are listed below.:

- *O 2.1.2. Raise the share of maritime transport compared to other modes of transport*
  - *M 2.1.2.2. Encourage line connections between the ports of the Adriatic and the Ionian Basin through tariff policy measures in ports and promote participation in EU programs that encourage a reduction in the share of road transport in favour of maritime transport.*
- *O 2.2.1. Improve the system of providing public services connecting islands with the mainland and islands with each other to contribute to the sustainable development of islands through the development of a socially sustainable, economical, and efficient system of public coastal liner shipping of the Republic of Croatia*
  - *M 2.2.1.1. Redefine regular transport systems (line system, ratio of ferry, classic and high-speed lines),*
  - *M 2.2.1.2. Connect coastal liner shipping with other modes of transport in accordance with the transport strategy of the Republic of Croatia,*
  - *M 2.2.1.3. Implement an accessible, efficient, and transparent system of preferential transport for the island population and the island economy,*
- *O 2.2.2. Ensuring the provision of public services on the principles of safety, consistency, accuracy, and comfort*
  - *M 2.2.2.1. Encourage the development and use of new technologies in coastal liner shipping, and the use of environmentally friendly ships in the coastal liner shipping system,*
  - *M 2.2.2.2. Design and build dedicated ships for lines connecting small islands without road infrastructure,*
  - *M 2.2.2.3. Computerize coastal liner shipping that will improve service availability,*
- *O 2.4.1. Specialization of ports*
  - *2.4.1.3. Specialize the port of Dubrovnik as a port for receiving ships on cruises,*
  - *2.4.1.4. Specialize the port of Split as a Ro-Ro/passenger and port for receiving ships on cruises,*
  - *2.4.1.6. Specialize the port of Šibenik as a port for the reception of more exclusive ships on cruises of smaller capacity (boutique ships) and mega yachts*
- *O 2.4.2. Achieve self-sustainability of the port system while increasing system efficiency*

- *2.4.2.2. Raise the efficiency and quality of service provision to ensure the competitiveness of the transport route.*

Master Plan for the Development of the Functional Region of South Dalmatia and Strategic Environmental Assessment of the Plan/Program with Heritage Impact Assessment (HIA) for World Cultural Heritage (WH), 2016

The document states that the competitiveness of the Croatian economy is negatively affected by poor quality and maintenance of public transport, lack of quality and comfortable transport and reliable transport links between and within the regions, as well as the lack of multimodal transport. In addition, it is stated that the lack of standardized systems and limited capacity lead to the results of low use of maritime transport, especially regarding access to islands. Accordingly, the general and specific objectives [26]to which the Project contributes are stated:

- *GO 2. Increasing the competitiveness of the economy,*
- *GO 3. Improving the efficiency of the transport sector,*
- *GO 5. Improving the sustainability of the transport system within cities and in urban centres,*
- *SO1a. Introduction of an integrated passenger transport system (ITS),*
- *SO1b. Increasing the level of courtesy,*
- *SO1d. Increasing passenger awareness,*
- *SO1g. Increasing the availability of public transport information to tourists.*

Development Strategy of Primorje-Gorski Kotar County 2016 – 2020

The strategy includes several goals and measures that need to be implemented to improve the quality of life in the Primorje-Gorski Kotar County.

The MIMOSA project and Multimodality Analysis contribute to Measure 2.1.4: Ensuring quality transport infrastructure and improvement and integration of infrastructure systems [27]and contributes to achieving the Strategic Goal: Strengthening regional capacities and balanced development whose purpose is to ensure transport accessibility and integration of infrastructure systems. Multimodal transport would ensure more efficient connection of territories and greater transport efficiency, with special emphasis on connecting the mainland and islands.

County Development Strategy of the County of Istria until 2020

Poor equipment of seaports and underdeveloped coastal liner passenger traffic, as well as unregulated and unsecured bicycle traffic in settlements have been identified as some of the

[26] Available on: https://www.edubrovnik.org/FRJD_01_c_Glavnog%20plana_01_V12.pdf

[27] Available on: https://zavod.pgz.hr/documents/razvojna_strategija_2016._2020_secured.pdf

weaknesses of the transport system of the Istrian County. Additionally, it is emphasized that it is necessary to redefine and improve coastal liner and passenger maritime transport and to connect it with other forms of transport to ensure the quality and accessibility of the service. The MIMOSA project and the Multimodality Analysis contribute to the following development priorities and measures[28] of the Strategy:

- *DP 3.2. Improving infrastructure systems,*
  - *Measure 3.2.1. Improving transport infrastructure*.

County Development Strategy of the Split-Dalmatia County for the period until 2020, draft

The draft County Development Strategy is a basic strategic planning document of a regional self-government unit with special emphasis on the role of large cities and cities of county headquarters in encouraging development and the development of less developed areas. The strategic goals and measures [29]to which the Project contributes are:

- *SO 1. Improve the quality of life with the sustainable use of natural resources - the priority of this goal is based on the sustainable development of basic infrastructure systems.*
  - *Measure C1P1M1. Raising the level of quality, accessibility and sustainability of transport systems and infrastructures, which refers to the improved transport, regional and international connection of the Split-Dalmatia County with the construction and reconstruction of transport infrastructure and the improvement of the transport system. According to the above, the aim of the county is to open new lines for better connection of the mainland with the islands and between the islands, to analyse the possibilities of developing multimodal transport as well as the improvement of bicycle traffic.*
- *SO 2. Increase the competitiveness of the economy whose priority for development is territorially evenly distributed year-round, diversified, sustainable and innovative tourism.*
  - *Measure C2P3M4. Development of horizontally and vertically integrated tourist and visitor infrastructure, which implies the improvement of tourist and visitor infrastructure in terms of quality with the possibility of achieving a tourist value chain, and quality and long-term sustainable markets of special interest. The development is focused on investments in integrated tourist facilities (trails, routes…) as well as in sustainable multimodal transport solutions (transport of bicycles by buses, trains, boats, cyclo and pedestrian paths, parking lots for buses, cars, tourist ports, docks, moorings).*

County Development Strategy of Zadar County until 2020

[28] Available on: https://ida.hr/media/filer_public/83/0b/830bc13c-7504-43a5-aab5-cb80b76d5c85/zupanijska_razvojna_strategija_do_2020_godine.pdf

[29] Available on: http://www.rera.hr/upload/stranice/2021/03/2021-03-22/20/nacrtupanijskerazvojnestrategije.pdf

The County Development Strategy is the basic strategic planning document for the socio-economic development of the county in accordance with the principles of sustainable development. It is based on three main categories for achieving growth in the European Union: inclusive, smart, and sustainable growth.

The document states Measure 2.4.4. *Development of maritime infrastructure and services and support for the Gaženica port project as a port of international importance* [30] to which the MIMOSA Project and Multimodality Analysis contribute. The aim of the measure is to strengthen the maritime traffic of the port of Gaženica and improve the maritime infrastructure, better transport connections between the island and the mainland and the islands with each other.

County Development Strategy of Dubrovnik-Neretva County 2016 –2020

The strategy is a strategic document that sets out guidelines for the future development of the county related to the economy, infrastructure and environment, social activities, and development management. County geographical-traffic connection is recognized as a development need, emphasizing traffic isolation and connection within the County. Identified development problems related to the transport sector are:

- Poor transport connections within the Dubrovnik-Neretva County,
- Traffic isolation of Dubrovnik-Neretva County from the rest of the Republic of Croatia,
- Abolition of the longitudinal ferry line Dubrovnik - Rijeka,
- Lack of fast boat connections between Dubrovnik and the islands (Korčula, Lastovo),
- Insufficient capacities of nautical tourism ports,
- Unbranched network of bicycle paths.

Investing in the transport sector would ensure better transport connections on the mainland and between the mainland and the islands and would further contribute to raising the quality of life of the local population. Specific objectives and measures[31] to which the MIMOSA project and the Multimodality Analysis contribute:

- *SO 2. Sustainable management of space, resources, and infrastructure,*
  - *Measure 2.1.3. Improving the organization of all forms of transport and appropriate infrastructure,*
- *SO 3. Improve the quality of life and strengthen institutional capacity, human and social capital.*

Šibenik-Knin County Master plan until 2020

[30] Available on: https://www.zadarska-zupanija.hr/images/dokumenti/Zupanijska_razvojna_strategija_Zadarske_zupanije_do_2020.pdf

[31] Available on: http://www.edubrovnik.org/wp-content/uploads/2017/01/Z%CC%8CRS-DNZ.pdf

The master plan defines the development goals, priorities and measures that need to be taken to achieve a quality and efficient development process. In addition, the document focuses on the analysis of the tourism sector and one of the important factors is the transport connection that enables greater mobility and passenger satisfaction. Deficiency of a transport system is evident in public transport, which is at a poor level and is not adapted to tourists (bus transport), and for better valorisation of the Šibenik islands, maritime transport is insufficient. Given that tourists most often use rented vehicles and taxi services for mobility, they need to be further developed. The project contributes to the following development goal and priorities[32]:

- *DG 2. Integrated development of tourist infrastructure and related services,*
  - *Priority 2.5. Development of infrastructure adapted to tourism products,*
  - *Priority 2.7. Development of a system that contributes to efficient and sustainable tourist mobility.*

5.1.3.2 *Analysis of the maritime transport offer in the territory of the Republic of Croatia*

In Croatia, in 2021, according to data downloaded from the website of the Coastal Shipping Agency[33], there are 60 national passenger shipping lines operating in the function of connecting Croatian islands with the mainland and with the islands. Of these 60 lines, 24 lines (40 %) refer to ferry lines, 11 (18,33 %) to ship lines, 16 (26,67 %) to high-speed lines and nine (15 %) to non-public service lines. These maritime passenger transport lines cover seven coastal counties, 45 Croatian islands, 17 cities/municipalities on the mainland and 80 cities/municipalities on the islands.

In addition to national lines, Croatia is connected to international maritime lines exclusively to Italy. Data on international routes are downloaded from the travel agency's website *Gomo Viaggi*[34] and carrier *Adriatic lines*[35]. Maritime lines between Italy and Croatia are realized between the following destinations[36]:

- Venice – Pula,
- Venice – Rovinj,
- Venice – Poreč,
- Venice – Mali Lošinj,

[32] Available on: https://sibensko-kninska-zupanija.hr/upload/stranice/2016/07/2016-07-19/214/dokumenti/MPTSKZ.pdf

[33] Coastal Shipping Agency, available on: https://agencija-zolpp.hr/linije/

[34] Gomo Viaggi, available on: https://www.gomoviaggi.com/

[35] Adriatic lines, available on: https://adriatic-lines.com/en/

[36] In 2021, international lines Zadar – Ancona, Umag – Venice, Rovinj – Trst i Poreč – Trst were cancelled.

- Cesenatico – Mali Lošinj – Novalja,
- Cesenatico – Rovinj,
- Pesaro – Mali Lošinj,
- Split – Ancona,
- Dubrovnik – Bari.

The northern Adriatic, with an emphasis on the western coast of Istria, is much better connected with Italy than the southern part of Croatia. One reason for this is higher population density and less spatial distance between destinations in the north compared to the south. A map of ports and lines of maritime passenger transport can be found in Figure 1.

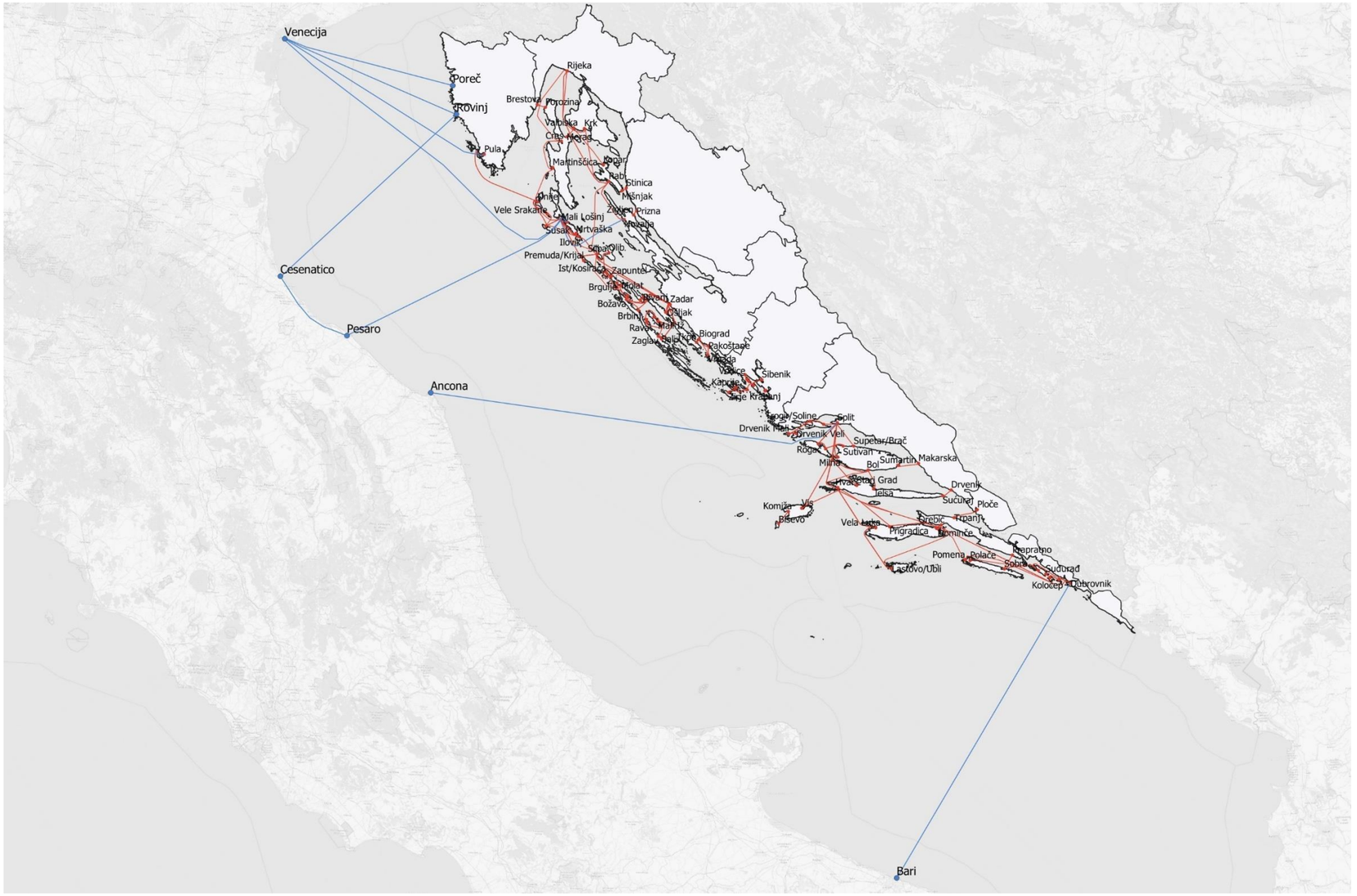
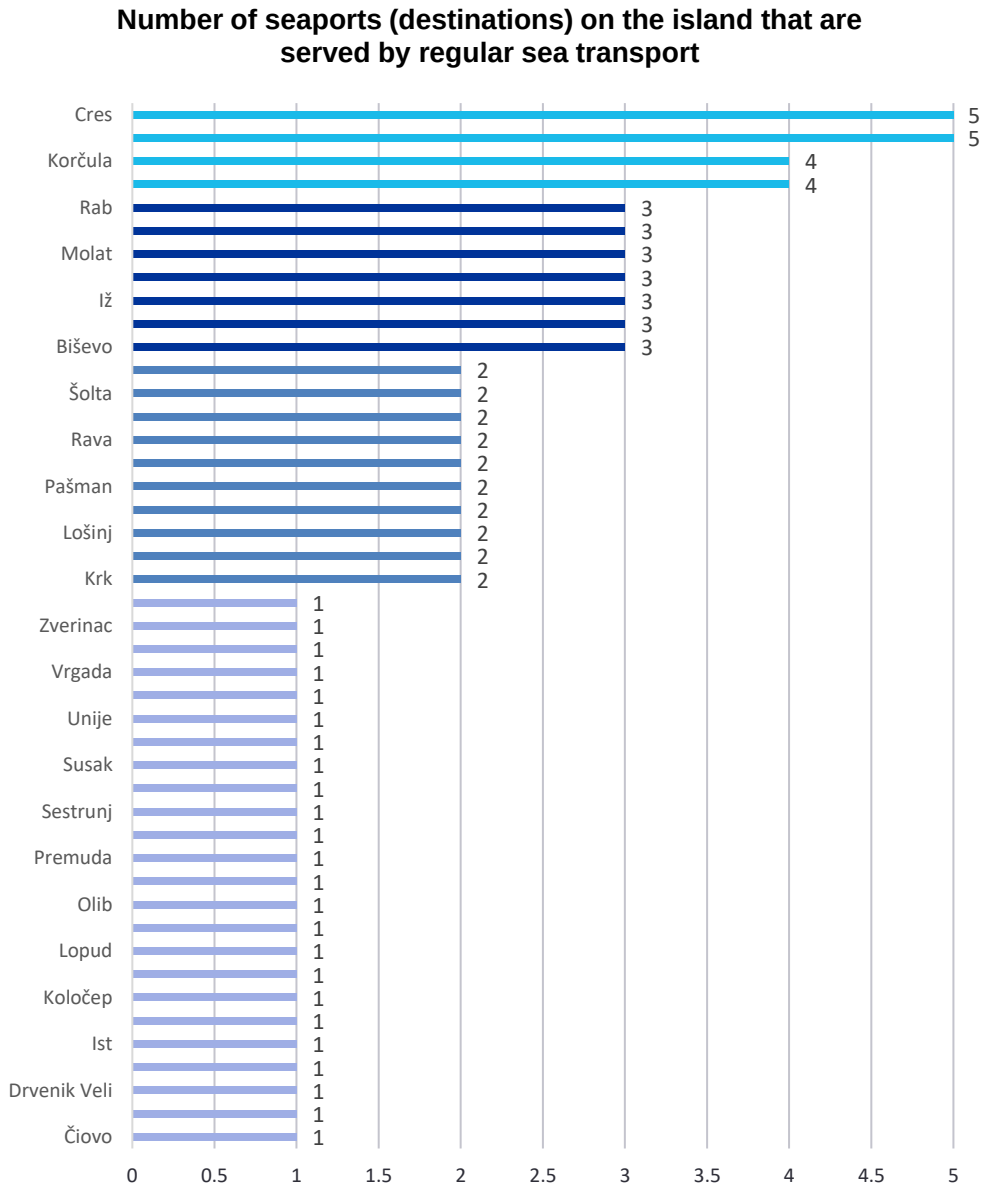


Figure 1 Destinations and lines of maritime passenger transport in Croatia *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), analysed by EY*

Further analysis includes all Croatian islands that are served by maritime transport.

Certain islands, mostly larger, have more locations where liner shipping ships enter/depart. The islands with the largest number of arrivals/departures of liner shipping are Cres, Brač, Korčula and Hvar. However, the island of Ugljan has only one seaport through which liner shipping takes place, and it is one of the larger islands in Croatia. The number of destinations by islands, i.e., seaports that serve liner shipping, is shown in the Graph 36.



Graph 36 Number of seaports (destinations) per island served by regular sea transport *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), analysed by EY]*

In order to gain insight into how many inhabitants in a certain area are served by maritime transport, demographic coverage was calculated. Demographic coverage was determined for seaports and shipping lines.

The number of inhabitants in a certain area is taken from the CBS data on the last census from 2011[37].

Demographic coverage of seaports means the share of the inhabitants of the settlement, municipality, or town in which the port is located, in relation to the total number of inhabitants per individual island or county. It is assumed that all residents of the settlement/city where the seaport is located have access to the port, regardless of the mode of transport. Therefore, the total number of inhabitants within the administrative boundaries of the city, municipality or settlement was considered according to the CBS data (PC AXIS database)[38]. The demographic coverage of seaports is calculated according to the expression:

$$Pd = \frac{\sum Sl}{Sp}$$

where is:

∑Sl – the sum of the number of inhabitants in the cities/municipalities/settlements where the seaport is located

Sp – the number of inhabitants on the island or county if it's a seaport on the mainland

The analysis established that 20 islands have full demographic coverage by seaports, and these are mostly sparsely populated and usually smaller islands, except for the island of Rab. The reason for the complete demographic coverage on the islands is that the total population on the island is located within the settlement in which the seaport is located, i.e., all settlements on the island have a seaport that is served by liner shipping. The islands of Vis and Hvar have a very good demographic coverage of seaports of 96 %. The least demographically covered islands are Mljet, Šolta and Čiovo, i.e., only 23 %, 20 % and 18 % of the population are located within the settlement with a seaport which is served by regular sea transport. Of the destinations on the mainland, the best covered is Šibenik-Knin County with 54 % coverage, and the least Lika-Senj County with only 7 % coverage (Graph 37).

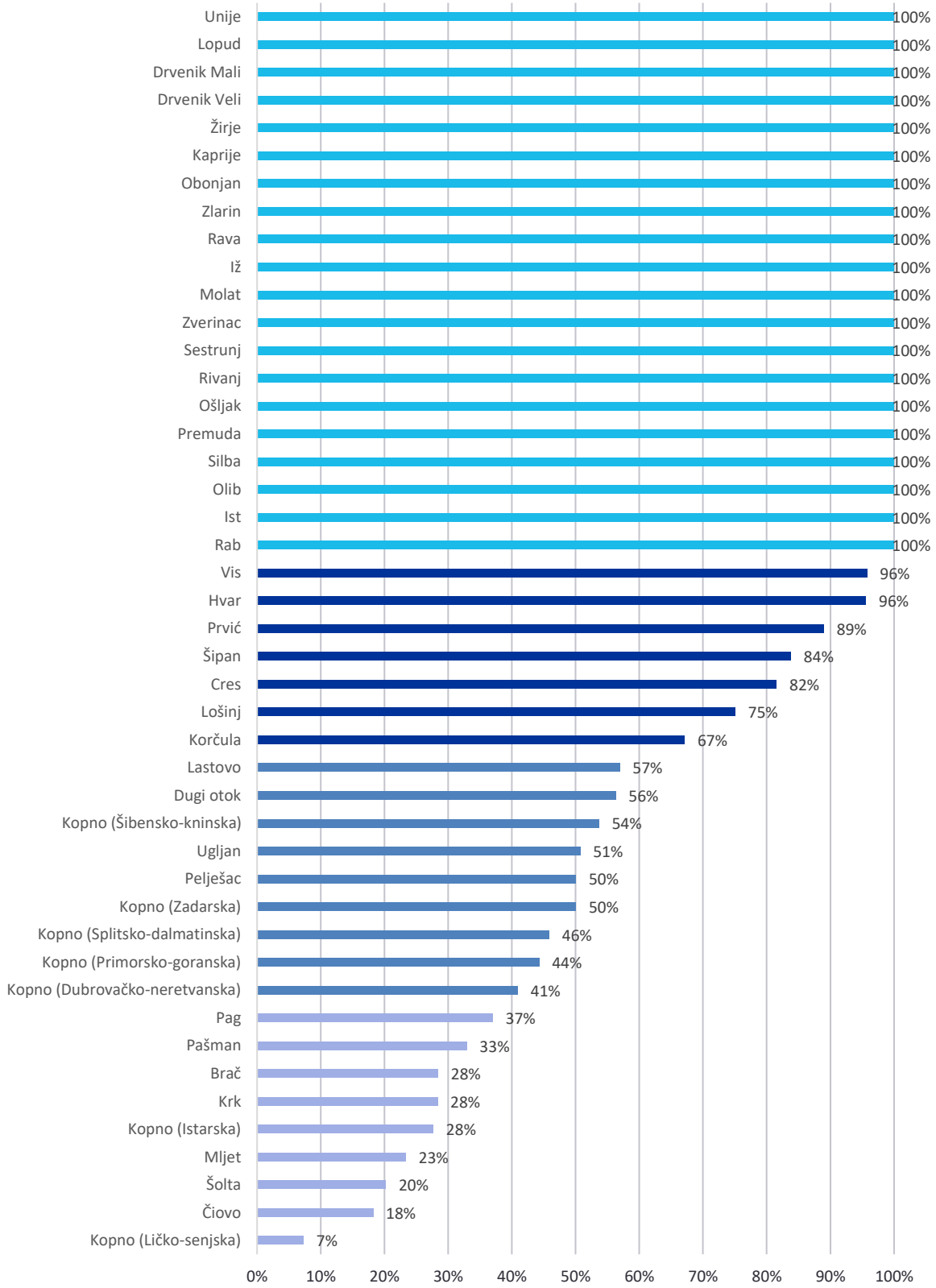
The islands have 72.269 inhabitants covered by seaports out of a total of 127.688 inhabitants on the islands (56 %).

The seaports on land cover about 582.342 inhabitants out of a total of 1.261.644 inhabitants on land (46 %).

[37] CBS, Population census 2011, available on: https://www.dzs.hr/Hrv/censuses/census2011/censuslogo.htm

[38] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

Demographic coverage of seaports on the island



Graph 37 Demographic coverage of seaports on the island (in %) *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

Demographic coverage of maritime lines represents the sum of the number of inhabitants in all destinations on sea routes according to CBS data (PC AXIS database)[39] with which a particular island is associated. Demographic coverage of maritime lines of an individual island depends on the number of destinations with which the island is connected and the number of inhabitants in these destinations. The demographic coverage of maritime lines is calculated according to the expression:

$$Pln = \sum Sln = Sl1 + Sl2 + \cdots + Sln$$

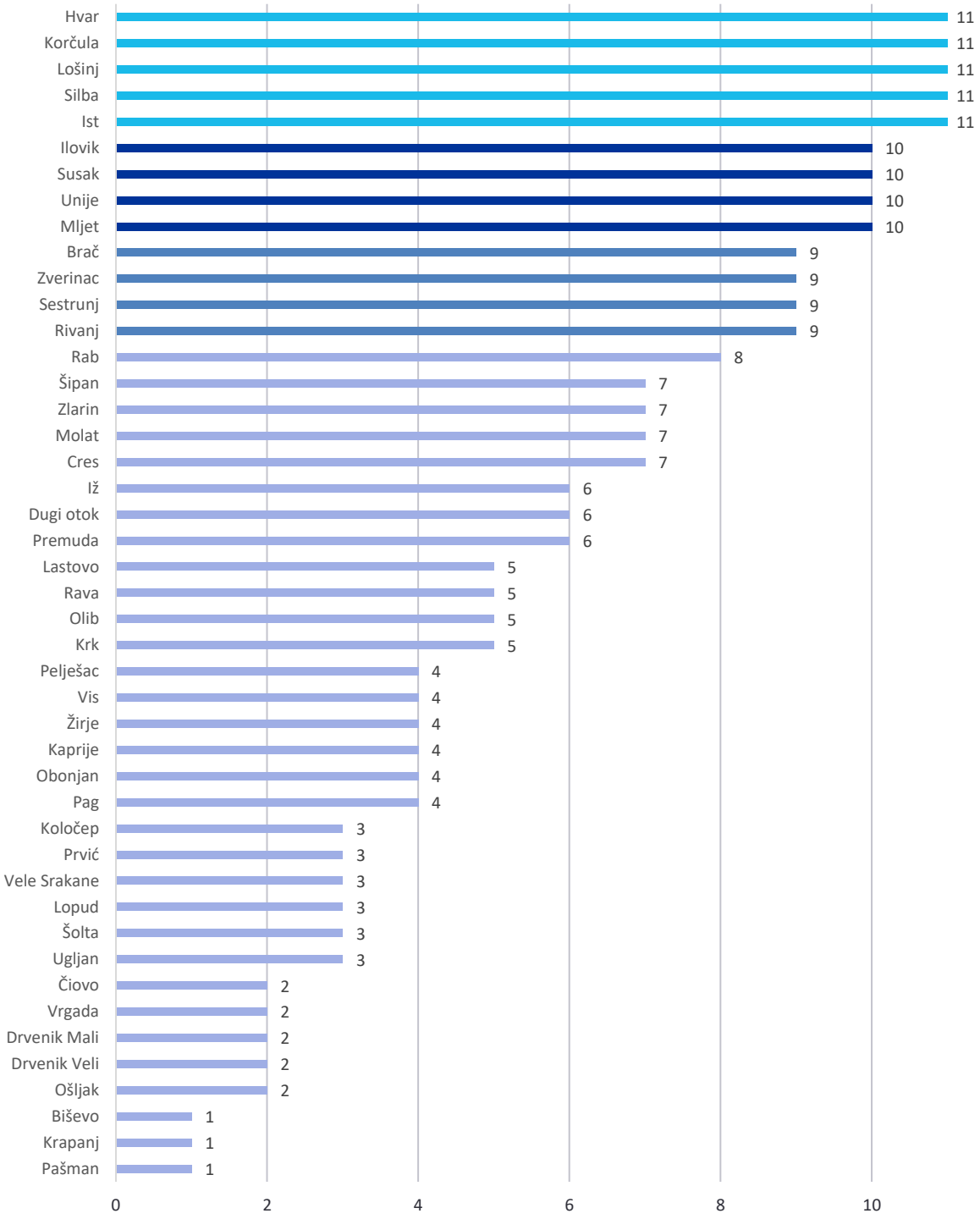
Where is:

Sl – the number of inhabitants in the town/settlement on the maritime line with which the island is connected

The islands of Hvar, Korčula, Lošinj, Silba and Ist are connected with the most destinations (11 destinations). The islands of Pašman, Krapanj and Biševo are connected with one destination. On average, islands in the Republic of Croatia are connected to six destinations (Graph 38).

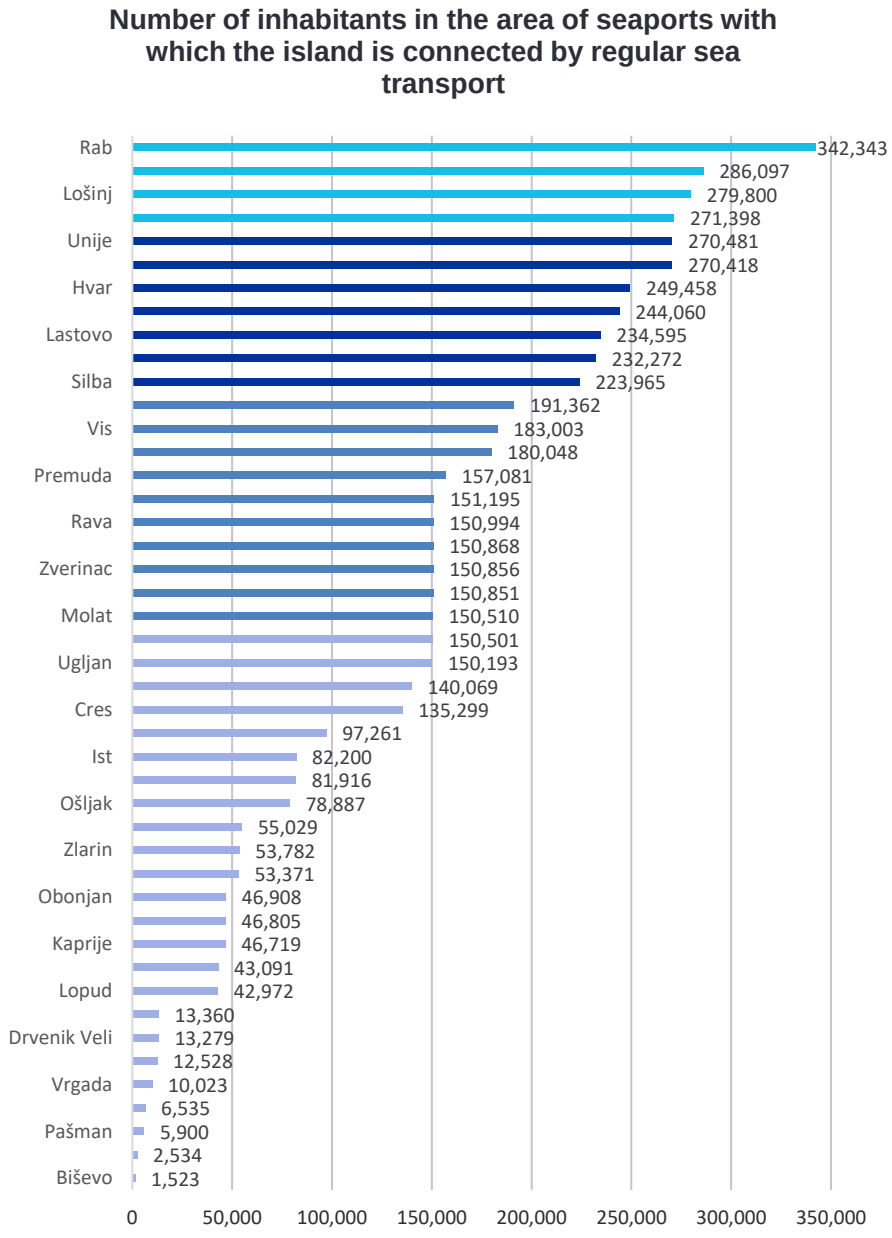
[39] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

Number of destinations (seaports) with which the island is connected by sea



Graph 38 Number of destinations to which the island is connected by sea *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

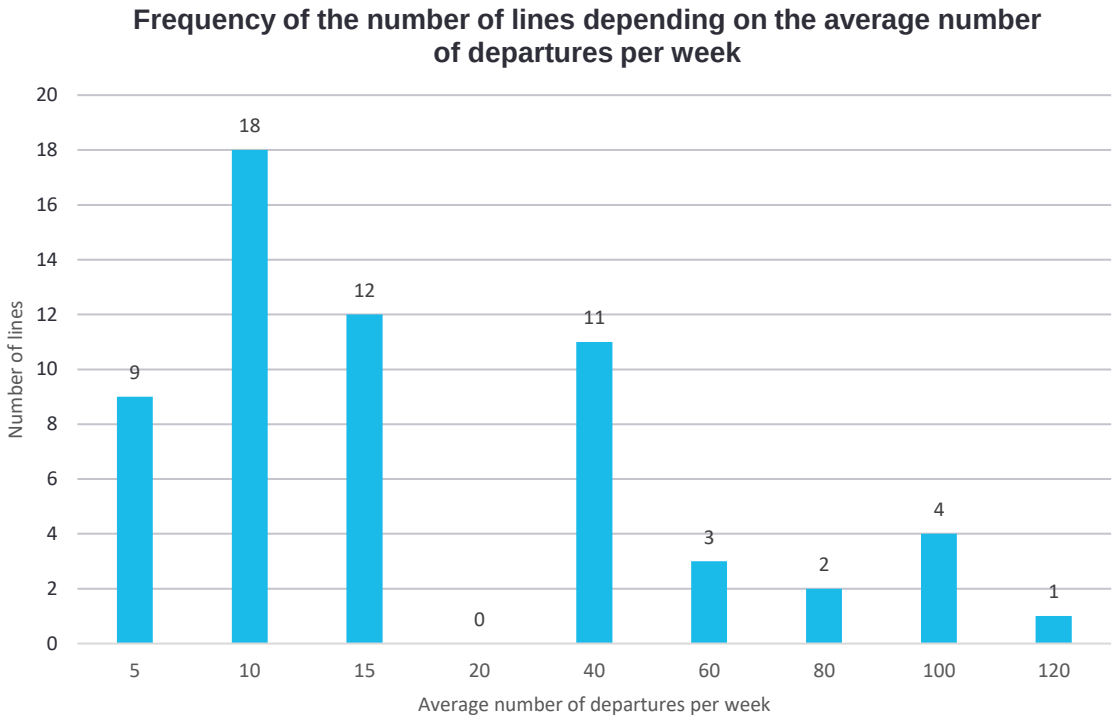
The islands of Rab, Mljet, Lošinj and Ilovik are connected by the most inhabitants, with an average of 300,000 inhabitants. The islands of Biševo and Krapanj are connected with the smallest number of inhabitants (Graph 39).



