

D. 3.1.1. Quantitative analysis of the existing demand

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1. Aim and scope of this document

Within the overall objective of the MIMOSA project, which is to lay the foundations for improving the sustainability of cross-border transport between Italy and Croatia, this deliverable has the task of providing the knowledge base on the quantitative aspects of cross-border travel demand in the programme area. More specifically, the objectives of this document are as follows:

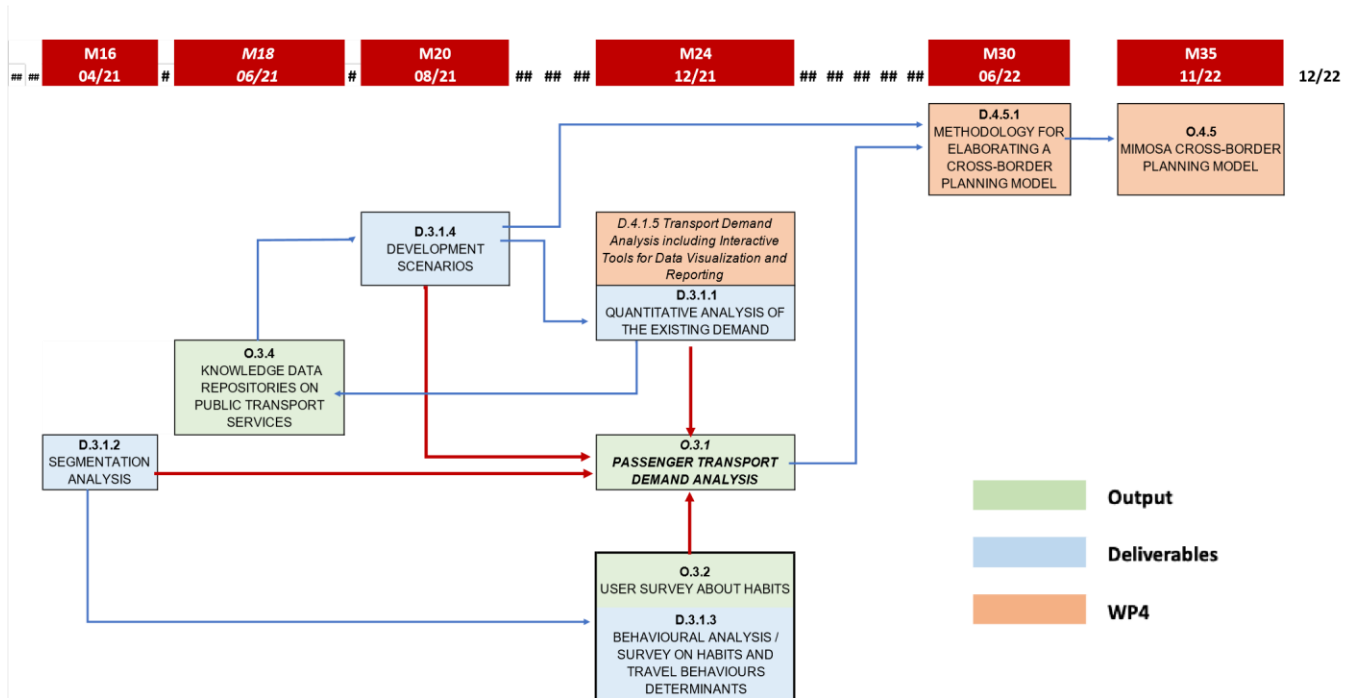
- To provide detailed data about passengers' travel in the programme area over time, disaggregated by origin & destination, travel mode, also estimating potential demand vs served demand;
- to include estimates about quantitative effect of Covid pandemic;
- to integrate and validate the scenario analysis (D3.1.4) with the updated data;
- to provide an overview of sea and ground travel alternatives through accessibility and connectivity analyses based on isochrones representation;
- to provide policy implications as for possible alternative routes development (in terms of travel efficiency).

This deliverable is part of a group of four deliverables which are at the heart of WP3 - Activity 3.1. and that, taken together, will represent the Output 3.1. of the MIMOSA project ((Passenger transport demand analysis). The report for Output 3.1. will provide the summary of the main results of the various survey activities carried out in this Activity 3.1 (i.e. this deliverable, together with D.3.1.2. - Segmentation analysis, D.3.1.4. - Scenario development, D.3.1.3. Behavioural analysis and survey about habits. See Figure 1). This deliverable, in particular, provides an up-to-date picture of both quantitative and qualitative aspects of the demand for cross-border travel between Italy and Croatia. The articulation of WP3 deliverables outputs is shown in Figure 1. Red connections highlight the connections of the 4 mentioned deliverables with the output that gathers summaries and conclusions.

The data and information collected for these activities have been included in the O.3.4 (Knowledge Data Repositories on Public Transport Services), from which they can be consulted. Regarding this document in particular, in accordance with the MIMOSA Application Form, the analysis started from the recognition of existing sources, that were used in order to build the datasets that are presently part of the O.3.4 repository and has been conceived to provide insights for the benefit of transport planning needs by the competent bodies in the program area.

This document is structured as follows. The Section 2 presents the general context, the main socio-economic variables generally considered to be the key drivers of demand for tourist travel and a summary of these main drivers for the two countries. Section 3 presents an overview of the main data on travel demand in the programme area, analysing total arrivals broken down by type (tourists and excursionists) and by country of origin, as well as a comparison between trends in the last pre-Covid year and the period 2020-first six months of 2021. Section 4 investigates available data about the travel modes and the origin and destination of travellers. The final section summarises main findings and try to sketch some policy implications among those more evident.

Figure 1. The relevance and relatedness of D. 3.1.4. with other Outputs and Deliverables of MIMOSA project



Some of the content of this deliverable overlaps with that of D.4.1.5. (Transport demand analysis including interactive tools for data visualization and reporting). Both documents are based on same data sources, however in this document we focus only on the quantitative aspects of demand that, in our view, provide insights into crucial information for the crossborder planning method and model that the MIMOSA project is expected to provide, and we include a focus on effects of Covid on transport demand. D.4.1.5. contains a descriptive overview on main data about travel demand and also includes an overall description of some qualitative aspects of demand, together with a deep insight into existing travel solutions. In this regard, the two documents are the end points of analysis having different focuses and goals.

2. Background and main travel-demand related aspects of the programme area

2.1. Overall framework of the Italy-Croatia cross border travel demand

Generally speaking, the travel demand between two neighbouring countries is a variable dependent on many factors. With particular reference to tourism flows, beyond the inherent attractiveness of destinations, and the sought benefits of travel, a summary of variables usually acknowledged in the literature for explaining the variation of tourism flows include:

(Deichmann & Liu 2017)

- Population of origin
- Income at origin

- Geographical distance
- Transportation infrastructure
- Historical and present political relationships
- Political Instability
- Price index or exchange rates of origin to destination

Among these, some groups of variables play a predominant role (Eilat 2004; Victoria Transport Policy Institute 2014; Khaderoo 2008):

- a) the political framework and relationships between the two countries (customs barriers, political, cultural, social, linguistic affinities, etc.);
- b) demographics (i.e., number of residents, education level, lifestyles, etc.);
- c) economic variables (i.e., currency value exchange, GDP, employment rate, average available income, business activity, passenger transport, tourist activity);
- d) available transport infrastructure, options, and service quality (i.e., connections infrastructures, public transit, delivery services, relative speed and delay, reliability, etc).
- e) relative prices of main transport services and related goods (i.e., fuel prices and taxes, vehicle taxes and fees, road tolls, parking fees, vehicle insurance, public transport fares).

Apart from the fact that Croatia is not yet part of the Schengen Agreement, point (a) no longer represents a significant barrier, insofar as Italy and Croatia are both European Union member states that have been long-time engaged in cooperation endeavours. Socio-cultural barriers between the two countries are becoming less and less relevant, The border controls between Italy and Croatia have an evident impact on the Slovenian border, through which visitors from most European countries come to Croatia. However, the entry of Croatia in the Schengen area is probably close to be realised, since on 9 December 2021 the European Council concluded that “Croatia has fulfilled the necessary conditions for the application of all parts of the Schengen acquis”, as a premise for “allowing for the lifting of [EU-Schengen] internal border controls.”¹

Differences in transport-related costs and tariffs are increasingly levelling out, while disparities in socio – economic development are still perceivable: the Italian side averages a GDP per capita of 27.210 Euros (but in the northern part of Italian programme area this value is significantly higher than the national average), while the Croatian side averages a GDP per

¹ Council of the European Union, 14883/21 SCH-EVAL 160 SCHENGEN 97 COMIX 622 Brussels, 9 December 2021, available at: <https://data.consilium.europa.eu/doc/document/ST-14883-2021-INIT/en/pdf> (last check: December 2021)

capita of 11.720 Euros (Data referred to 2019, Source: Eurostat). Apart from the language difference, economic relations and tourist flows are at such a level that these types of barriers can be considered irrelevant for planning purposes. On the contrary, it is reasonable to believe that visitor flows between the two countries could be significantly higher than they are today if connections were more intense and widespread.

Figure 2: Italy-Croatia Programme area



As for the Italy-Croatia Programme area (figure 2) demographics and territory, the cross – border area constitutes a territorial unit of approximately 85.562 square km and according to the last census the population equals 12.465.861 tenants. The Italian side constitutes a territorial unit of 57.221 square km with a population of 10.925.027 tenants, while the Croatian side constitutes of a territorial unit of 28.341 square km with a population of 1.540.834 tenants. This leads to the conclusion that the Italian side of the cross – border area

holds a share of 67% of the territorial area with 88% of the population (consequently the Croatian side of the cross – border area holds a share of 33% of the territorial area with 12% of the population).

Although the borders of Italy and Croatia are very close to each other (less than 30 kms), they are not directly in touch but are intersected by Slovenian territory. Both member states recognize the Adriatic Sea as a joint economic, social, and environmental asset that can be utilized as a natural platform for cooperation building on long – dating trade exchange contracts and tourism offer reflected in some common traits of cultural heritage. Both the Adriatic Sea and the coastal areas play a significant role in the development of the economy, cultural and social life of the programme area, that is the reason why they are given special attention regarding their utilization and conservation as well.

Tourism activities both in the Adriatic and respective national coastal areas are considered one of the most important industries within the area. The Italian tourism industry segment creates a contribution to national GDP with a share of 10.3% employing 2.6 million people, while the Croatian tourism industry segment creates a contribution to national GDP with a

share of 14.4% employing 83.488 people. Italian visitors represent a significant share of overall foreign visitors in Croatia (almost 1,2 million visitors in 2019, 6,8% of total foreign tourists). Presently, both the Italy and Croatia tourism industry segments strive towards advancing sustainable coastal tourism offer along with maritime and nautical tourism, cultural assets of UNESCO heritage sites, attractions around cities of influence coupled with rural and agritourism in the hinterland (The Government of the Republic of Croatia 2013; OECD iLibrary. s.d.). Although both Countries, supported by the EU, strive towards investments in improving the overall connectivity (by investing in multimodal transport systems, improving the quality of integrated destination management, enlarging tourist season and diversifying tourism offer, etc.) sustainable tourism strategies are hindered due to inadequate transportation practices. For Italians travelling to Croatia, cars represent the dominant transportation mode with a share of about 90%. Liner ships have a share of 5 - 6%, private vessels and airplanes have a share of about 2%, while coaches, busses and trains are utilized with a share of about 1-2%. Strains and bottlenecks on the cross – border area road networks are usual conditions in summer, while friendlier transportation modes such as ship, bicycle, and bus are often underutilized. Croatian visitors in Italy also utilize cars as the most dominant transportation mode, but with a very lower share (75 - 77%), coaches and buses are utilized with a share of 16-17%, airplanes have a share of 6 - 9%, trains and liner ships are utilized with a share of less than 1% and private vessels are near to zero. These differences are due to the differences in the type of travels and of destinations. Italian visitors are mainly concentrated in summer and in coastal areas while Croatian tourists over the year is much more uniform and spread on the Italian territory (mostly cities of arts). Moreover, Croatian widely use the bus and the train for day-travels. In this regard, analysis developed in the MIMOSA project for D.4.1.2. (Analysis on market potential research – with railway through Istria: route Buzet–Pula) and for D.4.1.3 (Analysing new intermodality solutions rijeka–šapjane route) have shown that a possible railway line connecting Italy to Croatia would have great potential to transfer travellers from car to train. These two studies have analyzed the market potential of two connecting railway lines integrated with intermodal transport systems. It was found that the potential number of both local and international users is such as to guarantee both the sustainability of the new routes and a decisive improvement in the accessibility of areas that are the main destinations of Italian tourists and, on the other side, of Trieste and therefore of the Italian railway network

Overall, both socio-economic trends and the actual demand trend up to 2019, before the pandemic, confirm that the demand for tourist travel from Italy to Croatia is set to increase, as is the number of excursionists, although to an extent that will strictly depend on the possible

activation of new high-speed maritime interconnections in the North Adriatic. It is also evident that: there are wide areas of improvements, specifically concerning the reduction of car use from Italy towards Croatia. We have estimated that currently about 4% of cars use Ferry for cross-border travel. Although ferry services can be increased, this does not seem to be the way to significantly reduce car traffic. Moreover, as already explained in the deliverable D.3.1.4 (scenario analysis), emission reductions are not exclusively linked to modal shift, as replacing car trips with boat or plane trips may not improve the emissions situation. The solution requires, on the one hand, innovation in ship propulsion technologies and, on the other hand, the implementation of integrated and multimodal systems combined with awareness-raising campaigns and the promotion of alternative tourism formulas (slow tourism, cycle tourism, etc.).

2.2. *Travel demand drivers in Italy and Croatia*

Table 1 reports Croatian population statistics by county (in green regions included in the Italy-Croatia programme area) concerning the main drivers for tourism: population (estimates derived from 2011 census), 2018 GDP per capita in euros, the average population age, the percentage of population with higher education. These socio-economic data are those that most of the literature agrees are significantly correlated with the demand for foreign travel, and thus express with reasonable approximation the distribution of travellers according to region of origin. Such data highlights how the city of Zagreb differs from the rest of the country. It is the most populated area (Split-Dalmatia, the second area per population, has less than the 60% of City of Zagreb inhabitants), the richest in terms of GDP per capita (Istria, the second area per GDP per capita, has less than the 70% of City of Zagreb GDP per capita), the most educated (Primorje-Gorski Kotar, the second area per population with higher education, has less than the 70% of City of Zagreb percentage of population with higher education). Figure 3 provides a graphic representation of the differences measured by the data in the Table 1.

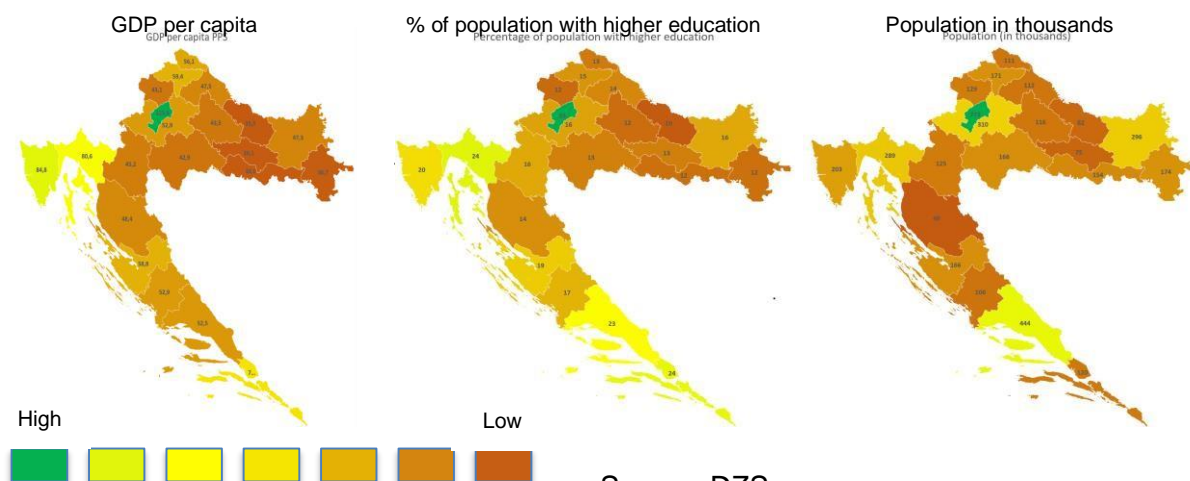
Table 1 main socio-economic travel demand drivers in Croatia by County

Administrative regions (NUTS3)	Population	GDP per capita, EUR	GDP per capita index (EU28=100)	Mean age	Population with higher education
Istria	203.000	15.570	84,8	43,0	20%
Primorje-Gorski Kotar	289.000	14.797	80,6	43,9	24%
Karlovac	125.000	8.301	45,2	44,0	16%
Lika-Senj	49.000	8.878	48,4	45,3	14%
Zadar	166.000	10.803	58,8	41,9	19%
Sibenik-Knin	106.000	9.713	52,9	44,1	17%
Split-Dalmatia	444.000	9.636	52,5	40,8	23%
Dubrovnik-Neretva	120.000	13.277	72,3	41,5	24%

Bjelovar-Bilogora	116.000	7.986	43,5	42,0	12%
Brod-Posavina	154.000	6.607	36,0	40,6	12%
Koprivnica-Križevci	112.000	8.711	47,5	41,6	14%
Krapina-Zagorje	129.000	7.919	43,1	41,7	12%
Medimurje	111.000	10.302	56,1	40,0	13%
Osijek-Baranja	296.000	8.684	47,3	41,2	16%
Požega-Slavonia	75.000	6.620	36,1	40,9	13%
Sisak-Moslavina	166.000	7.868	42,9	43,0	13%
Varazdin	171.000	10.899	59,4	41,2	15%
Virovitica-Podravina	82.000	6.525	35,5	41,2	10%
Vukovar-Syrmia	174.000	6.730	36,7	40,6	12%
Zagreb (County)	310.000	9.710	52,9	40,6	16%
Zagreb (Grad)	773.000	22.695	123,6	41,6	35%

Source: DZS

Figure 3: visual representation main socio-economic travel demand drivers in Croatia by County



Source: DZS

As far as Italy is concerned, Table 2 reports Italian population statistics by region concerning the main drivers for tourism (2021 population number, 2019 GDP per capita in euros and in percentage on average EU GDP per capita, the mean age, the percentage of population with higher education). Regions involved in the programme area are highlighted in green. Figure 4 provides a visual representation of these data.

Table 2: population, GDP per capita, average age, and education by Italian Regions

Administrative regions (NUTS2)	Population	GDP per capita, EUR	GDP per capita index (EU28=100)	Mean age	Population with higher education
Friuli Venezia Giulia	1.198.753	31.923	103	48	15%
Veneto	4.852.453	33.651	108	46	14%
Emilia-Romagna	4.445.549	36.727	118	46	17%

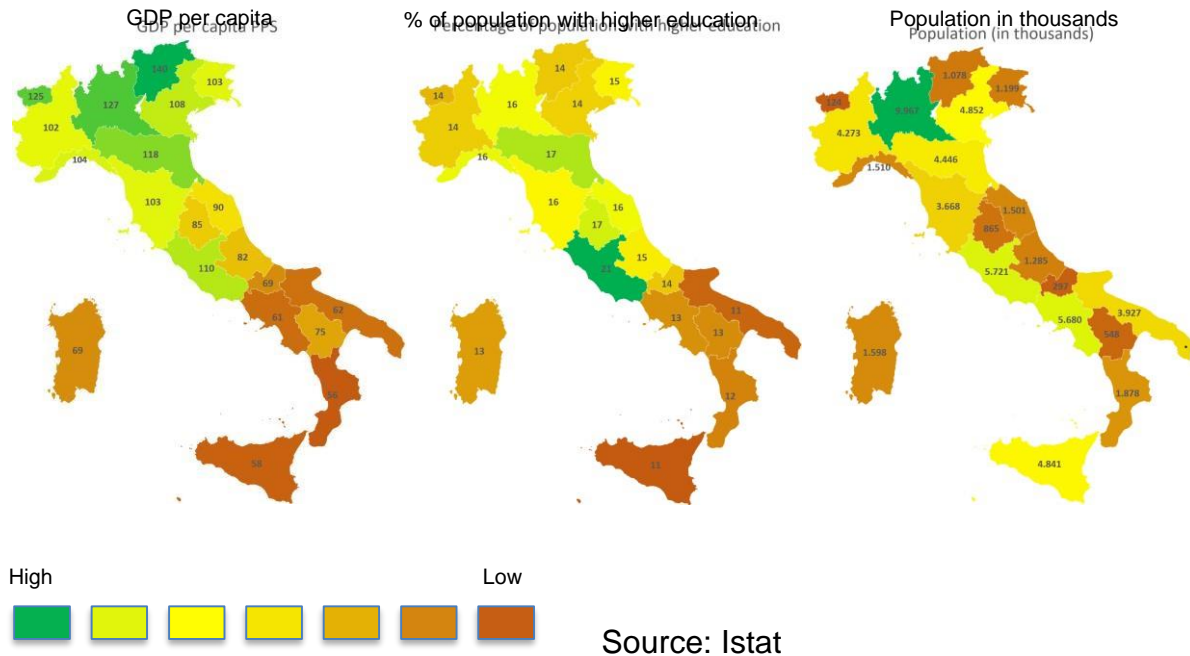
Marche	1.501.406	27.678	90	47	16%
Abruzzo	1.285.256	25.125	82	47	15%
Puglia	3.926.931	18.925	62	45	11%

Basilicata	547.579	23.051	75	46	13%
Calabria	1.877.728	17.289	56	45	12%
Campania	5.679.759	18.878	61	43	13%
Lazio	5.720.796	34.199	110	46	21%
Liguria	1.509.805	38.768	104	49	16%
Lombardia	9.966.992	39.694	127	46	16%
Molise	296.547	21.072	69	47	14%
Piemonte	4.273.210	31.724	102	47	14%
Sardegna	1.598.225	21.344	69	47	13%
Sicilia	4.840.876	17.855	58	44	11%
Toscana	3.668.333	31.928	103	47	16%
Trentino-Alto Adige	1.078.460	43.380	140	44	14%
Umbria	865.013	26.238	85	47	17%
Valle d'Aosta	123.895	38.768	125	47	14%

Source: Istat

The data in Table 2 and Figure 4 highlight that the northern part of Italy, together with Tuscany and Lazio, include a little more than half of the Italian population and have a GDP per capita above the EU27 countries. Differently, the remaining regions have a GDP that is significantly under the EU27 average. The above data, together with the fact that the Italian tourism is mainly a seaside one and that the southern regions of Italy are well-known touristic destinations, suggest the plausible hypothesis that most of Italian tourists are originated from the northern Italian regions together with Lazio and Toscana.