Graph 39 Number of inhabitants in the area of seaports with which the island is connected by regular sea transport *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), analysed by EY]*

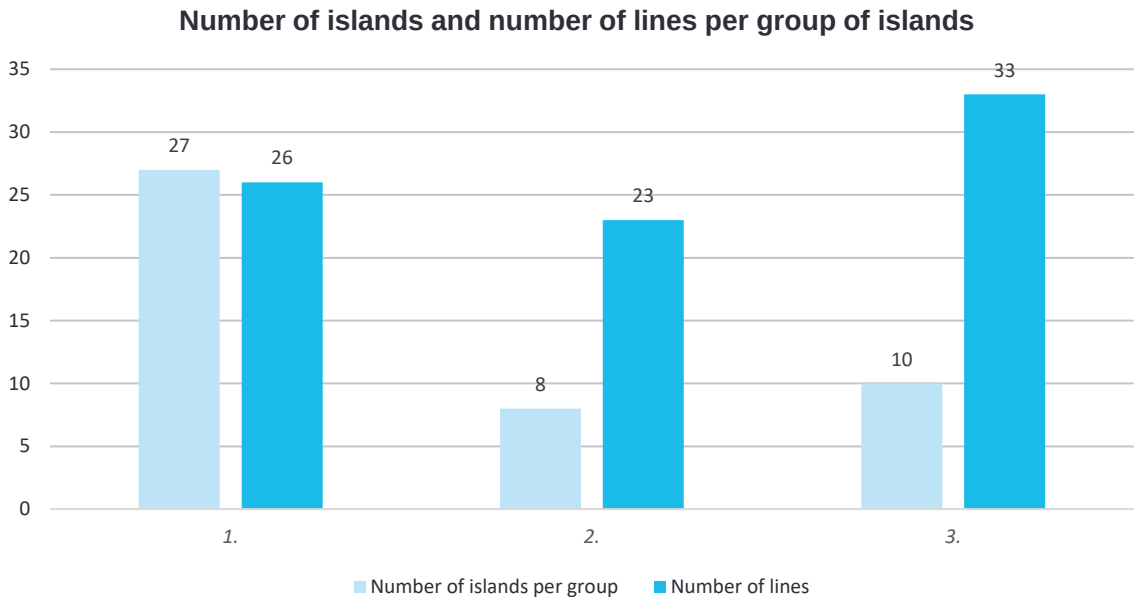
The analysis of the data of each individual line on the itinerary and timetable established that a total of about 126.000 ship departures, i.e., departures, are realized annually in the coverage area, which makes about 345 ship departures per day.

By analysing the number of departures per week per line, according to the timetable data, downloaded off the website of the Coastal Transport Agency (2021), it was recorded that the line 337 Mišnjak (Rab) - Stinica has on average the most weekly departures (119 departures), and the least, on average one departure per week, have lines 9602 Vis - Hvar - Milna - Brac and 9141 Pula - Unije - Susak - Mali Losinj - Ilovik - Silba - Zadar. The largest number, as many as 18 lines, have between 5 - 10 departures per week. The frequency of lines depending on the average number of departures per week is shown in the Graph 40.



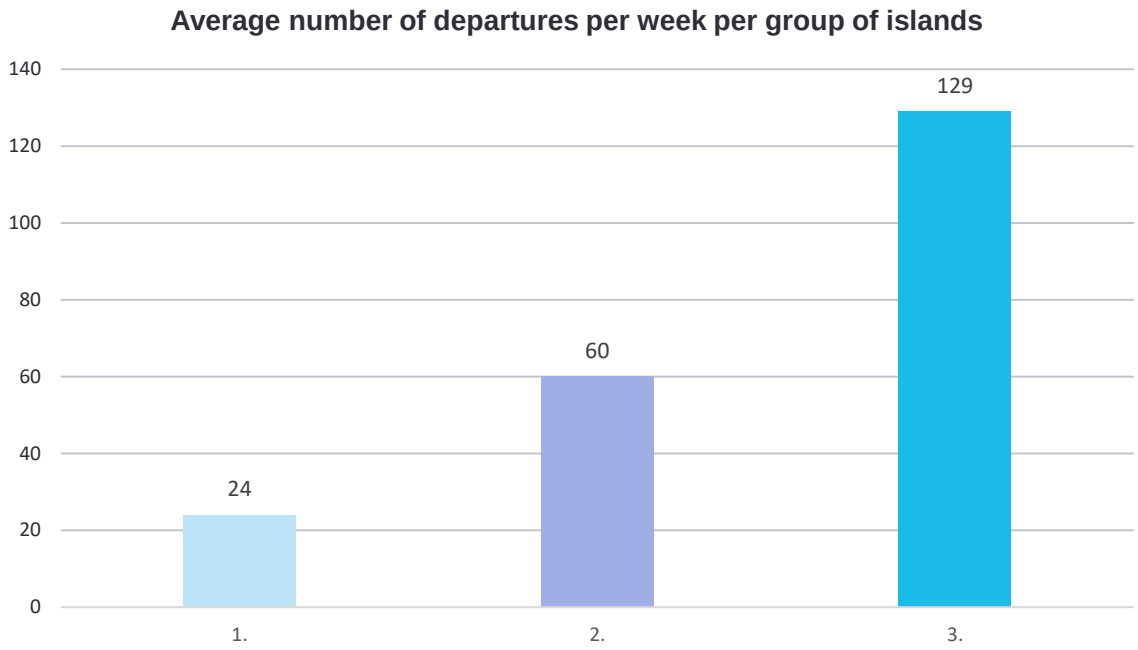
Graph 40 Frequency of the number of lines depending on the average number of departures per week *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), analysed by EY]*

The analysis of the number of lines and the average number of departures per week was also performed by group of islands. It was determined that the islands of the first group (27 islands) are served with a total of 26 sea lines, the islands of the second group (8 islands) with 23 sea lines while the islands of the third group (10 islands) have 33 sea lines (Graph 41).



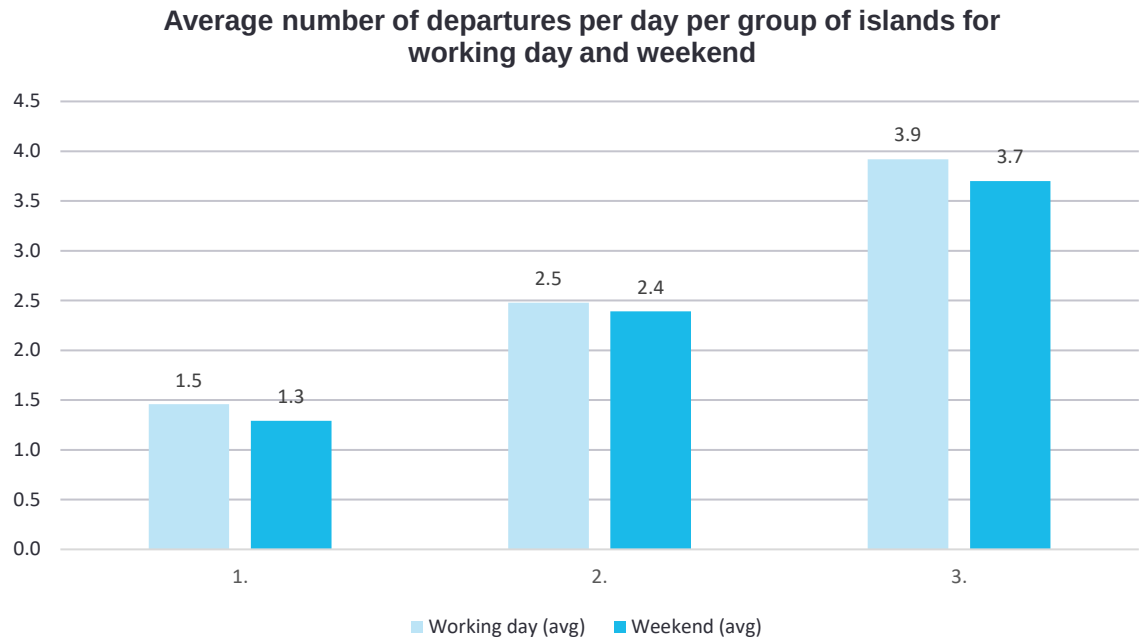
Graph 41 Number of islands and number of lines per group of islands *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), analysed by EY]*

By observing the average number of departures per week, it was determined that the islands of the first group have an average of 24 departures, the islands of the second group 60 departures and the third group 129 departures. The standard deviation for the islands of the first group is 11,6, for the second group of islands 22,8, while for the third group of islands standard deviation is 34,5. Consequently, it can be concluded that the number of departures per week is proportional to the size of the island, i.e., the number of inhabitants on the island, but there are also significant deviations in the number of departures that vary by seaport (Graph 42).



Graph 42 Average number of departures per week per group of islands *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), analysed by EY]*

The analysis of data on the differences in the average number of departures on weekdays and weekends showed that the number of departures on weekends decreased by about 6.84% in all three groups of islands (Graph 43). The reason for this is that Friday, as the working day preceding the weekend, is the day with the most departures as seen in the Graph 44.



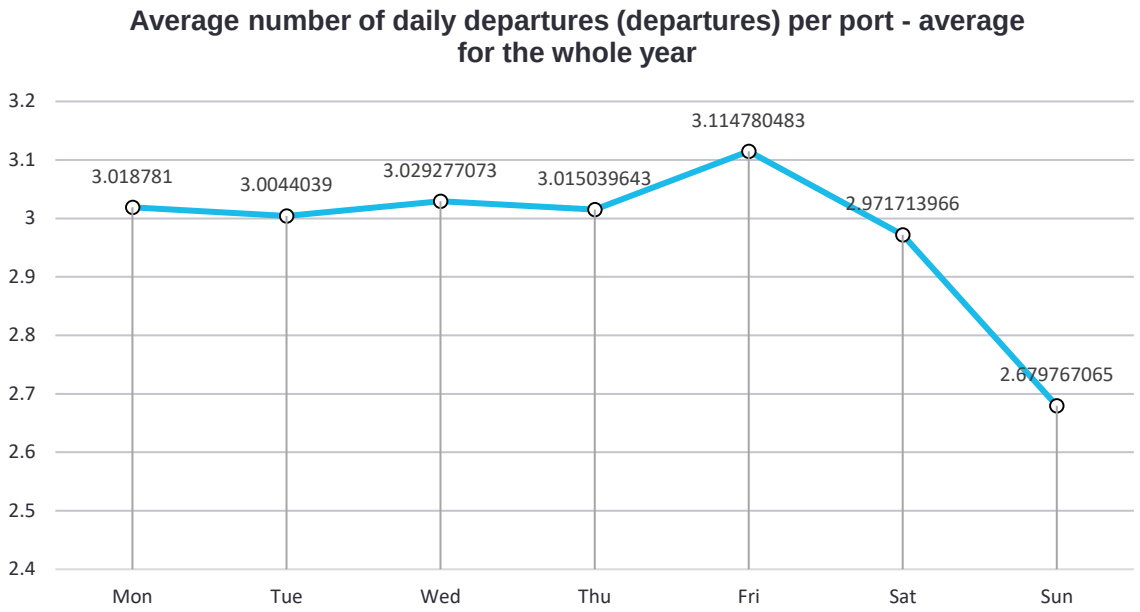
Graph 43 Average number of departures per day per group of islands for working day and weekend *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), analysed by EY*

By analyzing the average number of departures by days of the week throughout the year according to the data on the timetable downloaded from the website of the Coastal Line Transport Agency[40], it is evident that Friday is the day with the most departures (3,1 daily departures from the port). The lowest average number of departures per port was recorded on Sunday (2,7 daily departures from the port) (Graph 44).

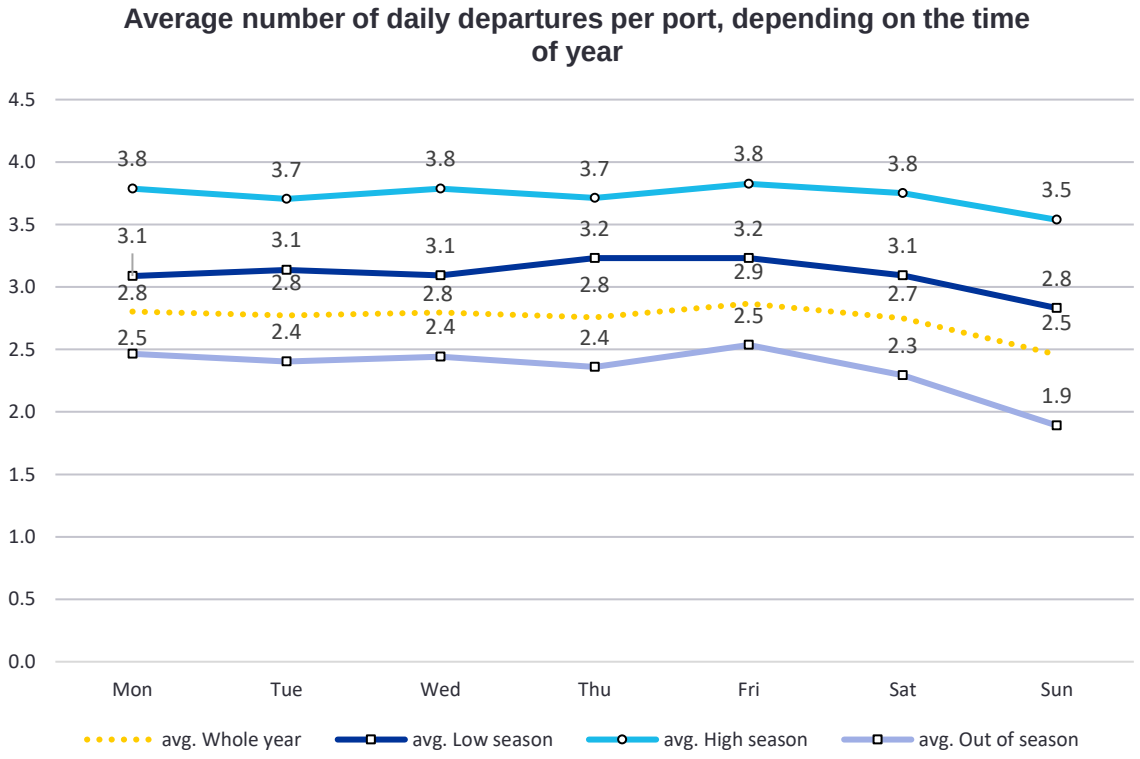
The standard deviation in the number of departures per day is about 3,8 for all days except Sunday, when it is 3,5. Accordingly, it was found that the number of daily departures in seaports varies significantly. The range of departures per day depending on the seaports varies the least on Sundays.

The analysis according to the period of the year shows that the highest average number of departures was expected in the high season (3,7 departures per day) while the lowest average number of departures was recorded in the off-season (2,3), which is about 38 % less (Graph 45).

[40] Coastal Shipping Agency, available on: https://agencija-zolpp.hr/linije/



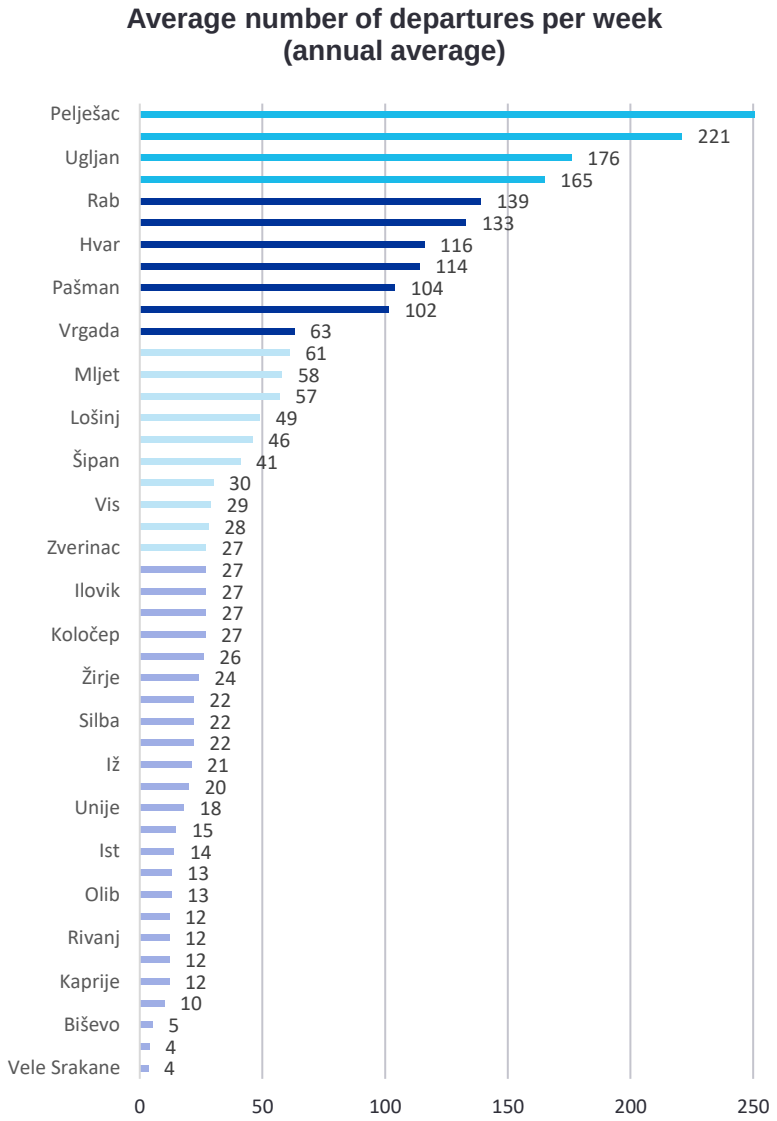
Graph 44 Average number of daily departures per port – average for the whole year *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), analysed by EY]*



Graph 45 Average number of departures per day per day depending on the time of year *[Source: Coastal Line Transport Agency*

(https://agencija-zolpp.hr/linije/), EY analysis]

In addition to the analysis of aggregate data on the number of departures, an analysis of the number of departures was performed for each of the 45 Croatian islands. The analysis showed that on an annual level the island of Pelješac has the most departures on average, i.e., 253 weeks of departure, followed by Korčula with 221, Ugljan with 176 and Cres with 165 departures per week. The islands of Vele Srakane, Obonjan, and Biševo have the fewest departures per week with five or fewer departures. The average number of departures per week for each island served by liner shipping is shown in the Graph 46.



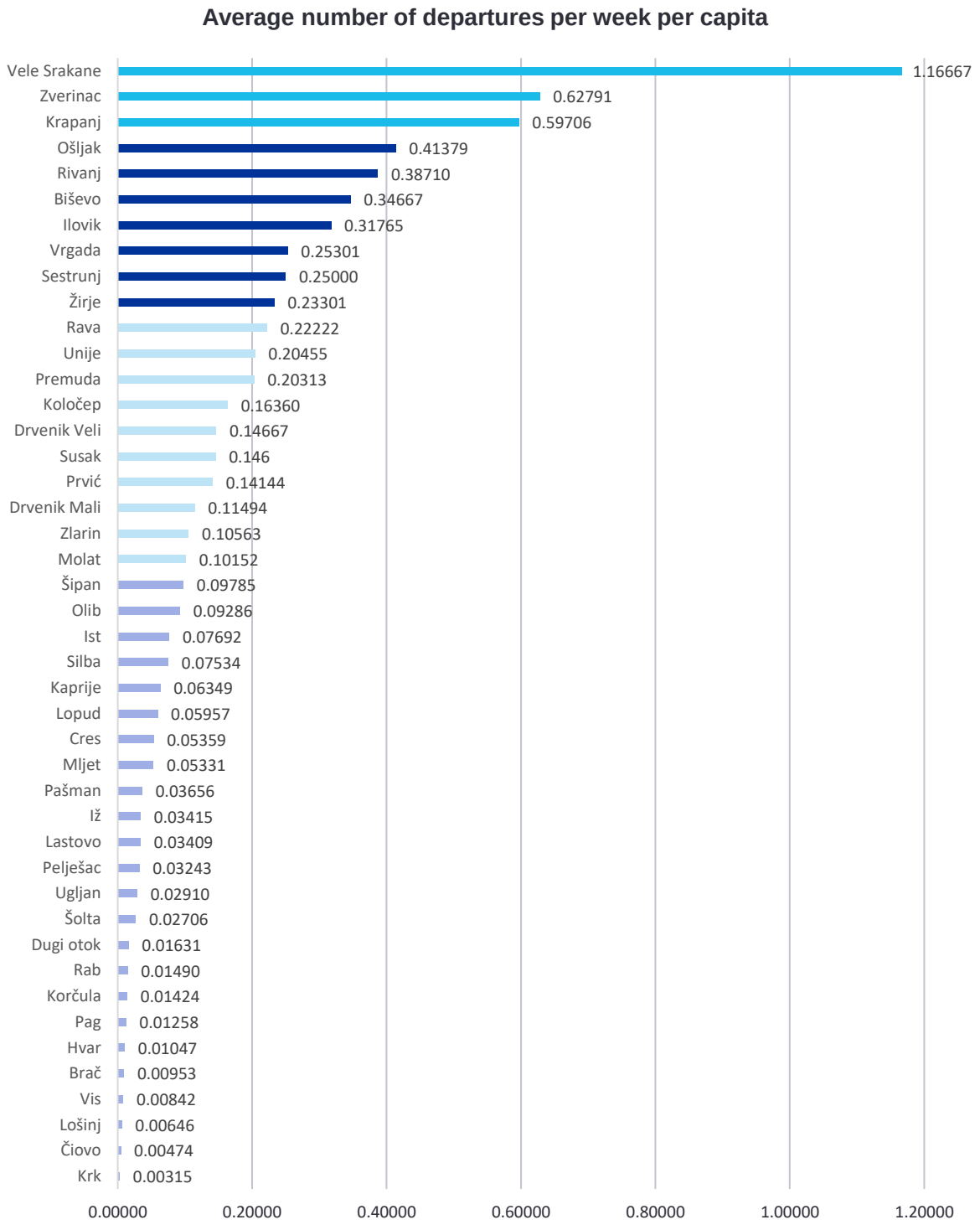
Graph 46 Average number of departures per week per island *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), EY analysis]*

To gain a clearer insight into the value of the number of departures, a comparison of the number of departures per week by islands with:

- the number of local population on the island, and
- the number of arrivals of Italian tourists on the island.

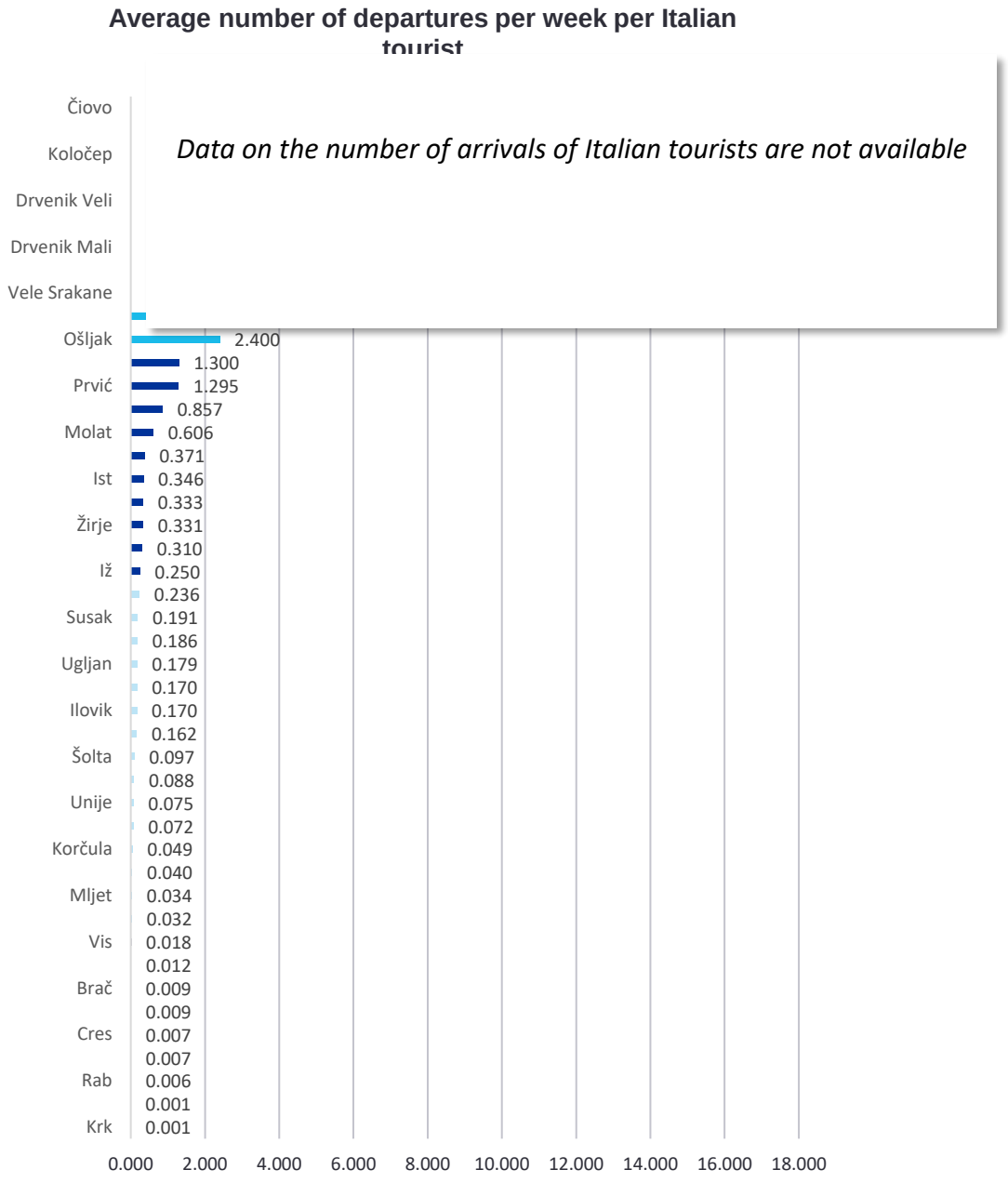
If the average number of departures per week is compared to the number of inhabitants on the island according to CBS data (PC AXIS database)[41], it is evident that the islands of Vele Srakane, Zverinac, Krapanj and Ošljak have the largest number of departures per capita, and the least Krk, Čiovo, Lošinj and Vis. The reason for this is the large difference in the population of individual islands and the weak correlation between the number of departures and the population of the islands. The average number of departures per week per capita for each island served by liner shipping is shown in the Graph 47.

[41] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm



Graph 47 Average number of departures per week per capita for each island served by liner shipping *[Source: Coastal Line Transport Agency (***https://agencija-zolpp.hr/linije/***), CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), EY analysis]*

By analysing the average number of departures of Italian tourists per week according to CBS data (PC AXIS database)[42] it is clear that the highest values are the islands of Vrgada (15.750), Ošljak (2.400), Biševo (1.300) and Prvić (1.295). The islands of Lošinj and Krk have the lowest average number of departures with 0,001 departures of Italian tourists per week (Graph 48).



Graph 48 Average number of departures per week per Italian tourist *[Source: Coastal Line Transport Agency (https://agencija-zolpp.hr/linije/), CBS, PC AXIS database (https://www.dzs.hr/hrv/system/stat_databases.htm), EY analysis]*

In addition to the timetable analysis, the coefficient of line straightness was also calculated. The line directness coefficient gives an assessment of the quality of an individual line from the point of view of the curvature of the line route in relation to the air distance between the source and the target. The higher the value, the more favourable the quality (directness) of the line, and the highest value is 1. It is calculated according to the formula:

$$Kz: \frac{Lp}{L}$$

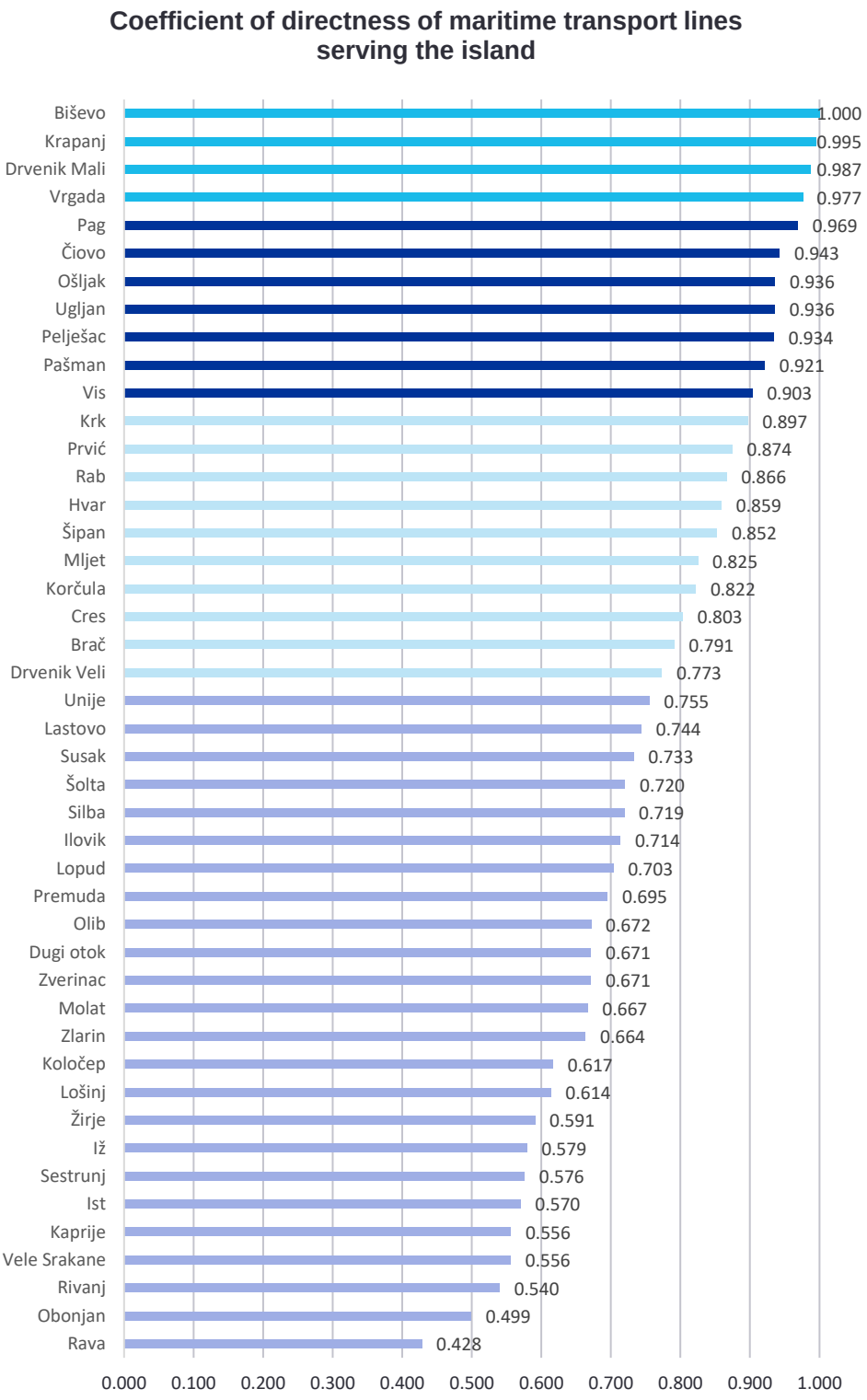
Where is:

Lp – straight distance from source to target

L – the actual length of the line

In accordance with the purpose and goal of the Multimodality Analysis which emphasis is on islands, the analysis of line curvature is structured towards islands. The islands with the highest coefficient of line straightness are Biševo, Krapanj, Drvenik Mali and Vrgada. The islands of Rava, Obonjan and Rivanj have the lowest directness of lines. The directness of the line significantly affects the duration of the voyage, and in this case, it is defined by the spatial allocation of seaports. Average coefficient of line straightness is 0,758 (Graph 49).