Figure 4: visual comparison of GDP per capita, education and Population by Italian regions



3. Overview on overall travel demand

3.1. Cross Border tourists travel demand

This section presents overall data on cross-border travellers between Italy and Croatia. The data sources consulted to trace the time series of travellers are the two national bureau of statistics (DZS - Državni Zavod Za Statistiku, and Istat - Istituto Nazionale di Statistica). Another available source is OECD (Organisation for Economic Co-operation and Development). The OECD data on the number of Italian tourists in Croatia coincide with those provided by the Croatian national statistical office, while as far as the Figure for Croats in Italy is concerned, the differences between the OECD Figure and the ISTAT Figure are significant. In this case it was therefore decided to use the data provided by DZS as they show greater consistency in the time series.

The terminology used here is the one recommended by [DESA2010] and the same as in D.3.1.4, previously released. Such terminology distinguishes "visitors" (foreign travellers), "tourists" (visitors who stay overnight) and "excursionists" (taking the cross-border trip during the same day). The statistical sources of the two countries systematically record only tourists, while the quantification of excursionists requires to be estimated. As for excursionists, in this report we will adopt the estimates that have already been calculated in the scenario analysis (D.3.1.4).

As in the previously implemented scenario analysis, unless otherwise specified most considerations refer to the period ending in 2019, because due to the pandemic the years 2020 and 2021 are not considered representative of the trend dynamics. Data from 2020 and the first half of 2021 are considered in comparison with 2019, to highlight the effects of the pandemic on travel demand.

Between 2010 and 2019, the last year before the Covid pandemic, the total number of tourists (travellers staying at least one night) who travelled from Italy to Croatia or vice versa increased by 27.9%, reaching just under one and a half million travellers in 2019. Italian travellers make up about 88% of Italy-Croatia cross-border tourists and 92% of excursionists. Table 3 shows the total number of foreign cross-border tourists between Italy and Croatia². Apart from the drastic drop recorded in 2020 due to the Covid pandemic, the overall movements in the last decade highlight different dynamics as for, at least, two relevant aspects.

Firstly, Croatian tourism in Italy is growing at a much higher rate than Italian tourism in Croatia (Figure 5). In the last 10 years pre-Covid, the overall growth in the number of Croatian tourists in Italy has more than doubled (+126,8%), while Italians have grown by only 15.4%. The number of Italian tourists remains far higher than that of Croatian tourists, but while in 2010 there was one Croatian tourist for every 7.8 Italians, in 2019 this ratio drops to about 1 / 4 (Table 3).

Table 3: total number of cross-border tourists between Italy and Croatia (2010 - 1st semester 2021).

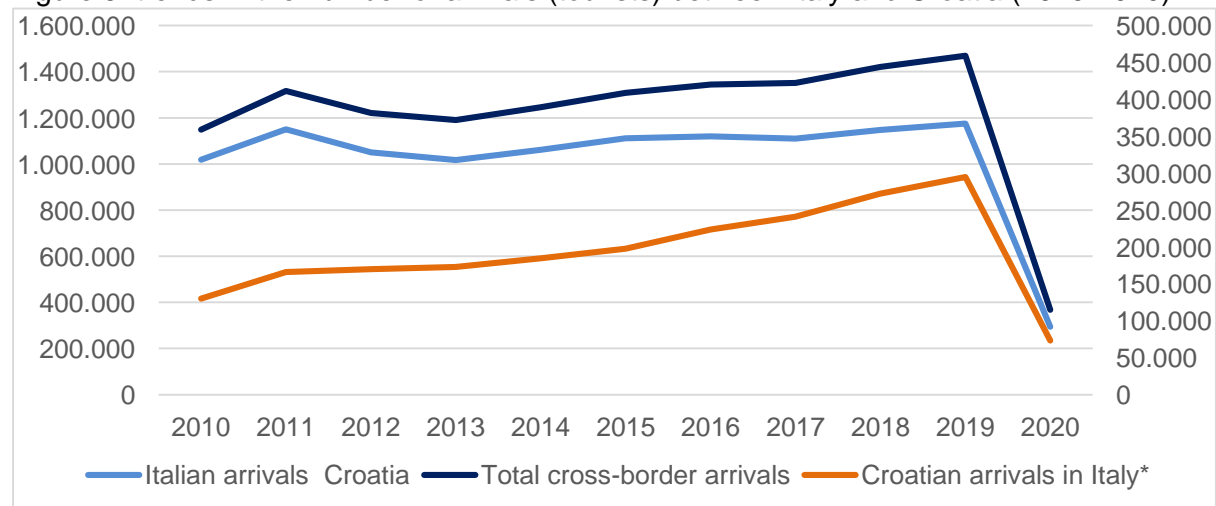
Year	Croatian arrivals in Italy*	Italian arrivals in Croatia	Total crossborder arrivals	% Annual variation arrivals in Italy	% Annual variation arrivals in Croatia
2010	130.000	1.018.375	1.148.375		
2011	166.120	1.150.311	1.316.431	27,8%	13,0%
2012	169.870	1.050.514	1.220.384	2,3%	-8,7%
2013	172.882	1.016.953	1.189.835	1,8%	-3,2%
2014	184.606	1.060.912	1.245.518	6,8%	4,3%
2015	197.550	1.111.428	1.308.978	7,0%	4,8%
2016	223.959	1.119.932	1.343.891	13,4%	0,8%
2017	241.197	1.110.219	1.351.416	7,7%	-0,9%
2018	272.484	1.148.078	1.420.562	13,0%	3,4%

² Please notice that Table 3 shows foreign tourists (i.e.: Italians in Croatia and vice versa), that is the data that we consider relevant for the appraisals related to cross-border transport planning. The deliverable D.4.1.5 (Cost - effectiveness analysis of the present intermodal maritime transport solutions within the MIMOSA project) shows instead the number of total tourists including domestic ones (i.e. Croatian tourists in Croatia).

2019	294.825	1.175.069	1.469.894	8,2%	2,4%
2020	73.437	294.825	368.262	-75,1%	-74,9%
Jan-June 2021	n.d.	329.800	n.d.	-	-
		% Variation 2010-2019		126,8%	15,4%

Source: ISTAT, DZS

Figure 5: trends in the number of arrivals (tourists) between Italy and Croatia (2010-2020)



Source: ISTAT, DZS

Table 4 shows Croatian tourists' arrivals in Italy. Croatian tourists have grown faster than the rest of arrivals, consequently, the share of Croatian visitors has grown from 0.3% of the total visitors in 2010 to 0.45% in 2019.

Table 4: Number of foreign and Croatian tourists in Italy (2010-1st semester 2021)

Year	Foreign arrivals	Croatian arrivals	Share of Croatian tourists in Italy
2010	43.794.338	130.000*	0,30%
2011	47.460.809	166.120	0,35%
2012	48.738.575	169.870	0,35%
2013	50.263.236	172.882	0,34%
2014	51.635.500	184.606	0,36%
2015	55.039.251	197.550	0,36%
2016	56.764.239	223.959	0,39%
2017	60.523.190	241.197	0,40%
2018	63.195.203	272.484	0,43%
2019	65.010.220	294.825	0,45%
2020	16.511.911	73.437	0,44%
2021 (Jan-June)	3.795.886	n.a.	n.a.

Source: Istat, OECD

Italians, on the other hand, represent a considerable share of the total number of foreign tourists in Croatia, but since Italian tourists have increased less than the total number of foreign tourists, their share in the decade under consideration has decreased considerably, from 11.2% in 2010 to 6.8% in 2019 (Table 5). Specifically, the segment of Italian tourists is the fourth most numerous one in Croatia, behind Germans, Slovenians, and Austrians.

Table 5: Number of foreign and Italian tourists in Croatia (2010-1st semester 2021)

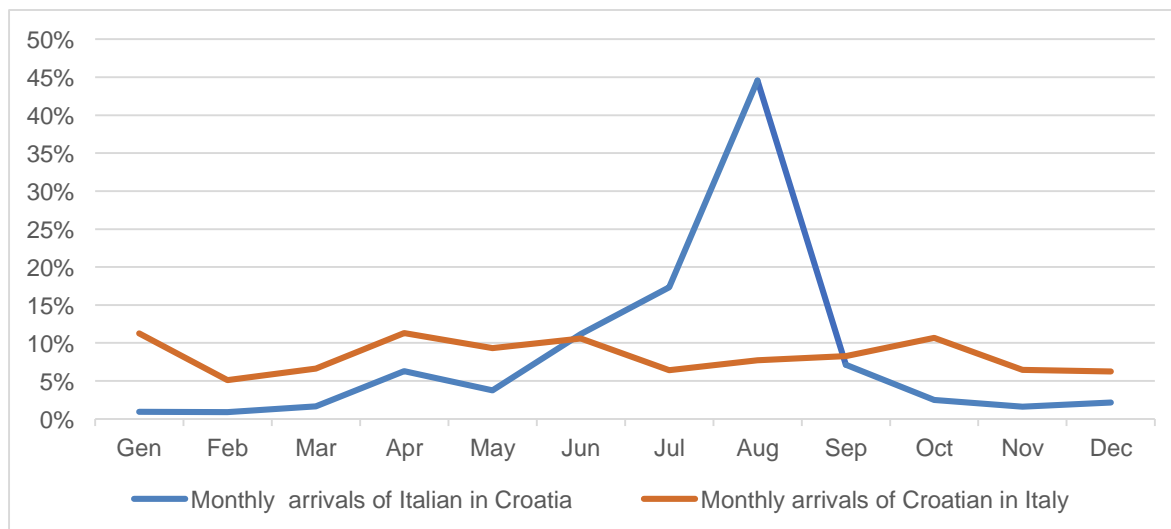
Year	Foreign arrivals	Italian arrivals	Share of Italian tourists in Croatia
2010	9.110.742	1.018.375	11,20%
2011	9.926.674	1.150.311	11,60%
2012	10.369.226	1.050.514	10,10%
2013	10.948.366	1.016.953	9,30%
2014	11.622.961	1.060.912	9,10%
2015	12.683.179	1.111.428	8,80%
2016	13.808.532	1.119.932	8,10%
2017	15.592.899	1.110.219	7,10%
2018	16.644.871	1.148.078	6,90%
2019	17.353.488	1.175.069	6,80%
2020	5.545.279	228.458	4,10%
2021 (Jan-June)	8.386.559	329.800	3,90%

Source: DZS, [OECStat2021]

Secondly, the characteristics of tourism of the two populations to the overseas country are significantly different, as had already emerged from the qualitative analysis set out in D.3.1.2 on the segmentation of demand. From a quantitative point of view, this emerges from the different distribution of tourism over the months of the year. Taking the last pre-Covid year, 2019, as an example, Figure 6 shows the percentage distribution of the number of annual tourists over the 12 months. Italian tourism in Croatia is strongly concentrated in the summer months, while Croatian tourists are distributed much more evenly throughout the year (Figure 4; the distribution of the year 2019, taken as an example, does not differ from that of the other years from 2010 to the last pre-Covid year).

The different distribution can be explained by the different choices of the characteristics sought by tourists in the other country, with sea and coastal holidays prevailing for the Italians, and winter holidays together with visits to historical and cultural centres for the Croats (See D.3.1.2 “Segmentation Analysis”, for details).

Figure 6: distribution of the number of annual tourists over the 12 months for Italian and Croatian tourists - 2019

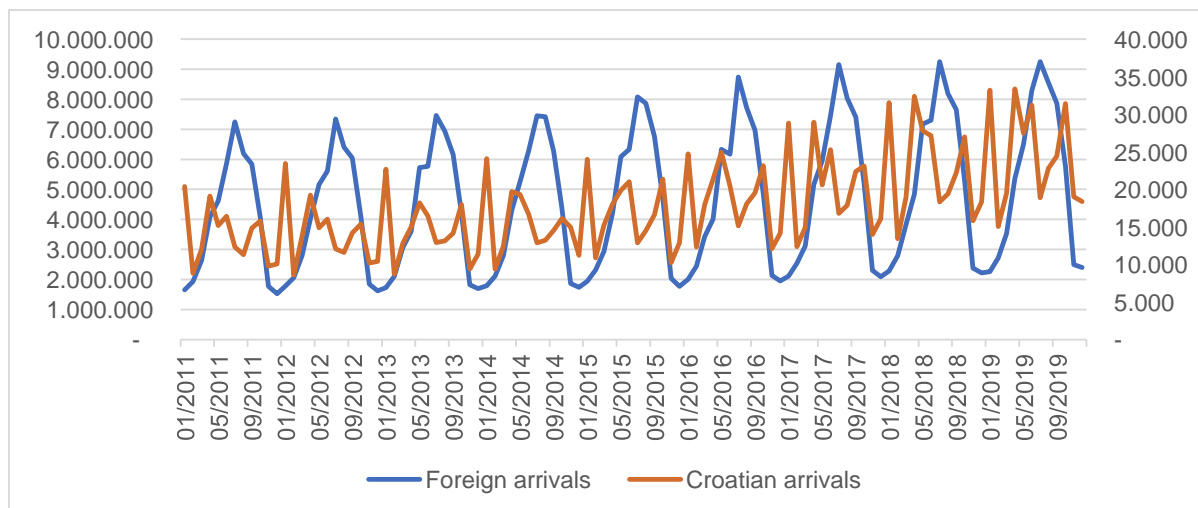


Source: ISTAT, DZS, OECD

The distribution of Croatian tourists in Italy in the various months of the year is very regular and differs significantly from that of all tourists from other countries. Figure 5 shows how in the decade 2010-2019 the seasonality of overall Croatian tourism in Italy was extremely regular, even in the face of an overall growth in both Croatian and overall arrivals. This can be seen in Figure 7, showing the pattern of Croatian arrivals in comparison with overall arrivals in Italy. Moreover, such pattern of Croatian arrivals follows a very different seasonality from the general ones, as can be seen detailing the yearly trend of the two data. While Figure 7 is meant to show the regularity of the seasonality pattern, Figure 8 enhance the detail of one year (2019) to highlight the differences between the two patterns, that consists in two main aspects: a) a peak of Croatian visitors in January, in correspondence with the minimum of overall tourism in Italy, b) two secondary peaks in spring and autumn, interspersed with a relative minimum between July and August, which is instead the period of maximum influx of overall foreign tourists to Italy.

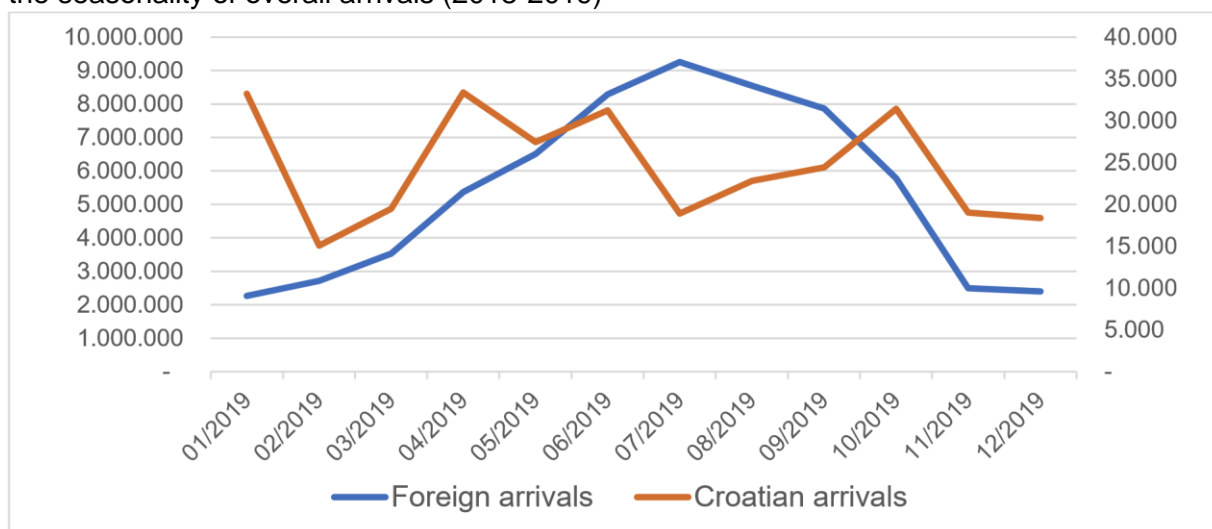
As reported on the website on Foreign Markets of the Italian Ministry of Foreign Affairs and International Cooperation and already discussed in Deliverable 3.1.4, Croatian tourists are more likely to travel to Italy in January, a typical winter sports month, and Spring and Fall, more favourable seasons than Summer for visiting the cities of art, shopping and religious tourism. The propensity for cultural tourism on the part of the Croatians in Italy also emerged from the analysis carried out for the deliverable D.3.1.2 (segmentation analysis).

Figure 7: seasonality of Croatian tourists in Italy compared with the seasonality of overall arrivals (2010-2019)



Source: ISTAT, DZS, OECD

Figure 8: detail of seasonality (monthly arrivals) of Croatian tourists in Italy compared with the seasonality of overall arrivals (2018-2019)

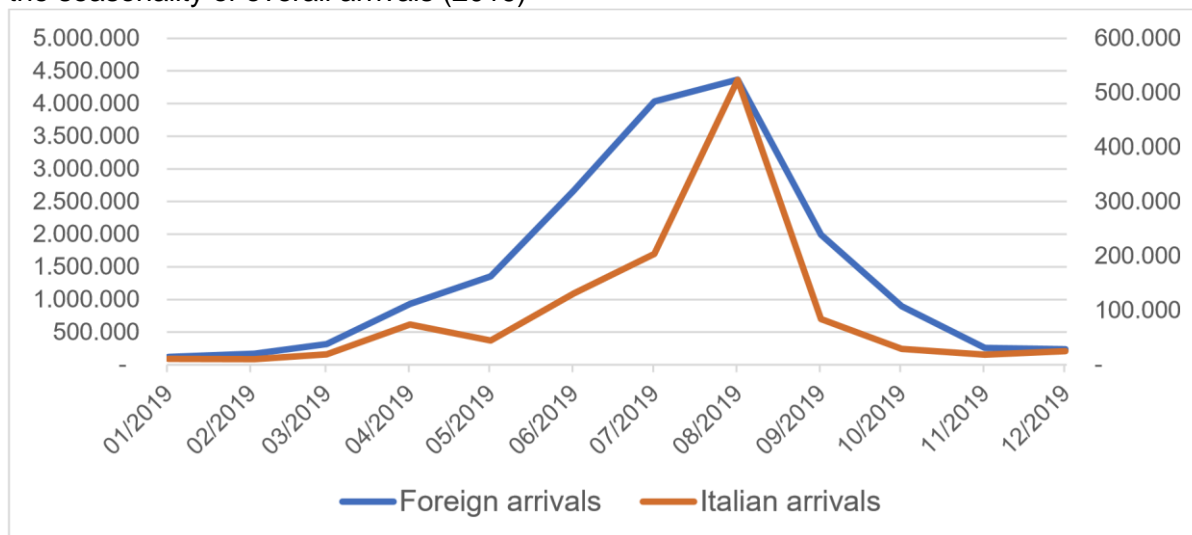


Source: ISTAT, OECD

Differently from what we have just seen, the seasonality of Italian tourism in Croatia does not differ significantly from that of overall tourism in this country (Figure 9). Italian travel demand towards Croatia is more concentrated than the average, with a peak in August (44,6% of yearly arrivals), as well as for the other foreign tourists, whose arrivals, however, are much less concentrated about 48% of overall presence equally distributed between July and August). Smaller peaks of Italian arrivals happen periodically over the years in which Easter holidays fall close to two national holidays (April 25th, celebration of the Italian Republic, and

May 1st, workers' day) to create a holiday "bridge" that makes it possible to plan trips lasting a few days.

Figure 9: detail of seasonality (monthly arrivals) of Italian tourists in Croatia compared with the seasonality of overall arrivals (2019)



Source: DZS, OECD

3.2. Cross Border excursionists

The geographical proximity, even in the absence of territorial contiguity, means that there is a significant number of excursionists ((travellers who cross the border and return to their own country during the day) between Italy and Croatia. Unfortunately, official sources do not record either the number of excursionists between specific countries nor their nationality. On the other hand, such number is relevant as for the impact on road traffic and, for some specific destinations, also on maritime transit. However, the number of excursionists between the two countries must be estimated on the basis of one or more estimates, then possibly check the consistency of these estimates with data from other sources, in particular the mobile phone tracking analysis. Such estimates have been described in detail in D.3.1.4 (Scenario Analysis), and consist, essentially, in assuming that a) excursionists can only be referred to bordering countries which can be reached within a time frame compatible with a day trip; b) the total number of excursionists from one country, as measured by statistical source (OECD 2021), is distributed over the neighbouring countries in the same way as the distribution of tourists in the same countries.

The upper and lower limits of the number of excursionists from the country of origin to a destination country is determined by the latter's position in the ranking of tourist destinations,

assuming that the distribution of day trippers follows the same distribution of tourists³. The upper and lower limits of the number of excursionists from the country of origin to a destination country is determined by the percentage number of tourists coming from the origin country in recent years.

Table 6 shows these estimates, following what has already been shown in deliverable 3.1.4. Note that the time series of data available for these estimates considers only the last 5 pre-Covid years. The number of excursionists in 2020 was not estimated since the assumptions underlying the estimate are not reliable for this year. While the number of Croatian excursionists is comparable to the number of Croatian tourists, the number of Italian excursionists in Croatia appears to be between 2 and 3 times greater than the number of Italian tourists and corresponds to about 10-12% of the overall number of the Italian excursionists.