[42] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm



Graph 49 Coefficients of directness of maritime lines serving the island *[Source: EY]*

In addition to the connection of the analysed area with maritime lines within the territory of Croatia, the connection with Italy was also analysed. The most important maritime lines, i.e., the lines with the highest transport power, are ferry lines to Split, Dubrovnik and Zadar[43]. Split and Zadar (before the Covid-19 pandemic) are connected by ferry lines with the city of Ancona, and Dubrovnik is connected with Bari. International ferry lines are organized by Jadrolinija, and the Italian carrier SNAV also operates on the Split - Ancona line.

According to data downloaded off the Jadrolinija website, the Split-Ancona ferry line had eight departures per week during July and August, of which four departures were organized by Jadrolinija and the remaining four by SNAV[44]. All departures are organized on Tuesdays, Thursdays, Saturdays and Sundays. The ferry line on the route Dubrovnik - Bari operates four times a week, more precisely on Mondays, Fridays, Saturdays, and Sundays. As previously mentioned, during 2021 there is no ferry line on the route Zadar - Ancona, so there are no departures accordingly.

In addition to ferry lines organized by Jadrolinija[45], in the North Adriatic, transport services from Italy are provided by a travel agency *Gomo Viaggi*[46] and company Adriatic Lines[47]. Maritime lines under their jurisdiction are not ferry lines but catamaran lines, i.e., it is not possible to board motor vehicles on the ship itself, but it is allowed to board bicycles with certain conditions and fees.

Catamaran timetables were taken from the Adriatic Lines website and analysed during the period of August, when demand is highest from Italian passengers. The company Adriatic Lines, which operates in locations in Istria, is a Croatian company that owns one ship and organizes trips to Venice from the cities of Pula, Poreč and Rovinj. Catamaran lines are organized as follows:

- Poreč – Venice – Poreč runs three times a week, Tuesdays, Wednesdays, and Thursdays,
- Rovinj – Venice – Rovinj runs on Mondays,
- Pula – Venice – Pula runs on Saturdays.

Also, on the Adriatic Lines website there is a line Umag - Venice - Umag, but for 2021 there is no timetable, so it is assumed that this line is not in operation.

Gomo Viaggi is an Italian travel agency that specializes in travel to Croatia and as part of its supplied services offers maritime transport in the direction of Croatia. *Gomo Viaggi* with its services covers three cities in Croatia and two in Italy. The lines organized as part of their maritime offer are:

[43] During 2021, at the time of the Analysis, the ferry line Zadar - Ancona did not operate due to expectations of low demand due to the crisis caused by the corona virus pandemic.

[44] SNAV, available on: https://www.snav.it/en/orari-e-tratte-2

[45] Jadrolinija, available on: https://www.jadrolinija.hr/hr/schedule/LineSearchResults/Index/2331731/2331792/31072021

[46] Gomo Viaggi, available on: https://www.gomoviaggi.com/

[47] Adriatic lines, available on: https://adriatic-lines.com/

- Cesenatico (bus) – Pesaro – Mali Lošinj – Novalja
- Cesenatico – Rovinj
- Pesaro – Mali Lošinj

Mali Lošinj is connected with two maritime lines, with a direct line from the direction of Pesara and a line starting from Cesenatico, going to Pesaro and then to Mali Lošinj. One day a week, the line in question runs to Novalja. The city of Rovinj has a direct line with Cesenatico. According to the data available on the website of Gomo Viaggia[48], regular transport on these routes is organized only in the period from July 24 to August 29 during 2021.

[48] Gomo Viaggi, available on: https://www.gomoviaggi.com/

5.1.3.3 *Analysis of bus transport offer on the islands*

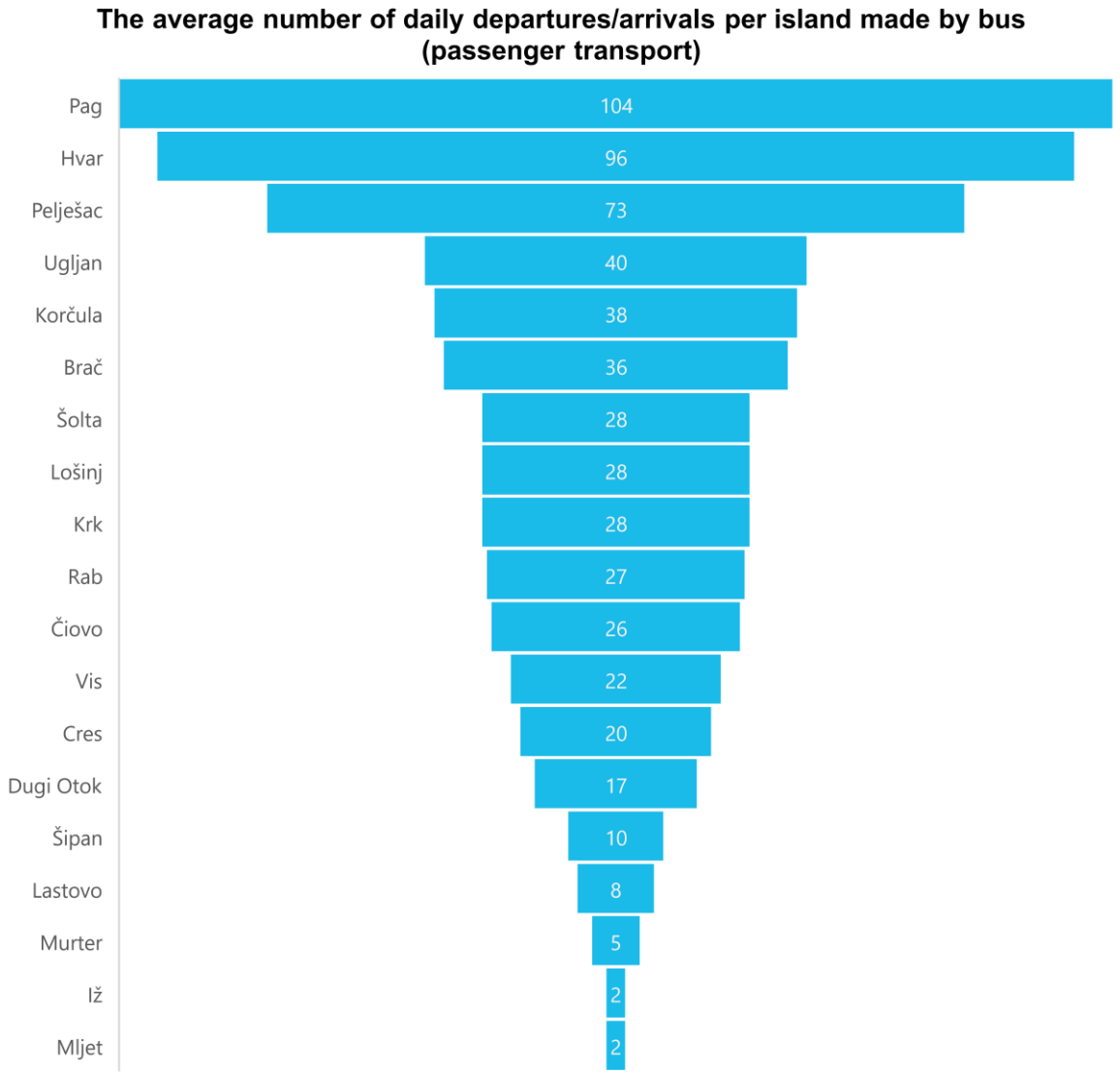
Analysis of bus transport offer on islands showed that 19 islands offer regular passenger bus service (Figure 2):

Figure 2 Cartographic presentation of the islands that offer bus services *[Source: EY]*

Carriers that provide bus service in the coverage area are Arriva, Čazmatrans, Liburnija Zadar, Autotransport Šibenik, Libertas Dubrovnik and Promet Split.

During the research period in the coverage area, by analysing the data taken from websites of previously mentioned bus carriers for 2021, it was determined that there are more than 550 departures/arrivals per day. The island of Pag is the island with the largest offer of bus lines with 104 departures/arrivals between 18 destinations. All major settlements within the island are connected, and in a long-distance transport, Pag is connected with Zadar, Split, Šibenik, Rijeka and Zagreb. The

island of Hvar has 96 departures/arrivals, and Pelješac has 73 departures/arrivals on bus lines operated on the island. Other islands have an average of 20 to 30 departures/arrivals per day (Graph 50).



Graph 50 Average number of daily departures/arrivals per island made by bus *[Source: Arriva (https://www.arriva.com.hr/hr-hr/naslovna), Čazmatrans (https://cazmatrans.hr/hr/), Liburnija Zadar (https://liburnija-zadar.hr/), Autotransport Šibenik (https://atpsi.hr/), Libertas Dubrovnik (https://www.libertasdubrovnik.hr/) Promet Split (http://www.promet-split.hr/vozni-red), EY analysis]*

5.1.3.4 *Analysis of taxi offer on the islands*

Taxi transport is a public passenger transport service that is performed by picking-up passengers at one or more places and disembarking at the location desired by the passenger. The system is organized in a way that payment is made at the end of the trip, after the price is defined via a taximeter or via an application within which the user is shown the maximum possible price and the planned travel route before the trip.

Taxi transport is a form of public transport that is mostly used in larger cities, while due to the high price on smaller routes it is very rarely used in smaller settlements. **On the islands, taxi transport is mainly used as a form of transport between more distant settlements on the island, which are difficult to reach by any other form of transport than by car.** In addition to the most frequently used taxi transport, boat taxi transport is extremely popular on the islands and has been increasingly used lately, especially for tourist purposes.

Taxi transport

In addition to the Association of taxi carriers operating in certain areas, in recent years private taxi carriers have appeared in Croatia, such as EkoTaxi and Taxi Cammeo. There are also world-famous companies that use their applications to organize passenger transport services, like Uber, Bolt, and similar. In the island areas, mostly locals work as taxi carriers, and as part of a private sector are providing services of passenger transport.

The increase in the offer and the decrease in prices over the last few years have resulted in an increased use of the taxi service.

According to the current situation, taxi transport on islands is often used as a form of transport in cases where tourists come to the island without their own means of transport and use a taxi service to travel from the harbour to the destination.

Given their size, Croatian islands have a very distinctive way of approaching taxi services.

Within the Group I islands, most of the islands have a complete ban on the car usage, therefore taxi service in these areas is impossible. On the Group I islands, where car traffic is allowed, there is no justified need for taxi transport because the size of the island is suitable for cycling and hiking, and the population density is extremely low.

In Group II islands, taxi transport is significantly more represented compared to the Group I islands. Given that in Group II islands are spatially larger islands, with a larger population and a larger number of tourists during the year, on all islands except the island of Iž, there is a taxi service. On most of the islands, these are private carriers that have a smaller fleet of cars at their disposal, with which they offer transport services to tourists on the island during the tourist season.

The Group III islands includes islands that are extremely well developed in terms of tourism and have more than 5.000 inhabitants in their area. Each of the ten islands within Group III islands offer a greater choice of taxi carriers that offer this type of transport throughout the year, regardless of

whether it is the tourist season. During the tourist season, the number of taxi carriers increases, due to the arrival of other carriers from the mainland who can perform the taxi service on the islands.

Boat taxi service

As mentioned, recently the so-called boat taxi transport, i.e., taxi transport service by boat, has been increasingly developing. Several tourists prefer this mode of transport to their destinations on the islands because of the attractiveness and experience that such service provides.

Many maritime routes (departures and arrivals) are not harmonized with other regular transport services and the departure frequencies of boats are not satisfactory for a certain number of users. That is why more and more tourists use the "taxi boat" service because it provides them with easily accessible transport to the destination.

Accordingly, this type of transport service is very common for the needs of transport to smaller islands, i.e., Group I islands.

On the islands of Group II islands, boat taxi transport is more represented on islands with a larger population. On larger islands such as Cres, Vis or Murter, carriers offer their boat transport services throughout the whole year.

On the Group III islands, i.e., large islands, boat taxi transport is a very common mode of transport among tourists. In addition to travel between islands and from the island to the mainland, the "taxi boat" is often used for tourist tours of the island, and for transport to locations (bays, beaches) that are inaccessible to other public transport services.

5.1.3.5 *Analysis of bicycle transport offer in the coverage area*

In the last few years, the offer of bicycle transport has been intensively developing in the territory of the Republic of Croatia. Increased road traffic congestion encourages the distribution of traffic to the public transport system, and thus to bicycle transport, which encourages the development of bicycle transport itself.

The development of the bicycle transport service is mostly accompanied by the development of the public bicycle system, both in the entire area and in the coastal area and islands of the Republic of Croatia. The most widespread system of public bicycles in the Republic of Croatia is the Nextbike[49] system, which offers a bicycle rental service at its stops in many cities.

The system of public bicycles has been implemented in 16 cities/settlements in the coverage area, and they are (Figure 3):

- Poreč
- Zadar
- Rijeka
- Šibenik
- Split
- Makarska
- Grad Krk
- Umag
- Pula
- Baška (otok Krk)
- Punat (otok Krk)
- Malinska (otok Krk)
- Vrbnik (otok Krk)
- Stara Baška (otok Krk)
- Klimno (otok Krk)
- Njivice (otok Krk)

[49] Available on: https://www.nextbike.hr/hr/zagreb/lokacije/

Figure 3 Cartographic presentation of cities that have public bicycle systems *[Source: EY]*

According to the current situation, only three cities (Krk, Šibenik and Split) have bicycle rental stops in the narrower area of seaports.

Positioning the public bicycle stops in the immediate vicinity of the port increases and encourages multimodality because it allows users to easily change the way they move.

According to the presented results, no island, except the island of Krk, has a system of public bicycles implemented in its offer.

According to data taken from the website Eco Island of Krk,[50] in 2020 the island of Krk introduced a system for renting public electric bicycles ("Krk bike") which encourages the development of tourist and transport infrastructure and the use of such a form of transport. By building stops and electric charging stations at eight locations throughout the island of Krk, residents and tourists were given the opportunity to rent and use public bicycles for the purpose of transportation in the island. The system is based on the Go2Bike application, through which users can rent bicycles every day, for 24 hours, for a fee of HRK 20,00 per hour.

Unlike the island of Krk, other Croatian islands do not have a public bicycles system that provides users with a greater opportunity to move around the island. Unlike the public bicycle system, the islands offer the possibility of renting bicycles by private renters. Private bike rental systems are generally more expensive and less practical due to the inability to leave the vehicle at multiple stops throughout the island, rather than the need to return the vehicle to the rental location.

On Croatian islands bicycle transport is mainly offered as a tourist attraction, and not as an efficient way of everyday traffic. Larger islands in Croatia use bicycle routes to attract tourists in terms of active tourism. Consequently, on the Croatian islands, mountain trails are mostly built/marked in the function of recreational cycling.

The islands with the largest offer of bicycle routes are Krk, Brač, Hvar, Pag and Korčula. Also, other islands that contain bicycle routes in their areas are Cres, Rab, Mljet, Vis, Vir, Murter, Prvić and Brijuni, while the islands of Ugljan and Pašman and the Pelješac peninsula contain bicycle routes that belong to the EuroVelo route.

EuroVelo[51] routes are intended for the development of cycling tourism and connections throughout Europe. In addition to connecting European destinations via bike paths, the goal is to bring the use of bicycles closer to locals for transport within or between settlements. The EV8 route, which passes through the territory of the Republic of Croatia, passes through the area of the islands of Ugljan and Pašman and the Pelješac peninsula.

[50] Available on: http://www.ekootokkrk.hr/krk-bike

[51] Available on: https://en.eurovelo.com/

5.1.3.6 *Analysis of electric scooter offer on coverage area*

As the world has seen a drastic increase in the use and development of electric scooters, such trend is happening in the Republic of Croatia as well. An increasing offer of electric scooter rental services is appearing, not only in larger cities, but also on some islands. Dash City[52] Company has implemented an electric scooter rental system in 15 cities across Croatia with a total fleet of 500 electric scooters available for rent. The system works through a mobile application through which it is necessary to register and after registration the user can rent a scooter.

During 2021, electric scooter rental systems have been implemented in the following cities/settlements in the coverage area (Figure 4):

- Murter,
- Rab,
- Krk[53],
- Korčula,
- Umag,
- Rabac,
- Lopar,
- Crikvenica,
- Zadar,
- Biograd na moru,
- Sv. Filip i Jakov,
- Tisno,
- Kaštela,
- Supetar,
- Gradac,
- Lumbarda

[52] Available on: https://www.dash.city/

[53] The rental system is still in the testing phase. Electric scooters are in the same locations where there are stops for electric bikes within the same system. At the time of writing, there are 20 electric scooters available for rent on the island of Krk.

Figure 4 Cartographic presentation of cities/settlements that have public scooter renting system *[Source: EY]*

5.1.3.7 *Analysis of the current state of multimodality on islands*

Given that multimodality of transport refers to the integration of different transport subsystems to enable the passenger simple, fast, and efficient traffic from source to destination, the analysis of the following parameters was performed:

- spatial coverage of ferry ports,
- compliance of maritime and bus passenger transport,
- coverage of seaports with micromobility offers.

There are 62 ferry ports in the coverage area, i.e., seaports (destinations) that are served by the state ferry line (64 %). The other 35 destinations (seaports) are not served by ferry. Of the 62 ferry ports, 48 (77 %) are located on the islands and the rest on the mainland. If we compare the share of ferry ports in the total number of seaports between islands and the mainland, we come to the data that ferry ports make up 61 % of ports on the islands, and 73 % of ports on the mainland.

It is important to emphasize that international maritime traffic between Italy and Croatia takes place through two ferry ports in Croatia (Split and Dubrovnik) and Italy (Ancona and Bari).

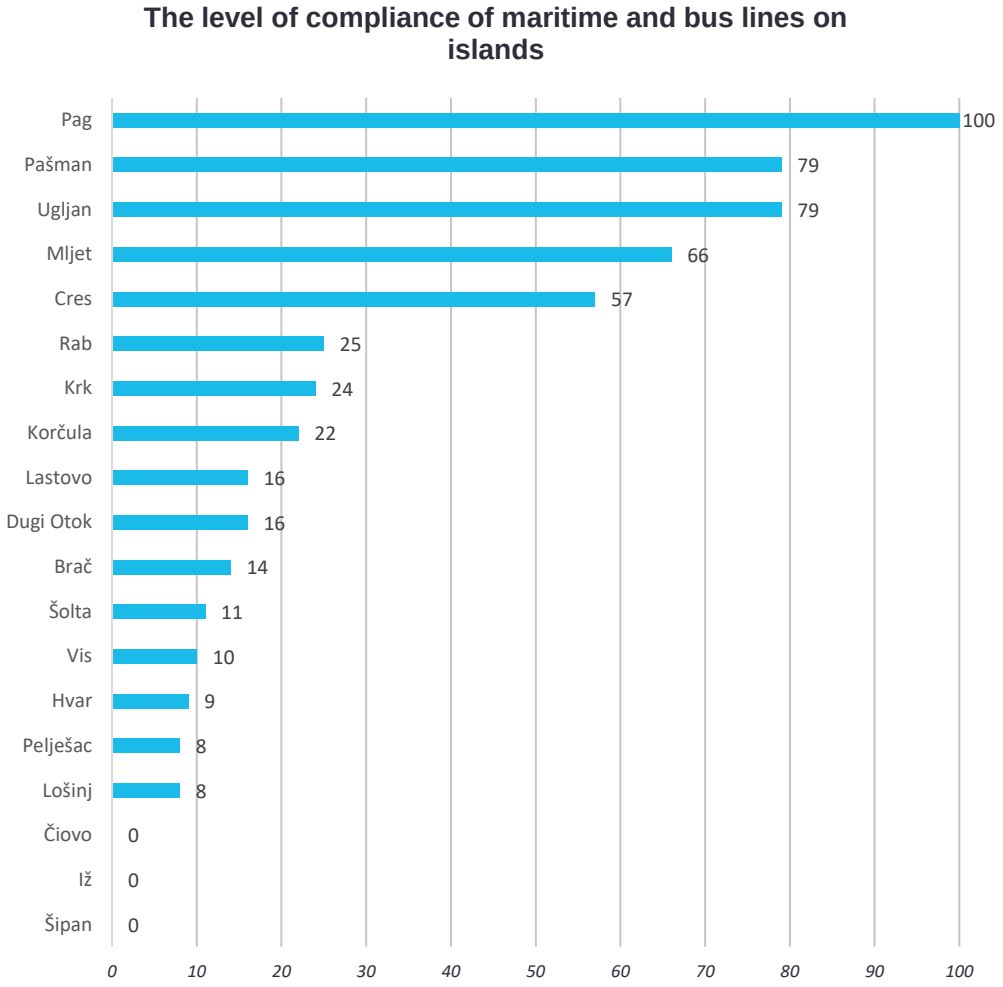
According to the CBS data (PC AXIS database),[54] the total number of inhabitants in the settlements/cities of ferry ports is 432.655, which is 74 % of the population covered by seaports (582.342). The analysis found that 49.809 inhabitants are covered by the ferry ports on the islands, which is 69 % of the total population on the islands covered by seaports (72.269). A map of the ferry ports is shown in Figure 5.

[54] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

Figure 5 Spatial arrangement of ferry ports in the coverage area *[Source: EY]*

Out of 97 seaports, 62 (64 %) are served by regular passenger bus transport.

By analysing the compliance of maritime and bus timetables taken from the websites of bus and maritime carriers, it was found that only about 19 %, i.e., 120 out of 700 departures and arrivals per day, were harmonized. In determining the compliance criteria, i.e., what period is acceptable for a safe transfer, the potential delay of the ship, the average time of embarkation/disembarkation on the means of transport and the time of walking to the means of transport were considered. Therefore, it is determined that the lines comply in case the time between the departure/arrival of the ferry line and the bus line does not exceed 30 minutes. By analysing the harmonization of maritime and bus transport on the islands, the highest compliance was found on the islands of Pag, Pašman and Ugljan, and the lowest on the islands of Čiovo, Šipan and Iž (Graph 51) (Figure 6).



Graph 51 The level of compliance of maritime and bus lines on islands *[Source: Arriva (https://www.arriva.com.hr/hr-hr/naslovna), Čazmatrans ((https://cazmatrans.hr/hr/), Liburnija Zadar (https://liburnija-zadar.hr/), Autotransport Šibenik (https://atpsi.hr/), Promet Split (http://www.promet-split.hr/vozni-red), Agencija za obalni linijski prijevoz (https://agencija-zolpp.hr/linije/), Jadrolinija (https://agencija-zolpp.hr/linije/), analysed by EY]*

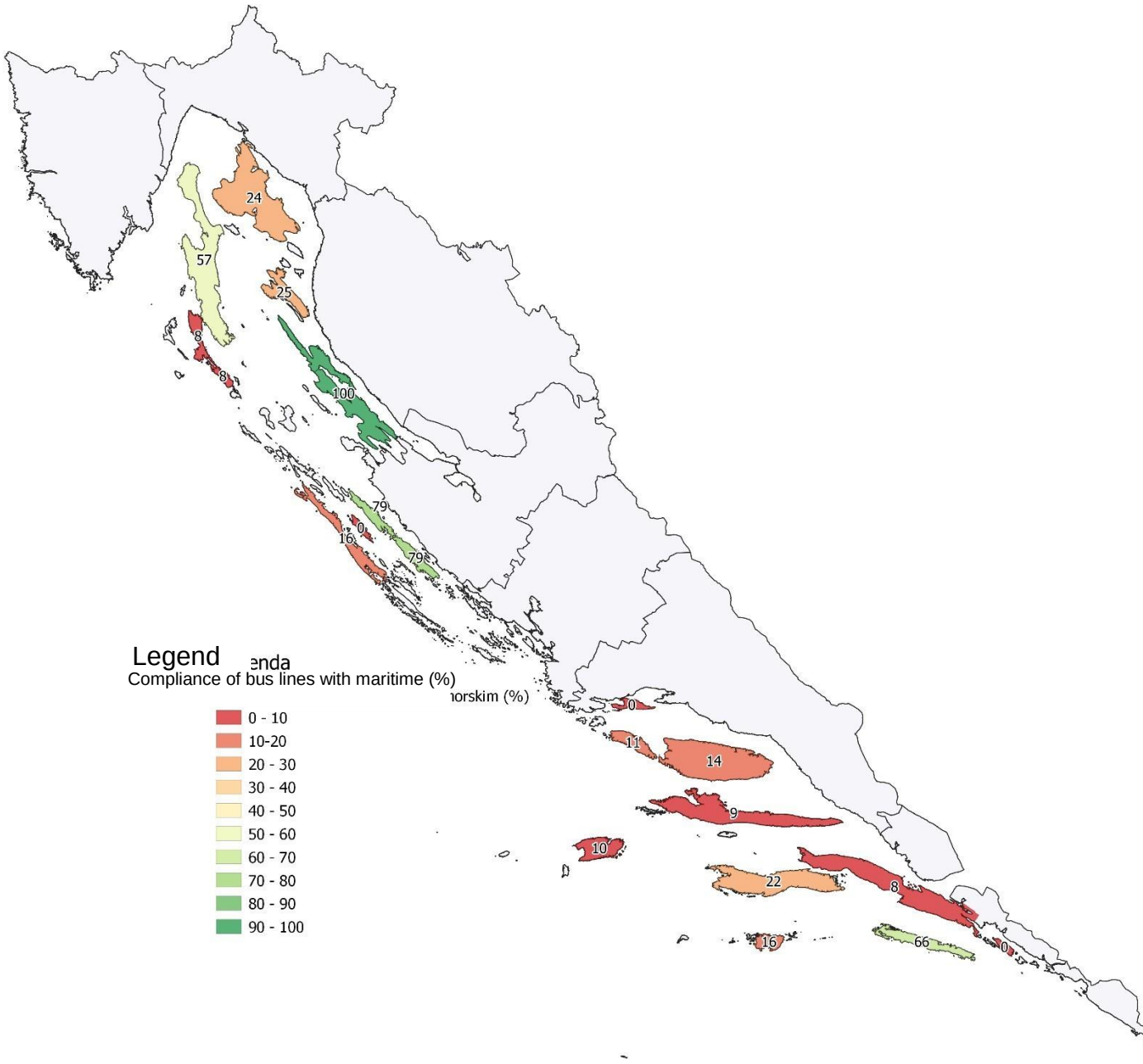


Figure 6 Cartographic presentation of level of compliance between bus and maritime lines on islands *[Source: EY]*

It was found that in the catchment area only seven islands (15 %) have available micromobility services, i.e., a system of public bicycles or electric scooters. Of all the seaports, only three cities (Split, Šibenik and Krk) in the coverage area have a system of public bicycles/scooters in the immediate vicinity of the seaport, which enables a quick transfer between the ship and the bicycle/scooter.

5.1.3.8 *Synthesis of results*

Documentation analysis with emphasis on multimodality, integration and intramodality	▶ Project MIMOSA and Analysis of multimodality are in compliance with analysed planning and strategic documentation and contribute to the defined goals.
Maritime transportation offer	▶ 60 national lines of passenger maritime transport, of which 40 % are ferry lines, 18,33 % are ship lines, 26,67 % are high-speed lines, 15 % are lines without public service obligation, ▶ Nine international maritime lines exclusively to Italy, ▶ The northern Adriatic, with an emphasis on the western coast of Istria, is better connected with Italy than the southern part of Croatia.
Coastal liner shipping on islands	▶ Islands with the largest number of seaports of arrival/departure of liner shipping: Cres, Brač, Korčula, Hvar, ▶ Ugljan has only one seaport through which liner shipping takes place.

Demographic coverage	▶ Highest demographic coverage of seaports:
	  ▶ 20 islands (100 %),
	  ▶ Vis and Hvar (96 %),
	  ▶ Šibenik-Knin County (54 %).
	▶ Lowest demographic coverage of seaports:
	  ▶ Mljet (23 %),
	  ▶ Šolta (20 %),
	  ▶ Čiovo (18 %),
	  ▶ Lika-Senj County (7 %).
	▶ Highest demographic coverage with liner shipping:
	  ▶ Hvar, Korčula, Lošinj, Silba (11 destinations),
	▶ Lowest demographic coverage with liner shipping:
	  ▶ Pag, Pašman, Krapanj, Biševo (1 destination).
	▶ The islands that have the largest number of inhabitants with whom the island is connected by regular maritime transport:
	  ▶ Rab, Mljet, Lošinj and Ilovik.
	▶ The islands that have the largest number of inhabitants with whom the island is connected by regular maritime transport:
	▶ Biševo and Krapanj.

Service of the island with maritime lines and the average number of departures per week	▶ In the coverage area, a total of about 126.000 ship departures are realized annually.
	▶ Average service with maritime lines and average number of departures per week per group of islands:
	  ▶ 26 maritime lines for the Group I islands, 24 departures per week,
	  ▶ 23 maritime lines for the Group II islands, 60 departures per week,
	  ▶ 33 maritime lines for the Group III islands, 129

	departures per week. ► For all groups of islands, the average number of departures on weekends is lower for about 6,84 % compared to the average number of departures on weekdays.
Daily number of departures per year by port and time of the year	► Average daily number of departures per year per port: ► Friday, the largest number of departures (3,1 daily departures from the port), ► Sunday, minimum number of departures (2,7 daily departures from the port). ► Average daily number of departures per year depending on the time of year: ► During the season (3,7 departures per day), ► Off-season (2,3 departures per day).
Number of departures of maritime lines per week on yearly level per island and per capita	► Islands with the most departures of maritime lines per week per year: ► Pelješac (253), ► Korčula (221), ► Ugljan (176), ► Cres (165). ► Islands with five or fewer departures per week per year: ► Vele Srakane, Obonjan and Biševo. ► The average largest number of departures per week per capita have islands: ► Vele Srakane, Krapanj and Ošljak. ► The average lowest number of departures per week per capita have islands: ► Krk, Čiovo, Lošinj and Vis.
Number of departures per week per Italian tourist	► The average largest number of departures per week per Italian tourist have islands: ► Vrgada (15,750), ► Ošljak (2,400), ► Biševo (1,300), ► Prvić (1,295). ► The average lowest number of departures per week per Italian tourist have islands: ► Lošinj and Krk (0,001).
Islands according to the directness coefficient	► The islands that have the highest directness coefficient are: ► Biševo, Krapanj, Drvenik Mali and Vrgada. ► The islands that have the lowest directness coefficient are: ► Rava, Obonjan and Rivanj.
Connection of Croatia with Italy by maritime transport	► The most important ferry lines: ► Split – Ancona (8 departures per week in July and August 2021), ► Dubrovnik – Bari (4 departures per week in 2021),

	▶ Zadar – Ancona (before Covid-19 pandemic). ▶ Catamaran lines from Istria to Italy: ▶ Poreč – Venice – Poreč (three times a week), ▶ Rovinj – Venice – Rovinj (once a week), ▶ Pula – Venice – Pula (once a week). ▶ The Italian Tourist Agency offers maritime transport on the following lines (July 24 - August 29, 2021): ▶ Cesenatico (bus) – Pesaro – Mali Lošinj – Novalja, ▶ Cesenatico – Rovinj, ▶ Pesaro – Mali Lošinj.
Analysis of bus transport offer on the islands	▶ 19 islands have a regular passenger bus service, ▶ Departures/arrivals of bus transport: ▶ Pag (104), ▶ Hvar (96), ▶ Other islands have an average of 20-30 departures/arrivals per day.
Analysis of taxi offer on the islands	▶ Taxi: ▶ Most of the islands of the first group do not offer a taxi service due to the ban on the movement of cars on the island, while on the islands where car traffic is allowed there is no justified need for taxi transport due to the size of the island. ▶ All islands of the second group have taxi transport (mostly private carriers) except the island of Iž, ▶ The third group of islands has taxi transport represented throughout the year, while in the period of the tourist season the offer of taxi carriers increases. ▶ „Taxi-boat“transport: ▶ Frequent need for transport on the Group I islands, ▶ The Group II islands has a more represented form of transport on islands with a larger population, ▶ The Group III islands have a distinct representation of this mode of transport among tourists (for the purpose of transport from island to island and tourist tour).
Analysis of bicycle transport offer on the islands	▶ 16 cities/settlements in the coverage area have implemented a system of public bicycles, ▶ Krk (1), Šibenik (2) and Split (1) have bicycle rental stops in the immediate vicinity of the seaports, ▶ The island of Krk offers the service of renting public electric bicycles, other islands do not have implemented system of renting public bicycles, ▶ The disadvantage of bicycle transport in Croatia is that it is offered exclusively as a tourist attraction, ▶ Islands that have bicycle routes: Krk, Brač, Hvar, Pag, Korčula, Cres, Rab, Mljet, Vis, Vir, Murter, Prvić and Brijuni, ▶ Bicycle routes belonging to the EuroVelo route: Ugljan, Pašman and the Pelješac peninsula.