Table 6: estimated number of excursionists (day trips) between Italy and Croatia (2015-2019)

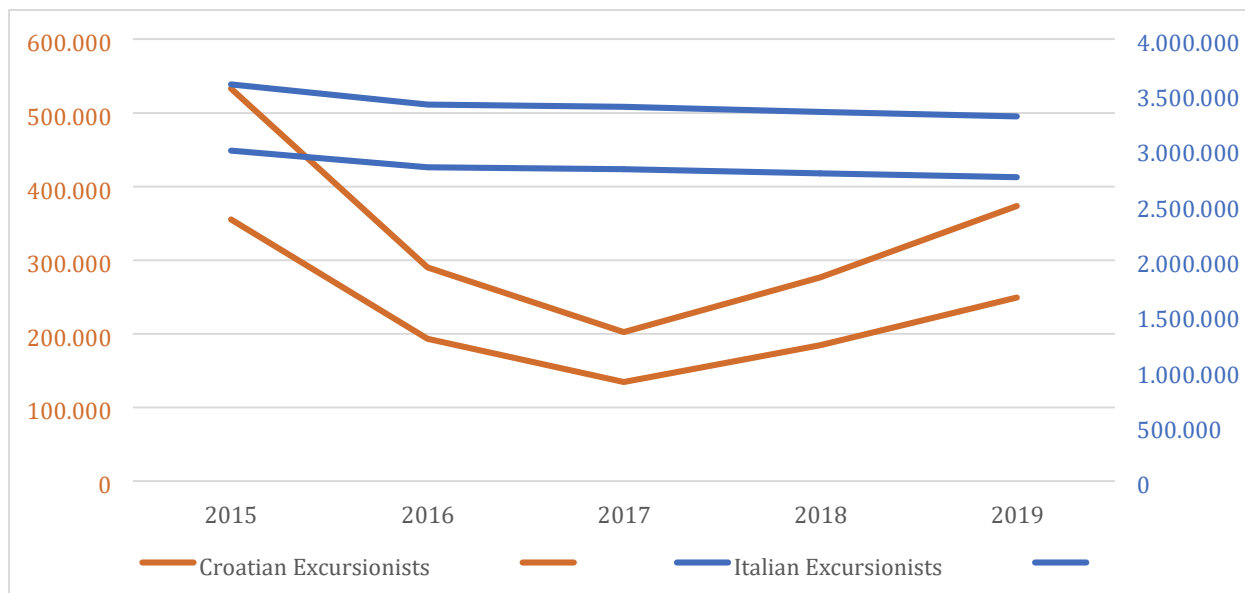
Year	Croatian excursionists towards Italy		Italian excursionists towards Croatia	
	Low estimate	High estimate	Low estimate	High estimate
2015	355.400	533.100	2.992.453	3.590.943
2016	193.400	290.100	2.841.273	3.409.527
2017	134.800	202.200	2.823.694	3.388.432
2018	184.400	276.600	2.784.756	3.341.707
2019	249.079	373.618	2.750.482	3.300.579

Source: elaboration of data from ISTAT, DZS, OECD (2021), MONTSTAT (2020), Ministry of Tourism, Republic of Croatia. (2020)

However, for both Italy and Croatia, the number of same-day trips decreased over the five years considered, and much more markedly for Croatians (-29,9% between 2015 and 2019) than for Italians (-8,1%). It should be noted that the number of excursionists is likely to be more volatile than the number of travellers as the determinants of the day trip are significantly different from those of the long-term trip.

Figure 10: trends in the number of day trips (excursionists) between Italy and Croatia (estimated range max-min)

³ As for Italy, the ranking of neighbouring destinations by number of tourists is as follows: Austria, France, Germany, Switzerland, Slovenia, Croatia. In the case of Croatia, the top six destinations are, in order, Austria, Bosnia and Herzegovina, Germany, Italy, Serbia, and Slovenia.



Source: elaboration of data from ISTAT, DZS, OECD (2021), MONTSTAT (2020], Ministry of Tourism, Republic of Croatia. (2020)

As we will discuss later on, some socio-economic variables are strongly correlated with the number of travellers between countries, in particular: GDP per capita, level of education, exchange rate between currencies. Day trips are also affected by the number of residents in the areas within the reach and are very much influenced by the accessibility of services and attractions that change much more rapidly and inconstantly over time than macroeconomic and socio-demographic variables (e.g., outlets and shopping centres, casinos, medical services, spas, etc.). Basically, the travel demand of excursionists is subject to greater variability and unpredictability than that of long-distance travel, which is a problem given that in the case of Italy and Croatia the estimated numbers confirm that this demand has a significant impact in terms of road traffic.

It is not possible to quantify the number of excursionists for each origin and destination, but it is possible to get an approximate picture based on the distance between the main locations near the border. Since there is no direct rail transport between Italy and Croatia, and assuming the plausible assumption that the maximum range of a day trip is 3 hours per route, day travels occur (reasonably) mainly by land and, to a lesser extent, by sea. Table 7 shows examples of main destinations in the mentioned time range

Table 7: minimum distance in hours by car and by High-Speed Vessels (HSV) between Croatian and Italian cities of possible interest for excursionists (distance between town centres in normal traffic condition. In red distances above the selected threshold of 3 hours)

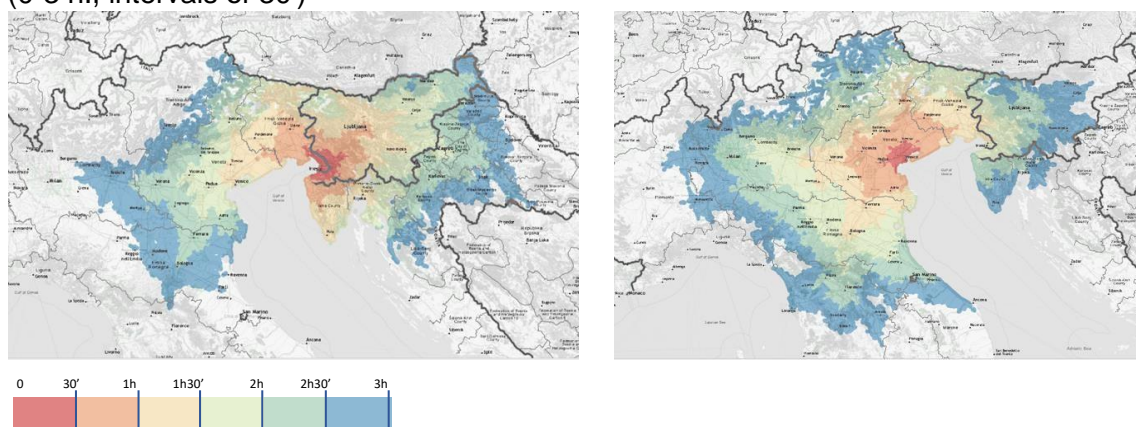
By car	Rijeka	Pula	Rovinj:	Senj/Krk	Karlovac	Zagreb
Trieste	01:30	01:30	01:45	02:15	02:30	02:45
Gorizia	01:45	02:00	02:20	02:45	02:45	02:45
Venezia	03:00	03:00	03:15	03:45	04:00	04:00
Tarvisio	03:00	03:00	03:30	03:45	03:00	03:00

By HSV	Porec	Rovinj:	Pula
Trieste	01:10	01:40	02:20
Venezia	03:00	02:45	03:00

Source: elaboration of data from Openstreetmap, Google Maps, maritime tour operators

The possible scope of day trip opportunities can be better understood if we consider the extent of the territory that falls within the time frame considered for the trip. Figure 11a shows the extent of the Italian and Croatian territory that can be reached from Trieste and from Rijeka within the threshold of 3 hours of travel time⁴. The Figure shows what the mere numerical data on the distance in hours of travel do not tell us, i.e., the vastness of the territory between these two destinations, which is a potential catchment area for day trips. Zagreb and Trieste, for instance, are entirely within the day-travel by car area, and so are Rijeka and Venice. Considering travel by fast ships, pre-pandemic timetables tell us that the furthest points that can be reached in three hours are Venice and Pula (Table 6).

Figure 11a: isochrone representation of destinations reachable by car from Trieste and Venice (0-3 h., intervals of 30')

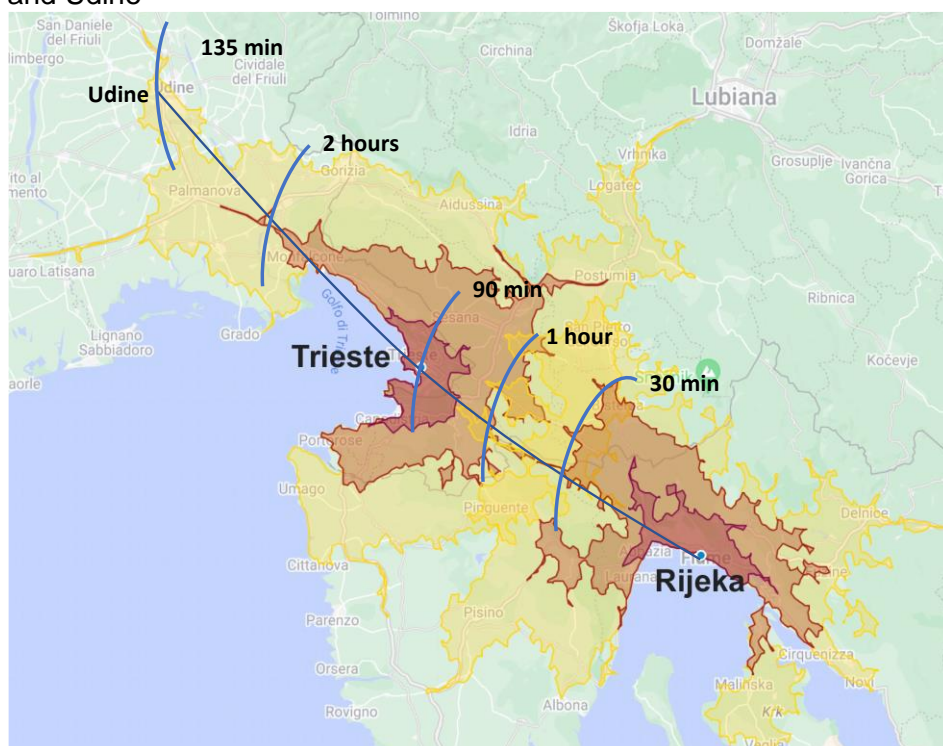


Source: elaboration of data from OpenStreetMap.

⁴ the isochrones are calculated on open dataset (OSM) assuming the base speed in absence of congestion and slowed down flows on the **transport** network.

If we consider the two closest Italian and Croatian urban centres (Trieste and Rijeka), we can detail the overall situation in Figure 11 by estimating the distances that can be travelled by car up to two hours from each city in the direction of the other (From Rijeka to Trieste and vice versa, Figure 11b).

Figure 11b: isochrone representation of the travel distances by car from Rijeka towards Trieste and Udine



Source: elaboration of data from OpenStreetMap, Google Maps.

It emerges that the most likely arrivals and departures areas for Croatian excursionists are circumscribed to the area Between Trieste, Monfalcone and the South-Western part of the province of Udine. These data are coherent with the survey carried out on the mobile phone tracking data of Croatian entries into Friuli Venezia Giulia, an analysis developed within the MIMOSA project and whose detailed results can be found in the Annex to this document.

This type of analysis plays a key role both in determining the catching areas of transport nodes used by daily cross-border travellers and in estimating the size of flows. Thus, these analyses are crucial for the planning of short-haul cross-border transport services (see the Annex to this document).

3.3. The impact of Covid pandemic on visitors' flows

In this section we provide some key evidence of the consequences of the restrictions and, more generally, the avoidance of travel resulting from the Covid pandemic.

The first lockdowns and the first limitations to international travels to Italy occurred in March 2020, they were partially relaxed during the summer season, reintroduced in the late Fall and Winter, and relaxed again in the late Spring 2021.

When comparing the changes in August 2020 compared to 2019 for the main European countries of origin of tourism to Italy and Croatia, significant symmetries emerge among European Countries as for 2020 vs 2019, suggesting that in the first year of pandemic the impact affected Italy and Croatia in the same way (Table 8). Moreover, the percentage variation of the number of local and foreign tourists in Croatia and in Italy in August 2020 with respect to August 2019 show that tourists of both countries preferred to spend their vacations in their own country rather than abroad. The data seem to suggest that a smaller decrease of eastern European tourists occurred in Croatia than in Italy and, vice versa, a smaller decrease of western European tourists occurred in Italy than in Croatia.

Table 8: percentage variation of the number of tourists from different countries in Croatia and in Italy between August 2019 and August 2020.

Origin	Croatia - Aug 2020 vs Aug. 2019	Origin	Italy - Aug 2020 vs Aug. 2019
Croatia	19%	Italy	6%
Poland	3%	Switzerland	-17%
Czech Republic	-21%	Germany	-22%
Germany	-24%	Slovenia	-29%
Romania	-30%	Austria	-35%
Slovenia	-33%	Belgium	-41%
Switzerland	-38%	Netherlands	-47%
Hungary	-55%	Romania	-52%
Slovakia	-58%	France	-53%
Belgium	-60%	Poland	-63%
United Kingdom	-63%	Czech Republic	-65%
France	-66%	United Kingdom	-66%
Austria	-69%	Hungary	-72%
Italy	-83%	Croatia	-77%
Netherlands	-89%	Slovakia	-82%
Spain	-90%	Spain	-85%

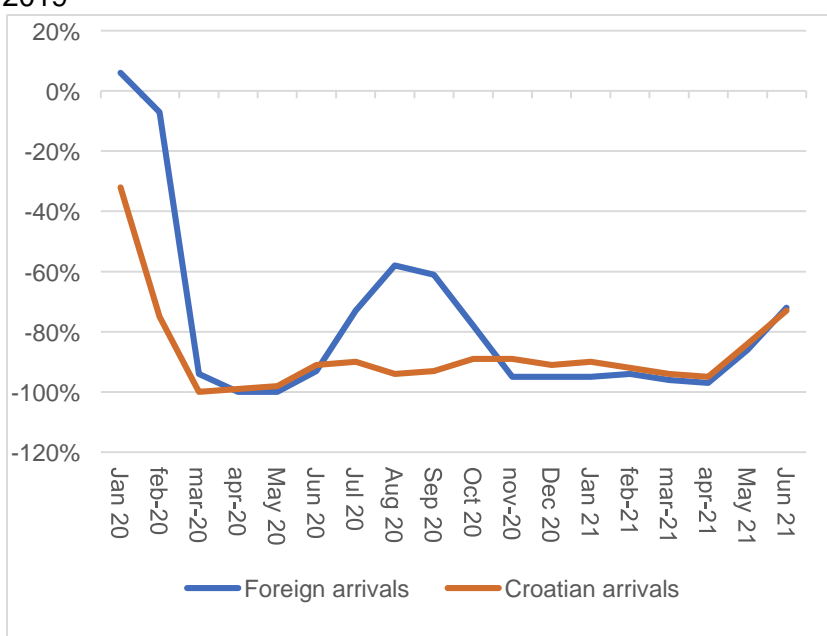
Source: DZS, Istat

We can see how the cross-border travel patterns between Italy and Croatia show some asymmetries. Table 9 and Figure 12 show the arrivals of Croatian tourists in Italy and the

overall foreign tourists' arrivals during 2020 as a % of 2019 arrivals. In the eighteen months taken into consideration, the decrease in arrivals from Croatia was more evident than that of other foreign tourists (-87% less from Croatia on average, compared to an average decrease in foreign tourism in Italy of 77%). It also emerges that there was no recovery in arrivals from Croatia during the summer months, when the rest of foreign tourism reduced its decline compared to the previous year.

Table 9 and Figure 12: comparison between the decrease of foreign and Croatian tourists in Italy in 2020/2021 with respect to 2019

Month Year	Variation with respect to the same month of 2019	
	Foreign arrivals	Croatian arrivals
Jan 20	6%	-32%
Feb 20	-7%	-75%
Mar 20	-94%	-100%
Apr 20	-100%	-99%
May 20	-100%	-98%
Jun 20	-93%	-91%
Jul 20	-73%	-90%
Aug 20	-58%	-94%
Sep 20	-61%	-93%
Oct 20	-78%	-89%
Nov 20	-95%	-89%
Dec 20	-95%	-91%
Jan 21	-95%	-90%
Feb 21	-94%	-92%
Mar 21	-96%	-94%
Apr 21	-97%	-95%
May 21	-86%	-84%
Jun 21	-72%	-73%



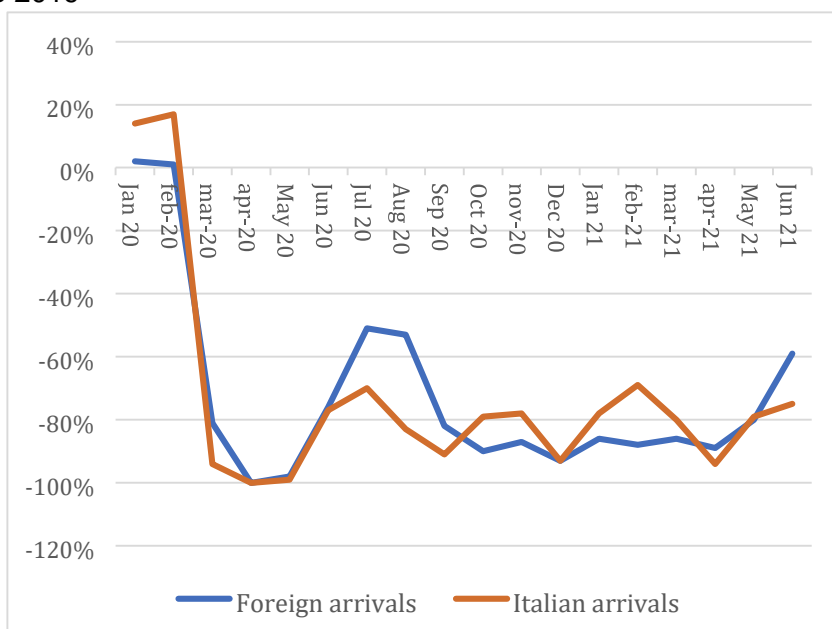
Source: ISTAT

During the period of the pandemic examined, the trend of Italian arrivals in Croatia shows a sharp drop (as expected) but then evolve over the months with a very different pattern from that typical of previous years, showing at least three peaks in a year (instead than one). In addition to the typical recovery in the summer of 2020, even during the autumn of 2020 and during the winter holiday period of 2021 there are slight recoveries in travel demand, although obviously these are much lower percentages than in the pre-Covid years (-70% at the busiest times and -100% at the worst times) (Table 10 and Figure 13).

Overall, the decrease in Italian tourism in Croatia during the pandemic was similar to that of foreign tourism, with an average reduction over the 18 months considered of between -72% and -73% in both cases.

Table 10 and Figure 13: comparison between the decrease of foreign and Italian tourists in Croatia in 2020/2021 with respect to 2019

Month/Year	Variation with respect to the same month of 2019	
	Foreign arrivals	Italian arrivals
Jan 20	2%	14%
feb-20	1%	17%
mar-20	-81%	-94%
apr-20	-100%	-100%
May 20	-98%	-99%
Jun 20	-76%	-77%
Jul 20	-51%	-70%
Aug 20	-53%	-83%
Sep 20	-82%	-91%
Oct 20	-90%	-79%
nov-20	-87%	-78%
Dec 20	-93%	-93%
Jan 21	-86%	-78%
feb-21	-88%	-69%
mar-21	-86%	-80%
apr-21	-89%	-94%
May 21	-80%	-79%
Jun 21	-59%	-75%



Source: DZS

The decrease in the number of Italian tourists was distributed over the various regions of Croatia in a similar way to the pre-Covid distribution. Table 11 shows the distributions of Italian tourists among the different Croatian administrative regions from 2019 to the first eight months of 2021. According to these data, Italian Tourists' distributions are almost identical and the counties of Istria and of Primorje-Gorski Kotar attracted more than 60% of the Italian tourists even during the pandemic years 2020 and 2021.

3.4. Post-Covid scenario of travel demand

In a previous project deliverable (D.3.1.4 – Scenario Development) the formulation of travel demand scenarios up to 2030 have been provided. The task faced was made particularly complex by the discontinuity caused by the Covid pandemic, since in general travel demand forecasts are based (with different methodologies) on the projection of time series combined with corrections linked to observable contingent factors. Any discontinuity in the data series is an element that affects the reliability of the forecasts. For this reason, in D.3.1.4 the number of cross-border travellers in 2020, although already available, were not used for projection purposes as they are not representative of the expected trend in a situation where the pandemic has ceased to have an effect.

Table 11: distribution of Italian tourists' arrivals among the different Croatian administrative regions from 2019 to the first eight months of 2021

County	2019		2020		2021	
Istria	457.279	38,90%	94.894	41,50%	126.955	38,50%
Primorje-Gorski Kotar	264.613	22,50%	59.295	26,00%	77.981	23,60%
Karlovac	26.198	2,20%	2.488	1,10%	5.730	1,70%
Lika-Senj	86.895	7,40%	9.934	4,30%	22.242	6,70%
Zadar	72.040	6,10%	11.968	5,20%	20.462	6,20%
Sibenik-Knin	28.060	2,40%	4.840	2,10%	8.993	2,70%
Split-Dalmatia	92.941	7,90%	14.256	6,20%	29.203	8,90%
Dubrovnik-Neretva	60.920	5,20%	6.794	3,00%	15.048	4,60%
Bjelovar-Bilogora	1.224	0,10%	370	0,20%	239	0,10%
Brod-Posavina	1.759	0,10%	697	0,30%	621	0,20%
Koprivnica-Križevci	260	0,00%	185	0,10%	194	0,10%
Krapina-Zagorje	2.414	0,20%	597	0,30%	526	0,20%
Medimurje	1.101	0,10%	300	0,10%	428	0,10%
Osijek-Baranja	1.677	0,10%	556	0,20%	696	0,20%
Požega-Slavonia	407	0,00%	170	0,10%	132	0,00%
Sisak-Moslavina	1.559	0,10%	417	0,20%	335	0,10%
Varazdin	1.973	0,20%	585	0,30%	651	0,20%
Virovitica-Podravina	508	0,00%	203	0,10%	153	0,00%
Vukovar-Symia	1.236	0,10%	356	0,20%	480	0,10%
Zagreb (County)	5.835	0,50%	1.400	0,60%	1.271	0,40%
Zagreb (Grad)	66.170	5,60%	18.153	7,90%	17.460	5,30%
Total	1.175.069	100,00%	228.458	100,00%	329.800	100,00%

Source DZS

However, the actual impact Covid pandemic goes beyond a mere "stop-&-go" of visitors' flows, while it represents a "catastrophic" factor, in the sense that it changes not only the time series but also the role of the travel determinants for a period of time that is likely to extend beyond

the emergency period. Predictions provided in Deliverable 3.1.4 were based on the econometric and regressive evaluation of both macro-economic travel demand determinants (see Section 2.1. of this document) and specific Italy-Croatia factors. More in particular, Section 4.3 of Deliverable 3.1.4 points out that:

- the exchange rates of the Croatian Kuna have only small fluctuations with respect to the Euro;
- the populations of both Italy and Croatia are quite stable or in slow decline due to low birth rates in the last years;
- the education levels of both Italy and Croatia are quite stable or in slow increase.

As the geographical distances obviously remain constant, the main drivers apparently are:

- the income at origin (usually measured in terms of GDP);
- the potential visitors' perception of the pandemic risk.

Please, notice that Deliverable 3.1.3 (Behavioural analysis on habits and travel demand psychological determinants) include an investigation about how the pandemic has shaped the travel safety perception. Here we just notice that the perception of the pandemic risk can be considered in some way similar to the perception of terrorism-like risk (Araña & León 2008), i.e., shocking in the immediate and affecting both the decision to travel and preferences for the attributes of the tourism product. However, according to related literature when the shocking events are not repeated, the industry can fully recover in a period of six to twelve months, according also on the degree of substitution among destinations from the perspective of the cost of avoiding risks. In this framework, the impact of the shocking event depends also on the perceived severity of the consequences on the country. If this is true, the perception of a country's Covid security level, and therefore local pandemic management policies, play a role in changing the propensity to travel to that destination.

If a parallel may be drawn between the behaviours induced by shocking events and the pandemic risk, then, all else being the same, a fast recovery shall be observed of visitors' movements when the pandemic is over. But for the time being we cannot say that we are in this situation and the two countries show different patterns of arrivals.

Generally speaking, in 2020 there was no such recovery in the programme area. In 2021, on the other hand, Croatia recovered much better than Italy overall. In fact, a partial recovery has been observed in August 2021 with respect to August 2019 Table 12 reports the percentage variation of the number of local and foreign tourists in Croatia and in Italy, comparing 2020 with respect to 2019 and the month of August 2020 and 2021 with 2019, since august is the month of the peak of demand and when the public health measures were relaxed. The local

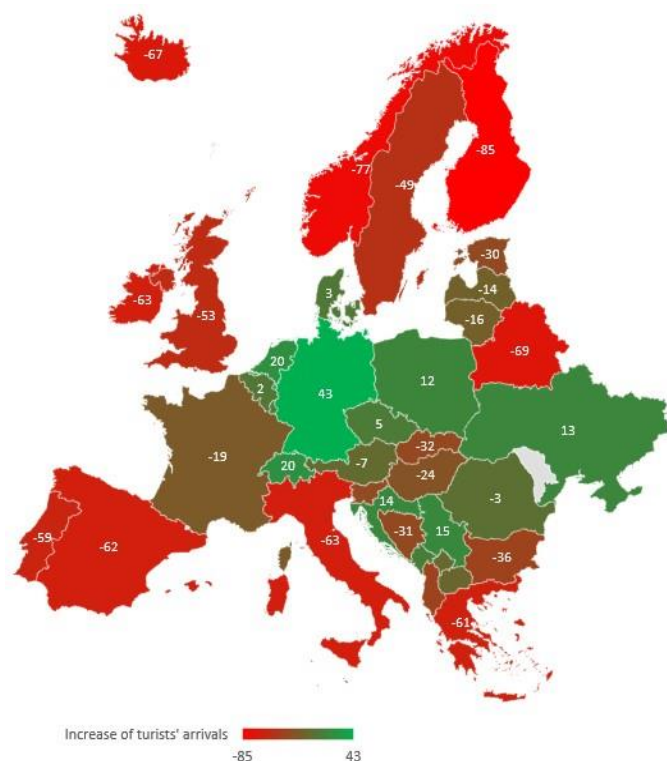
tourism has recovered and overcome the 2019 level and more, while cross-border tourism still lags behind in both countries.

Table 12: percentage variation of the number of tourists in Croatia and in Italy with respect to the whole year 2019 and the month of August 2019.

	Variation 2020 vs 2019		Variation Aug. 2020 vs Aug.2019		Variation Aug. 2021 vs Aug.2019	
	<i>Local</i>	<i>Foreign</i>	<i>Local</i>	<i>Foreign</i>	<i>Local</i>	<i>Foreign</i>
Croatia	-34%	-53%	19%	-53%	14%	-16%
Italy	-41%	-75%	6%	-58%	0%	-31%

Another significant finding is the reluctance of Italian tourists to travel to Croatia with respect to other European visitors, particularly German tourists. Figure 14 visually compares the increase of the number of tourists' arrivals in August 2021 with respect to the same month of 2019 from different European countries. In particular, one can observe the huge difference of behaviour between Italy (a decrease 63% of Italian tourists towards Croatia) and Germany (42% increase of German tourists towards Croatia). Such difference between the variation in the number of Italian and German tourists in Croatia is large enough that it cannot be accidental.

Figure 14: variation of the number of tourists' arrivals in Croatia from different European Countries in August 2021 with respect to August 2019



Possible hypotheses for such differences are: a) different degree of substitution among destinations: Italian seaside tourists have no obstacles in deciding to spend their holidays in their own country's seaside resorts, whereas this alternative is not available to German tourists; b) the two countries are perceived differently as for the degree of comfort/hospitality with regard to the Covid risk and/or to the restrictive measures in place, both for international travel and for local movements and activities.

Source: DZS

If the drop in demand for Italian travel to Croatia were due to a combination of the two abovementioned factors (availability of domestic alternatives and reluctance to face the inconveniences and restrictions linked to Covid in another country), then the resumption of regular flows should only be postponed until the end of the pandemic. We don't consider plausible that the crisis may have altered structural demand factors which, in essence, change the usefulness of the destination for travellers (benefits sought from the trip, relevance of destination characteristics, etc.), for at least two reasons.

Firstly, although both the segmentation analysis for D 3.1.4 and the analysis of psychological determinants were conducted in the midst of pandemic crises, respondents did not express preferences for the country Croatia other than the preferences expressed for the destination (benefits, characteristics, type of travel, etc.) such as to suggest that benefits and characteristics of the destination are specifically sought outside Croatia. Furthermore, in the survey conducted for D.3.1.3 (behavioural analysis) 83% of the respondents stated that they do intend to travel to Croatia in the future, which is such a percentage that it can be ruled out that the pandemic may have created a somewhat negative perception of Croatia among Italian tourists, and even though we were in the midst of a pandemic at the time of the survey. The second reason why we believe that the drop in travel demand between Italy and Croatia is not

accompanied by structural changes in preferences lies in the fact that the distribution of Italian tourist flows remained essentially the same on Croatian territory during the pandemic. Table 13 shows the distributions of Italian tourists among the different Croatian administrative regions from 2019 to the first eight months of 2021. Despite the drastic drop in both years, the distribution of tourists in 2021 is almost identical of 2019 one, and in 2020 is very similar.

Table 13: distribution of Italian tourists' arrivals among the different Croatian administrative regions from 2019 to the first eight months of 2021 (in light green the counties of the programme area)

County	2019		2020		Jan-Aug. 2021	
Istria	457.279	38,90%	94.894	41,50%	126.955	38,50%
Primorje-Gorski Kotar	264.613	22,50%	59.295	26,00%	77.981	23,60%
Karlovac	26.198	2,20%	2.488	1,10%	5.730	1,70%
Lika-Senj	86.895	7,40%	9.934	4,30%	22.242	6,70%
Zadar	72.040	6,10%	11.968	5,20%	20.462	6,20%
Sibenik-Knin	28.060	2,40%	4.840	2,10%	8.993	2,70%
Split-Dalmatia	92.941	7,90%	14.256	6,20%	29.203	8,90%
Dubrovnik-Neretva	60.920	5,20%	6.794	3,00%	15.048	4,60%
Total Programme area	1.088.946	92,6%	204.469	89,4%	306.614	92,9%
<i>Variation wrt 2019</i>			-81,2%		-71,8%	
Bjelovar-Bilogora	1.224	0,10%	370	0,20%	239	0,10%
Brod-Posavina	1.759	0,10%	697	0,30%	621	0,20%
Koprivnica-Križevci	260	0,00%	185	0,10%	194	0,10%
Krapina-Zagorje	2.414	0,20%	597	0,30%	526	0,20%
Medimurje	1.101	0,10%	300	0,10%	428	0,10%
Osijek-Baranja	1.677	0,10%	556	0,20%	696	0,20%
Požega-Slavonia	407	0,00%	170	0,10%	132	0,00%
Sisak-Moslavina	1.559	0,10%	417	0,20%	335	0,10%
Varazdin	1.973	0,20%	585	0,30%	651	0,20%
Virovitica-Podravina	508	0,00%	203	0,10%	153	0,00%
Vukovar-Syrmia	1.236	0,10%	356	0,20%	480	0,10%
Zagreb (County)	5.835	0,50%	1.400	0,60%	1.271	0,40%
Zagreb (Grad)	66.170	5,60%	18.153	7,90%	17.460	5,30%
Total	1.175.069	100,00%	228.458	100,00%	329.800	100,00%
<i>Variation wrt 2019</i>			-80,6%		-71,9%	

Source DZS

With regard to the methods used for travelling, the mode that suffered most from the effects of the pandemic was certainly maritime transport. Table 14 shows the variation of the number of international passenger departures from the main Croatian ports in 2020 and 2021 with

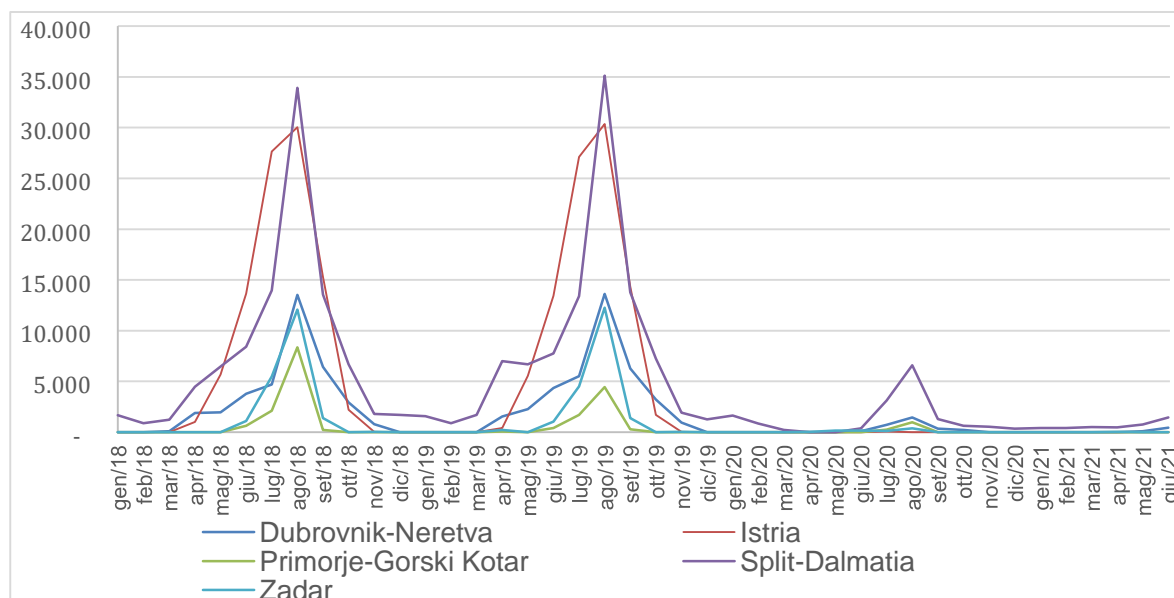
respect 2019. From the fact that the reductions in transits are much higher than the reductions in flows it can be inferred that in the pandemic years the share of cars increased at the expense of vessels. In fact, in the first half of 2021 for many ports the number of travellers dropped to zero.

Table 14: variation of the number of international passenger departures from the main Croatian ports in 2020 and 2021 with respect 2019.

Port	2019	2020	Variation w.r.t. 2019	2021 (Jan-June)	Variation w.r.t. 2019
Umag	4.380	-	-100%	-	-100%
Poreč	49.088	-	-100%	-	-100%
Rovinj	20.484	-	-100%	-	-100%
Pula	18.890	38	-100%	-	-100%
<i>Istria</i>	<i>92.842</i>	<i>38</i>	<i>-100%</i>	<i>-</i>	<i>-100%</i>
Mali Lošinj	5.603	1.213	-78%	-	-100%
<i>Primorje-G. K.</i>	<i>6.815</i>	<i>1.213</i>	<i>-82%</i>	<i>-</i>	<i>-100%</i>
Zadar	19.366	788	-96%	12	-100%
<i>Zadar</i>	<i>19.366</i>	<i>788</i>	<i>-96%</i>	<i>12</i>	<i>-100%</i>
Split	98.204	15.461	-84%	3.932	-96%
Dubrovnik	37.634	2.804	-93%	532	-99%
Other ports	418	8	-98%	-	-100%
Croatia	255.327	20.312	-92%	4.476	-98%

Source DZS

Figure 15: number of international passengers' departures from the main Croatian ports by month from 2018 until June 2021



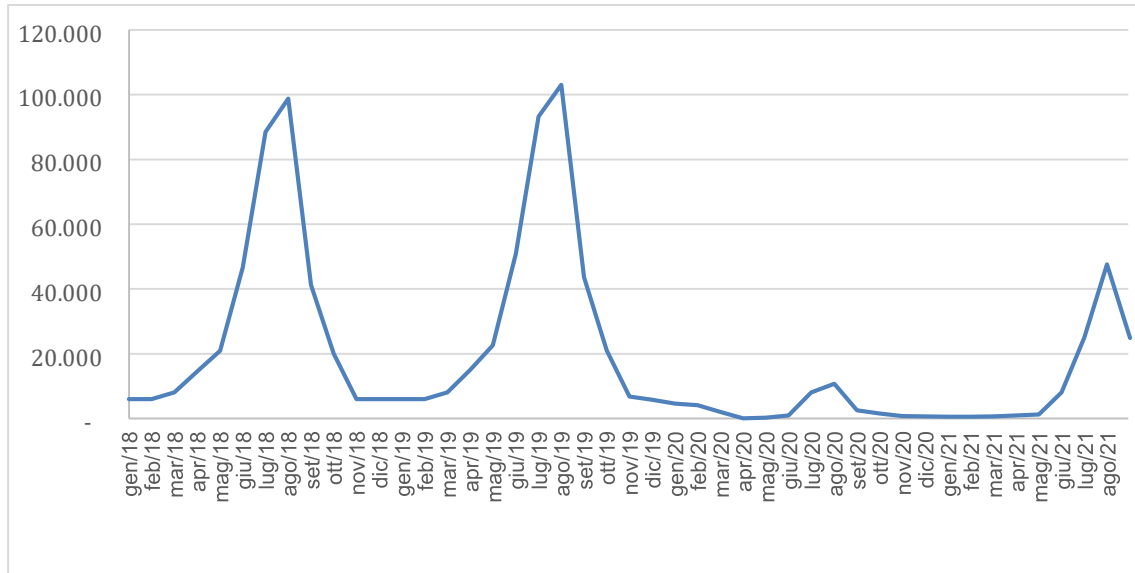
Source DZS)

Comparing the trend in the number of ship passengers with those who travelled by air and by land over the period 2018-june 2021 (September 2021 for air travels), two main aspects can be noted:

- The first is that **the reduction in the number of visitors was almost entirely reflected in shipping and air transport**. In fact, looking at the trend in road traffic over the same period (Figure 17) one can see a significant but much smaller reduction than that of ship and air passengers.
- The second is that **shipping did not recover in summer 2021 to the same extent as land and air transport** (please notice that as for air passengers (fig 15), the data about Italian tourists can be estimated, while for visitors who arrived by car or bus (Figure 17) only the data of foreign passengers (with no distinction) is available.)

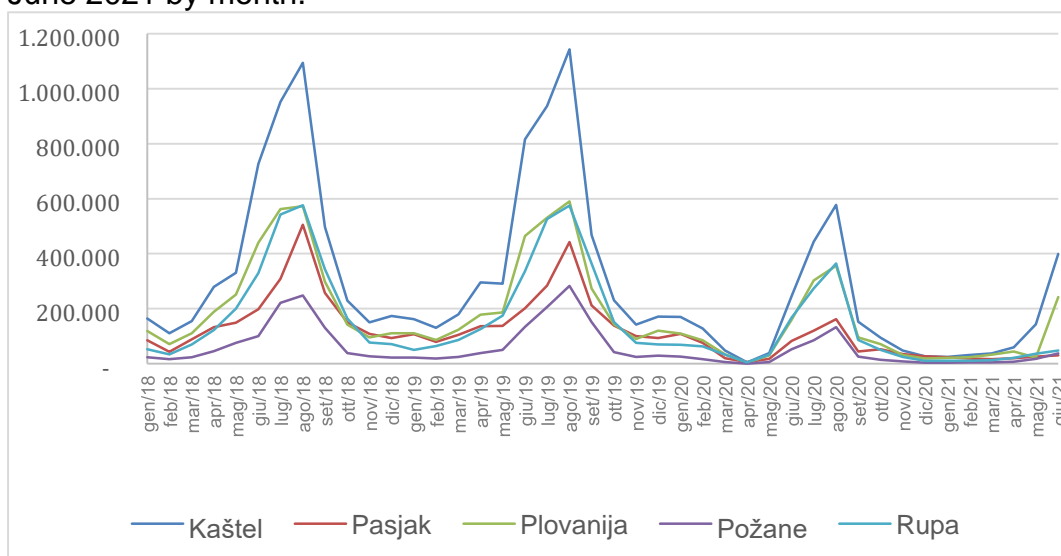
Sea transport was the one that was most affected by the reduction in travel demand caused by the pandemic. This can be explained by both supply-side factors (the reduction or cancellation of routes by shipping companies) and demand-side factors (the decision to reduce the time spent on the same means of travel with strangers). A contributing cause is probably the fact that Italy and Greece are the two neighboring countries from which the drop in tourists to Croatia was most evident (Figure 14).

Figure 16: number of Italian passengers' movements in Croatian Airports from January 2018 until September 2021 by month.



Source: estimations made of data from DZS

Figure 17: number of foreign passengers transiting through the Croatian border crossing points most used by Italian tourists and excursionists from January 2018 and June 2021 by month.



Source: DZS

In conclusion, some considerations regarding the projections developed in deliverable D.3.1.4 (scenario development). Although we are not yet in the situation to say whether and to what extent they will be met, there are currently no reasons to change the flow forecast to 2030, but rather only the slope of the demand growth curve over the period 2022-2030.e As the pandemic crisis eases its impact on social and economic life, it is conceivable that the effects

on demand will allow for a gradual recovery of demand to pre-crisis levels, while remaining correlated to the trends in the main economic and socio-demographic variables that have already been considered and which it is reasonable to assume will not deviate significantly from the estimated forecasts. Indeed, the literature is inclined to assume that in cases of shocks, demand will return to previous levels as soon as the causes of the shock gradually disappear over time. . The case of Covid, however, is rare and atypical, and studies on the recovery of tourism flows in a post-pandemic situation are ongoing. We therefore have no grounds for changing the scenarios already presented and, in particular, the range of tourist flows forecast for 2030 (Table 14 of D.3.14), except for a probable shift in the growth curve by two years compared to the initial forecast see D.3.1.4, section 4.4. “Travellers estimate”)

4. Destinations and travel modes

4.1. Tourists' destinations in Italy and Croatia

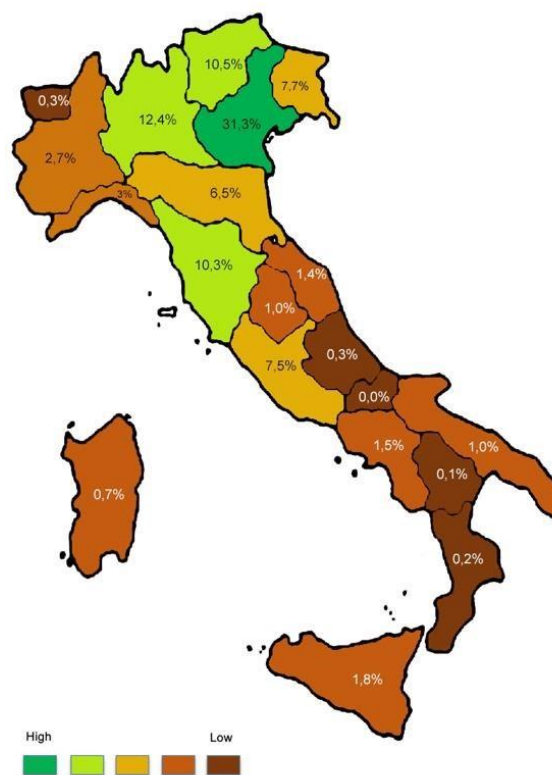
The analysis of tourists' destinations is an important element for transport planning insofar as it allows to design planned services in a way that makes the use of alternative mobility to the car more convenient. Unfortunately, available data on this aspect are incomplete and fragmented, especially on the Italian side. In fact, while the Croatian Bureau of Statistics carries out a systematic survey of foreign tourists' destinations, in Italy this data is not systematically collected for Croatian tourists. The result is that for this type of analysis we have only fragmentary data, which we shall nevertheless attempt to present in this document. It has already been mentioned both in this document and in D.3.1.4 (segmentation analysis) how the demand for travel Croatians in Italy is different in type and concentration from that of Italians in Croatia. Until 2019 (pre-Covid year) the former is more evenly distributed over the 12 months and over several regions, mainly mountainous areas and cities of art, while the second is concentrated in the summer months and in coastal areas.

Unfortunately, there are no recent statistics about the destination of Croatian Tourists in Italy. The last available data are from the “Croazia - Rapporto Congiunto Ambasciate / Consolati/ENIT 2017” from the Italian national agency for tourism, whose findings relate to the year 2015 and are reported Table 15 and Figure 18. Although the available survey is a few years old, data confirm what already emerged from the survey conducted for segmentation analysis, that is: the Veneto region concentrates a significant share of tourists' arrivals on itself by virtue of the proximity and of the presence of several cities of art (Venice, Padua, Verona), together with several sea and mountain landscape attractions, as well as food and wine

destinations. Lombardy, Tuscany and Trentino follow, again according to the 2015 survey, for reasons similar to those of Veneto. On the other hand, the percentage of Croatian tourists going to Friuli Venezia Giulia is probably underestimated, given that this region is the closest to Croatia and as such is the one most subject to visits by excursionists.