Analysis of electric scooter offer	▶ 16 cities/settlements have implemented a system of renting electric scooters in the coverage area.
Analysis of traffic multimodality on islands	▶ 48 ferry ports on the islands, 14 ferry ports on the mainland, ▶ In relation to the total number of seaports, 77 % are ferry ports on the islands, 23 % are ferry ports on the mainland, ▶ International maritime traffic between Italy and Croatia takes place in the ferry ports of Croatia (Split and Dubrovnik) and Italy (Ancona and Bari), ▶ 64 % of seaports are served by regular bus services, ▶ Only about 17 % of bus and maritime timetables are compliant: ▶ Maximum compliance: Pag, Pašman, Ugljan, ▶ Minimum compliance: Čiovo, Šipan and Iž.

[Source: EY]

5.1.4 Concluding remarks

Based on the analysis of the entire transport offer on Croatian islands and coastal cities, it was determined that the level of transport multimodality, i.e., mutual integration and coverage of different modes of transport, is not satisfactory. Travel in Croatia in total, and thus for Italian tourists, cannot be realized within the integrated transport system because it does not exist. Multimodal traffic in the coverage area is realized exclusively by ferry travel, through 62 ferry ports that enable the combination of road and maritime transport. The multimodality of other modes of transport is realized exclusively unplanned.

Multimodality of rail and air transport with maritime transport in the coverage area cannot be achieved mainly due to insufficient infrastructure and space limitations. The potential for integration of these transport systems exists only in larger coastal cities (Pula, Rijeka, Split, Zadar, Dubrovnik).

In the area of the Croatian islands, the public passenger transport system includes bus transport and taxi transport. The level of bus transport service is not adequate to attract new passengers, and an obstacle in multimodality with maritime transport is the mismatch between bus and maritime timetables. Namely, in coverage area, in the national regular maritime transport, about 700 departures (arrivals and departures) are realized daily, and only 17 % of arrivals are in compliance with bus traffic.

The combination of maritime and bicycle transport is realized mainly for the needs of recreational cycling (cycling tourism), and not for the needs of everyday travel, mainly because of the external trend of increasing the popularity of cycling.

The development and implementation of the public bicycles and public electric scooters system is gradually taking an important place in the context of solving traffic congestion in coastal cities. However, of the 16 settlements/cities/municipalities in the coverage area that have the systems in question, only Krk, Šibenik and Split have positioned public bicycle/electric scooter terminals near seaports.

In conclusion, it is necessary to change the current mode of transport planning, where different subsystems are developed "pointwise" and separately, in transport planning with an emphasis on the integration of transport subsystems and multimodality of different modes of transport.

5.2 Cartographic presentation of the state of multimodal transport solutions in the scope of Multimodality Analysis

5.2.1 Task description

As part of Task 2.2. Make a cartographic overview of the situation/analysis of multimodal solutions, a cartographic presentation of the current state of multimodal transport solutions in the area covered by the Analysis of multimodality has been made.

The map shows all seaports that are served by regular maritime passenger transport in Croatia and seaports in Italy that have a traffic connection with Croatia. Multimodality is presented in such a way that destinations (seaports) are presented differently depending on the modes of transport that are represented in the port area.

5.2.2 Methodology

A cartographic representation of the existing multimodal transport solutions was created using geographic information systems for analysis and management of spatial data. The process of using the GIS tool itself included manual entry and georeferencing of shapefile data on seaports (points) and maritime lines (lines) in the coverage area. In the attribute tables shapefile data, values are added to each point and line from the *MS Excel* database created as part of task 2.1. Different visual representations of spatial data were created using the GIS function "categorize" according to the data from the attribute tables shapefile data.

Cartographic representations were made according to the data sources listed in Task 2.1.

5.2.3 Results

The results of the task are presented in Annex 3.

5.3 Cartographic representations of the state of multimodal traffic solutions of coastal counties in the Republic of Croatia

5.3.1 Task description

As part of Task 2.3. Make cartographic representations of multimodal traffic solutions of coastal counties, cartographic representations of the current state of multimodal traffic solutions in coverage area are made.

The maps show all seaports that are served by regular maritime passenger transport in Croatia. Multimodality is presented in such a way that destinations (seaports) are presented differently, depending on the modes of transport that are represented in the port area. As part of this task, maritime transport lines between seaports are also shown.

5.3.2 Methodology

A cartographic representation of the state of existing multimodal transport solutions was created using geographic information systems for analysis and management of spatial data. The process of using the GIS tool itself included manual entry and georeferencing of shp. data on seaports (points) and maritime lines (lines) in the coverage area. In the attribute tables shp. data, values are added to each point and line from the *MS Excel* database created as part of task 2.1. Different visual representations of spatial data were created using the GIS function "categorize" according to the data from the attribute tables shp. data.

5.3.3 Results

The results of the task are presented in Annex 4, 5, 6, 7, 8, 9 and 10.

6 Evaluation of the effectiveness of current multimodal transport solutions

6.1 PESTLE analysis of multimodal transport

6.1.1 Task description

As part of task 3.1. Preparation of PESTLE analysis of multimodal transport, political, economic, social, technological, legal, and environmental aspects of the current state of multimodal transport in the coverage area are analyzed.

Analysis of political, economic, social, technological, legal and environmental aspects (hereinafter: PESTLE) is an analysis of external factors that the organization or entity (e.g. the Client) cannot directly influence, but which may have or have an impact on the development and implementation of multimodal transport solutions.

The purpose of the analysis is to establish a broader picture of the current state of the political framework, legislative and strategic framework, macroeconomic environment, technological development and trends related to environmental issues and sustainable development, and to identify key factors of the external environment that can positively or negatively affect the development and implementation of projects and other projects in the field of multimodality.

6.1.2 Methodology

The PESTLE analysis was made considering the results of the analysis of the existing situation and publicly available documentation. Data collection was performed using the desk research method using the following publicly available data sources:

- European Structural and Investment Funds (https://strukturnifondovi.hr/),
- Law on Local and Regional Local Self-Government (National newspaper, no. 33/01, 60/21, 129/05, 109/07, 125/08, 36/09, 36/09, 150/11, 144/12, 19/13, 137/15, 123/17, 98/19, 144/20),
- Coastal Liner Shipping Agency (https://agencija-zolpp.hr/agencija/),
- Jadrolinija (https://www.jadrolinija.hr/),
- Central Bureau of Statistics (CBS), PC AXIS database, available on: Statistical databases (https://www.dzs.hr/hrv/system/stat_databases.htm),
- European Commission, Eurostat, Database, (https://ec.europa.eu/eurostat/data/database),

- Environment Protection and Energy Efficiency Fund (https://www.fzoeu.hr/hr/sufinanciranje-nabave-energetski-ucinkovitijih-vozila/7713),
- Green Deal, European Commission (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en),
- Institute for Development and International Relations (https://polocro28.irmo.hr/wp-content/uploads/2015/10/Energetska-unija-i-klima-uvijek-nam-ostaje-Pariz.pdf),
- Directive 2003/87/EZ of European Parliament and Council, Eur-LEX (https://eur-lex.europa.eu/legal-content/HR/TXT/HTML/?uri=CELEX:32003L0087&from=HR),
- National Development Strategy until 2030, Croatian Government (https://hrvatska2030.hr/),
- European Maritime Safety Agency, European Maritime Transport Environmental Report 2021 (https://www.eea.europa.eu/highlights/eu-maritime-transport-first-environmental).

6.1.3 Results

The results of the PESTLE analysis are presented below, in accordance with the scope defined in Annex 3. Form for PESTLE analysis, submitted by the Client as part of Annex 1. Description of PD operations.

The results are presented in a table and contain the following information:

- The column "Factors" lists the factors that have or may have an impact on improving the connectivity of Croatian islands and the development and implementation of multimodal maritime solutions,
- The "Observations" column describes the key features of the analyzed factors,
- The "Type of exposure" column specifies the nature of the Project's exposure to each aspect of the factor. The type of exposure is marked as: Pos - positive, Neg - negative, Neu - neutral,
- The column "Size of potential impact" defines the degree of impact of these observations, marked as: H - high, A - average, L - low, I - indeterminate,
- The column "Impact on improving the connectivity of Croatian islands and the development and implementation of multimodal maritime solutions" describes the potential impact of these factors on achieving the purpose and objectives of the Project.

Table 3 PESTLE analysis

Factors	Observations	Type of exposure	Size of potential impact	Impact on improving the connectivity of Croatian islands and the development and

				implementation of multimodal maritime solutions
POLITICAL FACTORS				
Membership of the Republic of Croatia in the European Union	Due to membership in the European Union since 2013, the Republic of Croatia has the obligation to harmonize its strategic and development national documents with the strategic framework and development documents of the European Union.	**Pos**	**H**	Alignment with the legislative and strategic framework of the European Union directs the development of all sectors in the Republic of Croatia, and thus the transport sector, towards opening the market of passenger and goods transport, increasing efficiency and accessibility of transport, implementation of modern and energy efficient technologies, investment in sustainable development, reducing harmful emissions into the environment.
MSTI is the central state administration body responsible for transport affairs, and MRDEUF is the central state administration body responsible for regional development affairs and European Union funds	The Ministry of the Sea, Transport and Infrastructure (hereinafter: MSTI) performs professional, administrative and other tasks that, among other things, relate to the planning, development and implementation of strategic documents and transport infrastructure projects, and proposes a strategy for the development of all modes of transport. The Ministry of Regional Development and EU Funds (hereinafter: MRDEUF) performs administrative and other tasks related, inter alia, to the planning and implementation of regional development policy and the establishment of a comprehensive system of planning, programming, management, financing of regional development, and coordination of all tasks related to the harmonization with the European Union in the field of regional policy and management of structural instruments. In addition to the above roles, MSTI and MRDFFEU are stakeholders in the institutional framework for the implementation of the European Structural and Investment Funds in the Republic of Croatia.[55] More specifically, the Regulation on bodies in the management and	**Neu**	**H**	MSTI as the central state administration body responsible for transport affairs and MRDEUF as the central state administration body responsible for regional development and EU funds are responsible for the implementation of European Union legal acts in their areas of competence. Furthermore, as bodies in the management and control system of use, i.e. as the Managing Authority and the Level 1 Intermediate Body and/or the Level 2 Intermediate Body, MRDEUF and MSTI enter into agreements defining the roles of Intermediate Bodies in planning and programming, preparation of tender documents, tender announcement, the selection and contracting process, the process of monitoring the progress of project implementation, budget planning and payments, irregularity management, information and visibility activities, and other tasks and activities related to delegated functions. Therefore, these bodies have an influence on directing the development of transport and regional development in the entire territory of the Republic of Croatia, its mainland, and islands. Taking into account that the drafting of programming documents for the period 2021-2027 is underway,

[55] European Structural and Investment Funds (https://strukturnifondovi.hr/

	control system of the use of the European Social Fund, the European Regional Development Fund and the Cohesion Fund, in relation to the objective "Investment for growth and jobs" (OG 107/14, 23/15, 129 / 15, 15/17, 18/17, 46/21, 49/21) which refers to the programming period 2013-2020, the MRDEUF acts as the Coordinating Body and the Managing Authority of the Operational Program Competitiveness and Cohesion 2014-2020 and the Intermediate Level 1 bodies of the Operational Program Competitiveness and Cohesion 2014-2020, while MSTI acts as an Intermediate Body of Level 1 and Level 2 for certain priority axes of the Operational Program Competitiveness and Cohesion 2014-2020.			MRDEUF and MSTI have an impact on the creation of a programming foundation on the basis of which in the future will potentially be financed projects aimed at improving the connection of Croatian mainland with islands, development of transport infrastructure and improving the implementation of multimodal solutions in the Republic of Croatia.
In addition to the national level, traffic issues are also regulated at the local level.	Local self-government units (LGUs) perform tasks of local importance that meet the needs of citizens, and which are not assigned to state bodies by the Constitution or the law. Jobs include, but are not limited to, landscaping and housing, spatial and urban planning, and traffic in the area. As there are 555 local self-government units in the Republic of Croatia, traffic issues at the local level are managed decentralized[56].	**Neg**	**A**	LGUs, given the tasks for which they are responsible and the available financial resources, are often focused mainly on investments in areas that are of primary importance to the local community, such as the construction of basic communal infrastructure, transport infrastructure, social and economic investments, etc. The implementation of modern transport solutions that will contribute to the development of connections between local self-governments with other local self-governments and improve the quality of life of the local community often requires significant financial investments and is not in the focus of planning and spending budgets. Considering the above, LGUs can seek financial support in the available sources of co-financing of investment activities in the improvement of transport infrastructure and transport connectivity.
The Coastal Liner Shipping Agency is	The Agency for Coastal Liner Shipping is the main regulatory	**Pos**	**H**	The Coastal Liner Shipping Agency has a key role in the process of

[56] Law on Local and Regional Local Self-Government (National newspaper no. 33/2001, 60/2001, 129/2005, 109/2007, 125/2008, 36/2009, 36/2009, 150/2011, 144/2012, 19/2013, 137/2015, 123/2017, 98/2019, 144/2020)

the main regulatory body of the Republic of Croatia for liner passenger transport issues in the Adriatic	body of the Republic of Croatia for liner passenger transport issues in the Adriatic[57]. The most important work of the Agency is the selection of shipowners based on public tenders, which will provide transport services on state ferry, ship and high-speed lines in public coastal liner shipping, concluding contracts with selected shipowners and supervising their execution, especially in relation to the payment of contracted support. fees for public service to the shipowner and payment of the fee for the granted concession as well as supervision over the use of funds allocated from the budget of the Republic of Croatia for the maintenance of maritime connections with the islands. In addition, the Agency's activities include the establishment and management of the information system of public coastal liner shipping, approval, unification and publication of timetables on state lines, approval of timetables in international liner shipping, prescribing conditions for exercising the right to privileged passenger transport, and transport of vehicles and free transport and giving consent for the performance of public regular transport without the obligation of public service.[58]			implementation and development of multimodal transport solutions. It directly affects the adaptation of public maritime transport to actual needs, expanding the offer of maritime lines by granting concessions to shipowners who will provide regular transport on future necessary lines and expanding the conditions for exercising the right to benefits for the use of maritime transport (island tickets). Consequently, the Agency can influence the increase in the number of departures/arrivals of sea routes, harmonization of timetables, introduction of new lines, regulation of tariff provisions and ticket prices, etc.
Shipping companies have a key role to play in the development of the transport system	There are 11 shipping companies in the Republic of Croatia that are members of the Mare Nostrum Association[59]. The shipping company with the largest share of maritime lines in Croatia is Jadrolinija d.d. which is one hundred percent state-owned. The main task of Jadrolinija is to connect the islands with the mainland on the Croatian side of the Adriatic, which it does with 55	**Neu**	**L**	Shipowners, as the ultimate providers of maritime transport services, and Jadrolinija in particular, which is state-owned, must act in accordance with the European and national strategic goals. Therefore, all competent institutions must achieve quality vertical and horizontal communication with shipowners, in order to optimize liner shipping at the level of the Republic of Croatia. It is necessary to set standards for public maritime

[57] The Coastal Liner Shipping Agency, available on: https://agencija-zolpp.hr/agencija/

[58] The Coastal Liner Shipping Agency, available on: https://agencija-zolpp.hr/agencija/

[59] Alpha Adriatic d.d., Atlantska plovidba d.d., Brodospas d.d., Brodosplit- Plovidba d.o.o., Jadranski pomorski servis d.d., Jadrolinija d.d., Jadroplov d.d., Rapska plovidba d.d., Tankerska plovidba d.d., Hrvatski registar brodova, Golar Vikind Management

	ships, of which 10 are fast and four are classic passenger ships.[60]			transport services in order for the system to function as well as possible and to integrate as well as possible with other transport subsystems in the area.
ECONOMIC FACTORS				
GDP growth	From 2010 to 2018, there is a trend of GDP growth in Croatia (2 %) and in the EU27 (2,66 %), as well as GDP per capita - in Croatia an average annual growth rate of 2,4 % [61]was recorded, while in the EU27 the average annual GDP growth rate per capita in that period is 1,2 %.[62]	**Pos**	**H**	Positive developments in macroeconomic indicators, and in particular GDP growth, indicate economic recovery and a good economic situation. Positive economic trends and GDP growth provide a basis for investment planning and the state budget, which, among other things, can open space for investment in the development and implementation of multimodal solutions.
Significant contribution of tourism to the Croatian GDP	The number of tourist arrivals in Croatia from 2010 to 2019 has a growth trend of 11,66 %, while in the EU27 it has a growth trend of 5,6 %[63]. Regardless of the fact that the trend of tourist arrivals in the Republic of Croatia is higher than the EU average, the reliance of the economy exclusively on tourism also has negative consequences in terms of seasonality of income.[64] This seasonality of income creates a strong dependence on unpredictable situations such as pandemics, political conflicts, etc. Such events can have negative consequences, ie create negative demand, and thus compromise the possible return on investment in transport infrastructure.	**Neg**	**H**	Due to the trend of increasing the number of tourist arrivals in the Republic of Croatia and due to the fact that tourism represents the majority of economic activities in Croatia, there is a need to improve the transport system at all levels in order to ensure better travel conditions between tourist destinations. Improving the connectivity of the area directly affects the increase of economic activities and consumption. Transport demand in the territory of the Republic of Croatia annually oscillates significantly between the seasonal and off-season periods. Therefore, investments in large transport infrastructure projects to meet the increased traffic demand in the tourist season, from the aspect of economic value, may not be justified. Therefore, it is necessary primarily the organizational development of the transport system and the implementation of quickly

[60] Jadrolinija d.d., available on: https://www.jadrolinija.hr/

[61] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

[62] European Commission, Eurostat, Database, available on: https://ec.europa.eu/eurostat/data/database

[63] European Commission, Eurostat, Database, available on: https://ec.europa.eu/eurostat/data/database

[64] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

				applicable transport solutions as proposed in this Analysis.
Decrease of the unemployment rate	The trend of the unemployment rate (2010-2019) is 16,4 % in Croatia, while in the EU27 the trend is 9,2 %.[65] The current unemployment rate (2020) in Croatia is 8,9 %, in Adriatic Croatia 7,5 %, while in the EU27 it is 7,1 %.[66] Despite the declining unemployment rate, most coastal local governments and self-governments are experiencing labor shortages for all sectors, especially for services such as public transport.	**Pos**	**H**	Although the Republic of Croatia has a higher unemployment rate than the EU27, Adriatic Croatia has a lower unemployment rate than the Croatian average. Given that the quality and availability of transport modes to and from work for the local population, i.e. daily migrations, are a significant factor in the quality of life on Croatian islands, the development and implementation of multimodal solutions can contribute to improving the quality of life of the local population from the aspect of simplicity and speed of getting from home to work and vice versa, but also a potential reduction in travel costs, which can also reduce the gap between the number of unemployed people and people who are actively looking for work. Consequently, increasing the motivation to work can have a positive effect on reducing the unemployment rate. In addition to the above, increasing the availability of Croatian islands can have a positive impact on increasing the number of tourist arrivals, which creates a greater demand for tourist products and services, which can create new jobs on the islands themselves.
Decrease/increase of the inflation rate	The total inflation rate in Croatia from 2010 to 2020 is 11,1 %[67]. For 2020 in Croatia, the inflation rate is -0,7 %. Although the Central European Bank considers that current inflation is current - there are also counter-arguments that the current incoherence of global supply chains, energy (in the context of easy availability of money), can create stagflation.	**Neg**	**H**	The inflation rate has a direct impact on the increase in the prices of public transport services, which can lead to a decrease in the willingness of consumers to pay for such services. As transport prices rise, it is to be expected that users will prefer services that are least affected by the effects of inflation, such as walking, cycling, scootering and other forms of micro-transport. Consequently, it is necessary to develop such transport services so that the cost

[65] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

[66] European Commission, Eurostat, Database, available on: https://ec.europa.eu/eurostat/data/database

[67] CBS, PC AXIS database, available on: https://www.dzs.hr/app/rss/stopa-inflacije.html

				of transport does not significantly affect the mobility of users.
The negative impact of the Covid-19 virus pandemic	The Covid-19 virus pandemic has had a profound impact on society and the global economy. Due to the global lockdown, most market activities have slowed down, and social habits have changed in the direction of isolationism. The inability to move dealt a severe blow to the transport sector and to transport service providers. Due to the reduced number of trips within the public and mass passenger transport system, the use of cars, bicycles and walking has increased. Due to the Covid-19 pandemic in the second quarter of 2020, quarterly GDP was 15,1 % lower in real terms compared to the same quarter of 2019. In the second quarter of 2021, GDP was 16,1 % higher than in the same quarter of 2020, while the average GDP for the EU in the same period was higher by 13,2 %. Significantly higher GDP growth in Croatia compared to the EU average in the second quarter of 2021 was largely due to the good tourist season in which, only in August, there were 64,8 % more tourist arrivals and 56,9 % more overnight stays compared to August 2020. [68] The Government of the Republic of Croatia has adopted several measures to help preserve jobs, but also to preserve the safety and health of the population. With the introduction of measures, according to the available data of the Croatian National Bank, the public debt of the Republic of Croatia as at 31 July 2021 [69]is to HRK 344,320.30 million[70]. Due to the significant public debt that grew uncontrollably from 267 % to 479 % of GDP in the period from	**Neg**	**H**	In line with the positive trends of recovery from the Covid-19 virus pandemic, it is to be expected that the trend of increasing economic and tourist activities will continue, and thus the increase in traffic demand, which justifies further development of a sustainable transport system.

[68] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm

[69] At the end of each month, the Croatian National Bank publishes data with a standstill of 3 months in real time.

[70] Croatian National Bank, available on: https://www.hnb.hr/en/web/guest/statistics/statistical-data/general-government/general-government-debt,

	2000 to 2014, further borrowing by Croatia is not a popular solution in raising funds for financing measures[71], but significant financial assistance from the European Union.			
Introduction of the Euro as the official currency in the Republic of Croatia	By its decision at its 32nd session, held on 23 December 2020, the Government of the Republic of Croatia adopted the National Plan for the Exchange of the Croatian Kuna into the Euro, and instructed the National Council for Planning, Monitoring and Coordinating the Implementation of All Activities National plan. The introduction of the euro is planned for the beginning of 2023.[72]	**Pos**	**A**	The introduction of the Euro is expected to bring significant benefits to the economy, and extremely positive effects should be reflected in tourism, which accounts for a significant share of GDP. The introduction of the Euro makes it easier for tourists to stay and travel in Croatia. Tourist arrivals in Croatia are realized 70 % from countries where the Euro is the official currency and about 60 % of overnight stays come from the Eurozone, and the introduction of the Euro is expected to increase arrivals from these countries.[73]
Transport cost efficiency	The analysis of the cost-effectiveness of transport from Italy to Croatia, as well as transport within Croatia, found that the use of only a personal vehicle to arrive from the start to the end of the trip, from the passenger point of view is about 45 % cheaper than the cost of transport that includes a combination of road and maritime transport. The reasons for the cost-effectiveness of combining road and sea transport for travel between Italy and Croatia (from the passenger's point of view) are: 1. longer travel time (regardless of the fact that the length of travel is often shorter) and 2. additional cost of transport service. Longer travel times are affected by low ferry frequency, insufficient number of ferry lines, boarding and disembarking times	**Neg**	**H**	The cost-effectiveness of transport, which, according to the current situation, benefits road transport, is a major challenge in the context of developing sustainable modes of transport and multimodality. Namely, in order to positively influence the modal distribution of travel in favor of maritime transport and other sustainable forms of transport, it is not enough to encourage and develop multimodality but also directly improve the transport service in order to reduce the gap between cost efficiency of road transport and other transport subsystems. This, in the context of maritime transport, can be implemented through segments such as reducing the transport ticket, increasing the traffic speed of ships/ferries,

[71] IRMO current No. 9 2020, available on: https://irmo.hr/wp-content/uploads/2020/07/irmo-aktualno-9.pdf

[72] National plan to replace the Croatian kuna with the Euro, Croatian Government, 2020, available on: https://mfin.gov.hr/UserDocsImages/dokumenti/hr_i_eu/Nacionalni%20plan%20zamjene%20hrvatske%20kune%20eurom%20-%20donesen%20na%20sjednici%20Vlade%20RH%20odr%C5%BEanoj%2023.12.2020..pdf,

[73] Ministry of Tourism and Sports, available on: https://mint.gov.hr/vijesti/ministarstvo-turizma-i-sporta-pozitivni-ucinci-uvodjenja-eura-posebice-na-turizam/22040

	and low traffic speed. The additional cost of transport services is mostly reflected in the fact that the cost of road transport is equal regardless of the number of passengers in the vehicle (fuel, toll, etc.), and ferry transport is charged per person. The potential introduction of the so-called carbon tax concept and the elimination of incentives for hydrocarbons could affect the cost-effectiveness of transport.			increasing the availability of seaports and such.
SOCIAL FACTORS				
Depopulation as one of the negative demographic trends in Croatia	The population of Croatia from 2010 to 2019 has a decreasing trend of an average of 0,59 % per year, while in the EU27 it has a growth trend of an average of 0,15 % per year. With a decrease in the number of inhabitants, the demographic picture of Croatia in the period from 2010 to 2020 is characterized by a negative rate of natural change, in contrast to the EU27, which records a positive rate of natural change.[74] It should be noted that the so-called population pyramid significantly thinned in parts of the productive population, which creates pronounced instabilities in the near future (solidarity pension system, functioning of service social functions, etc.	**Neg**	**A**	The problem of depopulation is particularly pronounced on Croatian islands, and as one of the largest push[75] factors poor land transport links and poor transport infrastructure are often cited. The introduction of multimodal solutions would greatly improve the living conditions of the inhabitants of island communities. Increasing the availability of transport services and the accessibility of island areas and the mainland would enable easier daily migration from the island to the mainland (due to education or work), which would potentially reduce the trend of negative social trends.
TECHNOLOGICAL FACTORS				
Development of new technologies	New technologies are being developed in the shipbuilding industry, such as alternative propulsion ships (hydrogen, batteries, biofuels, etc.), autonomous ships. In addition, in order to optimize maritime traffic, smart solutions for intelligent transport systems (smart cards, integrated tickets, etc.) are being introduced).	**Pos**	**H**	It is expected that the development of maritime transport, as well as multimodality with other means of transport, will take place in the direction of using new technological solutions. The number of conventionally powered ships/buses/trains will be reduced, and the operating costs of transport will become more acceptable, which will enable faster development and expansion of public transport services.

[74] CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm; European Commission, Eurostat, Database, available on: https://ec.europa.eu/eurostat/data/database

[75] Nejašmić, I. 2005. Demogeografija. Školska knjiga. Zagreb.

Development of broadband and communication electrical networks	A good internet connection infrastructure is needed as a basis for the implementation of smart solutions in traffic. In Adriatic Croatia (according to HAKOM data) in 2019 the density of broadband internet connections was above the average density at the level of Croatia.[76] According to the National Development Strategy until 2030, it is planned to increase investment in public infrastructure and services, including broadband Internet, in order to improve the connectivity of coastal areas and islands with the domestic and international market. Investments in the development of digital infrastructure in island communities will be supported in order to provide their residents with access to ultra-fast broadband internet and thus create the preconditions for successful digitization and digital transformation of island communities.[77]	**Pos**	**A**	The use of the Internet is more prevalent in Adriatic Croatia than in other regions, so this region has a good basis for the introduction of smart transport solutions that are indispensable in the development and implementation of modern solutions that establish and develop multimodality.
Investments from EU funds enabled co-financing of energy efficient vehicles	In order to increase energy efficiency, Environment Protection and Energy Efficiency Fund (through the project "Driving efficiently") provides incentives for the purchase of vehicles with alternative propulsion.[78] In addition, large investments are planned through the Operational Program Competitiveness and Cohesion 2021-2027. One of the priorities is the development of sustainable, smart and safe mobility, for which it is planned to allocate HRK 7,6 billion, among other things, by investing in activities to improve multimodal transport and investing in the construction and development of multimodal terminals. Within the	**Pos**	**A**	There is a tendency of increasing EU investments in energy efficient and multimodal solutions in order to achieve the same level of energy efficiency at EU level. Due to the lack of basic communal infrastructure on the islands, a slower process of implementation of modern transport solutions is possible, which include multimodal solutions and alternatively powered vehicles. The process of implementing these solutions would be greatly facilitated by co-financing projects from EU funds.

[76] Zagreb Institute of Economics, Sector analysis - telecommunications, available on: https://www.eizg.hr/userdocsimages/publikacije/serijske-publikacije/sektorske-analize/sa_telekomunikacije-2020.pdf

[77] National Development Strategy until 2030, available on: https://hrvatska2030.hr/, accessed: 25.9.2021.

[78] The Environmental Protection and Energy Efficiency Fund, available on: https://www.fzoeu.hr/hr/sufinanciranje-nabave-energetski-ucinkovitijih-vozila/7713, accessed: 23.9.2021.

	Integrated Territorial Program, investment in the development of the islands is planned in order to enable the balanced development of Croatia.[79]			
LEGAL FACTORS				
Increasing emphasis on reducing harmful emissions into the environment	With the aim of reducing greenhouse gas emissions by at least 50 % by 2030 and achieving climate neutrality by 2050, the EU has launched the strategy "European Green Deal".[80] In accordance with the "European Green Deal", Croatia has developed a National Development Strategy which, among numerous goals, states the reduction of greenhouse gas emissions to 65 % in 2030 compared to 1990.[81]	**Pos**	**H**	The reduction of harmful gas emissions is envisaged, inter alia, by restructuring the transport system into a multimodal and integrated system with predominantly electric vehicles and using low-carbon and climate-neutral fuel. The purpose of the MIMOSA project is in line with European and national strategic documents, given that the main goal of the Project is to improve the offer of multimodal sustainable solutions and passenger transport services, using means of transport with lower CO_2 emissions.
Intermodality as a measure to reduce pollution in cities	One of the general measures of the Transport Development Strategy of the Republic of Croatia 2017-2030 is the increase of intermodality in passenger traffic and the development of intermodal passenger hubs. In particular, the modal transport application of cycling and public transport is encouraged in order to reduce pollution in cities.	**Pos**	**H**	
Multimodal and integrated modes of transport should be promoted at EU level	According to Regulation (EU) no. 181/2011 on the rights of passengers in bus transport, Member States should promote the use of public transport and the use of integrated information and ticket systems, in order to optimize the use and interoperability of different modes of transport and different carriers.	**Pos**	**H**	
Legal regulations regulate relevant issues related to	The legal framework is defined by laws, regulations and acts that regulate issues, for example, on liner and occasional coastal maritime transport, conditions and	**Neu**	**H**	All investments in multimodal solutions must be developed and implemented in accordance with applicable legislation.