Table 15 and Figure 18: distribution (in percentage) of Croatian tourists' arrivals among the different Italian administrative regions (2015)

Italian Region (NUTS 2)	Share of Croatian tourists
Friuli-Venezia Giulia	7,7%
Veneto	31,3%
Emilia-Romagna	6,5%
Marche	1,4%
Abruzzo	0,3%
Puglia	1,0%
Basilicata	0,1%
Calabria	0,2%
Campania	1,5%
Lazio	7,5%
Liguria	3,0%
Lombardia	12,4%
Molise	0,0%
Piemonte	2,7%
Sardegna	0,7%
Sicilia	1,8%
Toscana	10,3%
Trentino-Alto Adige	10,5%
Umbria	1,0%
Valle d'Aosta	0,3%



Source: Croazia - Rapporto Congiunto Ambasciate/Consolati/ENIT 2017

The distribution of arrivals from Italy in Croatia over 2019 has already been shown in Table 11. Here we compare the distribution of arrivals among the different Croatian administrative regions in April 2019 and August 2019, two months, where usually demand peaks occur, are considered to be representative of two possible destination demand in different seasons. Table 16 and Figure 19 show that the Istria County is the most attractive Croatia region for the Italian tourists both all over the year 2019, and in the two peak months. However, its relative importance decreased in August, when Italians usually enjoy longer holidays. Indeed, data also show that in August summer the Dalmatian coastal area about doubled its attraction power.

It is worth noticing that the distributions here presented section refer to the destination of overnight stay, and therefore do not consider the fact that visitors pass through one or more regions during their trip. In fact, there is a relatively low percentage of tourists in regions that are nevertheless important maritime hubs between the two countries. This is addressed in the next section.

Table 16: Distribution of Italian tourists' arrivals among the different Croatian administrative regions in April and August 2019.

County	2019 April		2019 August	
	Arrivals	%	Arrivals	%
Istria	33.797	45,60%	186.216	35,60%
Primorje-Gorski Kotar	15.198	20,50%	121.406	23,20%
Karlovac	2.893	3,90%	13.223	2,50%
Lika-Senj	3.805	5,10%	47.513	9,10%
Zadar	2.796	3,80%	40.369	7,70%
Sibenik-Knin	1.167	1,60%	15.370	2,90%
Split-Dalmatia	3.240	4,40%	52.516	10,00%
Dubrovnik-Neretva	2.778	3,70%	31.898	6,10%
Bjelovar-Bilogora	87	0,10%	199	0,00%
Brod-Posavina	103	0,10%	375	0,10%
Koprivnica-Križevci	17	0,00%	12	0,00%
Krapina-Zagorje	269	0,40%	458	0,10%
Medimurje	80	0,10%	119	0,00%
Osijek-Baranja	101	0,10%	189	0,00%
Požega-Slavonia	20	0,00%	53	0,00%
Sisak-Moslavina	110	0,10%	290	0,10%
Varazdin	162	0,20%	279	0,10%
Virovitica-Podravina	20	0,00%	122	0,00%
Vukovar-Syrmia	167	0,20%	289	0,10%
Zagreb (County)	419	0,60%	1.378	0,30%
Zagreb (Grad)	6.868	9,30%	11.285	2,20%
Total	74.097	100,00%	523.559	100,00%

source DZS

4.2. Sea travels

In the previous deliverable D.3.1.4 (development scenario) the Italian and Croatian visitors travel modes (car, vessel, bus, airplane) have been estimated starting from available data about foreign passengers in ports and airports, and cars crossing borders between Slovenia and Croatia. These data were then crossed with those provided by Statistics bureaus of

Croatia, Italy and OECD in order to estimate the number of visitors for each travel mode (see 3.1.4 for details).

We've then been able to estimate the share of visitors for each specific travel mode with data referred to 2019; results are shown in Table 17. The shares are calculated as mean values between maximum and minimum estimate in case of a range higher than 2 percentage points. The overall share is calculated by the average of the Italian and Croatian share for each mode, weighted by the total number of visitors (excursionists estimate as mean value of the estimated range). As can be seen, car use is largely predominant in both countries but is significantly higher for Italian visitors. Croatian visitors to Italy, in fact, have a greater propensity for intermodality, which is evident above all from a much greater use of buses and planes.

Figure 19: Distribution (in percentage) of Italian tourists' arrivals among the different Croatian administrative regions in April and August 2019



Source: DZS

Table 17: estimate of Italians and Croatians visitors travel mode share (2019)

Transport mode	Italian visitors	Croatian visitors	Overall visitors (weighted average)
Car	90,0%	76,0%	88,2%
Bus	1,0%	16,0%	2,9%
Plane	2,0%	6,0%	2,5%
Liner	5,5%	1,0%	4,9%
High Speed Vessels	1,5%	1,0%	1,4%
<i>Total</i>	<i>100,0%</i>	<i>100,0%</i>	<i>100,0%</i>

Source: elaborations of data from various sources

To summarise what emerges from the modal distribution of arrivals in the two countries, apart from the excessive use of cars it seems clear that by 2019 the demand for sea travel had

reached the limit of its capacity. Table 18 reports the number of passengers (in both directions) that used maritime services between Italy and Croatia from 2015 and 2020.

The data in the Table are therefore not specifically attributable to Italian or Croatian tourists but to those who crossed the Adriatic, including foreign visitors from other countries. However, the number of non-Italian and non-Croatian international travellers is thought to be very limited and concentrated on high-speed vessels making day trips. From 2015 to 2019 the share of international ferry travels remains constantly around 9%, with a slight decrease in 2019 with respect to previous years (9,2%).

Table 18: overall number of passengers and vehicles using maritime* transport services between Italy and Croatia in years 2015-2020

Year	Sea Passengers**	Vehicles	Total arrivals (tourists + excursionists) from Italy / Croatia	% of international Adriatic ferry passengers on total arrivals
2015	429.041	64.221	5.044.926	8,5%
2016	439.669	63.238	4.711.041	9,3%
2017	437.396	59.747	4.625.979	9,5%
2018	460.902	65.258	4.714.294	9,8%
2019	440.714	64.776	4.806.773	9,2%

Source: Agencija za obalni linijski pomorski promet. (2021)

* Private vessels and cruises passengers are excluded

** Total passenger count. A passenger who, for instance, makes a round trip is then counted twice

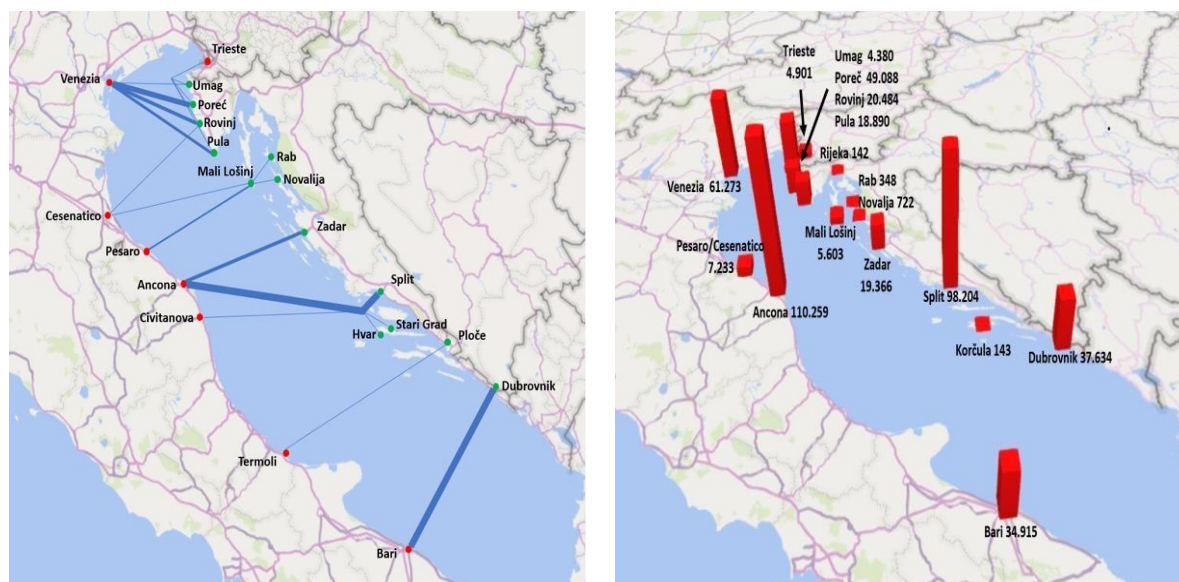
Since in this count a passenger making the round trip is counted twice, even if there were no other travellers on the ferries but Italians and Croats, this percentage is about twice as high as that for the total number of cross-border visitors. Basically, it is fair to assume that out of more than 4.8 million visitors per year, just over 220 thousand use the sea transports. Also, the number of cars transported by sea is negligible compared to the number of cars passing through the Italian and Croatian border points. In 2019, ferries transported a total of 64.776 cars on both sides of the Adriatic Sea, compared to an estimated number of 1,15 million Italian cars and about 350.000 Croatian cars transiting the Croatian entry points in 2019 (4,3% of Italian and Croatian cars). This is a small percentage, which could probably increase depending on two factors: a) improved accessibility to port nodes, b) an increase in ferry traffic. The demand for maritime transport is concentrated in a relatively small number of ports. Figure

20 shows the main maritime connections between Italy and Croatia between 2015 and 2019, together with a visual representation of cross-border passengers' distribution among main Adriatic ports in 2019.

On the Italian coast, the entire demand for cross-border maritime travel is divided among only 8 ports (Trieste, Venice, Cesenatico, Pesaro, Ancona, Civitanova, Termoli and Bari), but the three main ports (in this order: Ancona, Venice and Bari) concentrate about 94% of departures to and arrivals from Croatia.

Croatia offers instead at least 13 maritime departure points for Italy (Umag, Poreč, Rovinj, Pula, Mali Lošinj, Rab, Novigrad, Zadar, Split, Hvar, Hvar, Ploče and Dubrovnik), and the concentration of demand, although still high, is lower than in Italy, the three major Croatian ports (Split, Dubrovnik and Poreč) serving around 76% of travellers leaving from or arriving to Croatia.

Figure 20: main ferry lines between Italy and Croatia activated in 2015-2020 and estimates of the number of international passengers in the main Italian and Croatian ports in 2019



Source: estimates from Agencija za Obalni Linijski Pomorski Promet. (2021). (2021) and DZS data.

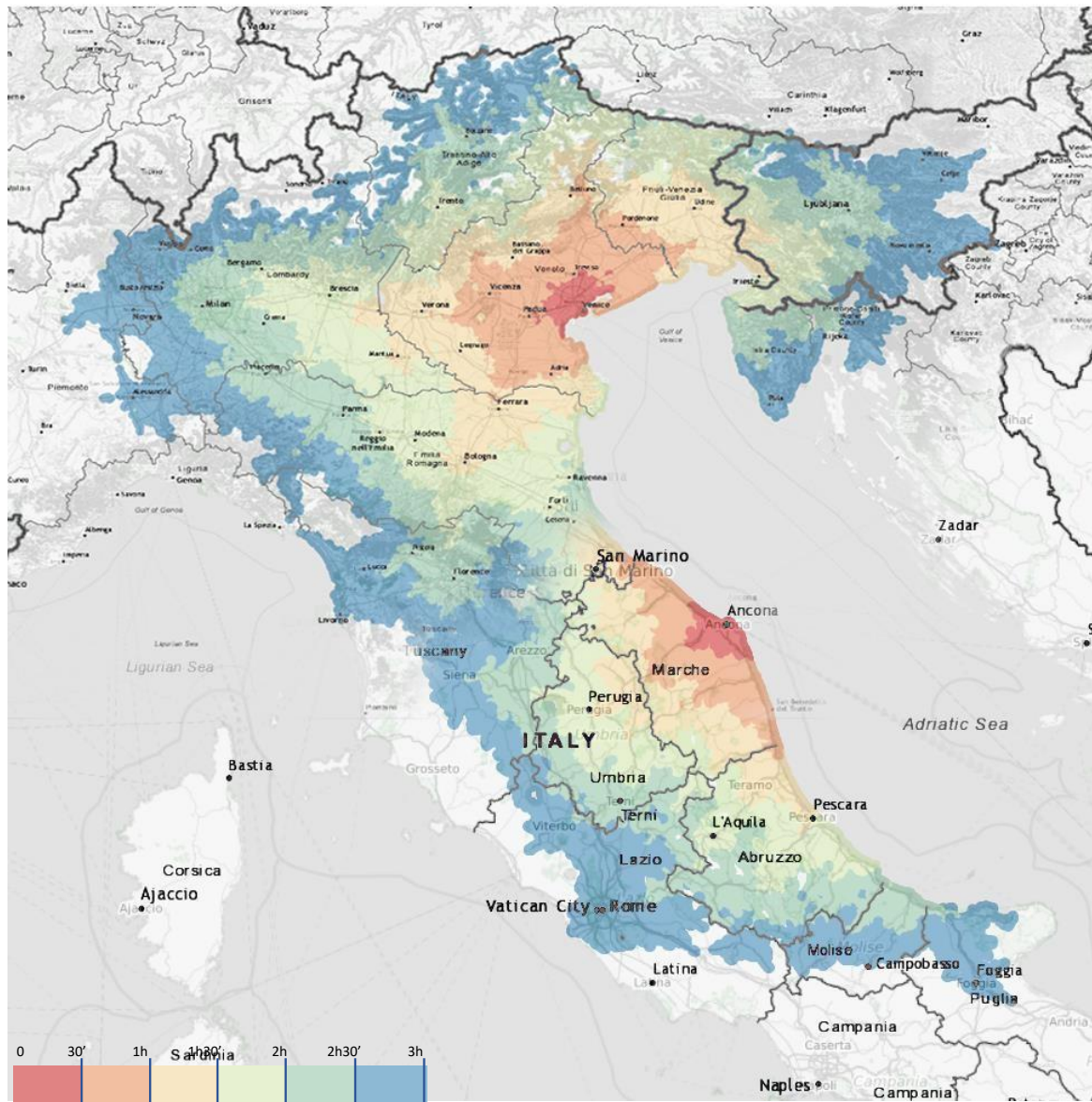
On the Italian side, Venice and Ancona alone account for about 78.5% of passenger departures to Croatia. The area of attraction of these two ports covers, on the whole, a large portion of the programme area and a good part of inland regions such as Lombardy, Tuscany, Umbria, as well as parts of Lazio and Tuscany (Figure 21). They are therefore also convenient

destinations for cultural tourism from Croatia due to their relative proximity to important destinations in those regions.

Bari's catchment area is much further south (about 4h45m from Ancona by car), and includes, in addition to Puglia, parts of Abruzzo, Calabria, Basilicata and Campania, with the city of Naples within a 3-hour drive of the boarding point.

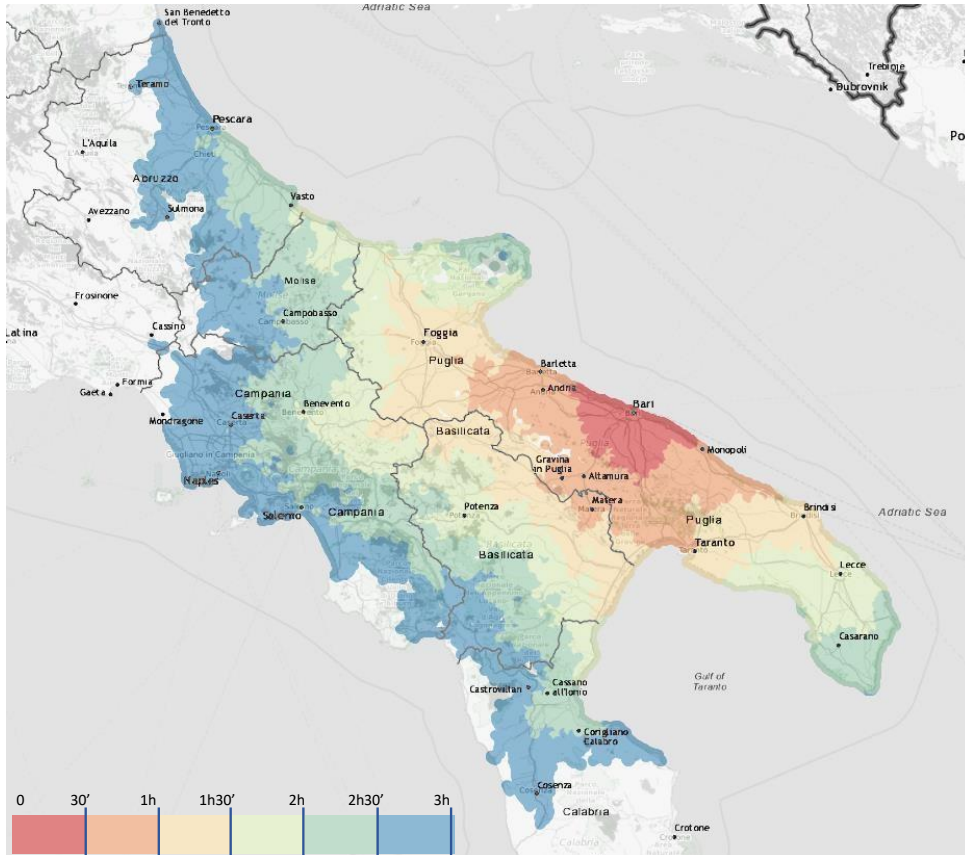
What stands out, however, is the lack of a passenger port whose catchment area includes Lazio (a region with almost 6 million inhabitants) and consequently Rome, a destination of maximum interest. For instance, the Porto di Vasto, in the Abruzzo region, would be a possible boarding point within 3 hours by car from Rome. A port in Vasto would also fill the gap between Ancona and Bari, being located almost exactly in the middle between these two ports (indicatively about 2h30m from both of them by car), thus providing an effective alternative for travellers whose origin or destination is Lazio and for those heading at or coming from the limit of the catchment area of Bari and Ancona (fig 20)

Figure 21: isochrone representation of destinations reachable by car from Venice and Ancona (0-3 h., intervals of 30')



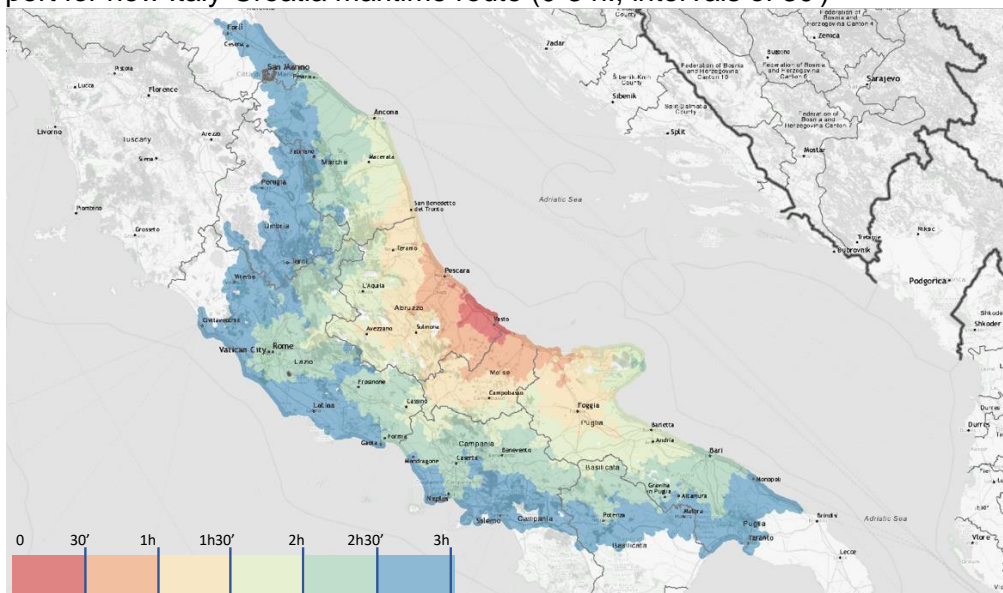
Source: elaboration of data from OpenStreetMap

Figure 22: isochrone representation of destinations reachable by car from Bari (0-3 h., intervals of 30')



Source: elaboration of data from OpenStreetMap

Figure 23: Isochrone representation of destinations reachable by car from Vasto as possible port for new Italy-Croatia maritime route (0-3 h., intervals of 30')



Source: elaboration of data from OpenStreetMap

On the Croatian side, the four ports of Umag, Poreč, Rovinj and Pula constitute, in fact, a port system within a radius of just over two hours by car and which overall served 36,4% of the international passenger departures from Croatia in 2019. Passenger traffic in Istrian ports also grew much faster than the overall trend of tourists, being probably largely made up of excursionists. In fact, between 2013 and 2019 the total number of passengers in these four ports grew by 51%, compared to an increase in the total number of cross-border tourists of 23.5% in the same period (Table 19).

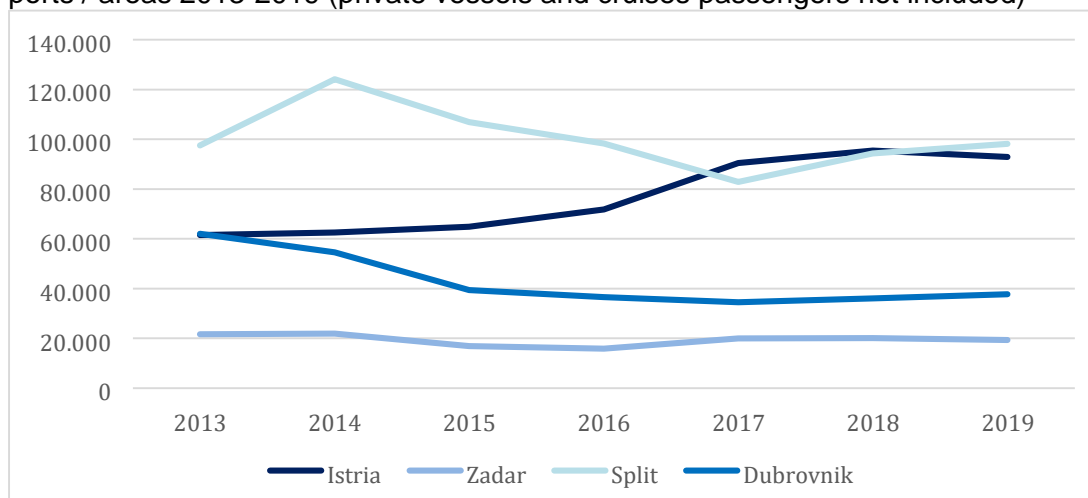
Table 19: number of international passengers' departures from the Istrian ports 2013 -2019 (private vessels and cruises passengers not included)

Port	2013	2014	2015	2016	2017	2018	2019
Umag	6.704	9.307	2.163	5.222	5.092	5.810	4.380
Poreč	33.599	33.849	38.877	43.351	46.093	48.592	49.088
Rovinj	12.781	9.155	11.200	11.781	19.226	19.139	20.484
Pula	8.367	10.216	12.545	11.494	20.025	21.966	18.890
<i>Istria</i>	<i>61.451</i>	<i>62.527</i>	<i>64.785</i>	<i>71.848</i>	<i>90.436</i>	<i>95.507</i>	<i>92.842</i>

source DZS

Istria is also the only Croatian county whose ports have seen an increase in departures of international passengers. Figure 24 shows the trend in international passengers' departures between 2013 and 2019 from Croatian main ports; it can be seen as the system of Istrian ports has acquired the same relevance, as for this aspect, of the port of Split.

Figure 24: trend in the number of international passengers departures from main Croatian ports / areas 2013-2019 (private vessels and cruises passengers not included)



source DZS

On the whole, considering that we are talking about pre-pandemic data excluding passengers from cruises, there seems to be opportunities to expand the offer of maritime transport between Italy and Croatia. For Italy, especially in view of the absence of any significant offer between Ancona and Bari. For Croatia, by virtue of the fact that in recent pre-pandemic years there has been a general decrease in international departures by sea, with the sole exception of the Istrian ports. It is not expected, however, that any increase in the supply of maritime transport will result in a significant reduction in car traffic, since the car transport capacity would still be a small fraction of the number of cars crossing the border. Moreover, according to the analyses carried out for D.3.1.4., with the technologies currently implemented on ships and high-speed vessels, an increase in transits would lead to an increase in polluting emissions (see D.3.1.4 for details).

4.3. Road travels

90% of Italian visitors to Croatia use cars as a mode of transport. The car is also the preferred means of transport for all foreign tourists from neighbouring countries. The vast majority of all tourists arriving in Croatia by car from Italy concentrate on only 5 crossings via Slovenia, through which a total of 4.8 million passenger vehicles passed in 2019. More than 56% of these vehicles are concentrated between June and September (Figure 26). The congestion caused by this situation is probably the most complex aspect of Croatian cross-border mobility to resolve.

The Croatian National Statistical Office records both the number of vehicles and of passengers' crossings the Slovenian border, distinguishing, however, only between Croats and foreigners. We therefore do not have the border data on the number of Italians or Italian cars going to Croatia, and the same applies to Croatian travellers going to Italy, but we can estimate them on the basis of a number of other related data.

Cross-border road traffic is concentrated at five main border crossing points between Slovenia and Croatia: Kaštel, Pasjak, Plovanija, Požane and Rupa. Italian tourists and excursionists travel almost exclusively through these points, together with visitors from Germany, Slovenia, Austria, Poland, Czech Republic and Hungary. As a whole, at these crossings are concentrated about 60% of all ground arrivals to and departures from Croatia. Table 20 shows the number of foreign and Croatian passengers transiting through the Croatian border crossing points, while Table 21 shows the number of vehicles. Overall, between 2015 and 2019 there

is a general increase in the number of both travellers and cars, while the number of buses decreases significantly over the same period, a sign of increasing private car use.

Table 20: number of foreign and Croatian passengers transiting through the main Croatian border crossing points (2015- 2019)

	2015	2016	2017	2018	2019	Variation 2015-2019
Foreign passengers						
Kaštel	4.861.943	5.035.663	4.893.893	4.861.744	4.966.007	2,10%
Pasjak	2.355.295	2.493.294	2.144.634	2.119.927	2.037.186	-13,50%
Plovanija	2.361.487	2.524.921	2.746.440	2.964.740	2.896.584	22,70%
Požane	736.653	663.488	891.132	974.364	1.023.504	38,90%
Rupa	2.471.693	2.606.269	2.638.119	2.582.796	2.601.388	5,20%
Total	12.787.071	13.323.635	13.314.218	13.503.571	13.524.669	5,80%

Croatian passengers						
Kaštel	839.819	818.316	761.848	771.221	841.099	0,20%
Pasjak	824.442	903.785	877.287	876.369	873.960	6,00%
Plovanija	548.585	563.722	546.868	566.644	599.206	9,20%
Požane	325.478	236.554	293.977	308.853	323.299	-0,70%
Rupa	539.713	520.340	613.202	674.283	626.633	16,10%
Total	3.078.037	3.042.717	3.093.182	3.197.370	3.264.197	6,00%

Total passengers						
Total	15.865.108	16.366.352	16.407.400	16.700.941	16.788.866	5,80%

Source DZS

Between 2015 and 2019, the total number of vehicles transited at these crossings increased by 9.7%, with the distribution among the five border crossings remaining mostly constant over time (Table 22 and Figure 25). It is noteworthy that the number

of vehicles grew faster than the number of passengers: +5,8% cross-border passengers between 2015 and 2019, while vehicle number in the same period is +9,7%. As a consequence, we have estimated that from 2015 until 2019 the average number of passengers per car decreased from 3,6 to 3,3.

Table 21: number of vehicles transiting through the main Croatian border crossing points (2015- 2019)

	2015	2016	2017	2018	2019	Variation 20152019
Foreign cars						
Kaštel	1.339.502	1.385.997	1.345.802	1.383.733	1.411.185	5,35%
Pasjak	580.710	624.973	547.267	563.892	554.428	-4,53%
Plovanija	795.528	868.345	909.117	949.809	930.570	16,98%
Požane	144.261	126.335	147.735	264.279	268.663	86,23%
Rupa	622.340	668.627	629.400	631.105	648.791	4,25%
Total	3.482.341	3.674.277	3.579.321	3.792.818	3.813.637	9,51%

Croatian cars						
Kaštel	244.177	231.946	220.441	226.067	258.220	5,75%
Pasjak	211.898	226.811	222.871	237.310	237.714	12,18%
Plovanija	172.868	180.772	172.128	179.129	189.151	9,42%
Požane	79.898	64.126	80.443	93.036	95.990	20,14%
Rupa	144.965	138.967	151.167	170.434	170.434	17,57%
Total	853.806	842.622	847.050	905.976	951.509	11,44%

Foreign coaches						
Kaštel	6.053	6.153	6.319	6.525	7.026	16,07%
Pasjak	10.995	8.637	7.812	5.910	6.003	-45,40%
Plovanija	3.627	4.109	5.099	5.710	5.686	56,77%
Požane	434	245	498	751	491	13,13%
Rupa	7.925	7.441	7.302	6.343	6.343	-19,96%

Total	29.034	26.585	27.030	25.239	25.549	-12,00%
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Croatian coaches						
Kaštel	2.741	2.786	2.264	2.142	2.258	-17,62%
Pasjak	3.695	3.617	3.537	2.978	2.599	-29,66%
Plovanija	1.412	1.452	1.407	1.051	892	-36,83%
Požane	381	129	273	348	327	-14,17%
Rupa	2.030	2.184	2.447	2.528	2.528	24,53%
Total	10.259	10.168	9.928	9.047	8.604	-16,13%

Total cars						
Total	4.336.147	4.516.899	4.426.371	4.698.794	4.765.146	9,89%

Total coaches						
Total	39.293	36.753	36.958	34.286	34.153	-13,08%

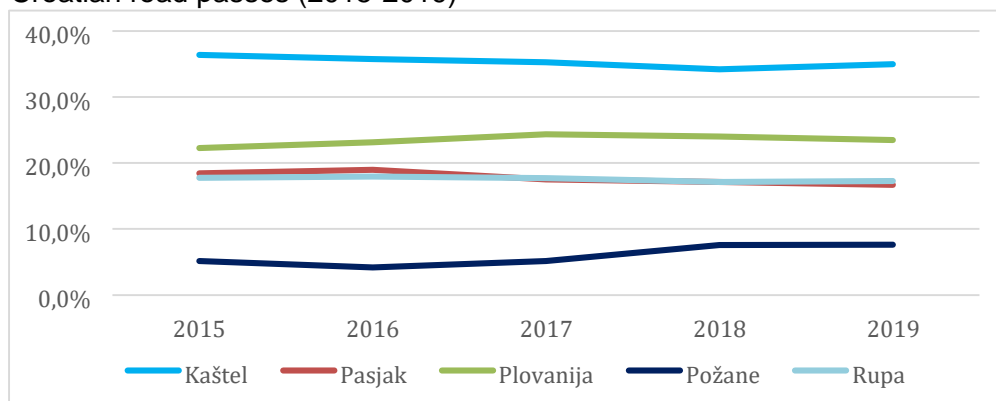
Source: DZS

Table 22: total number of cars & coaches crossing the main Croatian road borders (2015-2019)

Total cars & coaches						
	2015	2016	2017	2018	2019	Variation 2015-2019
Kaštel	1.592.473	1.626.882	1.574.826	1.618.467	1.678.689	5,41%
Pasjak	807.298	864.038	781.487	810.090	800.744	-0,81%
Plovanija	973.435	1.054.678	1.087.751	1.135.699	1.126.299	15,70%
Požane	224.974	190.835	228.949	358.414	365.471	62,45%
Rupa	777.260	817.219	790.316	810.410	828.096	6,54%
Total	4.375.440	4.553.652	4.463.329	4.733.080	4.799.299	9,69%

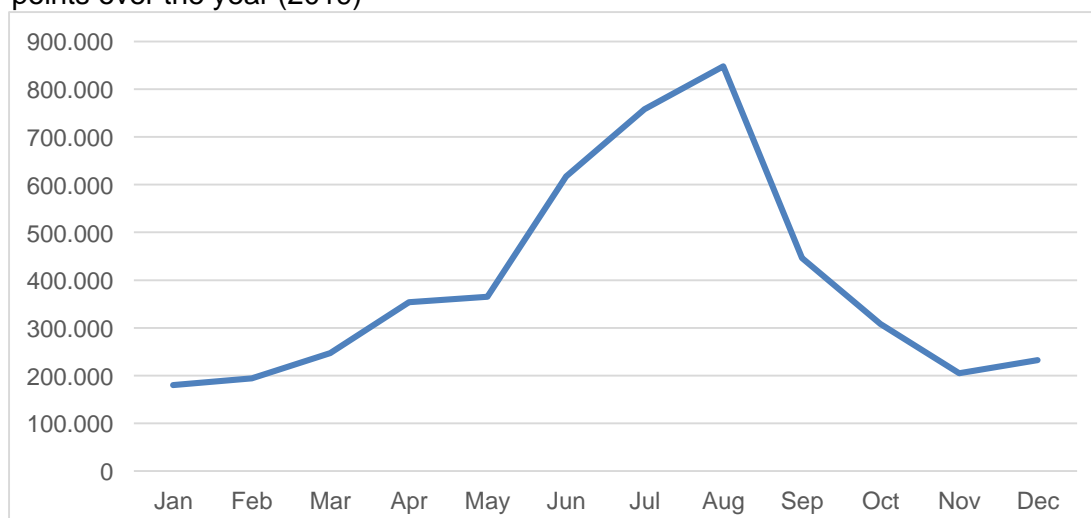
Source: DZS

Figure 25: percentage distribution of the number of vehicles in transit for the five main Croatian road passes (2015-2019)



Source: DZS

Figure 26: monthly distribution of car passages at the five main Croatian border crossing points over the year (2019)



Source: DZS

5. Concluding remarks

In the logic of the MIMOSA project, the knowledge of the quantitative status of the crossborder travel demand between Italy and Croatia is intended to support the implementation of pilots, awareness campaigns and the formulation of cross-border transport plans. The ultimate goal is to prepare instruments for the transition from a largely private car-based mode to a more sustainable multimodal system.

The data collected show that vehicular traffic to and from the two countries is very high and can be estimated at about 1.5 million cars per year in the pre-pandemic period, about 77% of which were cars of Italian travellers. The map of distances and the distribution of visitors' destinations tells us that this large number of cars travels mainly between the NorthEast of Italy and the counties of Istra and Primorje-Gorski Kotar. Car flows at the northern border of Croatia are minimally mitigated by the ferries that connect the two countries by sea (just over 4% of overall cars travel by sea).

On the whole, the large amount of car traffic that has been detected reveals opportunities for alternative means of transport, but these require an assessment of infrastructural problems and functional and performance characteristics (operation) that are beyond the scope of the demand analysis

The policies that can be used to reduce this traffic have a different nature and relevance according to: a) whether they are aimed at day trippers (excursionists) or tourists, b) according to the presumed origin and destination of the travellers, which can be deduced from the assessment of the accessibility of the destinations and the maritime connection nodes, especially for Italy.

The northern part of Italy (Friuli Venezia Giulia, Veneto, Trentino-Alto Adige/Südtirol, Lombardia, Piemonte, internal towns of Emilia-Romagna) which represent the area of origin of most Italian visitors travelling to Croatia, the car is the fastest way to reach Istria and Primorje-Gorski Kotar, two Counties that represents the destination of 60% or more of Italian visitors. (fig. 10). For visitors starting their journey in those regions, it is more efficient to use maritime transport only if: a) the origin is in the surroundings of the Italian cities of Venice and Trieste, connected to Istria through high-speed vessels, which are the means of transport more effective in taking excursionists away from the car, and b) if the destination is in the South of Croatia, i.e. Zadar, Sibenik-Knin, Split-Dalmatia, Dubrovnik-Neretva, which, however, as a whole are the destination of 16-17% of Italian tourists and, due to their geographical

distance, are not likely to be destinations for excursionists. With regard to Northern Italy as a starting area, therefore, the fast sea connections between the Italian cities of Venice and Trieste to Istria are the ones best able to take excursionists away from the use of cars, while to attract also tourists they require that connectivity and local services be put in place to make boarding points as accessible as possible and to ensure efficient mobility for tourists at the destination.

As regards central Italy, on the other hand, there is a connection gap that could be bridged by the creation of new cross-border maritime lines. For instance, the port of Vasto, has a position of relative advantage in connecting a large number of areas of both naturalistic and cultural value, including Abruzzo, Molise, part of Puglia, Marche and Lazio, including Rome within approximately a 3-hour range by car.

The question that remains unsolved, however, is that probably both strengthening maritime connections in the sense just described would in very likely have the effect of increasing the number of overall visitors, even before significantly reducing the use of a private car. In order to provide an effective alternative to car, the creation of new long-distance public transport must be accompanied by the implementation of both local and cross-border services that make travel easier and mobility on origin and destination at least as efficient as that of the car, including accessibility with luggage and for people with mobility difficulties. To provide a seamless mobility from the first to last mile is extremely difficult. However, even the simple implementation of bus lines can play a role. Technically, at current car occupancy rates one bus can replace 10 cars or more. However, according to data, the use of buses has declined in recent pre-pandemic years. The hope is that once the Covid emergency is over, the new bus operators that have entered the long-distance bus market will be able to attract large numbers of people.

Finally, it is fair to assume that the most efficient and effective long-term solution in reducing car use would be the train. However, at present this solution is not a relevant option for travellers. A possible railway line connecting North-Eastern Italy with Istria and PrimorjeGorski Kotar would certainly be able to change not only the tourist flows but also the permeability of the borders between the two countries, creating the conditions for a significant increase of excursionists in both directions, as well as for the reduction of travellers by car. However, we are not in a position to assess the implications of such an alternative, since it includes the analysis of complex operational and infrastructural aspects that are beyond the scope of travel demand analysis.

Annex: Cross-border movements analysis based on mobile phones

Methodology

The measurement of mobility is often carried out indirectly: rather than measuring the single movement itself, the measurement can, in some cases, focus on the traffic stream recorded across one or more section of the infrastructure or the duration of the stay in a place differing from the usual residence. As an alternative, it can rely on sampling regarding past travels or even a passengers' subset limited in time and space.

The ubiquitous presence of mobile phones in our lives (according to the Global Digital Report 2022 84,3% of the population uses internet, while 97,3% of internet user aged between 16 and 64 owns a smartphone) allows to study mobility through the tracking of phones. Mobile phones, smartphones in particular, are frequently connected to a mobile internet network. Through the analysis of users' daily connections to cell towers, telephone companies are able to esteem, using specific mathematical models, the amount of people located in a specific period of time in a specific area. This data, once anonymized and aggregated for privacy reasons, is processed by providers considering their users and foreign users for those foreign providers which have signed international roaming agreements, to be later extracted from the overall mobile users.

Movements of people and, to a lesser extent, devices connected to multiple cell towers at once even without physical movement, demand a processing capable of simplifying data to make the analysis feasible. Therefore, the concept of presence becomes essential: single users are considered physically present in a specific geographic area provided they remain active in the same area for a period of time exceeding a set threshold (in this specific case, two hours at least). A user physically present is called visitor and he can visit the considered area multiple times. Therefore, the number of visitors consists of a measurement of the population present in a specific geographical area in a specific period of time. The geographical area is defined according to mobile phone network coverage and it generally corresponds to the area of a municipality or a smaller one in case of larger municipalities. Figures showed in this study have been provided by WindTre and refer to year 2022.

Not only does this approach to mobility analysis fill a gap in traditional statistics, it is also of growing interest for official statistics: as an example, the Italian National Statistics Plan foresees a study of Big Data for statistical purposes (IST-02808), to be carried out by the Italian National institute for statistics (Istat), which is particularly attentive to mobile phone

data. Furthermore, the first employment of mobile data by Friuli Venezia Giulia Region for study and policy planning purposes dates back to 2015, while this data has been regularly updated starting from 2019.

The use of mobile phone network data proves to be particularly useful when studying cross-border mobility, because infrastructure-based recording cannot identify travelers' country of residence, while sampling based on resident population does not take into account foreign visitors. Despite being related to the network provider producing data, specifically to the Italian territory, information such as user's mobile phone operator and his country of residence is readily available, all caveats considered. This set of information, however, remains limited: whereas Italian users can be traced for a prolonged period of time, enabling a profiling process aiming at evaluating the reason behind the stay in a specific territory (such as residents, city users, tourists, etc.), this kind of tracing is not possible for foreign SIM cards. As a result, information available is limited to the amount of users located in the specific territory in a predetermined timespan, usually during a single day, not allowing to distinguish, for example, cross-border workers from tourists or hikers.

The provision of thorough data concerning all of the 215 municipalities of the FVG Region proved to be impossible, due to the nature of the network and the regional orography. As a consequence, in some cases data refers to unions of municipalities, totaling 208 municipalities or unions. For the sake of simplicity in the following sections the term "municipality" refers to both cases.

This analysis constitutes one of the first application of mobile phone network data to the analysis of cross-border mobility. Through the acquisition of further information, future analysis may become more detailed. For example, the provision of data subdivided in hours would make possible to identify the reason behind foreign presences, namely for work reasons, shopping or night leisure.

Presence of cross-border visitors

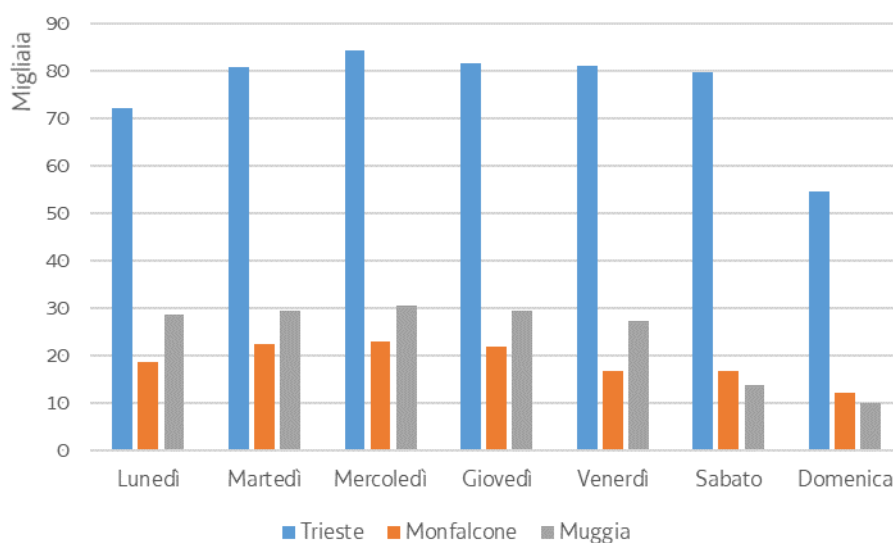
In 2022 visits from Croatia concentrated in the municipality of Trieste (34%, 533.000 total visits, 122.000 one-time visitors in the year), followed by the municipality of Monfalcone (11%, 169.000 visits, 18 one-time visitors) while 18% were distributed among the remaining municipalities of the Trieste province. Considering the Region as a whole, it's worth mentioning other municipalities such as Gorizia (3% of total visits), Udine (2%), and 1% for each of the municipalities of Ronchi dei Legionari, Villesse, Tarvisio, Visco.

In comparison to Slovenian visits, the latter are mainly distributed along the border area, with a more limited presence in Trieste (24% in the municipality of Trieste, 18% in Gorizia, 25% in

the other municipalities of the province of Trieste, 4% in Tarvisio). Austrian visitors prefer tourist destinations such as Lignano (25% of visits) and Grado (15%), besides Trieste (11%), Tarvisio (10%) and Udine (3%). The reason driving Austrian visits is mainly tourism, while Slovenians and Croatians can be present for several reasons, mainly related to working reasons and the attraction of shopping centers.

The analysis of movements through SIM tracking do not allow to discover the reasons behind the stay, which can be inferred instead considering the trend for each week day: the “commercial” stream of visits is higher during weekends, while remains low on Monday, which corresponds to the closure day for several businesses. On the other hand, cross border workers are detected during working days as well. Regarding the more than 533.000 visits by Croatians detected in Trieste in 2022, Wednesday represents the favorite day (more than 15% of overall visits, 1.620 visits on average during the year), while Sunday is the least favorite day (barely above 1.000 visits each Sunday).