79 Multiannual Financial Framework - Cohesion Policy 2021-2027, available on: https://strukturnifondovi.hr/wp-content/uploads/2021/09/Prezentacija-VFO-2021.-2027..pdf

80 European Commission, available on: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

81 National Development Strategy until 2030, available on: https://hrvatska2030.hr/

maritime and road transport	procedure for granting concessions for public transport in liner coastal maritime transport, conditions to be met by a ship and a shipping company to perform public transport in liner coastal maritime transport, conditions and procedures for granting a concession for the performance of public transport in liner coastal maritime transport, on the promotion of clean vehicles in road transport, provision of information on multimodal transport and the like.			
Lack of transport administration for multimodality issues	In Croatia, the Transport Administration has not been formed to function as a management body established by one or more local and/or regional self-government bodies in order to supervise and manage the integrated (multimodal) transport system.	**Neg**	**H**	Given that in Croatia there is no body responsible for the organization, development and improvement of multimodal transport, it is necessary to form such a body or organizational unit within the existing body to establish a quality integrated and multimodal transport system. Such a traffic administration may have the following functions: ▶ Organization and supervision of the functioning of the entire public transport system, ▶ Securing financial resources for the system operation, ▶ Allocation of financial resources to carriers based on contracts, ▶ Collection of traffic and marketing data, ▶ Calculation of transport demand, ▶ Development of timetables based on transport demand and other economic, social, and strategic needs, ▶ Determining the tariff, i.e. the prices of transport and the system (portfolio) of transport tickets, ▶ Marketing system, ▶ Traffic monitoring, real-time data collection and user information, ▶ Inspection control, ▶ Strategic, operational, marketing and financial

				development of the system.
ENVIRONMENTAL FACTORS				
Lack of a system for monitoring the impact of traffic on the environment	There is no quality system for monitoring environmental factors, which is why there is a lack of quality statistical data on the environmental impact of various transport systems on the territory of the Republic of Croatia.	**Neg**	**H**	Given that there is no quality system for monitoring environmental factors, it is not possible to adequately determine the impact of a sustainable transport system and multimodal transport on the environment. This makes it difficult to easily use existing data to demonstrate the benefits of implementing multimodal transport solutions on society and the environment (e.g. for feasibility studies and cost-benefit analyzes that are part of project applications for EU funding, project documentation, etc.) which can slow down the process of developing a multimodal transport solutions, closing the financial construction of the implementation of a multimodal solution, effective communication with the public that the implementation can affect, etc.
Maritime transport significantly pollutes the atmosphere and the marine environment	In addition to greenhouse gas emissions, maritime transport also affects the marine environment. Pollution caused by maritime transport is caused by the discharge of wastewater into the marine environment, oil spills, the spread of invasive species (49 % of non-indigenous species were introduced by maritime transport) and inadequate disposal of waste from ships[82].	**Neg**	**H**	Although shipping companies are using cleaner fuels, these fuels are still "dirtier" than those used in road transport. The development and implementation of multimodal transport solutions on the Croatian islands can contribute to reducing the negative effects of transport on the environment, given that such solutions encourage sustainable passenger mobility. Multimodal transport, from an environmental point of view, is promoted as a

[82] EMSA (European Maritime Safety Agency), European Maritime Transport Environmental Report 2021, available on: https://www.eea.europa.eu/highlights/eu-maritime-transport-first-environmental

One of the main goals of the National Development Strategy until 2030 is to reduce greenhouse gas emissions	Maritime transport causes significant pressure on the atmosphere. Greenhouse gas emissions from maritime transport amount to 13,5 % of total emissions from transport in the EU (2018)[83]. Croatia emphasizes the importance of reducing emissions by the umbrella strategic document, i.e. the National Development Strategy until 2030 (NN 13/2021), which as an indicator of success within Strategic Goal 8. Ecological and energy transition for climate neutrality defines 65 % greenhouse gas emissions reduction to base 1990. [84]	**Pos**	**H**	sustainable form of transport. The MIMOSA project is in line with the environmental guidelines for the development of transport because it encourages sustainable mobility of passengers with means of transport with lower CO_2 emissions while reducing the negative effects of transport on the environment.

6.1.4 Conclusion

The most important political factor influencing the development of multimodal solutions is Croatia's membership in the European Union. Accordingly, Croatia as a member has obligations, such as harmonization of its strategic and development documents with EU documents, but also the availability of EU funds for potential investments in multimodal solutions. The main bodies at the national level that are important for the development of multimodal solutions are the Ministry of the Sea, Transport and Infrastructure and the Ministry of Regional Development and EU Funds. Both bodies have their roles in the system of management and implementation of EU operational programs and directly influence the selection and implementation of solutions proposed under the Project.

The analysis of economic factors showed that in both Croatia and the EU there is an increase in the GDP trend and a decrease in the unemployment rate. Although the COVID-19 pandemic had a negative impact on macroeconomic factors, in 2021 the GDP in Croatia has grown significantly, which is mostly due to the good tourist season. Such positive macroeconomic parameters indicate a good environment for financial investments, and thus for potential investments in multimodal solutions.

Social or demographic factors proved to be extremely negative due to the declining population and natural increase rates. This trend is particularly pronounced on the islands, and the development of multimodal solutions in these areas of marked depopulation would have the potential to contribute to reducing the negative demographic trend. The

[83] EMSA (European Maritime Safety Agency), European Maritime Transport Environmental Report 2021, available on: https://www.eea.europa.eu/highlights/eu-maritime-transport-first-environmental

[84] EMSA (European Maritime Safety Agency), European Maritime Transport Environmental Report 2021, available on: https://www.eea.europa.eu/highlights/eu-maritime-transport-first-environmental

growing trend in the number of tourist arrivals, in addition to the problem of seasonality of income, brings the need for better transport solutions due to increased transport demand during the tourist season.

Analysis of technological factors has shown that new technologies and smart solutions are being developed in the shipping industry. However, the islands do not have adequate infrastructural prerequisites for the implementation of these solutions in the form of construction of filling stations. The tendency of the EU is to invest in the development and implementation of energy efficient solutions so that co-financing of such solutions on the islands is potentially possible from EU funds.

The analysis of the legal framework established that there is no multimodal transport management body in Croatia, and it is necessary to establish such a body to establish a quality integrated and multimodal transport system. Also, the main goals of legal and strategic documents at the EU level are to reduce CO^2 emissions, i.e. to limit the growth of the average global temperature. This is envisaged, inter alia, by restructuring the transport system into a multimodal and integrated system, which is, inter alia, the goal of this Project.

The analysis of environmental factors showed that maritime transport is an extremely large factor in marine pollution and greenhouse gas emissions, but still significantly lower than road transport. Consequently, the reduction of the negative impact of transport on the environment will be achieved, inter alia, by the development of multimodal transport solutions with an emphasis on modern maritime transport, in accordance with the purpose and objectives of this Project.

6.2 Evaluation of the effectiveness of current multimodal transport solutions

6.2.1 Task description

As part of Task 3.2. Make an assessment of the effectiveness of current multimodal transport solutions, and based on the results and conclusions of Activities 1 and 2 and Task 3.1, the proposals of efficiency indicators are defined, as well as the method of evaluating them and the methodology for assessing the effectiveness of existing multimodal transport solutions.

The purpose of this task is to assess the effectiveness of existing multimodal transport solutions based on demographic, spatial and tourist indicators and the current transport offer of maritime transport and other forms of transport in the Croatian islands.

The aim of the task is to determine the current state of multimodal transport solutions through the development of a unified and unified efficiency assessment in order to create preconditions for further development of transport multimodality.

The systematization of key factors that reflect the current situation defines performance indicators and the method of evaluating them. Part of the defined indicators is included in the calculation of the efficiency assessment of current multimodal transport solutions, while part of the indicators is not included since they cannot be directly influenced through improvement measures (e.g. number of arrivals of Italian tourists in the Republic of Croatia). However, it is necessary to continuously monitor these indicators as they show the potential impact of the transport system on tourist and demographic trends, and in accordance with these values it is necessary to plan further development and implementation of transport services. Performance indicators are listed below.

1. **Performance indicators not included in the calculation of the efficiency assessment of current multimodal transport solutions:**
   - total number of tourist arrivals in Croatia,
   - total number of Italian tourist arrivals in Croatia,
   - number of passengers in international traffic arrived from Italy to Croatia,
   - number of Italian tourists on the islands,
   - number of Italian tourists on land,
   - share of using different means of transport of Italian tourists to come to Croatia.
2. **Efficiency indicators included in the calculation of the efficiency assessment of current multimodal transport solutions:**
   - number of bus lines per island,
   - number of seaports to which the island is connected by sea transport (direct lines),
   - international shipping lines to Italy,

- demographic coverage[85],
- number of inhabitants on the maritime lines with which the island is connected,
- the ratio of the number of maritime lines and the population density of the island,
- average number of sea departures per week per island,
- average number of departures/arrivals of bus lines on the island,
- availability of the bus service of regular passenger transport on the island,
- availability of taxi service for passengers on the island,
- availability of boat-taxi transport service for passengers on the island,
- existence of a bicycle/scooter rental system on the island,
- the level of compliance of maritime and bus lines on the island,
- the existence of a ferry port on the island,
- existence of a bicycle/scooter rental system in the port.

6.2.2 Methodology

Given that this Multimodality Analysis explored parameters that are difficult to accurately monetize as stated in Chapter *3.4. Implementation of the cost-effectiveness analysis method for the purpose of Multimodal Analysis*, as an alternative to cost-effectiveness analysis, multicriteria analysis (hereinafter: MCA) was used. Performance indicators of current multimodal transport solutions that can be directly influenced were assigned grades using the method of multicriteria analysis.

The following data sources were used for the performance indicators evaluated by the MCA:

- The Coastal Liner Shipping Agency, available on: https://agencija-zolpp.hr/linije/,
- CBS, PC AXIS database, available on: https://www.dzs.hr/hrv/system/stat_databases.htm,
- CBS, Population Census 2011, available on: https://www.dzs.hr/Hrv/censuses/census2011/censuslogo.htm,
- Jadrolinija, available on: https://www.jadrolinija.hr/hr/schedule/LineSearchResults/Index/2331731/2331792/31072021,
- SNAV, available on: https://www.snav.it/en/orari-e-tratte-2,
- Gomo Viaggi, available on: https://www.gomoviaggi.com/,
- Adriatic lines, available on: https://adriatic-lines.com/,
- Arriva, available on: https://www.arriva.com.hr/hr-hr/naslovna,
- Čazmatrans, available on: https://cazmatrans.hr/hr/,
- Liburnija Zadar, available on: https://liburnija-zadar.hr/,
- Autotransport Šibenik, available on: https://atpsi.hr/,

[85] The methodology for calculating demographic coverage is defined in Task 2.1. as part of the First Interim Report

- Promet Split, available on: http://www.promet-split.hr/vozni-red,
- Eko otok Krk, available on: http://www.ekootokkrk.hr/krk-bike,
- Next bike, available on: https://www.nextbike.hr/hr/zagreb/lokacije/.

The methodology of this task includes the use of *MS Excel* programs for the need to systematize and statistical analysis of data for descriptive performance indicators, while for measurable indicators in addition to statistical analysis used MCA.

As the performance indicators are not presented in the same units of measurement, equivalence was performed before the evaluation was carried out. Equivalence was carried out in such a way that the value of each indicator was scored from 1 to 10 within its set based on which it is possible to make a ranking. The scoring of each indicator was performed according to the following formula:

$$Number\ of\ points = 9 * \left(\frac{a - MIN}{MAX - MIN}\right) + 1$$

Where is:

$\boldsymbol{a}$ – the value of the indicator being scored,

$\boldsymbol{MIN}$ – the minimum value of the indicator to be scored in the analyzed set,

$\boldsymbol{MAX}$ – the maximum value of the indicator to be scored in the analyzed set.

The defined indicators are assigned weight factors in the amount of 1 to 100 % and the total sum of 100 %, where the indicator with a higher percentage has a higher priority, i.e. more influences the final assessment of the effectiveness of current multimodal transport solutions. The allocation of weighting factors was carried out based on an expert assessment of the impact of individual factors on the multimodality of transport. Factors that have a stronger impact have a higher weighting factor. The weighting factors according to the indicators are shown below:

- compliance of sea and bus lines on the island – 25 %,
- average number of sea departures per week per island – 10 %,
- the existence of a ferry port on the island – 10 %,
- bicycle/scooter rental system in the port – 10 %,
- international shipping lines to Italy – 7,5 %,
- number of seaports to which the island is connected by sea (direct lines) – 5 %,
- demographic coverage – 5 %,
- the ratio of the number of maritime lines and the population density of the island – 5 %,
- average number of departures/arrivals of bus lines on the island – 5 %,
- bicycle/scooter rental system on the island – 5 %,
- number of bus lines per island – 2,5 %,
- number of inhabitants on the maritime lines with which the island is connected – 2,5 %,
- existence of a bus service of regular passenger transport on the island – 2,5 %,

- the existence of a taxi service for passenger transport on the island – 2,5 %,
- existence of a boat-taxi transport service for passengers on the island – 2,5 %.

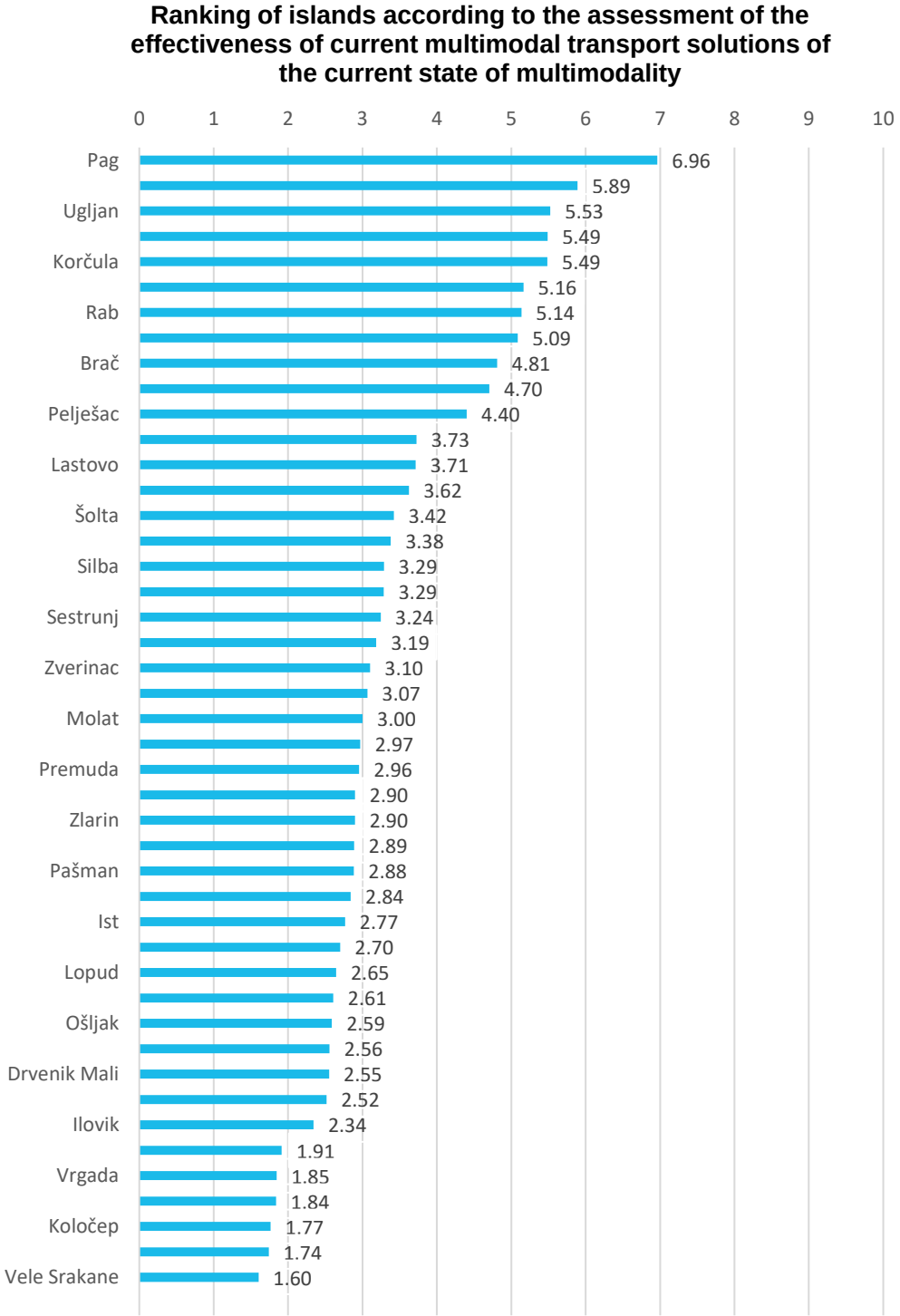
To ensure easy access to the data used and the results of this activity, the *MS Excel* database was created as part of Task 4.1. This database contains collected data, identified indicators, defined weighting factors, and implemented method of ranking islands in the Republic of Croatia according to the assessment of the effectiveness of current multimodal transport solutions. The database is in Annex 11 of this Multimodality Analysis, and the description of the database is in clause 7.1.3. of these Multimodality Analyses.

6.2.3 Results

The results of scoring, i.e., the evaluation of the efficiency indicators of current multimodal transport solutions, can be found within the Database attached in Annex 2, while the final ranking of the island and the total number of points (evaluation) per island are shown on Graph 52. The range of total number of points is from 0 to 10. As seen in the graph below, the island with the highest score (6,69) is the island of Pag, followed by the island of Cres with 5,89 points and the island of Ugljan with 5,53 points. The island of Vela Srakane has the lowest score with 1,60 points, followed by Biševo with 1,74 and Koločep with 1,77 points.

Given the analyzed performance indicators of current multimodal transport solutions, it can be seen that only eight islands [86] have a score greater than five, while most islands are in the range of 2,34 to 3,73 points. The average efficiency rating of the current multimodal transport solutions for all the islands shown is 3,40 points, which indicates the unsatisfactory condition of the existing multimodal transport solutions.

[86] Pag, Cres, Ugljan, Hvar, Korčula, Krk, Rab i Mljet



Graph 52 Ranking of islands according to the assessment of the effectiveness of current multimodal transport solutions of the current state of multimodality *[Source: EY]*

7 Proposal and methodology for the development of performance indicators for the implementation of multimodal transport solutions

7.1 Creating a database

7.1.1 Task description

As part of Task 4.1. Create a database, a database was created that shows the data collected through Activities 1, 2 and 3.

The purpose of this task is to provide a transparent, well-founded, and structured database in which all measurable and realistic indicators of the current and future state of multimodal transport solutions in the area of Croatian islands will be combined.

The aim of the task is to provide a basis for conducting evaluation activities in the future.

7.1.2 Methodology

The basis for the development of the database is the database from Task 2.1, i.e., data on the connection of all islands by liner shipping transport (ferry, boat, and high-speed line) with the mainland, which was supplemented with data from Activities 1 and 3.

The database includes all data collected during the creation of Activities 1, 2 and 3. It was created by *MS Excel* in a way that allows regular annual updating of data. Calculations within the database are made based on related formulas to achieve the greatest possible automation of obtaining results, i.e., evaluation of the efficiency of multimodal transport solutions. During the creation of the database, EY proposed the type of data implemented in the database, and in communication with the Client, the data structure was defined in accordance with the Client's requirements and needs, all with the aim of better future evaluation activities

7.1.3 Results

The result of the Task is created Database which is presented in Annex 11.

The database contains sheets that enable:

a) evaluation of the efficiency of current multimodal transport solutions, the results of which are presented in Chapter *6.2 Evaluation of the effectiveness of current multimodal transport solutions*:

- Database_current state - the collected data used during the creation of this document are put here. Appropriate indicators, those listed in this chapter, were used in the calculation of the assessment of the current state of multimodality,
- Scoring_current state - points are automatically generated here according to the data of the existing status indicator, and taking into account the weighting factors for each indicator,
- Evaluation - here the size of weight factors for each indicator is determined,
- Ranking - here the ranking of islands is automatically performed in accordance with the collected points according to the existing data of the indicators listed in this chapter. Also, within the sheet there is a graphical representation of the scoring and ranking of all analysed islands, while the key results are presented below.

b) assessment of the effectiveness of the implementation of multimodal transport solutions, the results of which are presented in Chapter *7.2 Development of proposals for efficiency indicators for the implementation of multimodal transport solutions, including maritime transport:*

- Database_future state - the data collected from year 2022 to 2030 on the indicators listed in chapter 7.2.2 are entered here. All entries are numeric to allow automation of data calculations in the following tables,
- Scoring_future state - points are automatically generated here in accordance with the data of the indicators listed in chapter 7.2.2., And considering the weighting factors for each indicator,
- Evaluation_future state - here the size of weight factors for each indicator is determined,
- Ranking_future state - here the ranking of islands is automatically performed in accordance with the collected points according to the data of indicators listed in chapter 7.2.2. In the future, with the collected data and the ranking carried out for several years, it will be possible to show the trends in the efficiency of multimodal transport solutions for each island.

7.2 Development of proposals for efficiency indicators for the implementation of multimodal transport solutions, including maritime transport

7.2.1 Task description

As part of Task 4.2. Develop a proposal for indicators of the effectiveness of the implementation of multimodal transport solutions that include maritime transport, proposals for indicators of the effectiveness of the implementation of multimodal solutions are defined, as well as the methodology for evaluating them. The analysis includes all

Croatian islands that are connected by liner shipping with the mainland or with another island.

The purpose of this task is to provide a transparent and well-founded methodology for assessing the effectiveness of the implementation of multimodal transport solutions to support the systematic implementation of monitoring and evaluation activities in the future. For the purposes of monitoring the indicators, it is necessary to collect data on an annual basis and to supplement the submitted database prepared for the needs of Task 4.1.

As stated in Chapter *3.4. Implementation of the cost-effectiveness analysis method for the purpose of Multimodal Analysis*, for the purposes of this activity, multicriteria analysis was used as an alternative to the classical cost-effectiveness analysis. It is important to note that cost-effectiveness analysis, in this case multi-criteria analysis, serves to measure the effectiveness of the implementation of future multimodal transport solutions, thus measuring key implementation results (e.g., number of maritime lines or number of departures of maritime lines).

The proposed performance indicators for the implementation of multimodal transport solutions are measurable and allow easy monitoring by the Client, and are listed below:

- the existence of a ferry port on the island,
- development of cycling infrastructure on the island [km/km^2],
- average number of departures of maritime transport lines per week per island,
- number of international maritime lines to Italy,
- number of departures on international maritime routes per island,
- establishment of a car sharing system in the port on alternative fuels,
- establishment of an integrated travel card on the island,
- establishment of a bicycle/scooter rental system in the port area,
- the average number of daily bus departures on the island,
- the level of compliance of maritime and bus lines on the island,
- implementation of the promotion of the multimodality system on the island,
- the number of lines on which alternative-powered ships operate,
- **potential savings in transport costs by switching to multimodal transport.**

  The potential savings in transport costs by switching to multimodal transport is an economic indicator related to the calculation of the change in the cost of transport between car transport and transport within a multimodal transport system. The calculation considers the costs exclusively from the perspective of the passenger for the journey from the starting to the final destination. The annual calculation of this efficiency indicator should be performed on the same sample of trips and routes defined in the first year of measurement. For example, if in the first year of measurement is determined that the calculation will be performed for the trip from Split (Hrvatska bratska zajednica Square) to Pražnica (settlement on the island of Brač) then the calculation must be performed every following year for this route due to validity and traceability. It would be desirable for the calculation to be performed

for multiple trips, that is, more destinations (at least one trip per county) due to higher quality and accuracy of data. The cost-effectiveness of multimodal transport is the difference between the cost of traveling by car (Scenario 1) and multimodal modes of transport (Scenario 2) on the same route.

The cost of travel within Scenario 1 includes:

- *1. cost of personal vehicle (market price of vehicle, fuel, depreciation, regular and extraordinary maintenance, registration, technical inspection, and parking) and*
- *2. cost of travel time (average value of one hour in the Republic of Croatia depending on the average net salary).*

The cost of travel within Scenario 2 includes:

- *1. cost of travel time from the starting point of the trip to the first stop/terminal/public transport port (average value of one hour in the Republic of Croatia depending on the average net salary),*
- *2. price of transport service (price of bus and/or sea transport ticket, price of renting bicycle, scooter, moped, etc.),*
- *3. cost of travel time in the public transport system and*
- *4. cost of travel time from the final stop/terminal/public transport port to the final destination.*

Accordingly, the formula for calculating the potential savings in transport costs by switching from a passenger car to multimodal modes of travel is:

$$TU = (Toa + Tv) - (Tv1 + C + Tv2 + Tv3)$$

Where is:

TU - cost savings

Toa - the cost of a personal vehicle

TV - travel time cost

Tv1 - cost of travel time from the starting point of the trip to the starting station/terminal/public transport port (average value of one hour in the Republic of Croatia depending on the average net salary),

C - price of transport service (price of bus and/or maritime transport ticket, price of bicycle, scooter, moped, etc.),

Tv2 - travel time cost in the public transport system

Tv3 – travel time cost from the final stop/terminal/public transport port to the final destination.

7.2.2 Methodology

As part of Task 4.2. based on the conclusions of statistical and quantitative analysis of transport demand and transport supply in the scope of Activities 1, 2, and 3, a proposal for a methodology for evaluating, calculating, and monitoring indicators of multimodal transport solutions implementation, including maritime transport. As part of Task 4.2. a list of potential indicators of the efficiency of multimodal transport solutions implementation has been prepared and a methodology for monitoring individual indicators has been proposed. The basic indicator of the effectiveness of implementation is the difference between the situation before implementation (existing situation) and the situation after implementation, i.e., the comparison of indicators from year to year. The database developed within Task 4.1 was used as a basis for the development of efficiency indicators of multimodal transport solutions implementation.

The methodology for evaluating the efficiency of multimodal transport solutions implementation, which also includes maritime transport, is implemented using the method as in Task 3.2, i.e., the method of multicriteria analysis and equivalence of indicator values. To enable the expression of an individual indicator of the effectiveness of the implementation of multimodal transport solutions, the Client collects data on an annual basis (using the methodology as set out in Table 4). By entering the collected data for the expression of the value of an individual indicator into the database, an assessment of the effectiveness of the implementation of new multimodal transport solutions is calculated, which will enable continuous monitoring of progress in the development of multimodal transport system in Croatian islands. According to the needs, the database can be expanded and supplemented.

Table 4 Methodology for collecting data required for the expression of indicators efficiency of implementation of multimodal transport solutions

Indicator of the effectiveness of multimodal transport solutions implementation	Data collection methodology
Establishment of an integrated travel card on the island	▶ desk research, ▶ communication with LGUs by phone or email.
The level of compliance of maritime and bus lines on the island	▶ statistical analysis of timetables of maritime and bus lines according to official data of carriers, ▶ desk research.
Establishment of a bicycle/scooter rental system in the port	▶ field research/georeferenced data, ▶ communication with LGUs by phone or e-mail, ▶ desk research.
Establishment of a car sharing system in the port on alternative fuels	▶ field research/georeferenced data, ▶ communication with LGUs by phone or e-mail, ▶ desk research.
Number of lines on which alternative-powered ships operate	▶ field research/georeferenced data, ▶ desk research.
Existence of a ferry port on the island	▶ field research/georeferenced data, ▶ communication with LGUs by phone or e-mail, ▶ desk research.
Development of cycling infrastructure on the island	▶ field research/georeferenced data, ▶ desk research.
Average number of maritime lines departures per week per island	▶ statistical analysis of timetables of maritime lines according to official data of carriers.
Number of international maritime lines to Italy per island	▶ statistical analysis of timetables of maritime lines according to official data of carriers.
Number of departures on international maritime routes per island	▶ statistical analysis of timetables of maritime lines according to official data of carriers.
Average number of daily bus departures on the island	▶ statistical analysis of bus timetables according to the official data of the carrier.

Implementation of the promotion of the multimodality system on the island	▶ field research/georeferenced data, ▶ communication with LGUs by phone or e-mail, ▶ desk research.
Cost-effectiveness of multimodal transport	▶ desk research, ▶ mathematical cost-effectiveness calculations.

The defined indicators were assigned weight factors in the amount from 1 to 100 % with the sum of 100 %, where the indicator with a higher percentage has a higher priority, i.e., more influences the final assessment of the effectiveness of the implementation of multimodal transport solutions. The allocation of weighting factors was carried out based on an expert assessment of the impact of individual factors on the multimodality of transport. Factors that have a stronger impact have a higher weighting factor. The weighting factors according to the indicators are shown below:

- establishment of an integrated travel card on the island – 17,5 %,
- the level of compliance of maritime and bus lines on the island – 12,5 %,
- establishment of a bicycle/scooter rental system in the port area – 12,5 %,
- establishment of a car sharing system in the port on alternative fuels – 10 %,
- the number of lines on which alternative-powered ships operate– 7,5 %,
- the existence of a ferry port on the island – 5 %,
- development of cycling infrastructure on the island [km/km^2] - 5 %,
- average number of departures of maritime transport lines per week per island – 5 %,
- number of international maritime lines to Italy – 5 %,
- number of departures on international maritime routes per island – 5 %,
- the average number of daily bus departures on the island – 5 %,
- implementation of the promotion of the multimodality system on the island – 5 %
- cost-effectiveness of multimodal transport – 5 %.

To ensure easy use of the results of this activity, the *MS Excel* database was created as part of Task 4.1. Creating a database contains identified indicators, defined weighting factors, and implemented method of ranking islands in the Republic of Croatia. The database is in Annex 11 of this Multimodality Analysis, and the description of the database is in clause 7.1.3. of these Multimodality Analyses.

7.2.3 Results

The results of the Task are presented in the database attached in Annex 11.

The parts within the database related to monitoring the efficiency of multimodal transport solutions need to be filled with the collected data in the future, starting in 2022.

In the future, the collected data and the conducted ranking made for several years will enable the presentation of trends in the efficiency of multimodal transport solutions for each island.

8 Suggestions for improving the application of new models of multimodal transport solutions

8.1 Catalog of good practice examples of multimodal transport solutions that include maritime transport

8.1.1 Task description

As part of Task 5.1. Create a catalogue of good practice examples of multimodal transport solutions that include maritime transport, an analysis of ten examples of good multimodal transport solutions was made, of which eight examples are in Europe and two in Australia and Oceania. The analysis includes the basic characteristics of the organization of multimodal and integrated transport systems with the aim of gaining insight into transport solutions that can potentially be implemented in Croatia.

8.1.2 Methodology

The methodology of the task includes a qualitative analysis of good practice examples of multimodal maritime transport solutions. Publicly available data such as scientific and professional articles on the effects of multimodality improvement measures in an area were analysed and based on that a descriptive catalogue was made with relevant examples of good practice applicable to the scope of the Multimodality Analysis. The following sources were used to create a catalogue of good practice examples:

- Schweizerusche Bundesbahnen – SBB https://www.sbb.ch/en/leisure-holidays/travel-in-switzerland/international-guests/swiss-travel-pass.html),
- Glimble (https://www.glimble.com/),
- PlusBus (https://www.plusbus.info/),
- Dubrovnik Card (https://dubrovnikcard.com),
- Intermodality in Mallorca, Thematic Workshop B, Bremehaven (https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1574770810.pdf),
- Visit Oslo (https://www.visitoslo.com/en/activities-and-attractions/oslo-pass/),
- Keolis Downer (https://www.keolisdowner.com.au/newcastle-transport/),
- City of Newcastle (https://newcastle.nsw.gov.au/living/transport/parking),
- McDonald Jones Stadium (https://mcdonaldjonesstadium.com/page/Park-and-Ride),
- Newcastle Transport (https://newcastletransport.info/plan-your-trip/on-demand/),

- Aktiebolaget Storsrockholms Lokaltrafik - SL (https://sl.se/en/in-english),
- Scania (https://www.scania.com/group/en/home/newsroom/press-releases/press-release-detail-page.html/3591235-hybrid-electric-commuter-boat-launched-in-stockholm),
- Innovation Origins (https://innovationorigins.com/en/commuting-sustainably-between-stockholms-islands-by-electric-ferry/),
- Azienda del Consorzio Trasporti Veneziano - ACTV (https://actv.avmspa.it/en/content/mobility-services),
- Wellington City Council (https://wellington.govt.nz/parking-roads-and-transport/transport/public-transport),
- Metlink (https://www.metlink.org.nz/#plan).

8.1.3 Results

The results of the task, i.e., examples of good practice of multimodal transport solutions that include maritime transport, are presented below, according to the following chapters:

- Switzerland - Swiss Travel Pass,
- The Netherlands - GLIMBLE,
- Great Britain - PLUSBUS,
- Dubrovnik, Croatia - Dubrovnik Card,
- Mallorca, Spain,
- Oslo, Norway - OsloPass,
- Newcastle, Australia,
- Stockholm, Sweden,
- Venice, Italy,
- Wellington, New Zealand.

The locations of good practice examples of multimodal transport solutions are presented on Figure 7, which are described later in this chapter.

Figure 7 Overview of practice locations of good multimodal solutions *[Source: EY]*

8.1.3.1 *Switzerland - Swiss Travel Pass*

Population	8.636.896[87]
Population density	201,7 inhabitants/km^2

As one of the countries that still has a relatively expensive rail transport service within the country, in 2015 Switzerland introduced the Swiss Travel Pass[88] through which foreign citizens are allowed unrestricted movement through the territory of Switzerland by train, bus or boat with a few additional services as part of the service.

The most important advantage when buying a Swiss Travel Pass is certainly the service of unlimited transport by rail, bus, and boat, while in addition, free public transport in more than 90 cities throughout Switzerland is provided, free admission to more than 500 museums and additional discounts for certain tourist attractions. Through the pass, tourists

[87] The World Bank database, https://data.worldbank.org/indicator/SP.POP.TOTL?locations=CH

[88] SBB CFF FFS, Swiss Travel Pass, available at: https://www.sbb.ch/en/leisure-holidays/travel-in-switzerland/international-guests/swiss-travel-pass.html

are allowed a simple and connected use of public transport services without the need to purchase transport tickets for each form of transport.

The pass can be purchased for a period of three, four, eight or 15 days depending on the needs of the user. There is also a Swiss Travel Pass Flex which allows users to use the pass for three, four, eight or fifteen days, but within a period of a month. When using a flexible pass, the user can specify the exact days when the card is active to use the services it provides.

In addition to passes for foreign citizens, Switzerland offers SwissPass to its citizens[89]. It is a pass that includes a public transportation service with many additional benefits. In addition to transport by rail, bus, or boat, in agreement with many partners, users are offered the possibility of using the public bicycle system, car rental, car-share services or preferential parking prices at certain parking facilities. In addition to the benefits related to transport, SwissPass provides the benefits of various discounts when using or going to certain tourist locations, sports activities or when visiting various cultural attractions.

The main purpose of the Swiss Travel Pass and SwissPass is to increase the attractiveness and integration of the public transport system. By implementing additional content within the mentioned passes, the availability of tourist content is promoted and improved with the aim of increasing the number of users of tourist services, as well as alternative modes of transport.

8.1.3.2 *The Netherlands - GLIMBLE*

Population	17.441.139[90]
Population density	401 inhabitants/km^2

One of the most well-known platforms for using the multimodal mode of transport is certainly MaaS, i.e., the Mobility as a Service. The development of MaaS originated from Finland, and it soon expanded, and the development of these services is now accelerating significantly. The key goal of Maas is to put customers at the centre of transport services by offering customized transport solutions according to the individual needs of users. Also, through MaaS, users are provided with a combination of transport services of public and private providers of transport services through a unified service.

As a great example of using the MaaS platform is Arriva, one of Europe's major bus carriers which in August 2021 introduced its Maas Glimble application[91] which facilitates the

[89] SBB CFF FSS, SwissPass, available on: https://www.sbb.ch/en/help-and-contact/produkte-services/swisspass.html

[90] The World Bank database, available on: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=CH

[91] Glimble, available on: https://www.glimble.com/

organization of multimodal transport throughout the Netherlands. The application integrates various types of transport such as:

- railway,
- bus,
- tram,
- boat,
- *bike sharing*,
- *car sharing*,
- taxi,
- e-scooter.

By displaying data about all listed types of transport, the user of the application enters the point of departure and the point of destination, and the application, based on the route, offers the user the options for the easiest and fastest arrival to the destination.

Within the application itself, all modes of public transport in the Netherlands are integrated and are easily processed and presented to the end user. Through the application, the user is enabled to plan a trip in advance, book or pay for tickets for all types of transport within the system. The main advantage of the MaaS system and application is the easy way to pay for all types of transport by having the user add their bank card within the application and pay for the trip costs, without the need to purchase separate transport tickets.

8.1.3.3 *Great Britain – PLUSBUS*

Population	67.081.000[92]
Population density	274,45 inhabitants/km^2

PLUSBUS[93] is a supplement to the transport ticket introduced in Great Britain in 2002, which allows railway users, with a small surcharge, to have unlimited use of the public transport system in the city area from or to which they travel by rail.

The integration of rail transport tickets and other public transport services allows users to easily use and switch between multiple means of transport when traveling.

The main advantages of PLUSBUS are manifested in a simpler combination of transport because the ticket supplement allows the use of several different modes of transport within a single ticket and information about the public transport network in the area for which the ticket supplement was purchased. PLUSBUS can be purchased in addition to the

[92] Office for National Statistics, UK, available on: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates

[93] PlusBus, available on: https://www.plusbus.info/

basic railway ticket at all points of sale of the national railway, via the websites of railway operators or via self-service devices located at individual railway stations and stops.

In 2002, the PLUSBUS map add-on was implemented in 35 locations, while by 2021 it has been implemented in more than 290 cities across Great Britain. It is important to note that the capital and largest city of the United Kingdom, London, does not belong to the PLUSBUS service network.

The PLUSBUS card supplement can be purchased for a period of one, three or seven days, and there are also subscriptions that are valid for three months, six months and a year. Also, with the development of technology, the PLUSBUS card add-on, which was originally only available in paper form as a classic card, is now available as a smart card thus significantly speeding up passenger changes and enabling transport demand tracking as well as a simpler and fairer control system.

8.1.3.4 *Dubrovnik, Croatia – Dubrovnik Card*

Population	42.615[94]
Urban area	21,35 km^2
Population density	1.996 inhabitants/km^2

In the area of the city of Dubrovnik, with the development of tourism and the increase in the number of tourists from year to year, the Dubrovnik Card service was presented.[95] The Dubrovnik card provides benefits that offer users easier movement around the city and a more cost-effective visit to tourist attractions. The Dubrovnik card is primarily based on the offer of tourist sights, i.e., by purchasing a card for a period of one, three or seven days, users are provided with free entry to many cultural and historical sights.

In terms of traffic, the purchase of the Dubrovnik Card offers users the use of public city bus services, depending on the period for which the card is valid. By purchasing a Dubrovnik card for a period of one day, users are offered unlimited daily use of the public city bus system in the city of Dubrovnik, by purchasing a three-day Dubrovnik card, users are provided with six free public transport rides in the city of Dubrovnik and two coupons for bus line 10 to Cavtat. The purchase of a seven-day Dubrovnik card offers users ten free rides by public transport in the city of Dubrovnik and four coupons for rides on the suburban line number 10 to Cavtat.

Due to its benefits, the Dubrovnik Card encourages the use of the public transport system, which increases the level of mobility in the city area without the use of personal cars. As a result, traffic congestion within the city is reduced, and tourists and all users of the

[94] Dubrovnik-Neretva county, available on: https://www.edubrovnik.org/en/demographic-data/

[95] Dubrovnik Card, available on: https://dubrovnikcard.com/

Dubrovnik Card are given the opportunity to easily reach many tourist attractions in the city of Dubrovnik.

8.1.3.5 *Mallorca, Spain*

Population	947.804[96]
Urban area	3.640,11 km^2
Population density	260,37 inhabitants/km^2

As a very popular tourist destination, in the period between 2005 and 2015, the traffic on the island of Mallorca increased by 42 %[97]. With a high degree of motorization and an increased number of tourists in the island area, local authorities have been forced to develop a multimodal mode of transport, primarily focusing on public transport with the aim of reducing congestion on roads.

Considering the distinct seasonality that defines Mallorca, as is the case on both the Croatian coast and islands, it was important to provide quality transport in the summer when the number of trips increases up to four times. Precisely because of this, the main goal of the development of transport multimodality was aimed at improving the connectivity of the island and enabling the residents and visitors of the island to easily move around the island.

The development of multimodal transport is taking place in such a way to minimize the use of passenger cars and to increase the use of public transport. This was done with the development of the Park&Ride system, i.e., the construction of parking areas for cars next to railway stations where people would leave their cars and continue their journey by rail. Also, in the largest city of Palma, six parking lots have been built at the entrance to the city, where users could leave their vehicle for the whole day at a low price and change to public transport lines. From the area of these parking lots, bus lines are organized that transport tourists to certain tourist attractions, all with the aim of removing a large number of tourists with their own vehicles on the road network of the island.

For tourists arriving by plane, a shuttle bus service to the five largest cities is organized, with many stops on the route itself, making it easier for tourists to reach their final destination. The shuttle bus system is charged at special rates.

In addition to the focus of switching road transport to bus transport, a system of multimodality has been implemented at individual locations. All public transport users who

[96] Statista, available on: https://www.statista.com/statistics/449291/population-of-the-balearic-islands-by-island/

[97] Alvaro Phillipe, Intermodality in Mallorca, Thematic Workshop B, Bremehaven available on: https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1574770810.pdf

have previously purchased a bus, metro or train ticket have free access to all-day use of public bicycles located at multimodal stops. Users use bicycles for free all day with the obligation to return it by the end of the same day to one of the many stops.

The most important step towards establishing an efficient multimodality system is the implementation of a user intermodal card that allows Mallorca residents to use most transport services at discounted prices. The card is tied to the user and works in such a way that a monetary amount is added to it, from which the amount is reduced in accordance with the price of transport when using the public transport service. An important feature is that the price of public transport service decreases with increase of public transport, which is a good incentive method.

Since this intermodal card is intended only for residents of Mallorca, the use of contactless bank cards to pay for transport when using public transport services is anticipated for tourists. As in the case of the intermodal card, more frequent use of public transport reduces the price for further travel.[98]

8.1.3.6 *Oslo, Norway - OsloPass*

Population	1.060.630[99]
Urban area	480 km^2
Population density	2.209 inhabitants/km^2

The city of Oslo in Norway presented the Oslo Pass card[100] through which the users of the service were enabled to facilitate movement throughout the city of Oslo. By purchasing the card, users benefit from free public transport in two traffic zones in the city, and this includes the use of rail, bus, tram, and boat transport. Also, Oslo Pass provides free access to certain tourist attractions and certain discounts on various tourist attractions, restaurants, and other activities.

The card can be purchased for a period of 24, 48 or 72 hours, valid only for the area of two zones in the inner part of the city, while for the outer zones it is necessary to buy additional tickets. In addition to free public transport, boat transport to the surrounding islands located within the free public transport zones is also provided. Free boat transport to the Bygdøyfergene Museum is included, although museum is not located within the two zones where free transport is included[101]. The biggest disadvantage of Oslo Pass is the non-

[98] Alvaro Phillipe, Intermodality in Mallorca, Thematic Workshop B, Bremehaven available on: https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1574770810.pdf

[99] Urban area; available on: https://populationstat.com/norway/oslo

[100] Visit Oslo, OsloPass, available on: https://www.visitoslo.com/en/activities-and-attractions/oslo-pass/

[101] Visit Oslo, OsloPass, available on: https://www.visitoslo.com/en/activities-and-attractions/oslo-

inclusion of the airport in the benefits of free transportation, which means that passengers must buy a separate ticket from the airport to the city and vice versa.

Apart from the Oslo Pass card, the public transport system in the city of Oslo uses an integrated tariff system, i.e., one ticket is valid for all types of transport in the city, which makes the moving around the city easier for both residents and all visitors.

8.1.3.7 *Newcastle, Australia*

Population	308.308[102]
Urban area	261,8 km^2
Population density	1.177 inhabitants/km^2

Keolis Downer [103] presents itself as the main organizer of multimodal transport solutions in public transport in Australia. By managing various modes of transport such as metro, rail, light rail, bus lines, ferry lines and bicycle traffic, Keolis Downer focuses on organizing multimodal passenger transport.

In 2017, Keolis Downer signed a ten-year contract to operate a public transport system in the Newcastle area, Australia, during which time it exceptionally developed and launched multimodal transport in the city area. During the period from 2018, the number of departures on bus and boat lines connecting various parts of the city increased, while in 2019 they presented and included the tram system as part of the public transport service. The implementation of tram lines in certain areas has improved the connection with certain locations and other modes of transport.

In addition to the public transport service itself, the Park&Ride system has been implemented in the city area[104] which enables users to leave their vehicles in certain locations and, as part of the parking price, to use bus transport services to the city, making the use of public transport services easier. It is important to note that the Park&Ride system in the Newcastle area was suspended during the Covid-19 pandemic, but the system is expected to reopen after the end of the pandemic.[105]

pass/whats-included/free-public-transport/

[102] Available on: https://populationstat.com/australia/newcastle

[103] Keolis Downer, Newcastle Transport, available on: https://www.keolisdowner.com.au/newcastle-transport/

[104] City of Newcastle, available at: https://newcastle.nsw.gov.au/living/transport/parking

[105] McDonald Jones Stadium, available on: https://mcdonaldjonesstadium.com/page/Park-and-Ride

In addition to the listed services, on demand transport is also organized[106], i.e., transport by invitation. Users can order transportation through the application in which the user determines the starting and ending point of the trip, and transportation is performed by vans at the price of public city transport.

As a major addition to multimodality, an autonomous vehicle was introduced during 2020[107] which serves as a shuttle transport for users who switch between certain types of transport. The autonomous vehicle was used as part of the implementation of a pilot project within which the readiness of the system for implementation within the public transport service was tested. The system has been tested for a period of three months and is currently out of service, but it certainly shows the possibilities of developing multimodality in the near future.

The Newcastle city public transport billing system is integrated within the Opal system, which allows users to make contactless payments with a user card on all modes of transport. Smart cards are possible to top up with a certain amount of money and are then used when entering and exiting the vehicle, based on which the system defines the price according to the length of the trip and charges it from the specified card. Users who travel outside peak hours, i.e., outside the time when the greatest congestion on the network is expected, have an additional discount of 30% compared to the regular price.

8.1.3.8 *Stockholm, Sweden*

Population	1.664.408[108]
Urban area	381,63 km^2
Population density	4.361 inhabitants/km^2

The Stockholm public transport system is considered to be one of the best organized transport systems, and data showing that about 60 % of the city's inhabitants use the public transport system on a daily basis confirms that.[109] The organizer of the public transport service is the company SL[110] which in its jurisdiction provides various transport services such as:

[106] Newcastle Transport, available on: https://newcastletransport.info/plan-your-trip/on-demand/

[107] City of Newcastle, available on: https://www.newcastle.nsw.gov.au/council/news/latest-news/wheels-turning-on-driverless-vehicle-trial

[108] Available on: https://populationstat.com/sweden/stockholm

[109] Scania, "Hybrid electric commuter boat launched in Stockholm", available on: https://www.scania.com/group/en/home/newsroom/press-releases/press-release-detail-page.html/3591235-hybrid-electric-commuter-boat-launched-in-stockholm

[110] SL, available on: https://sl.se/en/in-english

- bus,
- metro,
- train,
- tram,
- boat.

Stockholm is known for its developed archipelago, which contains about 24.000 islands, and for this reason the public transport service includes maritime transport, which is frequently used. Public transport includes four ferry lines connecting certain islands in the archipelago area[111], both for the inhabitants of the island and for tourists when visiting the city. Maritime transport is integrated as part of the public transport ticket and does not require a separate ticket.

Due to the highly developed maritime transport in the Stockholm archipelago, this form of transport is constantly evolving, all with the aim of reducing environmental pollution. It is for this reason that the implementation of an electric hydrofoil is expected in 2022, which will be used for the purpose of public transport in the archipelago. The electric hydrofoil will reach speeds of up to 30 knots, or about 55 km/h, which will enable fast transport between the island and the mainland, and the expected distance it will be able to cover with one charge is 60 nautical miles, which is about 110 km.

The biggest problem of the planned hydrofoil is the planned capacity of about 30 passengers, which is significantly less compared to existing ships with a capacity of about 200 passengers.

8.1.3.9 *Venice, Italy*

Population	258.600[112]
Urban area	414,57 km^2
Population density	624 inhabitants/km^2

Public transport in the city of Venice is managed by ACTV, which is the main provider of public city transport services, which provide transport by boat and bus. The main form of transport in Venice, due to its specific shape, are boats that operate throughout the city.

In addition to standard ferry lines, during the tourist season, due to the multiplied number of tourists, new seasonal lines are introduced that make the transport of users in the entire

[111] Innovation Origins, "Commuting sustainably between Stockholm's islands by electric ferry, available on: https://innovationorigins.com/en/commuting-sustainably-between-stockholms-islands-by-electric-ferry/

[112] Available on: https://worldpopulationreview.com/world-cities/venice-population

area of Venice even easier. In addition to classic boat lines, there is offer of 159 different types of other boats, which certainly attract visitors to use public transport.

In addition to the most frequently used boat lines, there is also bus and tram transport, as well as a bike-sharing system and parking services for personal vehicles within the Park& Ride service. The entire transport system is tariff integrated, which enables easy transition of users between individual forms of transport.[113]

8.1.3.10 *Wellington, New Zealand*

Population	506.814[114]
Urban area	442 km^2
Population density	1.147 inhabitants/km^2

In the city of Wellington, New Zealand, the public transportation system is operated by Metlink. As part of the public transport offer in the city of Wellington, bus, boat, and rail services are offered, as well as cable car transport, which provides a multimodal transport service to all users.[115]

As part of maritime transport, there are two lines on offer, but at the time of research, one of the lines was out of order due to damage caused to one port by the earthquake in New Zealand in early 2021.

The payment system, in addition to individual cards, is enabled through subscription cards called Snapper cards, which provide users with additional discounts when using public transport services. Customers are granted an additional discount if they use a combination of different lines on a single trip or if they travel during periods when there is not the greatest demand on the lines.

A useful thing when planning a trip is a travel planner that can be found on the Metlink website[116]. On the website, it is possible to enter the exact location of departure and destination, based on which the route of the trip, the lines to be used and information on whether there are delays or congestion on the lines required to travel is shown.

[113] ACTV, available on: https://actv.avmspa.it/en/content/mobility-services

[114] Available on: https://www.newzealandnow.govt.nz/choose-new-zealand/regions-cities/wellington

[115] Wellington City Council, available on: https://wellington.govt.nz/parking-roads-and-transport/transport/public-transport

[116] Metlink, available on: https://www.metlink.org.nz/#plan

8.1.4 Concluding remarks

In order to make better conclusions and guidelines for improving the multimodal transport system, a catalog of good practice examples in multimodal transport solutions including maritime transport was created, which shows how to organize passenger transport using modern and integrated transport policies in 10 cities and countries.

Unlike the analysed positive examples, in the territory of Croatia there is currently no functional form of an integrated transport system through the operation of the transport administration with a common transport tariff system and a unified real-time passenger information system. The integrated tariff system and the passenger information system speed up and facilitate the public transport process, which significantly stimulates passengers to use such a system. The above examples show that each of these systems has some form of tariff and data integration.

In addition to the integrated tariff system itself, some cities and countries offer a subscription card service for tourists. As part of the subscription card, users are provided with an unlimited public transport service with additional benefits within the tourist offers. On the example of Switzerland, which offers the Swiss Travel Pass, it is possible to integrate public transport services and provide additional services such as preferential prices for various tourist attractions in the country. The Republic of Croatia, as an extremely tourist-oriented country, has favourable features for the implementation of a similar system, which is partially used only in Dubrovnik and Zagreb.

Depending on the specifics of the area, some examples within the multimodal mode of transport also provide a maritime transport service. Carriers in cities such as Stockholm, Oslo or Venice provide a shuttle service, and by aligning timetables with other public transport services, users are given an intuitive use and easy transfer. In 2022, an electric passenger hydrofoil will be introduced in Stockholm in the function of public transport, which shows the tendency to switch from classic to alternative fuels, even in maritime transport.

The organization of timetables of all transport systems is an extremely important factor in the quality of service. Harmonizing the timetables of all modes of transport would contribute to more efficient and faster passenger transport, which would reduce the disadvantages of long waiting times when switching from one form of transport to another. Thus, maritime transport would be more accessible and attractive to users as a mode of transport.

The latest tool for organizing and displaying multimodality is the MaaS (Mobility as a Service) platform. The mentioned platform is based on a mobile application, and unites all transport services in the area, which enables easier organization of travel. Within the application, the user determines the starting and ending point of the trip, and the application suggests possible routes and travel options with the price of the service itself. Based on the proposed options and the price of the service, the user can combine several transport services according to their wishes. With continuous development, MaaS has become an increasingly

used form of travel organization globally in recent years. Considering the characteristics of travel in island areas, due to the greater number of transfers between different forms of transport, the MaaS platform would show users all combinations of travel, based on which the user would choose the fastest, cheapest, or favourite travel option.

8.2 Suggestions for improvement of passenger transport in the area covered by Multimodality Analysis using new technologies of multimodal transport solutions with the use of renewable energy sources

8.2.1 Task description

As part of Task 5.2, and based on the conclusions of the analysis of the current situation, i.e. identified needs and opportunities through Tasks 1.1., 1.2., 1.3., 1.4., 2.1., 3.1., 3.2., 4.2. and 5.1., a suggestion is made to improve passenger transport in the scope of Multimodality Analysis by applying new models and technologies of multimodal transport solutions in the scope of Multimodality Analysis with the emphasis on the use of renewable energy sources.

The purpose of this task is to provide the Client with a basis for the idea and development of new models of multimodal transport solutions that will ensure the application of new technologies and the use of renewable energy sources in the short term (one to three years), medium term (four to seven years) and long term (eight and more years).

8.2.2 Methodology

As part of the preparation of the task, activities and improvement measures aimed at the development of multimodal transport were proposed. The emphasis of the proposed activities and measures is on improving transport by applying new models of multimodal and integrated transport solutions with the use of renewable energy sources. In addition, improvement proposals are systematized according to the duration of the implementation process: short-term (one to three years), medium-term (four to seven years) and long-term period (eight to ten and more years).

It is necessary to consider that the implementation of the proposed measures depends on a number of factors and trends. Therefore, deviations between planned and realized activities are possible. In accordance with the above, the implementation plan should be understood as a framework plan that can be achieved, and not as a fixed obligation for the implementation of the proposed measures.

8.2.3 Results

Short-term period - Refers to the period from 2022 to 2023 and includes measures that are quickly implemented, or whose start of implementation does not depend on other measures.

Development of a modern real-time passenger information system

It is necessary that all stops, terminals, and ports with greater passenger turnover, and in the long run all facilities for the handling of passengers, are equipped with smart information panels. It is also proposed to develop an integrated application with information on timetables, transfers, itineraries, tariff provisions, etc. Such systems provide passengers with information on the schedule of departures and arrivals of public transport vehicles in real time. For this reason, they need to be compatible with other systems such as e-ticketing or AVL (automatic vehicle locating) for reliable functioning. In order to adequately inform passengers while driving, all vehicles must be equipped with a visual and audible announcement of the stop.

The implementation of this measure is in line with the guidelines of the European Commission 2019-2024 entitled "Europe fit for the digital age" which is focused on development of data, technology, and infrastructure, which in this context will increase the efficiency of the public passenger transport system in the coverage area.

Development of a modern ticket collection system in public passenger transport (e-ticketing)

The public passenger transport system has significantly greater opportunities to access all the necessary target groups of users if it has an optimal and diverse number of channels for the sale of transport tickets. In addition, one of the basic preconditions for the quality and efficient functioning of multimodal passenger transport is a simple and efficient ticket payment system. Such system should be simple for the user and easily extendable to all modes of transport as well as on new public transport service providers. Special emphasis should be placed on sales channels with support for modern payment methods (Internet, mobile applications, contactless cards, etc.). Modern ticket payment systems also enable easy collection and processing of data on the characteristics of transport demand, which can serve to properly form the transport offer.

The implementation of this measure is in line with the guidelines of the European Commission 2019-2024 entitled "Europe fit for the digital age" which is focused on development of data, technology, and infrastructure, which in this context will increase the efficiency of the public passenger transport system in the coverage area.

Promotion and visibility of multimodal transport solutions

In order to encourage users to use a certain mode of transport, quality promotion and visibility of such solutions is necessary. Consequently, it is important to consider that certain resources for the development of transport solutions need to be invested in marketing activities such as the production of advertising materials, conducting media announcements, workshops for target groups and the like.

Development of a system for monitoring and evaluating the effectiveness of the implementation of multimodal transport solutions

In order to assess the effectiveness of future transport solutions, and for the needs of potential changes, additions and/or corrections of strategic plans, a monitoring and evaluation system is an essential step in any planning process. This document defines indicators that indicate the effectiveness of the implementation of multimodal transport solutions. To conduct monitoring and evaluation in the future, it is proposed to form a working group that will be in charge of collecting, processing and evaluating data.

Supplementation of the strategic and spatial planning documents at the level of local self-government units

Previous studies warn that the lack of methodology in the preparation of spatial planning documentation, with non-compliance with basic planning criteria, has a very negative impact on spatial and economic development. In order to optimize transport solutions, it is necessary that local self-government units in the coverage area condition traffic-technological analyses and participation of transport experts in all major interventions in the area and on the transport network in order to reduce potentially generated external costs to a minimum.

When drafting new spatial plans at all levels, it is necessary that local self-government units condition the construction of infrastructure for sustainable forms of transport. It is necessary to plan the locations of terminals and stops for public transport vehicles, bearing in mind the development of Park&Ride and Bike&Ride services and the best possible integration of transport subsystems.

In addition to defining the elements of sustainable transport planning, it is necessary that amendments to the spatial planning documentation are implemented on time, with the aim of timely implementation of planned improvement measures.

Implementation of the system of benefits for the use of maritime transport on the route Croatia - Italy

As the catalogue of examples of good practice of multimodal transport solutions indicates the existence of smart and efficient organizational/tariff transport solutions at local or national level, it is proposed to extend or introduce such solutions to cross-border areas through cross-border cooperation. Namely, to encourage the use of maritime transport between Italy and Croatia, it is proposed to establish a benefits system. The benefits system can function in such a way that the user, when buying a ferry ticket, gets a discount on hotel accommodation, museums, restaurants, etc. in the destination area. It is also possible that the purchase of a ferry ticket includes a discount on the use of public transport at the destination, or a discount on the use of air, rail or bus long-distance transport in case Italy or Croatia are used as transit destinations. Such benefits can significantly stimulate passengers to use alternative, sustainable modes of transport, with the aim of reducing the number of car journeys.

For a quality design of the benefits system, it is necessary to make a comprehensive market analysis to identify potentials and opportunities. Also, for the implementation of such a system, the cooperation of all relevant stakeholders in the coverage area is extremely important, and those are national, regional, and local authorities, carriers, tourist boards, agencies, and other entities.

Medium-term period - refers to the period from 2023 to 2027 and includes more complex measures that depend on other, short-term measures and for the implementation of which it is necessary to take certain preliminary work.

Implementation and development of public micromobility systems (public bicycles, scooters, etc.)

Micromobility is playing an increasingly important role in urban transport systems. One of the main reasons for this trend is the possibility of door-to-door travel without dependence on traffic jams, on the road or in public transport, which provides users with confidence in this form of travel. An additional benefit of using a micromobility system is manifested through lower transportation costs and positive health effects.

The system of public bicycles, scooters, etc. serves as a supplement to public transport and significantly helps reduce traffic congestion, solves parking problems in the city centre, contributes to environmental protection, enriches the tourist offer, positions the city or island as a desirable cycling destination and generally affects improving the quality of life in the area. The system is particularly suitable as an alternative to motorized vehicles at distances of up to 5 km for all island towns and even entire areas of smaller islands.

Organization and coordination of existing maritime and bus public transport lines

According to the current situation, it has been established that, although there is a significant number of maritime lines, departures on islands, and bus lines, maritime and bus transport are not reasonably harmonized. Consequently, it is necessary to organize and harmonize the existing bus and maritime timetables in such a way that the subsystems in question complement each other and allow easy transfer and resumption of travel. Such organized public transport would attract more passengers due to better spatial coverage, and thus increase the efficiency and sustainability of transport services, especially for areas of the island where certain lines do not attract satisfactory traffic demand.

For this to be carried out systematically, it is necessary to establish jurisdiction and function, such as a transport administration, for coordination and integration of the various modes of transport.

Implementation of new municipal bus transport lines at the levels of local self-government units or islands with alternative fuel vehicles

In order to reduce car dependence on certain islands and within island cities, it is proposed to introduce new municipal bus transport lines with alternative fuel vehicles. Bus lines need to connect major seaports on the islands, and the departures and arrivals of bus and maritime lines must be harmonised.

Given the relatively low level of population of the island and the rurality of the area, it is extremely important to optimally determine the capacity of public transport by bus for the transport service to be efficient and sustainable.

In addition, in the future it is necessary to encourage the modernization of bus vehicles on existing lines in the direction of vehicles with zero CO_2 emissions. Such vehicles have lower operating costs, which can significantly help in the exploitation of the transport service.

Implementation of new maritime lines to connect islands and mainland and islands with each other

Traffic connectivity significantly affects the quality of life in an area. Consequently, to encourage positive socio-economic changes, it is necessary to improve the maritime connectivity of certain islands with the mainland and with other islands with each other. When establishing new lines, it is extremely important to consider the optimal utilization of transport service capacity.

In order to improve the quality of maritime transport services in the coverage area, it is necessary to increase the frequency of existing lines, i.e., increase the number of arrivals and departures in accordance with traffic needs. Lines that intersect with each other need to be timed to achieve the shortest waiting interval between lines. For settlements on islands with a larger population, it is necessary to establish direct lines with larger cities on the mainland.

Establishment of on-demand transport

On-demand transport works almost the same as any other public transport system: it has a network of lines, lines in the system that have a predetermined schedule of stops that are served, and a timetable. The key difference is that a single departure on the line operates only when at least one user "calls" it, i.e., pre-registers for transport by agreed communication channel (e.g., phone, SMS, web application, etc.) within the specified time (e.g., at least 20 minutes before departure according to the timetable). If there is no request (call), the departure does not operate. Minibuses, vans or even cars are often used in the on-demand transport system. Such service would enable the connection of dispersed island settlements with seaports and other public transport systems.

Establishment of new international shipping lines with Italy

Based on the conclusions of the analysis of the current situation on the transport demand of Italian tourists in the Croatian islands, the number of arrivals of Italian

tourists potentially depends on cross-border transport supply. Therefore, to improve the cross-border transport offer, with the aim of increasing the number of tourists and tourist activities, it is proposed to establish new international maritime lines between Italy and Croatia. Some potential locations that can be connected are Pescara - Korčula - Split and Rimini - Pula.

Development of cycling infrastructure on the islands

Quality cycling infrastructure is the basis for the development of cycling in an area. Given that motor traffic on a large number of islands is not excessive, especially on smaller islands, the development of cycling infrastructure can be carried out by improving and setting up adequate traffic signals on the existing road network.

On larger islands, it should be considered to build a bicycle path, lane, or road during the reconstruction of state, county or local roads, depending on local possibilities.

The development of cycling infrastructure also has an extremely important impact on the tourist offer of an area. Namely, according to the data of the Ministry of Tourism and Sport, there are about 60 million active cyclists in Europe, and about 20 million cyclists who spend at least one night. About 7 % of all tourism activities in Europe include bicycles.

Development of carsharing systems on islands with an emphasis on alternative fuel vehicles

Carsharing (car sharing system) is a system of public cars, i.e., a system in which several drivers use the same vehicle according to their needs. The main goal of the carsharing system is to reduce the need to own a private car, while increasing mobility of users who do not have a car. According to international research, it has been concluded that one shared vehicle replaces ten to fifteen passenger cars.

Carsharing service is important in the process of reducing the carbonization of the transport system because most users who cannot currently afford a private electric car can use the carsharing service with electric cars available.

This measure can be encouraged through the construction of carsharing terminals in seaports where there will be free parking, through the development of Internet and mobile applications for the exchange of information on the possibility of carsharing, how to connect users, etc. In addition to the carsharing terminal, it is also possible to rent vehicles in parking spaces in a certain area, i.e., a zone (free-floating system). To propose an appropriate model for each individual island, additional research of potential users is needed.

Long-term period - refers to the period from 2027 to 2030 and includes the most demanding measures whose implementation depends on many factors.

Establishment of integrated passenger transport - formation of a tariff union and transport administration

The establishment of integrated public passenger transport is an important precondition for achieving sustainable mobility and achieving equality between transport modalities.

For public transport to be competitive and ensure equal mobility for all potential users, it is necessary to take advantage of certain forms of transport in certain conditions and integrate them. Disproportionate development of one transport service will not contribute the highest level of efficiency as well as quality integration of various transport services in the wider area. Only integrated public transport can be a quality alternative to a personal vehicle.

Accordingly, the establishment of integrated passenger transport in the coverage area is one of the most important measures for the development of a sustainable multimodal transport system. Establishing integrated passenger transport is an extremely complex process, and some basic items that should be met are:

I. Introduction of an integrated tariff system and introduction of a common transport ticket. Such transport tickets will enable the user to travel on the scope of municipal bus lines, maritime transport, public bicycle system and railway. A prerequisite for this is the development of an e-ticketing system.

II. Establishment of a transport administration, i.e., allocation of competence for the organization, development, and improvement of multimodal and integrated transport. The role of the transport administration, the purpose of which is to unify and coordinate the legal, administrative, and operational affairs of the various transport subsystems, may be performed by an existing/new body or an organizational unit within the existing body.

III. Optimization of timetables between different forms of transport with the aim of easier and faster transfer.

IV. Construction of multimodal passenger terminals for the purpose of infrastructural and spatial integration of various forms of transport.