Average visits from Croatia each day of the week, year 2022

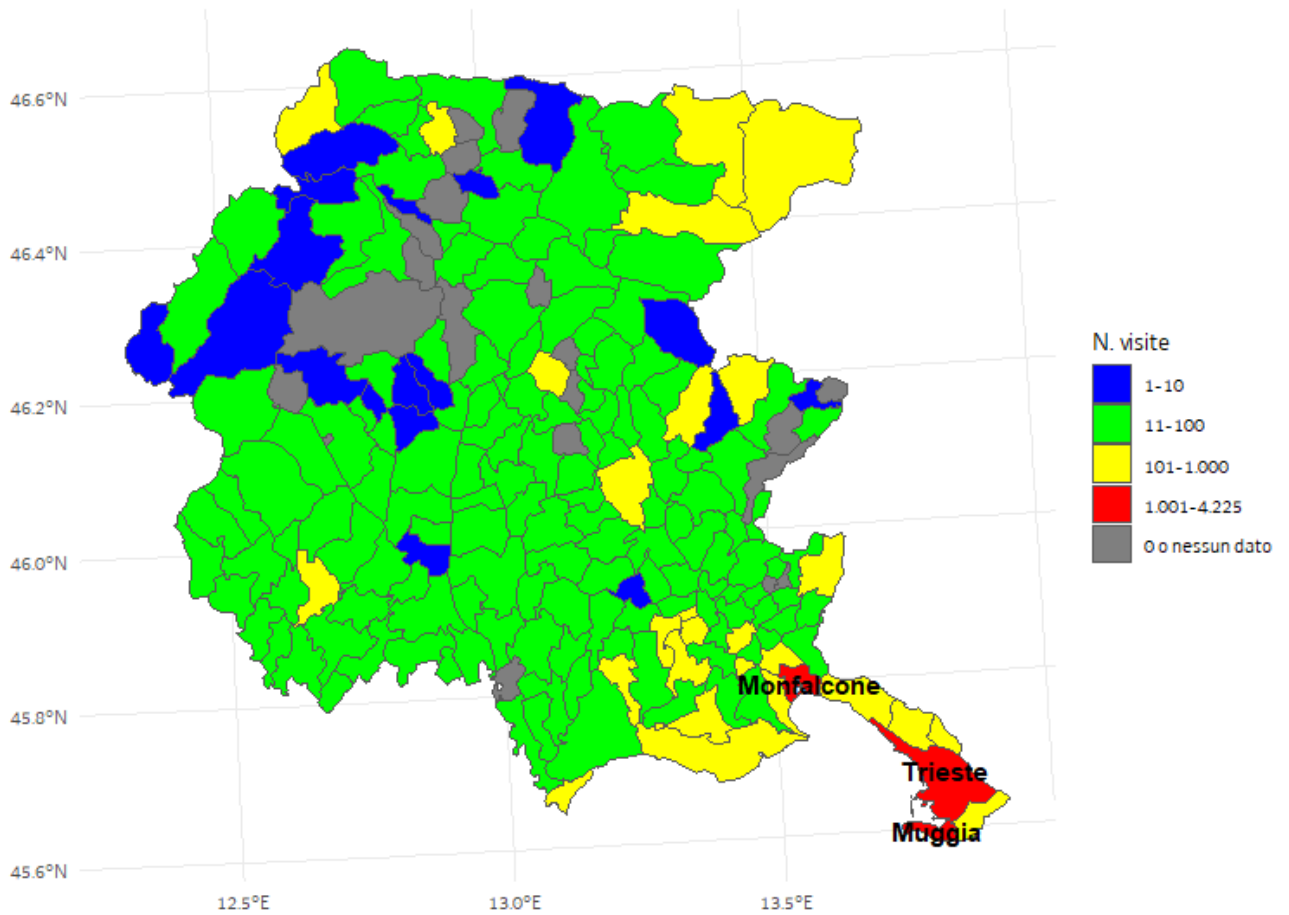


Source: processing made by the Service based on WindTre data

All of the municipalities of the Trieste province witness Croatian visitors on a daily basis, in the same way as the municipalities of Gorizia, Monfalcone, Ronchi dei Legionari and Udine. Almost no Croatian visitors have been detected in the small municipalities located in the western mountains and the Natisone river valley.

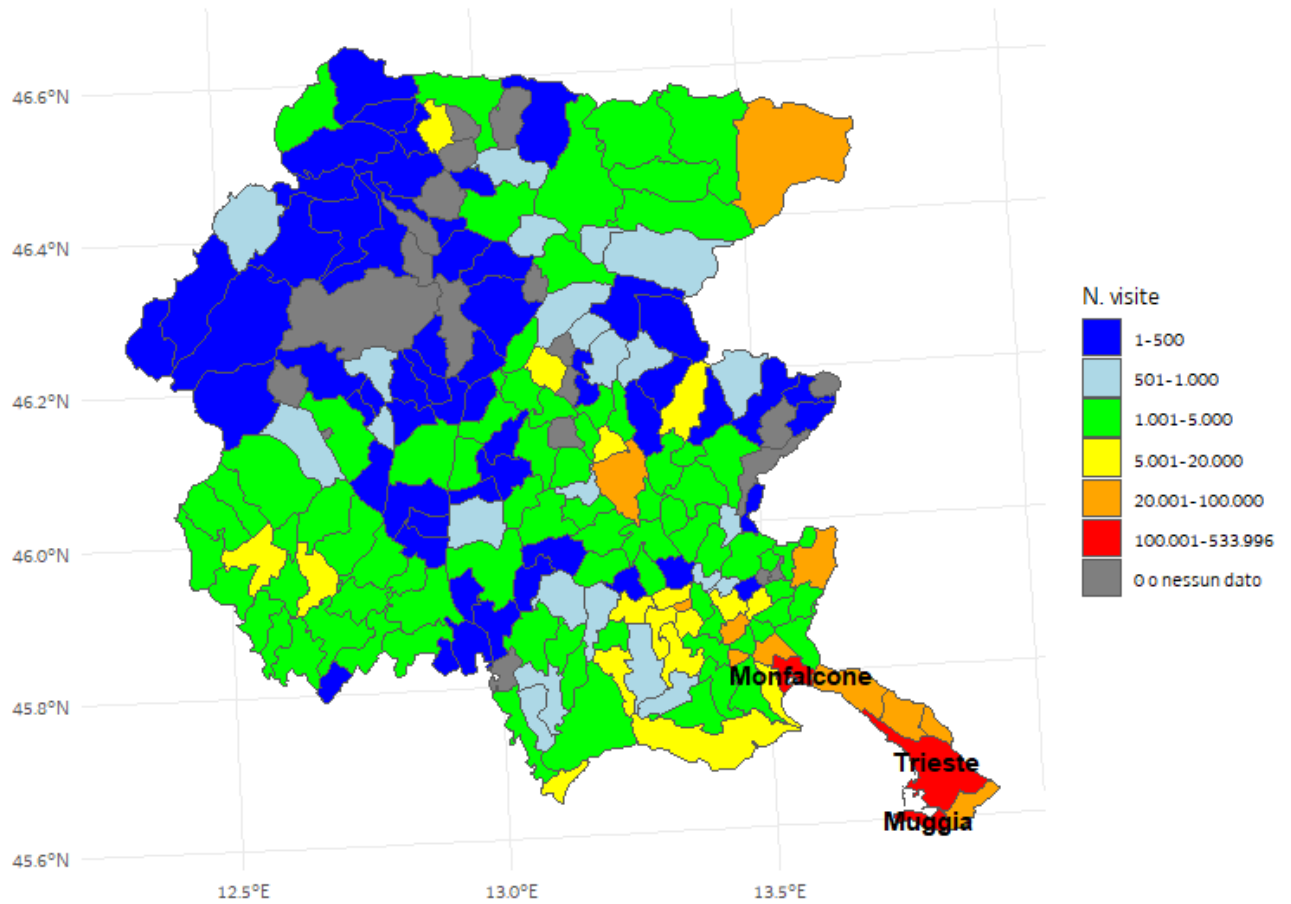
Croatians

Visits from Croatia, daily maximum, year 2022



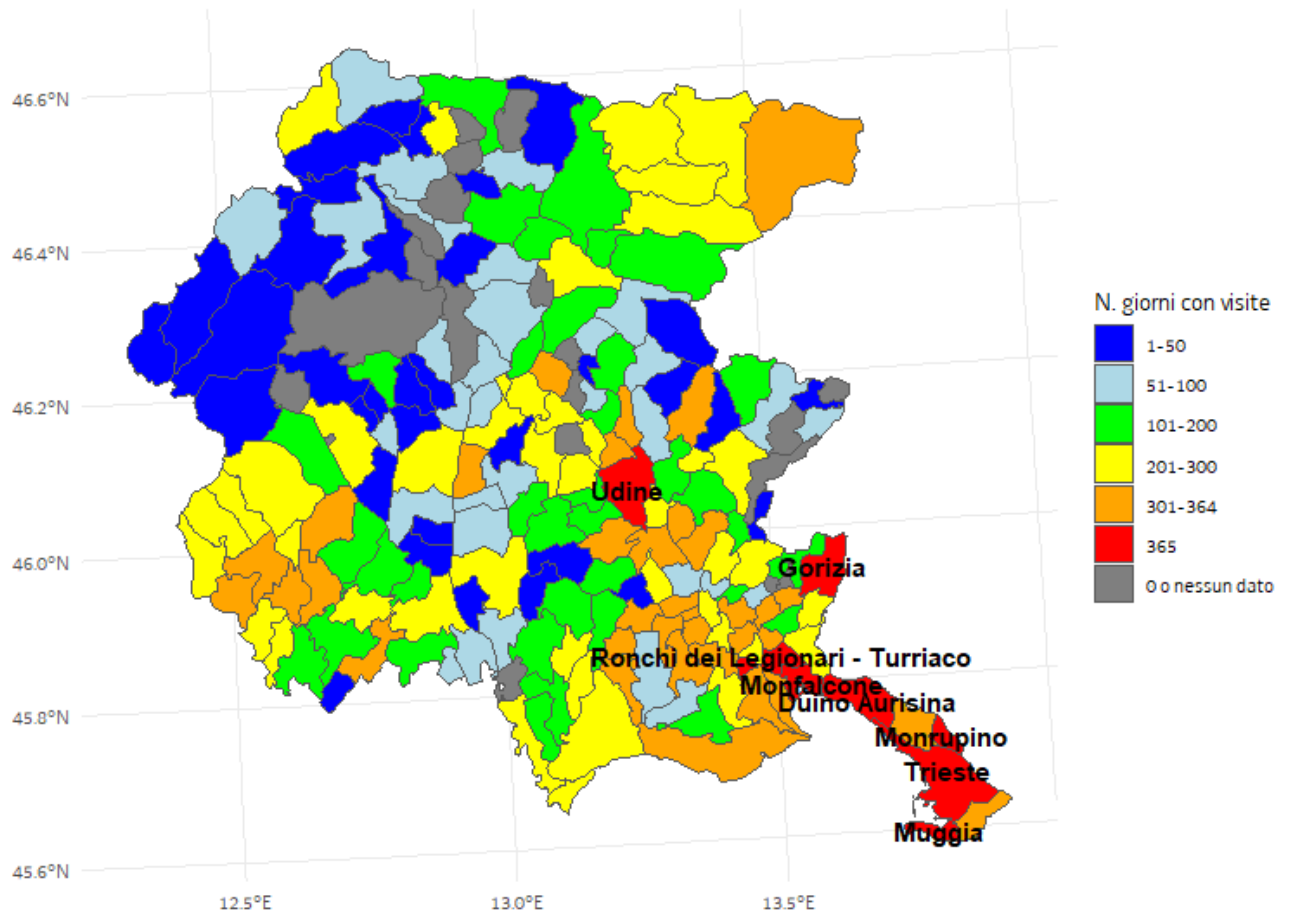
Source: processing made by the Service based on WindTre data

Total visits from Croatia, year 2022



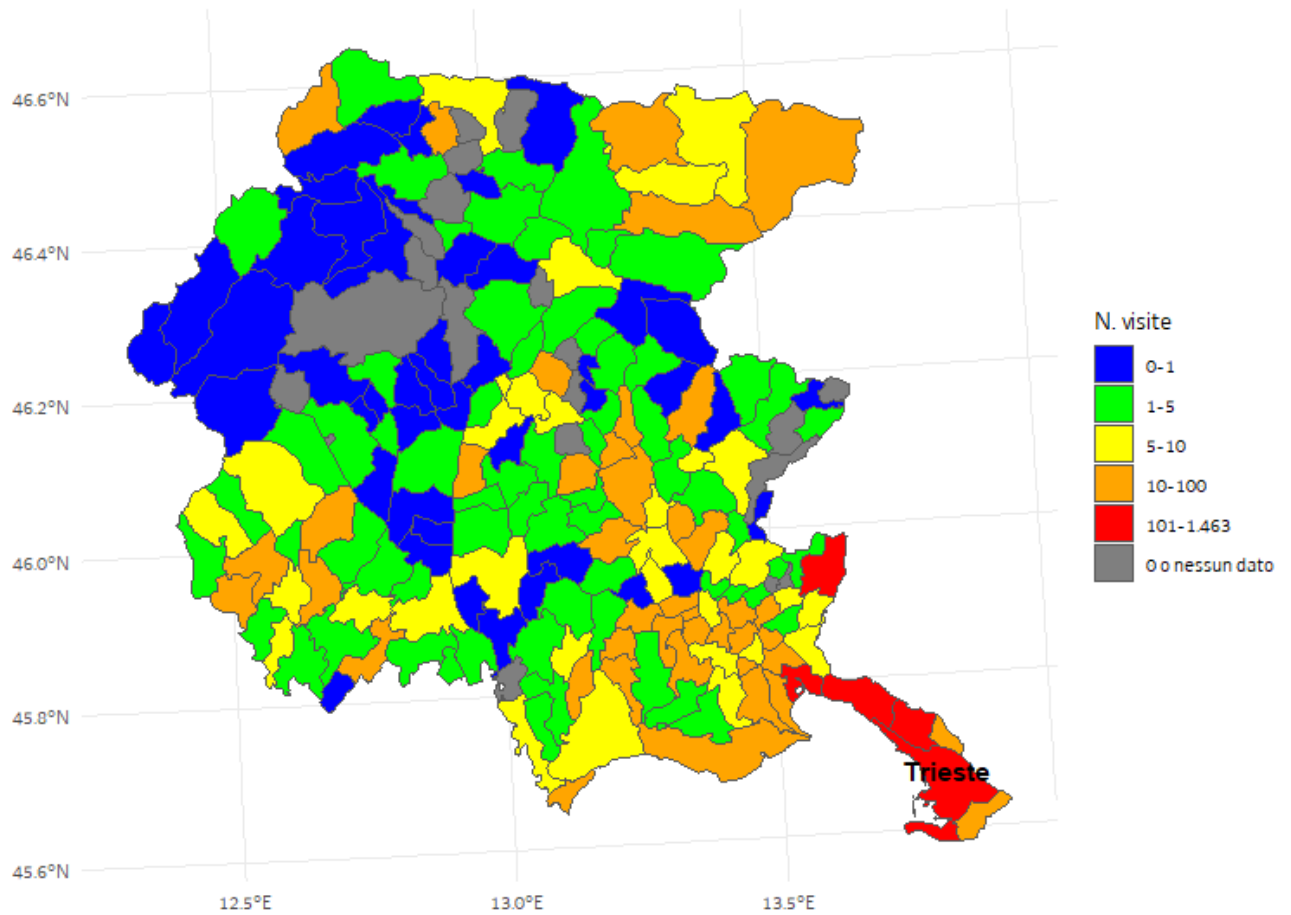
Source: processing made by the Service based on WindTre data

Number of days with Croatian visitors, year 2022



Source: processing made by the Service based on WindTre data

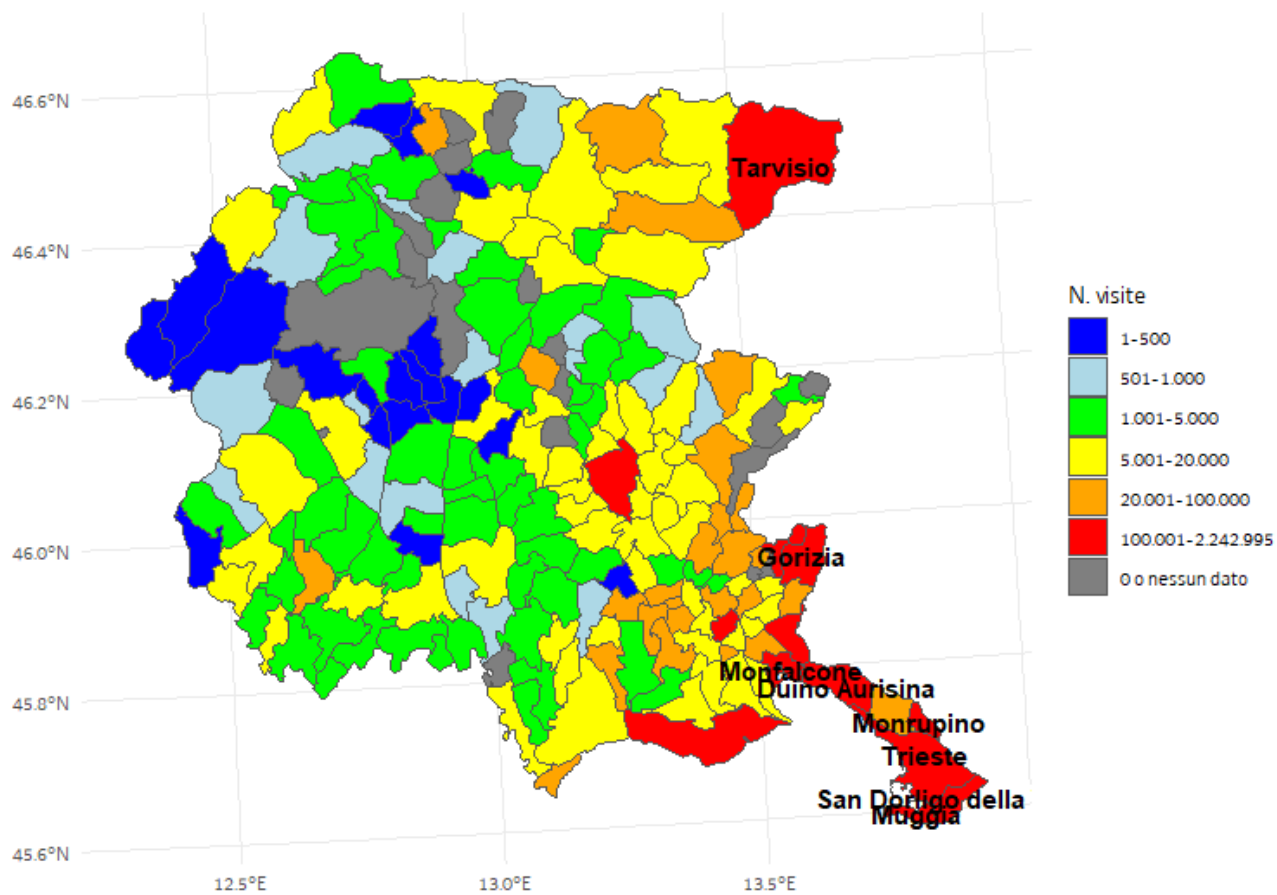
Average visits from Croatia only in days having at least a single visit, year 2022



Source: processing made by the Service based on WindTre data

Slovenians

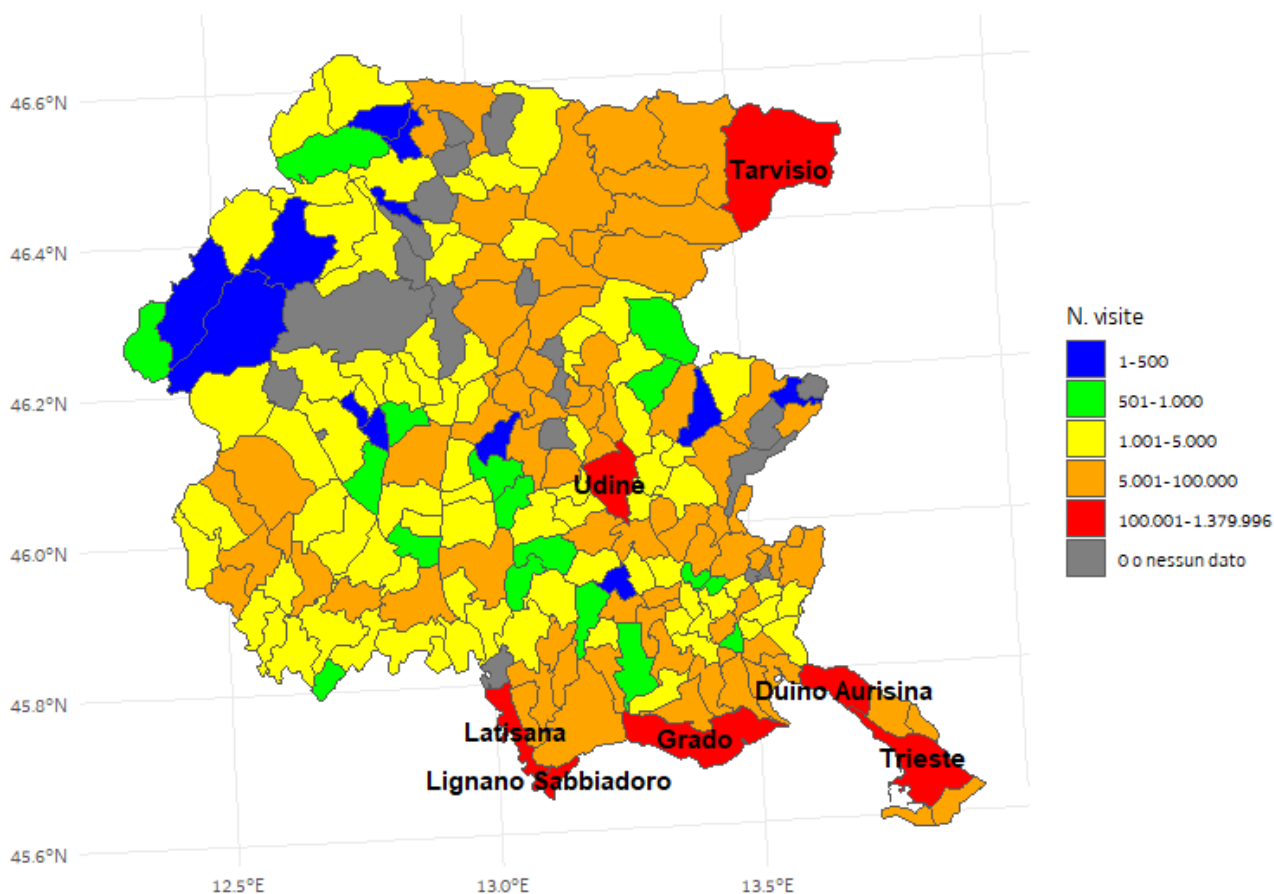
Total number of visits from Slovenia, year 2022