Construction of intermodal passenger terminals

With the development of an integrated transport service, it is necessary to build/equip/organize the locations of intermodal terminals. Intermodal public transport terminals are locations for the handling of passengers that can accept vehicles of different modes of public transport in the common area, such as buses, boats, trains, public bicycles, and personal vehicles. Their purpose is to enable passengers to switch between different forms of transport with quality infrastructure.

Considering the spatial and traffic importance, all major coastal cities and the largest cities on the islands in the coverage area need to be developed as the main intermodal terminals.

Development of existing and construction of new seaports

Seaports are crucial for intra-national and international connectivity. The development of port infrastructure should be guided by the European Green Plan, which states that seaports must enable more sustainable forms of connection. Seaports should become multimodal hubs for mobility and transport, connecting all relevant modes of transport. This will improve air quality thus contributing to improving the health of the local population. Seaports have great potential to become new clean energy hubs for integrated electricity systems, hydrogen and other low-carbon fuels, and self-sustaining zones with the establishment of a circular economy.

For the purposes of integrating maritime transport into the existing transport system in the coverage area, it is necessary to further build and improve port infrastructure for the purpose of developing freight and passenger transport. The port infrastructure should be in accordance with the standards and adjusted to the vessels that come to the port for mooring.

Modernization of the maritime transport fleet with alternative propulsion ships

Modernization of public transport vehicles and vessels and accompanying infrastructure is an important factor in the process of decarbonisation of traffic in the coming periods and directly contributes to the development of a competitive, energy sustainable and efficient transport system.

Vehicles and public transport vessels that use zero-emission propulsion do not primarily pollute the environment and are more comfortable for urban space near seaports due to lower noise levels and the creation of a visual identity. Accordingly, it is proposed to systematically replace older vehicles and vessels with vehicles/vessels that use sustainable and environmentally friendly energy sources. In addition to the renewal of the fleet on alternative fuels, it is necessary to build ancillary infrastructure for refuelling and maintenance.

8.3 Pilot projects for the improvement of the application of new multimodal transport models/solutions for the three Croatian islands with the use of new technologies using means of transport with lower CO_2 emissions

8.3.1 Task description

As part of the development of Task 5.3. Developing 3 pilot projects for the improvement of the application of multimodal transport new models/solutions by applying new technologies using means of transport with lower CO2 emissions, pilot projects were developed for three groups of islands according to the population of the islands. Accordingly, EY developed one pilot project for one representative island from each of the following groups:

- Group I islands consist of islands with less than 500 inhabitants;

- Group II islands consists of islands with between 500 and 5.000 inhabitants;
- Group III islands consists of islands with more than 5.000 inhabitants.

Purpose of Task 5.3. is to provide the Client with a basis for the implementation of new models of multimodal transport solutions that will improve the transport system and improve alternative modes of transport in order to develop sustainable connectivity of islands with the mainland, islands with each other and create better mobility within the island.

8.3.2 Methodology

In accordance with the results of Activities 1, 2, 3 and 4, within Task 5.3. three pilot projects were developed to improve the application of new model/solutions of multimodal transport modes on Croatian islands with the use of new technologies with an emphasis on the use of means of transport with lower CO_2 emissions.

The list of islands by groups according to the population criterion used by EY in the preparation of this task can be found in the Job Description, Annex 4 and was prepared in accordance with the 2011 census of the Central Bureau of Statistics of the Republic of Croatia. The proposal of the islands for which a pilot project has been prepared has been agreed with the Client before the start of the preparation of this task. Pilot projects have been developed in a unified manner, i.e. in such a way that they can be replicated to other Croatian islands.

All proposed pilot projects are described below in a way that contains the following information:

- name of the pilot project,
- area of implementation of the pilot project,
- description and goal of the pilot project,
- activities and time period of the pilot project implementation.

8.3.3 Results

For easier review, the presentation of the results is structured according to the following chapters:

- Pilot project for the Group I islands (up to 500 inhabitants) - Establishment of a system of public bicycles in the area of seaports and other main points of interest in the area of the island,
- Pilot project for Group II islands (between 500 and 5.000 inhabitants) - Establishment of public bus transport with alternative propulsion vehicles,
- Pilot projects for Group III islands (more than 5.000 inhabitants):
  - Construction of a Park & Ride terminal in the area of seaports that allows users to park vehicles for a long time and use maritime transport in the price of a parking ticket,

- Establishment of an international maritime line between Group III islands and Italy.

8.3.3.1 *Pilot project for Group I islands (up to 500 inhabitants) - Establishment of a public bicycle system in the area of seaports and other main points of interest in the island area*

Area of implementation of the pilot project

The pilot area belongs to Group I islands with up to 500 inhabitants. The island of Zlarin in the Šibenik archipelago with 284 inhabitants and an area of about 8,19 km^2, or a population density of 35,28 inhabitants/km^2, was chosen as a representative island.[117]

Zlarin is an island of rich cultural and historical heritage and untouched nature[118] and attracts many tourists, which, according to the results of the analysis of the demand for the transport of Italian passengers described in Chapter 4.1., is reflected in the number of arrivals of Italian tourists.

The characteristics of the Group I islands, including the island of Zlarin, are the low level of population density, the large dispersion of attractors on the island, which is accompanied by the lack of road infrastructure. Because the size of the island is suitable for hiking and cycling, as is the case with a large number of Group I islands, the potential for the development of bicycle traffic or some form of micromobility is evident.

The analysis of the traffic offer on the island established that the island of Zlarin is connected to seven destinations via state ferry and state shipping lines, which on average number about 30 departures per week. On the island itself, there is a taxi service available by boat and two recreational cycling and walking routes "Put Borovice" and "Put Klepeca". It is interesting that on the island of Zlarin, "papamobiles" were used as an attractive and efficient way of personal transport used by both locals and tourists. However, this form of transport is not within the legislative framework and is not sustainable under existing legislation because the vehicles are not homologated.

Description and goal of the pilot project

In order to develop a sustainable transport system and multimodality in the area of Group I islands, it is proposed to implement a system of public bicycles in seaports and other main points of interest in the island (e.g. in the center of island settlements, camps, hotels, beaches, etc.). The main goal of the pilot project is to improve mobility on the Group I islands without dependence on cars, the development of cycling culture and improve the offer of cycling tourism and increase the attractiveness of the islands.

Such a system has exceptional potential for improving the mobility of residents and tourists taking into account the small area of the island and the already existing recreational cycling

[117] Statistical Yearbook 2018, CBS, available on: https://www.dzs.hr/Hrv_Eng/ljetopis/2018/sljh2018.pdf

[118] Tourist Bord of the island Zlarin, avialable on: https://www.tz-zlarin.hr/

routes. In addition, motor traffic on such islands often does not exist or is negligible, so cycling on existing local roads does not pose a safety hazard. The benefit of establishing a public bicycle system is manifested by stimulating tourist travelers not to come to the island by car (where possible) because the public bicycle system provides an efficient, attractive, and cost-effective way to travel within the island. Namely, the price of a ticket for car transport by ferry is significantly more expensive than a ticket for passengers without a vehicle, which can be an additional motive for the successful acceptance of the public bicycle system by users. The implementation of the public bicycle system will have a positive effect on the quality of the environment and on the health of the island's inhabitants due to reduced emissions and lower noise levels. This can positively affect the development of tourism due to the increasing attractiveness of the island.

In addition to building a public bicycle terminal on the island, with the aim of developing cycling tourism, it is important to offer users and accompanying facilities, such as accommodation units, restaurants, service facilities, organized tours, thematic routes and maps with all offered routes, and lectures for children and adults about safe cycling[119]. It is also equally important to carry out adequate marketing activities in order to inform users that such a transport service exists. It is necessary to inform passengers in seaports in larger cities on the mainland, which are often the starting and ending point of maritime transport for trips to Croatian islands. Information should also be provided through various communication channels such as websites, applications, travel agencies and institutions, when buying tickets for a ferry, boat, etc.

In order to implement a successful system of public bicycles on the island, the priority is to set up public bicycle terminals in the area of seaports and other points of interest where there is increased human turnover in such a way as to cover the entire island area in the long run. The installation of public bicycle terminals in populated areas should be carried out with a distance between stops of about 500 meters, which, according to international research, is an acceptable walking distance between the terminals. Considering the already existing recreational bike paths on the island of Zlarin, it is proposed to set up a terminal in the area of Marina Zlarin, near Cape Martin (or the end of the bike path Put Polja), in the museum Koralj, Church of Our Lady of Rašelj, near the observation post Zlarin and area of trade Antonia. These locations are located along the existing recreational bike trails and near the points of interest of the island settlement.

In the areas of larger islands, with more intensive motor traffic, as a precondition for optimal use of the potential of the public bicycle system, it is necessary to improve the bicycle network. Otherwise, even the best designed public bicycle system will not achieve a satisfactory effect.

[119] Zoran Klaric, Phd, Institut za turizam, *Action plan for the development of cyclotourism*, available on: http://sindikatbiciklista.hr/wp-content/uploads/2015/12/cyclotourism_2015.compressed.pdf

Potential participants in the implementation of the pilot project for the implementation of public bicycle systems on Group I islands are local self-government units, i.e., in this case, the City of Šibenik, with the support of the Ministry of the Sea, Transport and Infrastructure and the Ministry of Regional Development and EU Funds. A potential provider of public bicycle rental services can be a private company or a local self-government unit (organizational unit in charge of utilities and transport).

Activities and time period of pilot project implementation

Given that certain improvement measures, due to the nature of the transport system, are interdependent, a framework proposal of the action plan for the implementation of the pilot project has been defined. The implementation plan proposes a period of implementation depending on the complexity of each measure. Given that the implementation of the public bicycle system is a relatively simple process that does not require significant infrastructural prerequisites, the implementation of the entire public bicycle system in the island of Zlarin, as well as other Group I islands, is possible in the short term, or until the end of 2024.

A prerequisite for the implementation of a pilot project is the preparation of project documentation, i.e. a feasibility study and/or a study that must provide implementing measures with specific deadlines and phases of implementation. It must include a demand analysis to define locations, number of stops and the optimal number of public bicycles at each stop in order to establish a quality service that is financially feasible (with potential co-financing of pilot project implementation from city, county, national and/or European level) in individual stages of development.

8.3.3.2 *Pilot project for Group II islands (from 500 to 5.000) – Establishment of a public bus transport system with alternative propulsion*

Area of implementation of the pilot project

The pilot area refers to Group II islands with from 500 to 5.000 inhabitants, and as a representative island within that group was chosen the island of Cres with 3.079 inhabitants and an area of 405,78 km^2, or population density of 7,6 inhabitants/km^2.[120] Cres has an extremely rich history which, along with the diverse and preserved natural heritage, attracts foreign and domestic tourists. Based on the analysis of the demand for the transport of Italian passengers, described in Chapter 4.1, it can be seen that the island of Cres is one of the most common destinations for Italian tourists coming to the territory of the Republic of Croatia.

Cres is an island located in the Kvarner Bay and is the largest Croatian island in area. It is well connected with the northern coast and Istria. The island of Cres can be reached by ferry line Brestova (Istria) - Porozina (Cres) and ferry line Valbiska (Krk) - Merag (Cres). The island is

[120] Statistical Yearbook 2018, CBS, available on: https://www.dzs.hr/Hrv_Eng/ljetopis/2018/sljh2018.pdf

well connected by sea transport with an average of 165 departures of sea lines per week, which allows residents and tourists to frequently arrive and depart from the island. Also, in the area of the island there is a service of public bus transport of passengers in the form of county and inter-county lines with an average of 20 daily departures in the area of the island, which are mainly in the function of long-distance travel. There is no communal bus transport system on Cres organized according to local needs. The island also offers the possibility of renting bicycles and e-scooters, but through private renters, and not through the public utility service. Car taxi and boat-taxi services are also offered.

The spatial specificity of the island of Cres is the road connection with the island of Mali Lošinj via the Osor bridge, which provides a road connection that facilitates the transport of passengers and goods between the two islands. Consequently, in the context of the implementation of one of the public passenger transport systems, it is necessary to consider the island of Cres and Mali Lošinj as one traffic unit.

Considering the area and population of the island, the dispersion of settlements, villages and hamlets throughout the island is evident. Such a spatial-demographic situation is characteristic of the Group I and II islands, and even the Group III islands, and it adversely affects the profitability of the introduction of the classic service of public regular passenger transport.

Description and goal of the pilot project

To establish and develop traffic multimodality on the island of Cres, Mali Lošinj and other Group II islands with similar spatial-demographic and tourist characteristics, it is proposed to establish a system of public bus transport with alternative propulsion vehicles whose function will be to connect seaports and the largest settlements and tourist destinations on the island. To create an attractive and efficient transport service, it is necessary to plan and organize bus lines in a way that is consistent with the departures and arrivals of sea routes on the island.

Given the biodiversity and good preservation of natural sights on the island, it is proposed to exploit the service with buses on alternative fuels with zero-rate emissions of harmful gases and particles, in accordance with the optimal energy source. This ensures a reduced level of environmental and operational costs and increases the attractiveness of the service itself, which is in line with new trends in the field of mobility. Consequently, in addition to the introduction of transport services, it is necessary to build ancillary infrastructure for charging, service, and accommodation of vehicles. Reducing energy consumption and CO_2 levels is in line with the objectives of the European Green Deal.

The establishment of such a passenger transport system will increase the mobility of residents and tourists on the island with numerous positive effects on the environment and the attractiveness of the island, as well as the health of residents. A quality, efficient and harmonized public transport system on the island will consequently reduce the need for passenger cars for traffic on the island, which will consequently reduce their use, and thus the external costs generated by road motor traffic (congestion, traffic accidents, traffic

delays, etc.). Also, by increasing the mobility of the local population and tourists and increasing the availability of tourist facilities, it will have a positive impact on the economic and tourist activities of the island. Given that the price of passenger car transport by ferry is high, the implementation of an alternative public bus system will encourage the arrival of tourists on the island without a car, which will significantly reduce the cost of accessibility of the island.

The aim of the implementation of the public transport system on the island is to motivate users, primarily tourists, to come to the island without a car, without reducing the level of mobility.

In order to develop traffic multimodality and to increase the efficiency of transport services, with the introduction of new municipal bus lines, it is proposed to build a terminal of public bicycle systems in seaports, in accordance with the proposed measure in the pilot project for Group I islands. This would ensure an alternative to transport and even greater passenger mobility, especially for areas not covered by the new bus lines. The public bicycle system and the bus passenger transport system are complementary, i.e., they do not create direct competition with each other on the transport market.

Potential participants in the implementation of the pilot project for the implementation of bus lines powered by alternative fuels and the implementation of public bicycle systems are local governments on the islands of Cres and Mali Lošinj, with the support of the Ministry of the Sea, Transport and Infrastructure, Ministry of Regional Development and EU Funds and Coastal Liner Shipping Agency for the harmonization of maritime and bus lines. A potential service provider in the field of pilot project implementation can be a local self-government unit (organizational unit in charge of utilities and transport) in cooperation with a private company that provides bus transport services.

Activities and time period of pilot project implementation

Considering the proposed improvement measures in the area of the island and the very complexity of introducing a comprehensive public transport system, a framework proposal for the implementation plan of the pilot project has been defined. The implementation period is defined as follows:

- Short-term (until the end of 2023):
  - preparation of a sector study for the implementation of the municipal regular bus transport system in the island area,
  - implementation of one bus line harmonized with the maritime transport timetable in the area of the port of Porozina (Porozina - Dragozetići - Cres - Stivan - Miholašćica - Martinšćica),
- Mid-term (until 2027):

- implementation of a larger number of bus lines in the entire island area with harmonization of the timetable with maritime transport and other bus lines, and below are the proposed routes of bus lines:
  - Porozina – Dragozetići – Cres – Stivan – Miholašćica – Martinšćica,
  - Merag – Cres – Mali Podol - Lubenice – Valun – Pernat,
  - Porozina – Cres – Belej – Osor – Nerezine – Mali Lošinj – Veli Lošinj,
  - Punta Križa – Osor – Belej – Cres – Vodice – Sv. Petar – Beli,
  - Stanić – Merag – Cres – Vodice – Porozina.[121]

- Long-term (until 2030):
  - construction of intermodal hubs in the areas of seaports with the availability of maritime, bus and bicycle transport services with harmonized timetables between sea and bus lines,
  - intermodal hubs in the area of the seaports Porozina and Merag and in the cities of Cres, Lubenice, Valun.

A prerequisite for the implementation of a pilot project is the preparation of project documentation, i.e., a feasibility study and/or a study that must provide implementing measures with specific deadlines and phases of implementation. It must include a demand analysis to define locations, number of stops and optimal transport capacity on each line, in order to establish a quality service that is financially feasible (with potential co-financing of pilot project implementation from city, county, national and/or European level) in individual stages of development.

8.3.3.3 *Pilot project for Group III islands (more than 5.000 inhabitants)*

Construction of a Park&Ride terminal in the area of seaports that allows users to park vehicles for a longer period and use maritime transport in the price of a parking ticket

Area of implementation of the pilot project

The pilot project implementation area refers to Group III islands with more than 5.000 inhabitants. The island of Brač with 13.956 inhabitants and an area of 394,57 km^2, i.e., a population density of 35,37 inhabitants/km^2, was taken as a representative island.

Brač is the largest island in Dalmatia and the third largest Croatian island. It is best known for the beach Zlatni rat on Bol and the Brač stone that was used to build many famous buildings in the world. Brač attracts many tourists, which, according to the results of the analysis of the demand for the transport of Italian passengers described in Chapter 4.1, is reflected in the number of arrivals of Italian tourists.

[121] The proposed lines are not final defined lines. Through the implementation of the feasibility study, it is necessary to determine possible lines for performing the bus transport service.

The analysis of the traffic offer on the island established that the island of Brač is connected to nine destinations via state ferry, high-speed lines and non-public service lines, which have an average of 133 departures per week. There is also a regular bus service on the island, which has about 36 daily departures, taxi service, boat taxi service, and e-scooter rental service. Bicycle paths are not developed in the function of mobility for the needs of everyday travel but are used for recreational purposes.

The Group III islands, as well as the island of Brač, compared to other islands, is characterized by a relatively high level of population density, but also a partial dispersion of settlements and villages on the island, which requires the use of motorized vehicles for everyday travel. The island of Brač, as well as other Group III islands has a developed road infrastructure because most of the mobility on the island has so far focused on road traffic. Given their spatial-demographic and tourist indicators, the Group III islands have a clear potential for the development of the Park&Ride system.

Description and goal of the pilot project

In order to improve multimodality in the island, it is proposed to develop a Park&Ride system in the area of seaports and on the outskirts of island settlements with adequate parking capacity and acceptable parking tariff provisions. Since on the Group III islands there are various public transport services, the construction of Park&Ride terminals in the island will serve as a tool to encourage the use of alternative modes of transport in order to reduce the number of personal car trips in the island. For passengers arriving on the island by ferry and car, the Park&Ride terminal will enable parking of vehicles within the port and the continuation of travel to the largest settlements and tourist destinations by other forms of transport. Such a way of redistributing travel will reduce the pressure of road motor vehicles on settlements on the island.

With the establishment of the Park&Ride system, it is necessary to introduce restrictive parking provisions in larger settlements on the island. In other words, it is necessary to introduce a parking fee for commercial users with reasonable prices to discourage tourists from coming by car to island settlements. Accordingly, the price of the Park&Ride service must be lower than the parking price.

The benefit of implementing the Park&Ride system is manifested through stimulating tourists to use alternative modes of transport on the island, and less personal cars. This contributes to improving the quality of the environment on the island with the reduction of harmful gas emissions and lower noise levels, as well as the reduction of traffic congestion caused by excessive use of personal vehicles.

Given that the establishment of an integrated tariff system is not expected in the short-term period, it is important to promote and inform passengers about the benefits and opportunities of the Park&Ride system for a particular area. It is necessary to inform passengers about the service at the seaports in larger cities on the mainland, which are often the starting and ending point for trips to Croatian islands. Information should also be

provided through various communication channels such as websites, applications, travel agencies and institutions, when buying tickets for a ferry, boat, etc.

To build and successfully implement the Park&Ride system, it is important to ensure sufficient parking capacity in seaports and the outer parts of island settlements and equip it with public bicycle systems (electric if necessary, depending on the topographic characteristics of the island), car sharing system, public transport system (alternatively powered buses) etc. It is important to emphasize that the pilot projects described for Group I and II can also be implemented on Group III islands as a complement to this pilot project, as they do not create significant competition between transport services but are complementary. Considering the connection with the mainland and neighbouring islands, as priority locations for the construction of Park&Ride terminals are proposed:

- Port Supetar,
- Port Sumartin,
- Port Milna,
- Port Sutivan and
- Port Bol.

In the case of island-to-island travel, the development of the Park&Ride service can reduce car transport by ferry, which can establish other, high-speed lines that will, at higher speed, provide shorter travel times between islands or islands and the mainland and enhance transport accessibility and connectivity. The main goal of the pilot project is to regulate internal road traffic and reduce the use of personal vehicles on Group III islands.

Potential participants in the implementation of the pilot project on Group III islands are local self-government units, i.e., the Municipality of Bol, the Municipality of Milna, the City of Supetar and the Municipality of Sutivan and their municipal offices for communal arrangement and parking. The connection of Park&Ride locations should be carried out in cooperation with public transport service providers on the island, with the support of the Ministry of the Sea, Transport and Infrastructure and the Ministry of Regional Development and European Union Funds. A potential provider of public bicycle rental services at the terminal can be a private company or a local government unit (organizational unit in charge of communal utilities and transport). For the future establishment of an integrated tariff system, it is necessary to form a transport administration, i.e., a public body that will unite the stakeholders of other transport subsystems.

Activities and time period of pilot project implementation

A precondition for the implementation of a pilot project is the preparation of project documentation, i.e., a feasibility study and/or a study that must provide implementing measures with specific deadlines and phases of implementation. It must contain an analysis of the existing offer of public transport services, as well as the potential of transport demand, the number of vehicles on the island, the occupancy of parking spaces per hour,

vehicle retention times and vehicle changes per parking space. Accordingly, it is necessary to define the locations of Park&Ride terminals, the number of parking spaces and the optimal offer of public transport services at each terminal, in order to establish quality service that is financially feasible (with potential co-financing of pilot project implementation from city, county, national and/or European level) in certain stages of development.

Considering that certain improvement measures, due to the nature of the transport system, are interdependent, a framework proposal of the action plan for the implementation of the pilot project has been defined:

- In the short term, it is planned to develop a sectoral implementation plan for the establishment of the Park&Ride system on the island.
- In the medium term, it is necessary to provide the necessary parking capacity as a prerequisite for the implementation of the Park&Ride system. If there are already areas in the seaports that are adequate for parking, greater dynamics of project implementation is possible. In parallel with the construction of the Park&Ride car park, it is necessary to establish an adequate system of public bicycles at the newly built Park&Ride terminals
- In the long run, it is planned to define and establish an integrated tariff policy at the local level between parking service providers, maritime carriers, bus transport operators, public bicycle service providers and competent institutions.

Establishment of an international maritime line between the Group III islands and Italy

Area of implementation of the pilot project

The pilot area refers to Group III islands with more than 5.000 inhabitants. The island of Korčula with 15.522 inhabitants and an area of 276,03 km^2, i.e., a population density of 56,23 st/km^2[122], was taken as a representative island.

The island is known for its knights' games, world explorer Marco Polo and other cultural and historical heritage, which is why it attracts many tourists, which, according to the results of the analysis of the demand for the transport of Italian passengers described in Chapter 4.1, is reflected in the number of arrivals of Italian tourists.

The analysis of the traffic offer on the island established that the island of Korčula is connected to 11 destinations via state ferry, high-speed lines and non-public service lines, which have an average of about 221 departures per week. On the island itself, there is a bus service available with an average of about 38 daily departures, taxi service, boat taxi service, and e-scooter rental service. Bicycle paths are not developed in the function of mobility for the needs of everyday travel but are used for recreational purposes.

[122] Statistical Yearbook 2018, CBS, available on: https://www.dzs.hr/Hrv_Eng/ljetopis/2018/sljh2018.pdf

Considering their spatial-demographic and tourist indicators, the Group III islands have a clear potential to establish new international maritime transport lines to Italy.

Description and goal of the pilot project

To achieve better connections between Italy and Croatia and a larger number of arrivals of potential Italian tourists to the Group III islands, it is proposed to establish international maritime lines between the Group III islands and Italy, in this case the establishment of an international maritime line on the route Korčula - Pescara.

Currently established maritime lines between Italy and Croatia are:

- Venice – Pula,
- Venice – Rovinj,
- Venice – Poreč,
- Venice – Mali Lošinj,
- Cesenatico – Mali Lošinj – Novalja,
- Cesenatico – Rovinj,
- Pesaro – Mali Lošinj,
- Ancona – Split,
- Bari – Dubrovnik.

It is obvious that in southern Dalmatia there are only two maritime lines that connect Italy and Croatia, which is one of the reasons for choosing the island of Korčula for this pilot project.

With the establishment of new international lines between the Group III islands and Italy, a better connection between southern Dalmatia and the southern part of Italy will be achieved, and an increase in the number of arrivals of Italian tourists to Croatia, i.e., southern Dalmatia is expected.

In order to reach a larger number of users of the newly introduced international lines, it is important to promote and inform passengers about their establishment. Information needs to be provided through various communication channels such as websites, applications, travel agencies and institutions, television, and radio. It is necessary to inform passengers at seaports in larger cities on the mainland, which are often the starting and ending point for trips to Croatian islands.

Potential participants in the implementation of the pilot project of establishing an international maritime line between the Group III islands and Italy are local self-government units, i.e., the City of Korčula and the City of Pescara, a provider of international maritime transport and port authorities, with the support of the Ministry of the Sea, Transport and Infrastructure and the Ministry of Regional Development and EU Funds and other competent institutions in charge of transport on the Italian side.

Activities and time period of pilot project implementation

A precondition for the implementation of a pilot project is the preparation of project documentation, i.e., a feasibility study and/or a study that must provide implementing measures with specific deadlines and phases of implementation. It must contain an analysis of the existing supply of international maritime transport lines, the number of arrivals of Italian tourists, as well as the potential of future demand according to which the capacity of the new transport service is defined. Accordingly, to further develop the international maritime connection between Italy and Croatia, it is necessary to define cities between which an international maritime line would be established, with an optimal number of arrivals and departures, with the aim of establishing a quality service that is financially feasible (with potential co-financing city, county, national and/or European levels) in individual stages of development.

Given that the introduction of new international maritime transport lines is a relatively simple process that does not require significant infrastructural prerequisites, the implementation of an international maritime line on the route Korčula - Pescara is possible in the short term, i.e., until the end of 2024.

8.3.4 Concluding remarks

The proposed pilot projects to improve the application of new models/solutions of the multimodal mode of transport on Croatian islands for all three groups of islands have an emphasis on the use of means of transport with lower CO_2 emissions.

Pilot projects have been unified, i.e., they can be replicated to other Croatian islands. Also, in order to develop transport multimodality, pilot projects are designed in such a way that the proposed measures for Group I islands can be applied to Group II and III islands, while the proposed measures for Group II islands can also be applied to Group III islands.

All three (four) proposed pilot projects contribute to increasing mobility, improving the quality of the environment on the island while reducing greenhouse gas emissions and lower noise levels, as well as improving the quality of life of the local population. Also, the implementation of the proposed pilot projects will increase the mobility of local people and tourists, the availability of tourist facilities and will have a positive impact on the economic and tourist activities of the island.

In order for all pilot projects to be successfully implemented, the precondition for implementation is the preparation of sectoral or implementation studies or a traffic study for each of the proposed pilot projects. The sector study must provide a detailed needs analysis and implementation measure with specific deadlines and stages of implementation to establish a quality service that is financially feasible (with potential co-financing of pilot project implementation from city, county, national and/or European level) in individual stages of development.

9 Conclusion

The development of a multimodal transport mode is extremely important for the sustainable development of society, primarily the economy. Excessive development of the transport system, exclusively in the direction of building infrastructure for the needs of road transport and passenger cars, causes significant costs borne by society as a whole. The costs in question arise mainly in the context of the negative impact of traffic on the environment and health, time losses due to traffic congestion, increased risk of accidents, occupation of space and reducing its attractiveness. Consequently, there are limitations to road transport in terms of economic viability and efficiency in relation to transport performance.

One possible way to address the growing range of transport challenges is to develop a multimodal mode of transport. A multimodal transport system is a form of integration of different transport subsystems that allows the user to travel easily, reliably and efficiently from the starting point to the destination by different, but harmonized, modes of transport. Multimodality uses the advantages of individual modes of transport and by combining them with each other greatly minimizes their disadvantages. However, the development of multimodality, especially in low-density areas such as islands, poses a major challenge.

Island areas provide a higher quality of life due to a cleaner environment, natural beauty, and lower levels of stress for the local population, which are also the main reasons for tourists to come to such areas. The characteristics of island settlements are dispersion and inaccessibility of the area. According to the conducted analysis, the average population density of the island is only 49 inhabitants/km^2, which is significantly less than the average of the Republic of Croatia. The consequence is insufficient traffic development, lack of options in choosing the mode of transport and a low level of mobility that is oriented mainly to the passenger car. Consequently, the potential of island areas is not fully exploited, there is a negative demographic trend marked by a significant trend of emigration, and tourist attendance is lower than visits to mainland areas.

In addition, the entire public transport on the Croatian islands is not financially sustainable, which is why it is subsidized by the state.

In order to improve the accessibility, attractiveness and quality of life of island areas, it is important to plan and organize a sustainable transport system such as public passenger transport or micromobility systems. Namely, sustainable transport systems are necessary to achieve a higher level of mobility and enable residents and visitors not to depend solely on passenger cars.

Planning and organizing sustainable transport systems in island areas is a complex process. Transport demand on the islands is often low, making it difficult to establish and launch a financially viable public transport system or to develop alternative mobility systems such as the public bicycle system. Since there is a close correlation between population density and the quality of public transport services, it is clear that the development of such a service for

island areas must rely solely on better planning of transport services in order to optimize the cost-benefit ratio. Given that large investments in the development of transport infrastructure on islands are often not financially or economically viable, to increase the quality of transport services it is necessary to improve the organization of existing transport processes such as harmonization of bus and sea lines, encourage bike on boat services, public bike system services, etc.

As a solution to these challenges, the development of multimodal passenger transport is imposed, which neutralizes the shortcomings of individual transport subsystems and ensures greater benefits for all road users. Multimodal passenger transport basically increases the utilization of transport supply capacity and thus reduces transport costs, which is extremely important for areas with low population density. The advantages of multimodal passenger transport are better connectivity of different forms of transport, greater accessibility of the area, shortened transfer time, reduced ticket prices and ease of use. Such a development of the transport service increases the cost-effectiveness of public transport subsystems compared to passenger car transport, thus encouraging the transformation of modal distribution in favor of sustainable modes of transport.

Experiences that can be taken into account when planning the implementation of multimodal solutions also derive from the results of the primary research conducted within this Analysis. Namely, during traffic planning, travel experiences by passengers gained through the use of existing transport systems are extremely important. Such an attitude towards mobility ensures a better understanding of user needs and optimal planning of future transport services.

Taking into account the integrity of the activities carried out within the development, this Multimodality Analysis is a quality basis for further development of multimodal transport solutions in the context of improving mobility on the Croatian islands and their connection with Italy.

10 Recommendations

For the successful development of a sustainable and multimodal transport system in accordance with the objectives of the MIMOSA project, it is proposed to systematically promote the implementation of multimodal sustainable solutions and passenger transport services using vehicles with lower CO2 emissions and continuously implement planning and monitoring activities. For the sake of clarity, the recommendations are set out below.

1.	**Establishment of an integrated and shared database and quality data collection mechanisms**
	Systematic data collection is necessary to guide the further development of multimodal transport solutions, but also to monitor the success of the implementation process of future multimodal transport solutions.
2.	**Mutual coordination and communication of all relevant stakeholders at local (municipal or city), county and national level**
	In order to ensure the preconditions for the implementation of the entire process of implementation of sustainable and multimodal transport solutions, it is necessary to involve all relevant stakeholders that directly or indirectly affect the development, implementation, use of multimodal solutions in the scope. The functions of coordination and management of communication among relevant stakeholders may be performed by the Transport Administration, i.e. the body responsible for the organization, development and improvement of multimodal and integrated transport. The role of the transport administration, the purpose of which is to unite and coordinate the legal, administrative and operational affairs of different transport subsystems, can be performed by the existing/new body or organizational unit within the existing body.
3.	**Promoting the benefits and positive effects of a sustainable and multimodal transport system**
	In order to provide targeted and continuous information and education to relevant stakeholders on the need to develop a multimodal transport system, it is extremely important to inform local and regional authorities about the benefits of implementing multimodal transport solutions and systems, but also the possibilities of co-financing sustainable and multimodal transport solutions. or from other possible sources of co-financing.
4.	**Encouraging the development and adoption of sustainable mobility plans in the administrative areas of local governments**

	With the aim of strategic orientation and a systematic approach to the improvement of multimodality in the area of an individual unit of local self-government, it is proposed to develop and adopt periodic plans for sustainable mobility, their monitoring and updating. Such an approach will enable, among other things, the consideration of opportunities and challenges for the development of a sustainable and multimodal transport system at the micro level.
5.	**Conditioning the implementation of modern and sustainable traffic principles in the preparation of spatial planning documentation at the county and local levels**
	Given that spatial planning documents are the basis for the implementation of infrastructure projects, it is necessary to indicate the need for spatial integration of transport subsystems in order to enable effective transport multimodality in terms of transport infrastructure.
6.	**Encouraging the development and implementation of transport sector plans at the implementation level and other project documentation necessary for the implementation of sustainable and multimodal transport solutions**
	For further implementation of measures aimed at the development of a sustainable and multimodal transport system, it is necessary to prepare the necessary project documentation, including transport studies, sector plans, feasibility and/or feasibility studies, construction project documentation, marketing plans and the like.