Source: processing made by the Service based on WindTre data

Austrians

Total number of visits from Austria, year 2022



Source: processing made by the Service based on WindTre data

The visitors in the main points of interest

During 2022, more than two million and a half foreign visits in the most important commercial locations in the region have been recorded through SIM tracking. These locations comprise single shopping centers and areas with high density of businesses, which have been identified as particularly attractive points of interest for the *shopping tourism*. The destinations considered are as follows: Belforte Shopping Center (Monfalcone), I Salici Shopping Center (Sacile), Montedoro Shopping center (Muggia), Torri d'Europa Shopping Center, Città Fiera (Martignacco), Emmezeta Commercial Complex (Bagnaria Arsa), Gran Shopping Granfiume shopping center (Fiume Veneto), Palmanova Outlet Village (Aiello del Friuli), Pradamano commercial complex (Pradamano), Tiare Shopping shopping center (Villesse), Udine nord

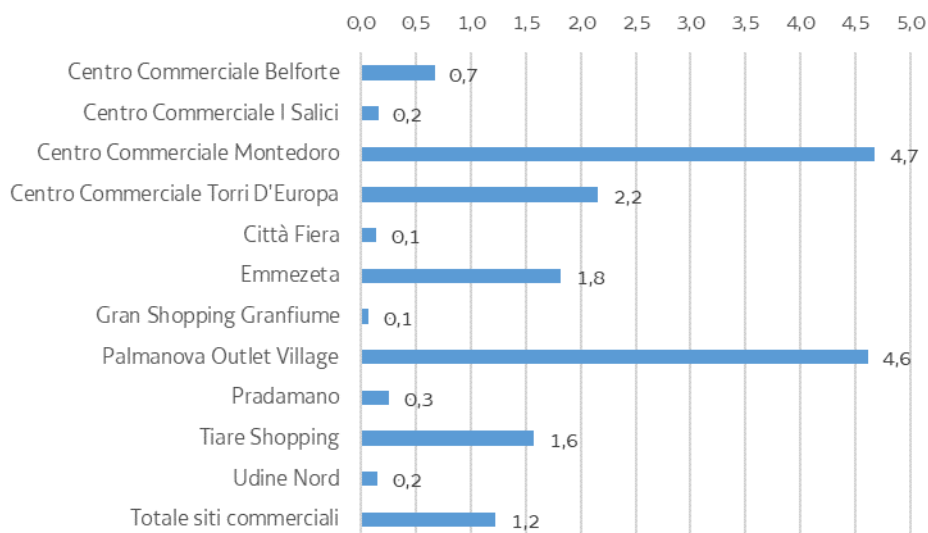
commercial area (Udine e Tavagnacco). To a large extent, visitors having a foreign SIM card come from Slovenia (1.100.000 visits), who choose Tiare Shopping shopping center as the preferred destination, followed by Montedoro shopping Center and Palmanova Outlet Village. Croatian visitors rank second: 268.400 visitors during 2022, a little more than the 263.700 Austrian visitors in the same year. The favorite destination of visitors with Croatian SIM card is the Centro Commerciale Montedoro of Muggia, the largest shopping center after crossing the border, which collects more than 68.000 visits from Croatia, representing 4,7% of the total visits to that shopping center. The second preferred destination is the Palmanova Outlet Village, totaling 57.000 visits (4,6% of its total visits), which is the furthest location among all of those considered while being specifically oriented to branded clothing; the Outlet Village, among all the surveyed destinations, represents the most attractive for foreigners, even for those coming from countries such as Romania and Serbia (39,8% of visits can be traced back to foreigners). The destinations following favorite destinations are Tiare Shopping (almost 50.000 visits), Torri d'Europa (41.6000 visits) and Emmezeta of Bagnaria Arsa (25.000 visits).

Visits in commercial points of interest, by origin. Year 2022

	Totale visite	Visite di stranieri	Austria	Croazia	Slovenia
Centro Commerciale Belforte	1.498.711	82.600	6.000	10.022	20.902
Centro Commerciale I Salici	772.522	23.604	1.014	1.203	1.910
Centro Commerciale Montedoro	1.457.216	451.758	8.264	68.151	333.247
Centro Commerciale Torri D'Europa	1.928.336	259.460	11.939	41.632	94.449
Città Fiera	3.603.455	160.666	47.538	4.969	20.258
Emmezeta	1.416.587	281.538	33.165	25.779	57.602
Gran Shopping Granfiume	2.213.600	59.277	4.056	1.529	4.289
Palmanova Outlet Village	1.241.261	493.739	81.955	57.244	200.097
Pradamano	1.156.782	41.439	4.056	2.949	9.617
Tiare Shopping	3.162.090	551.799	18.501	49.764	351.074
Udine Nord	3.440.603	149.825	47.207	5.171	22.366
Totale siti commerciali	21.891.163	2.555.705	263.695	268.413	1.115.811

Source: processing made by the Service based on WindTre data

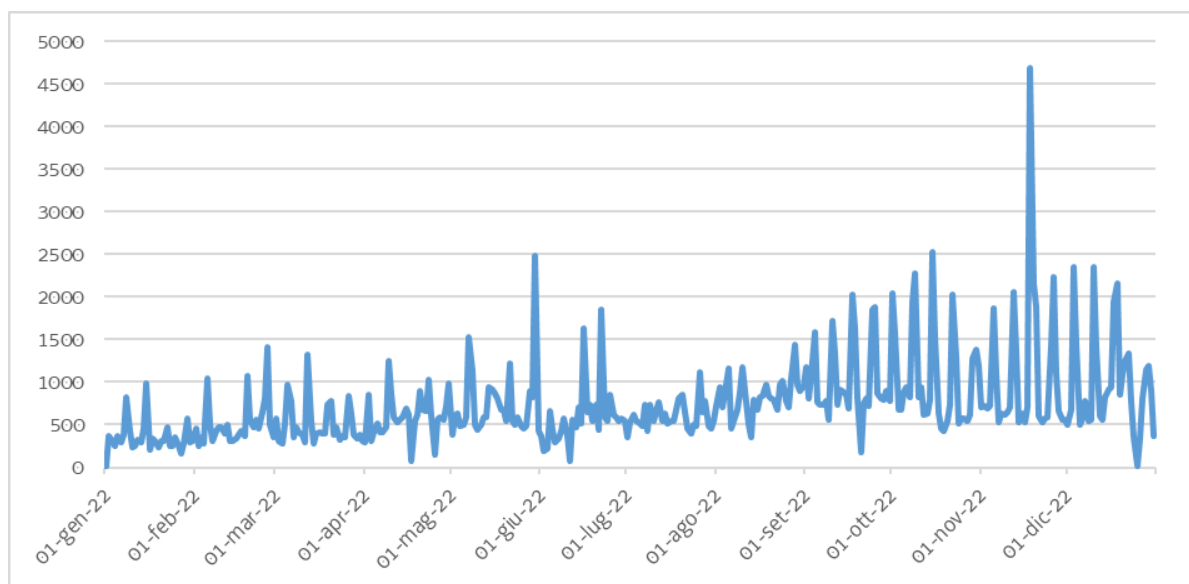
Percentage of visits from Croatia out of the total visits, by destination. Year 2022



Source: processing made by the Service based on WindTre data

As far as time dimension is concerned, visits from Croatia to commercial destinations reached a maximum during Croatian national holidays, namely 18th November and 30th May. On 18th November the visitors to commercial sites coming from Croatia amounted to 4.683, including 1.341 to the Montedoro Shopping Center and 1.120 to Tiare Shopping. On Monday 30th May, visitors amounted to 2.483. Generally speaking, visits to shopping centers from Croatia took place mostly on Saturday (22,3%) and on Sunday (16,9%). During the first half of 2022 arrivals from Croatia averaged 16.000 visitors each month, while on the second half they increased to 28.000 on average each month. It should be taken into consideration how at the beginning of 2022 some limitations to the access to public spaces were still in force, being gradually revoked during the year (in particular in May 2022). In June and July visits remained around 18.000 units per month, while increasing and becoming more regular starting from September, with a highest frequency during weekend.

Visits from Croatia to commercial destinations. Year 2022⁵



Source: processing made by the Service based on WindTre data

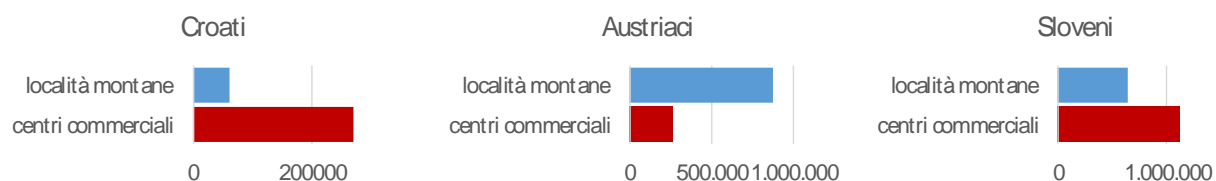
Croatian SIM cards tracking on the regional territory outlines a geography of movements driven by the commercial offer of the territory rather than by the touristic attractions offered by seaside or mountain destinations. As an example, visits to Miramare Castle⁶ by Croatian visitors represents only a tenth of the number of visits recorder at the Montedoro Shopping Center, despite these two locations being only half an hour far by car. The visits to the main tourist locations in the mountains⁷ amount to approximately 61.000, a little more than a quarter of the visits to shopping centers in the region. This represents a typical trend of Croatian visitors, which cannot be compared, as far as the total amount is considered, to the trends of Slovenian or Austrian visitors.

⁵ This data refers to overall visits to the destinations considered, therefore the same individual visiting two locations on the same day is counted twice

⁶ Comparing the Italian ministry of Culture statistics regarding State museums and SIM card presences in the area of the park and museum of the Miramare Castle shows that the latter are underestimated since SIM tracking only considers visitors staying for at least two hours in the cell tower area. Regardless of this consideration, commercial locations remain to a greater extent the favorite location.

⁷ The municipalities belonging to the territory of Tarvisio, those of the Carnia territory, as well as Forni di Sopra, Sappada, Sauris, Piancavallo.

Visits to shopping centers and main mountain destinations in the Region by Croatian, Austrian and Slovenian visitors. Year 2022

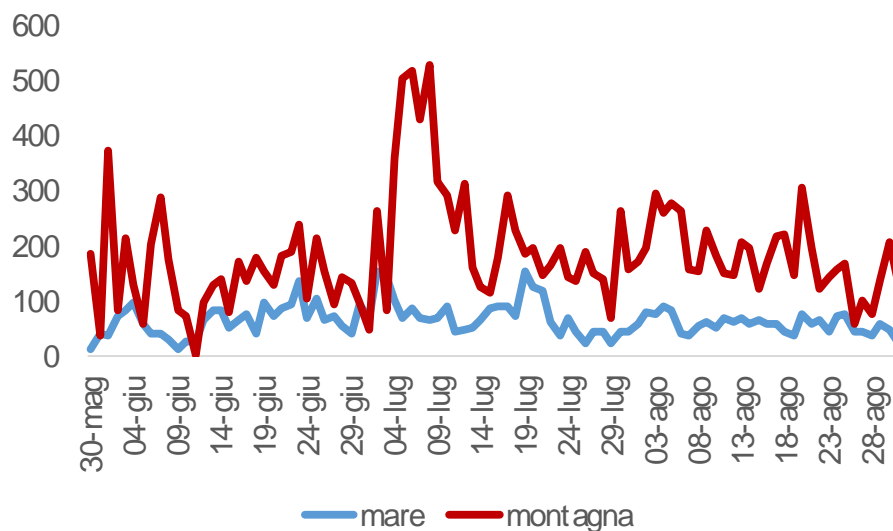


Source: processing made by the Service based on WindTre data

In summer, Croatian visitors to the main seaside location of FVG region (namely Lignano Sabbiadoro and Grado) totaled 6.100 between June and August 2022, one of the lowest results when considering only European tourists visits. Visits reached their peak at the time of major shows or sport events, as shown by the record number of visits on Thursday 23rd June, on the occasion of the concert of the rock band Måneskin at Lignano Sabbiadoro, on 2nd and 3rd June, always in Lignano Sabbiadoro, corresponding to the Jova Beach Party concert and on 4th June in Grado during a triathlon event in the lagoon.

Regarding the mountains, the favorite destinations are those in the area of Tarvisio during both summer and winter: more than 14.000 visits between June and August and approximately 11.000 ones between December and March. During the winter season 2021-2022 more than 18.000 Croatian visitors were recorded overall, mostly during February 2022 (41,3%), traditionally the favorite month for skiing holidays and the usual period for school holidays. According to statistics by Istat concerning tourist movements, these visits entail a night stay especially when the destination is far from the border, mainly Sappada, followed by Ravascletto, Ovaro and Sutrio, other than Tarvisio and Sella Nevea to a lesser extent.

Visits to the main seaside and mountain destinations of FVG region by Croatian tourists in summer. 30th May⁸ 2022- 31st August 2022.

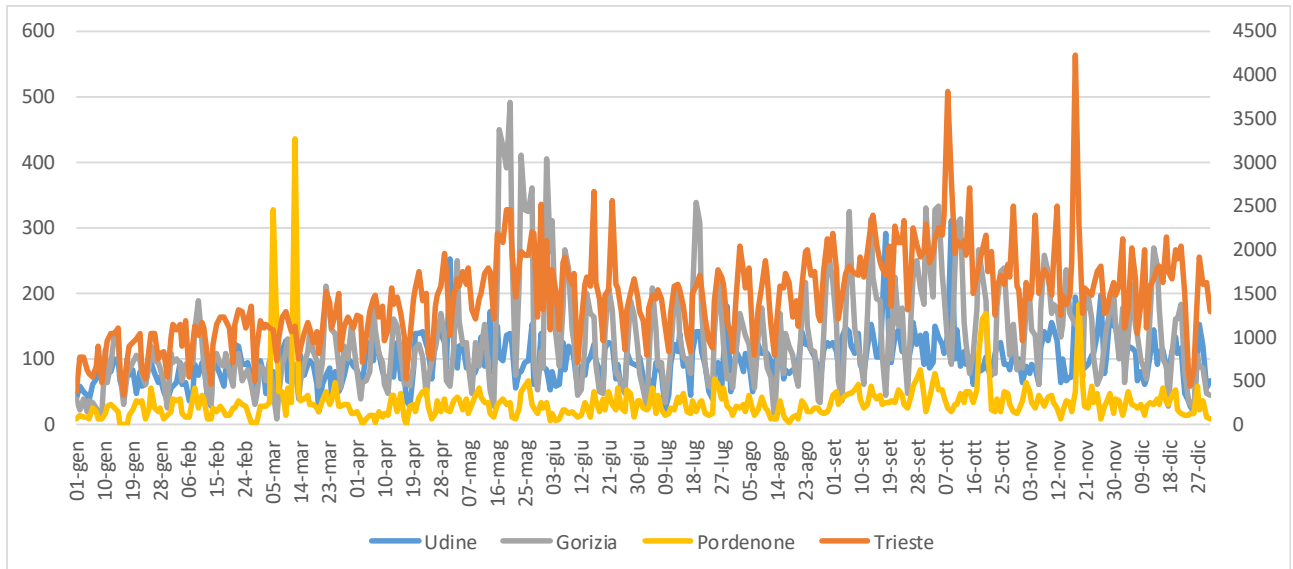


Source: processing made by the Service based on WindTre data

Unlike events at the seaside, the events located in the mountains seem to be less attractive for Croatian tourists. As an example, considering each point of interest, the visits on the mountain Lussari are condensed on February, remaining however lower than the trend of Austrian and Slovenian tourists during the days of the sport event “Lussarissimo” (from 18th to 20th February). In the same vein, visits to the Fusine lakes and Tarvisio were concentrated in the month of July, **remaining however lower than** those of Austrians and Slovenians on the occasion of the “No Borders Music Festival” (from 22nd July to 7th August). Concerning this music festival, Slovenian tourist visits reached their maximum on 4th August for the concert of the singer James Blunt.

Visits to the municipalities of Trieste, Gorizia, Pordenone and Udine by Croatian tourists. Year 2022.

⁸ The end of May, corresponding to the Croatian national holiday, was considered as well in order to verify potential deviations.



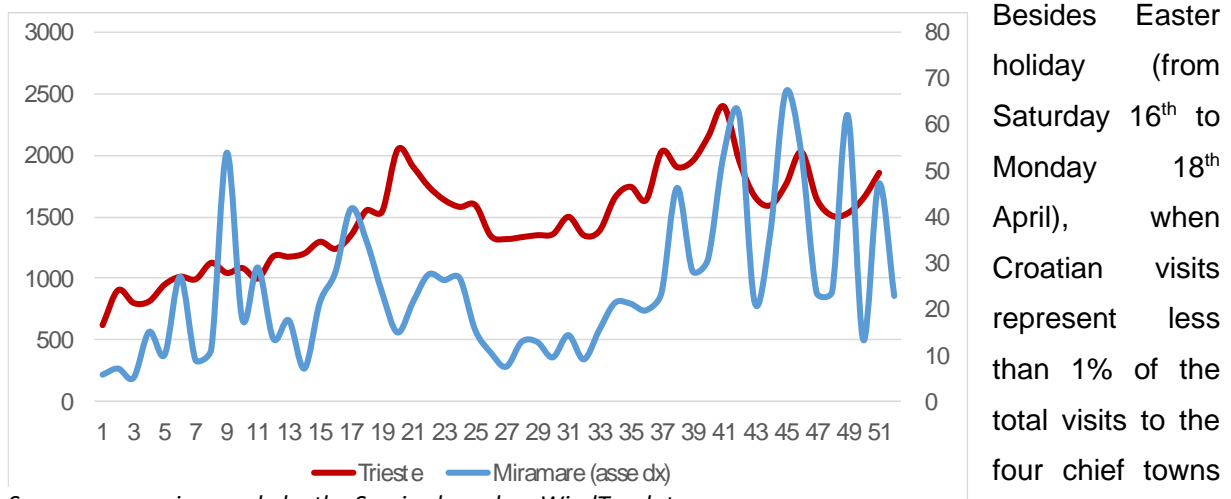
Source: processing made by the Service based on WindTre data

Considering the trends for city destinations, Trieste appears as the favorite one: more than 55.000 visits during 2022, ten times more than those recorded in the municipality of Gorizia (47.000 visits), fifteen times higher than in the municipality of Udine (35.000 visits).

Visits in Trieste follow a trend matching with the main Croatian national holidays.

Average daily visits to Trieste and Miramare by Croatian tourists each week.

Year 2022.



Source: processing made by the Service based on WindTre data

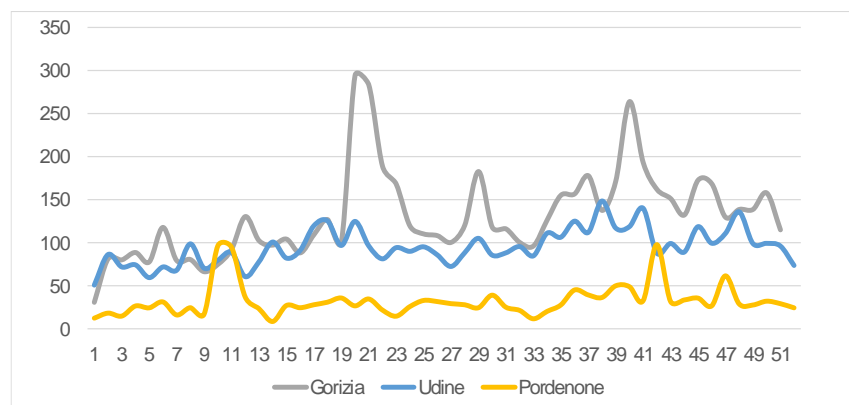
Besides Easter holiday (from Saturday 16th to Monday 18th April), when Croatian visits represent less than 1% of the total visits to the four chief towns in the region,

increase in visits was recorded on the occasions of the Croatian national holiday on 30th May (2.517 daily visits compared to an average of 1.462), the Corpus Domini on 16th June (2.677 visits) and the Memorial Day on 18th November, (4.225 visits).

The most attractive event for Croatian visitors was the sailing race “Barcolana”. During the week of the event visits almost doubled compared to the rest of the year, totaling 3.822 on Saturday 8th October. A similar trend, on 8th of October only, was registered for Miramare castle as well.

In Gorizia and Udine visits are more evenly distributed over the year, averaging 130 and 95 each day respectively. Concerning Gorizia, two weeks represent a remarkable exception: from 14th to 20th May and from 1st and 7th October, with the latter corresponding to the food event “Gusti di Frontiera”. No significant deviation was recorded during the week of the food event “Friuli Doc” from 8th to 11th September in Udine.

Average daily visits to Gorizia, Udine and Pordenone by Croatian tourists each week. Year 2022.



In Pordenone, Croatian visits amount to 12.000 with a distribution strongly related to the main events in town, especially fairs, which took place again after a two-years hiatus due to the pandemic. The first peak was recorded on 5th,

Source: processing made by the Service based on WindTre data

6th and 12th March during the literary event “Dedica Festival” and the gardening fair “Ortogiardino”, when visits were ten times higher than the average during every other Saturday and Sunday in the municipality. Other peaks were recorded during the furniture exhibition “SICAM”, from 18th to 21st October, amounting to 138 daily visits in comparison to the daily average of 33, and during the “Fiera del gioco, del fumetto e dell’intrattenimento” fair, in particular on Saturday 19th November, where the latter represents the third highest during the year. No increase in visits was recorded during the literary event “Pordenone Legge” from 14th to 18th September.

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