Annexes

Annex 1. Survey questions for tourist institutions and agencies

Annex 2. Survey questions for the purpose of field research of Italian travellers' travel habits

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Annex 5. Cartographic representations of the state of multimodal traffic solutions in Primorsko-Goranska County

Annex 6. Cartographic representations of the state of multimodal traffic solutions in Lika-Senj County

Annex 7. Cartographic representations of the state of multimodal traffic solutions in Zadar County

Annex 8. Cartographic representations of the state of multimodal traffic solutions in Šibenik-Knin County

Annex 9. Cartographic representations of the state of multimodal traffic solutions in Split-Dalmatia County

Annex 10. Cartographic representations of the state of multimodal traffic solutions in Dubrovnik-Neretva County

Annex 11. Database

Annex 1. Survey questions for tourist institutions and agencies

1) **What are the most common destination trips of Italian travelers in Croatia? – Rank at least the three most common destinations**

_____

2) **According to your knowledge and/or information available to you, which means of transport are most used by Italian travelers traveling to Croatia?**

_____

3) **What are the feedback experiences of Italian travelers traveling to Croatia on transportation services, with an emphasis on maritime transport, in both countries? (0 – bad experience, 5 – great experience)**

ITALY: 0 1 2 3 4 5,

CROATIA: 0 1 2 3 4 5.

4) **How familiar is your tourist institution/agency with the possibilities of combining different modes of transportation from the seaport to the final destination for the tourists' needs?**

   a. It is not familiar
   b. It is partially familiar
   c. It is familiar
   d. It is familiar and encourages tourists to combine different modes of transport

Respondents who are NOT familiar with the possibilities of combining different modes of transport from seaport to the final destination for the tourists' needs do NOT answer question 5).

5) **Indicate which possibilities of combining different modes of transportation are you familiar with?**

_____

6) **Comment on the quality of transportation in the destination area.**

_____

_____

7) **What are your suggestions for a possible improvement regarding the connection of maritime transport with other modes of passenger transport, which are primarily related to Italian travelers traveling to Croatian islands?**

_____

_____

8) **What are the most common reasons for Italian travelers to travel to Croatia?**

   a. Natural beauties
   b. Gastronomic offers
   c. Entertainment and festivals
   d. Destination proximity
   e. Availability of the destination by different transportation modes
   f. Value for money
   g. Other

Annex 2. Survey questions for the purpose of field research of Italian travelers' travel habits

1) **What means of transport did you use to get to the port? (it's possible to circle more answers)**
   a. Personal car
   b. Rented car
   c. Bus
   d. Taxi
   e. Camper
   f. Motorcycle
   g. Bicycle/Scooter
   h. Walking
   i. Train
   j. Ferry
   k. Passenger ship
   l. Airplane
   m. Other

2) **Are you planning to travel or have you already traveled to any of the Croatian islands during your stay?**
   a. Yes
   b. No

Respondents who do NOT plan to travel or have not traveled to Croatian islands do NOT answer questions 4, 5, 6 and 7.

3) **What means of transport do you use or plan to use to get to the islands? (it's possible to circle more answers)**
   a. Personal car
   b. Rented car
   c. Bus
   d. Taxi
   e. Camper
   f. Motorcycle
   g. Bicycle/Scooter
   h. Walking
   i. Train
   j. Ferry
   k. Passenger ship
   l. Airplane
   m. Other

4) **In your opinion, what would make your arrival on the island easier or more pleasant?**

_____

5) **What means of transport do you use or plan to use to get from the port on the island to your destination on the island? – *also applies to travel from a destination on the island to a port of boarding on the island.***

   a. I continue to travel by the same means of transport
      i. Personal car, camper or motorcycle
      ii. Bicycle/Scooter
      iii. Walking
   b. I continue my journey by other means of transport
      i. Rented car (carsharing)
      ii. Bus
      iii. Taxi
      iv. Rented bicycle/Scooter
      v. Passenger ship
      vi. Other

6) **On the island, during your stay, which modes of transport would be suitable for you? (which you do not use now)**

_____

7) **If you have visited any of the Croatian islands so far, rate the quality of the offer of different modes of transport on the island (0 – Extremely bad, 5 – Excellent)**

0 ***1*** ***2*** ***3*** ***4*** ***5***

8) **How has the Covid-19 virus pandemic affected your behavior and travel-related habits?**

   a. I travel less and spend less
   b. I travel and spend equally, as if there is no pandemic
   c. I travel and spend equally, but with changes in habits according to measures (I isolate myself more)

d. I travel and spend more

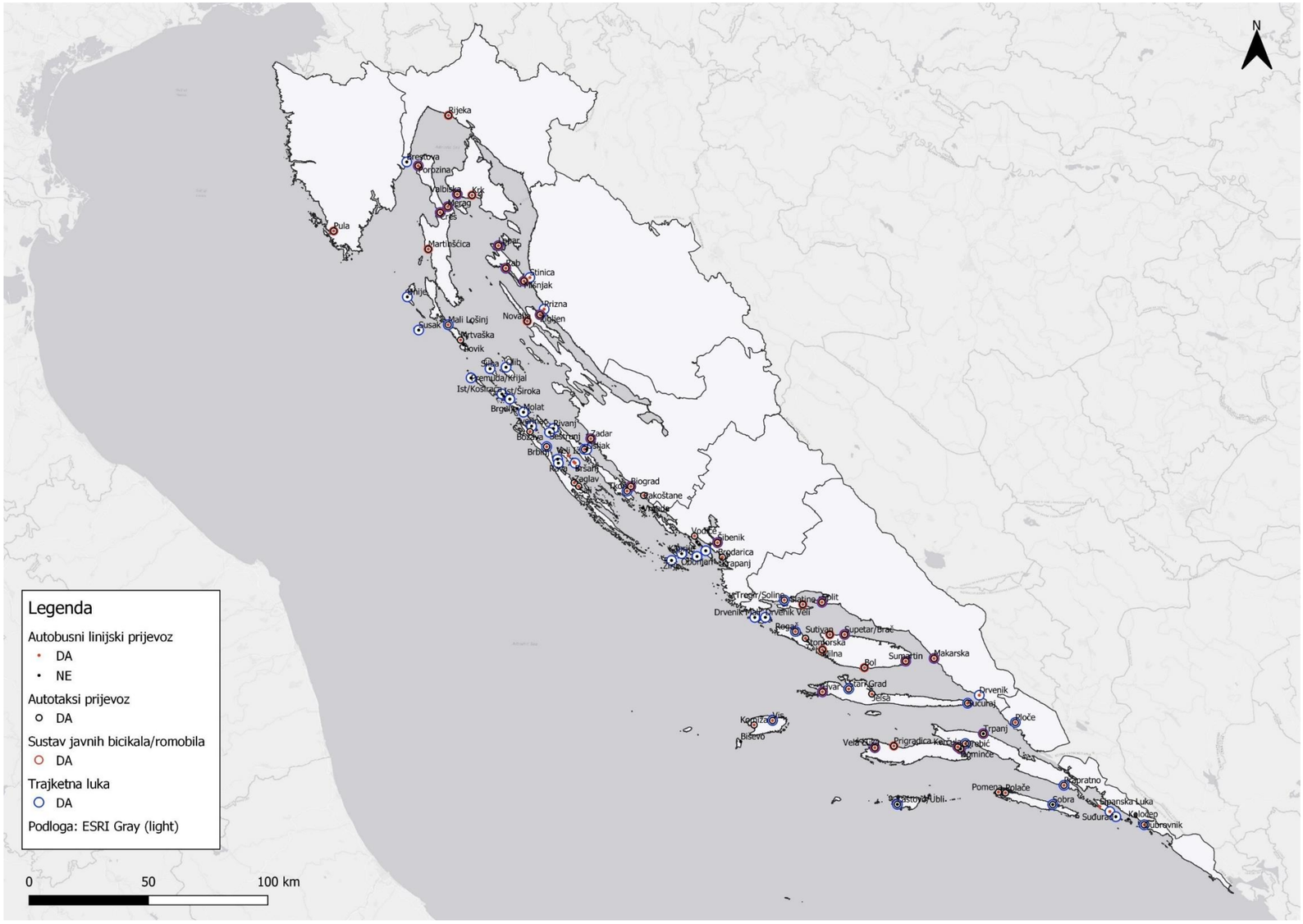
9) How much did the Covid-19 virus pandemic affect your public transportation avoidance? (0 – No impact, 5 – Strong impact)

0 ***1*** ***2*** ***3*** ***4*** ***5***

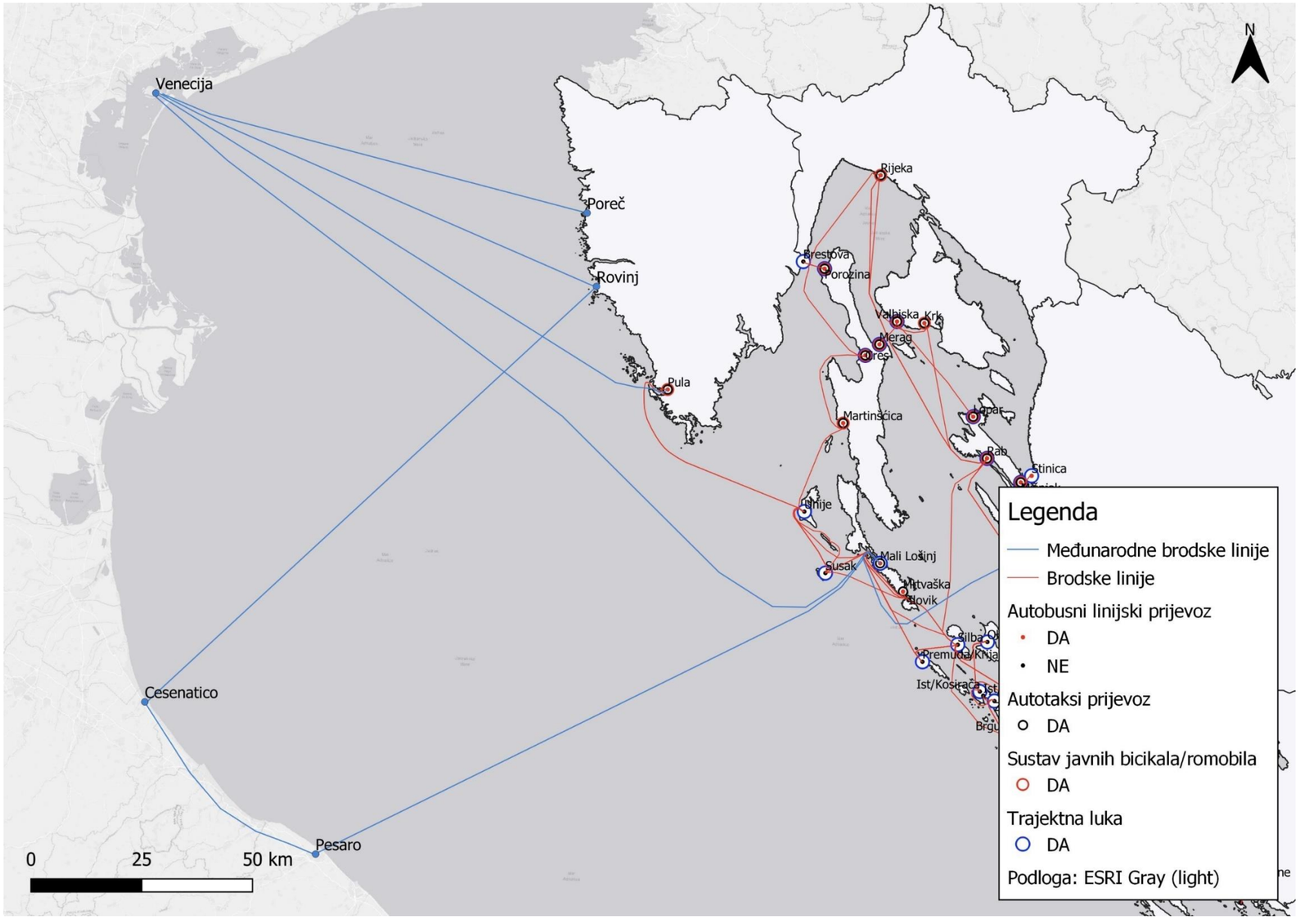
10) What is your main motive for traveling to Croatia?

a. Natural beauties
b. Gastronomic offers
c. Entertainment and festivals
d. Destination proximity
e. Availability of the destination by different transportation modes
f. Value for money
g. Other

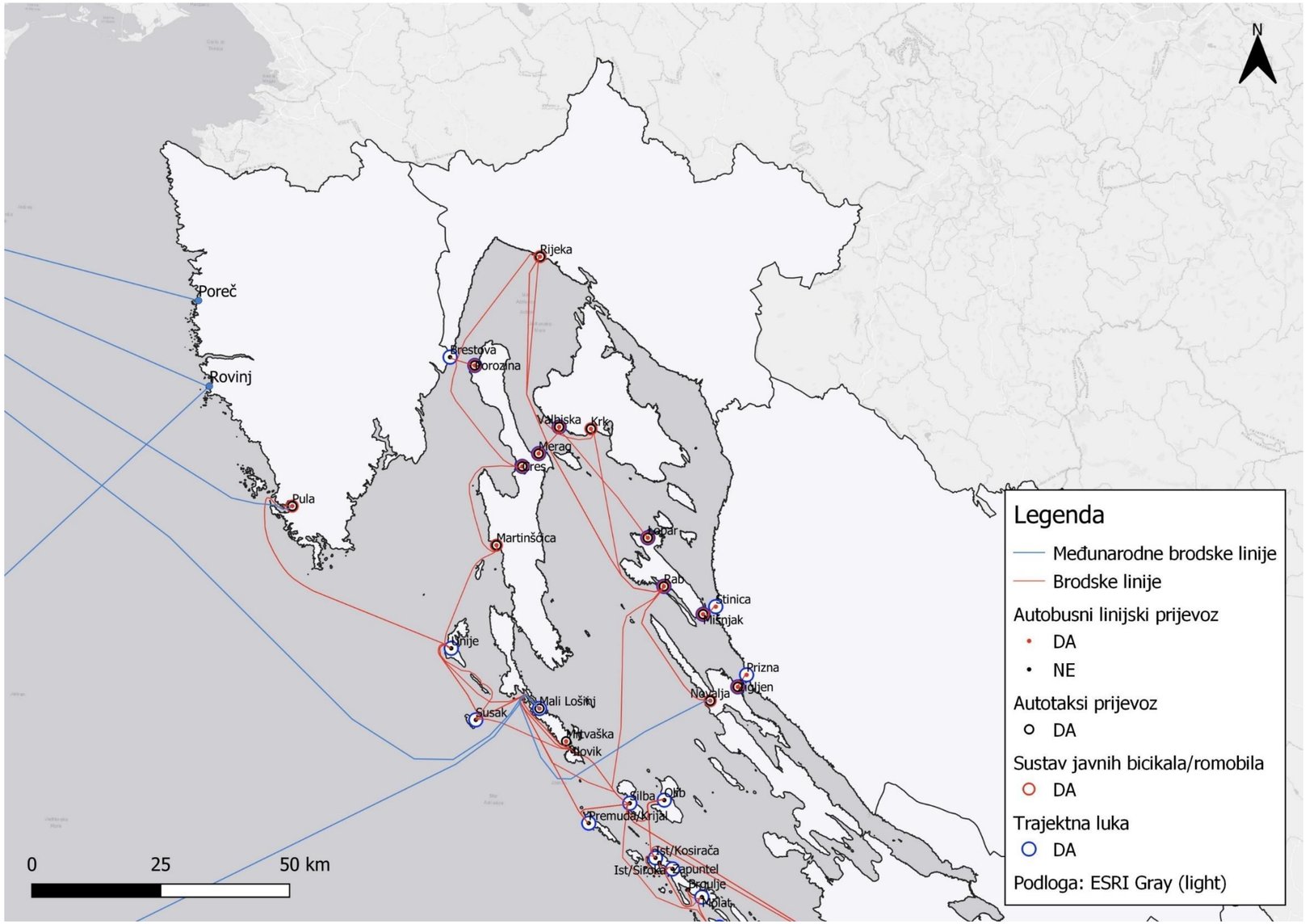
Annex 3. Cartographic representations of the state of multimodal traffic solutions in the scope of Multimodality Analysis



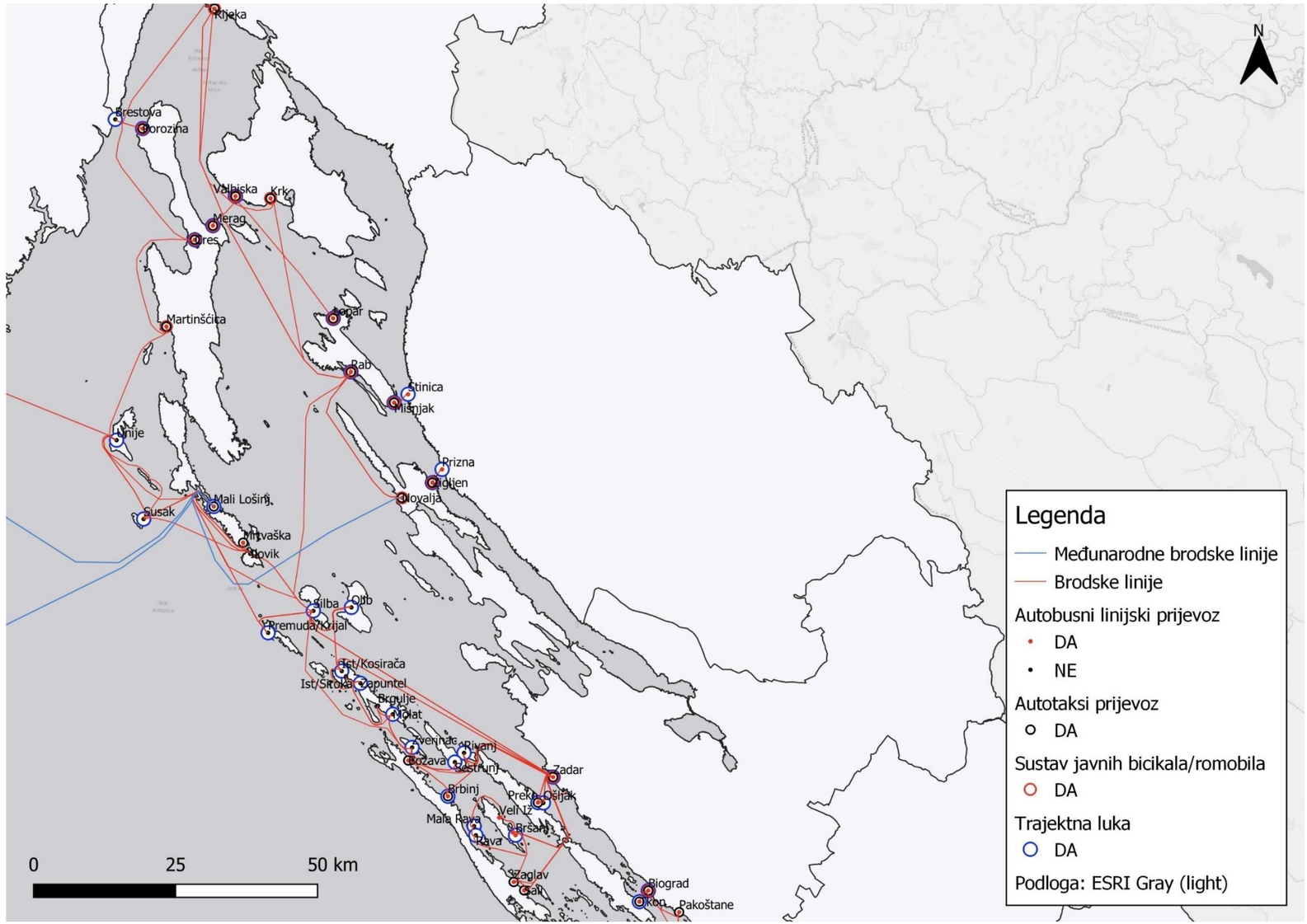
Annex 4. Cartographic representations of the state of multimodal traffic solutions in Istra County



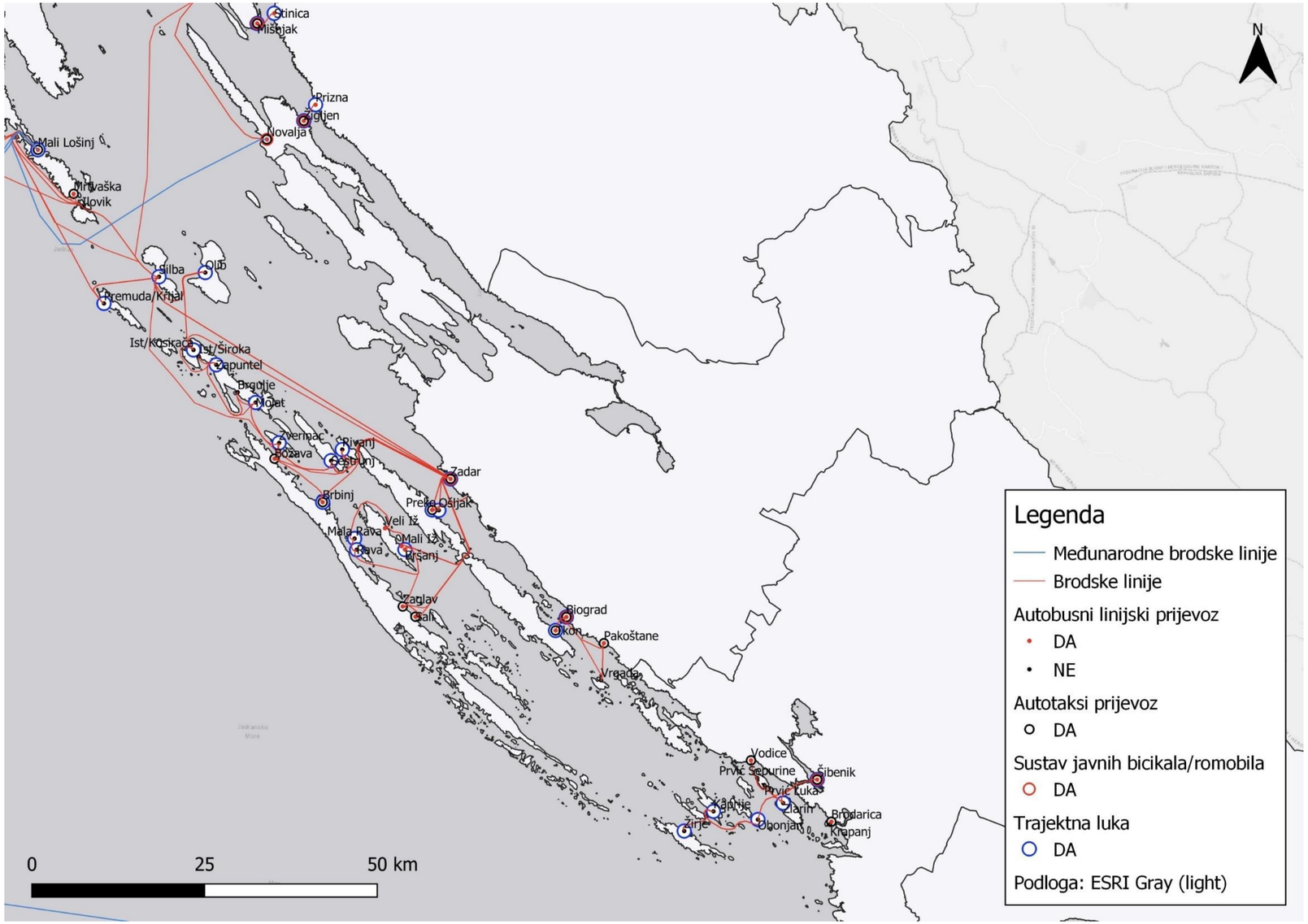
Annex 5. Cartographic representations of the state of multimodal traffic solutions in Primorsko-Goranska County



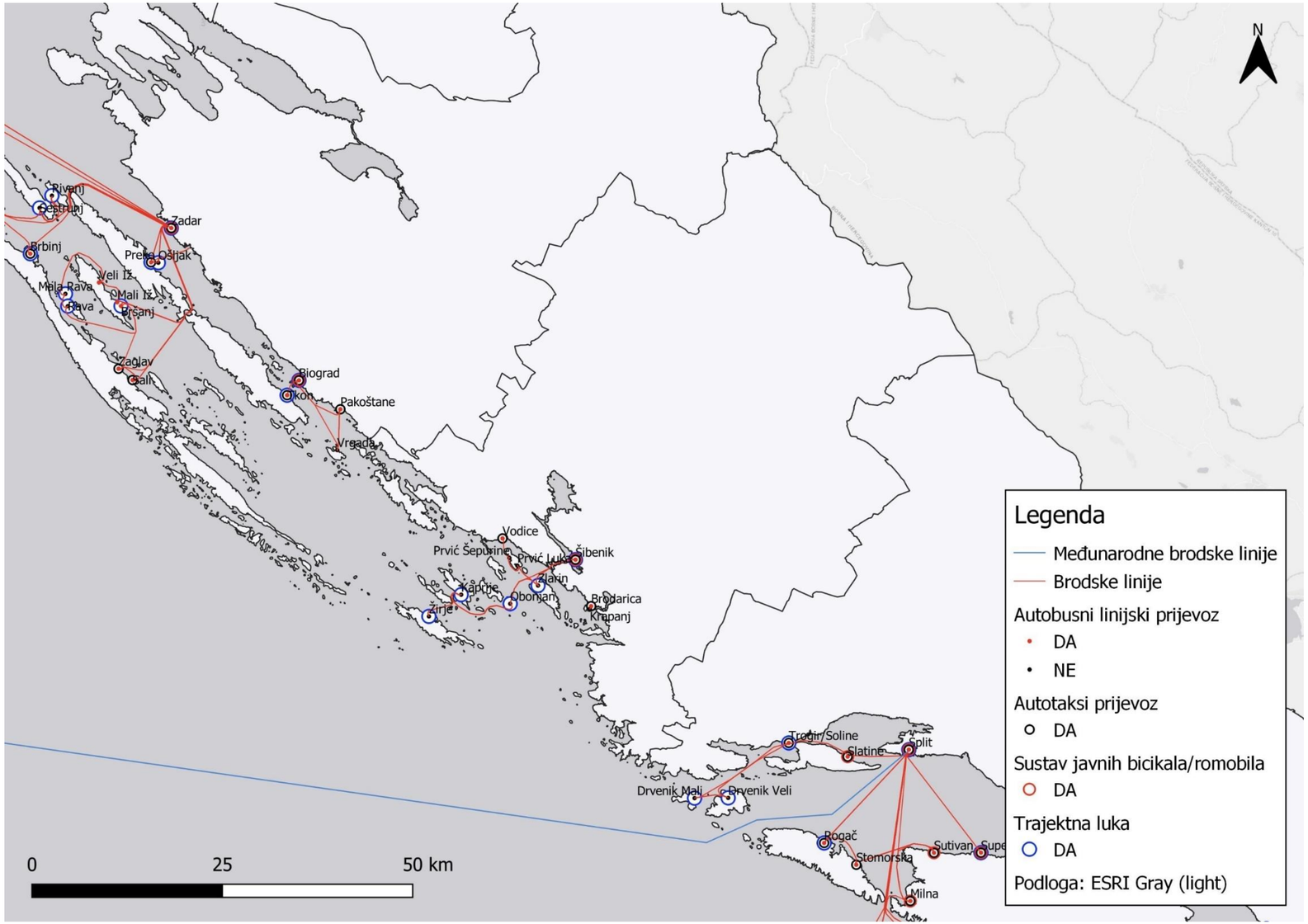
Annex 6. Cartographic representations of the state of multimodal traffic solutions in Lika-Senj County



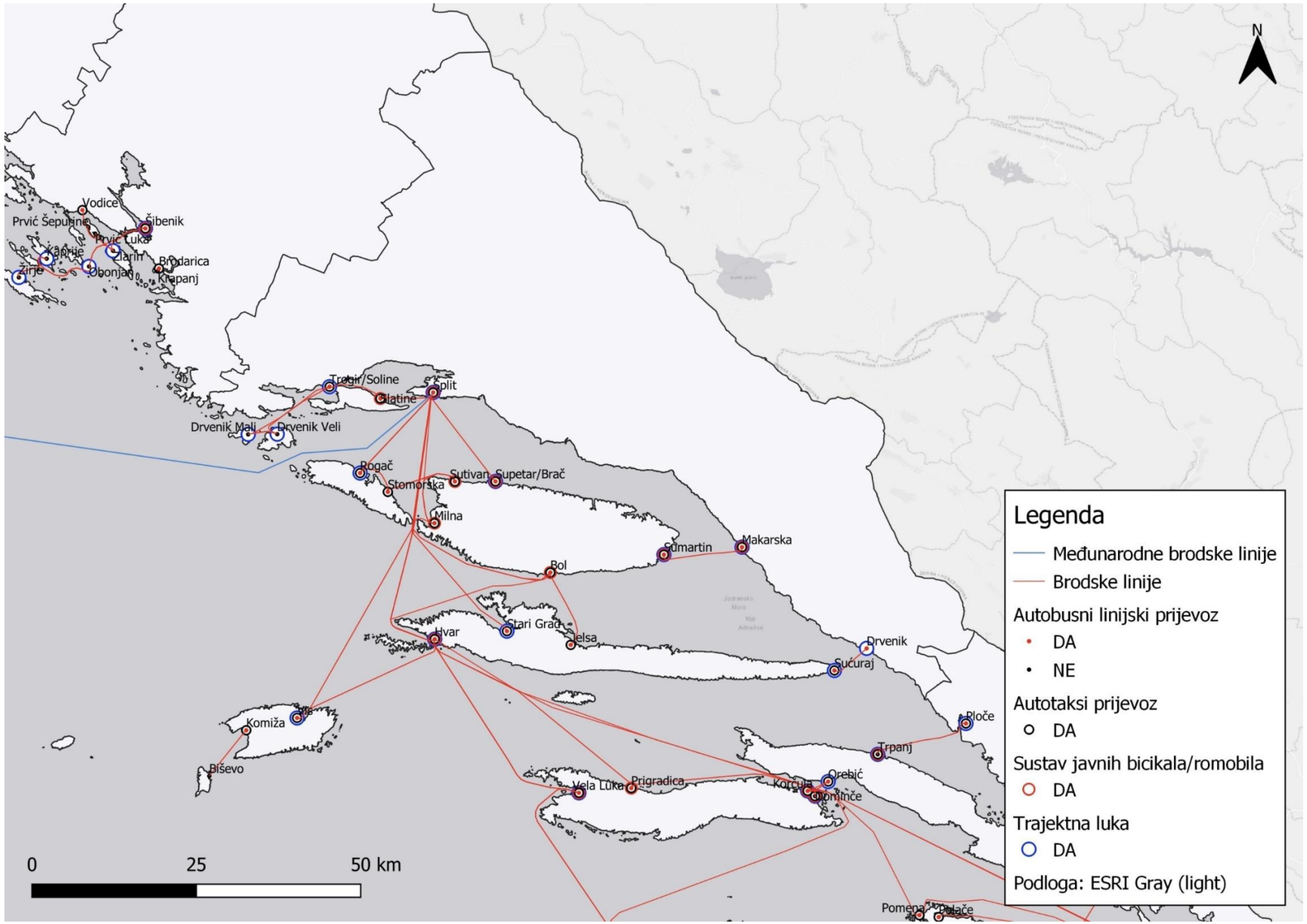
Annex 7. Cartographic representations of the state of multimodal traffic solutions in Zadar County



Annex 8. Cartographic representations of the state of multimodal traffic solutions in Šibenik-Knin County



Annex 9. Cartographic representations of the state of multimodal traffic solutions in Split-Dalmatia County



Annex 10. Carographic representations of the state of multimodal traffic solutions in Dubrovnik-Neretva Count