O.3.1. Passenger Transport Demand Analysis

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1. Aim and scope of this document

One of the characteristic elements of the approach that the MIMOSA project proposes in support of the EUSAIR strategies is that of basing the pilot activities, the awareness campaign and the definition of the transport planning model on a wide and exhaustive knowledge of the transport demand between Italy and Croatia and its determinants. To this end, WP3 foresees, among other things, the carrying out of four strands of analysis related to transport demand: quantitative and qualitative analysis of demand, scenario analysis and analysis of behavioural determinants of travel choices. The results of these research activities have been described in four deliverables (D.3.1.1-2-3-4) that report the analyses, data and key results relevant to the policies, as well as the methodologies used, so that the studies carried out can be replicated and possibly transferred to other contexts.

The ambition of the WP3 is therefore to provide an up-to-date portrait of the demand, on its segmentation, and its future evolution, with the goal to shift passengers from cars to other, more sustainable, transport solutions.

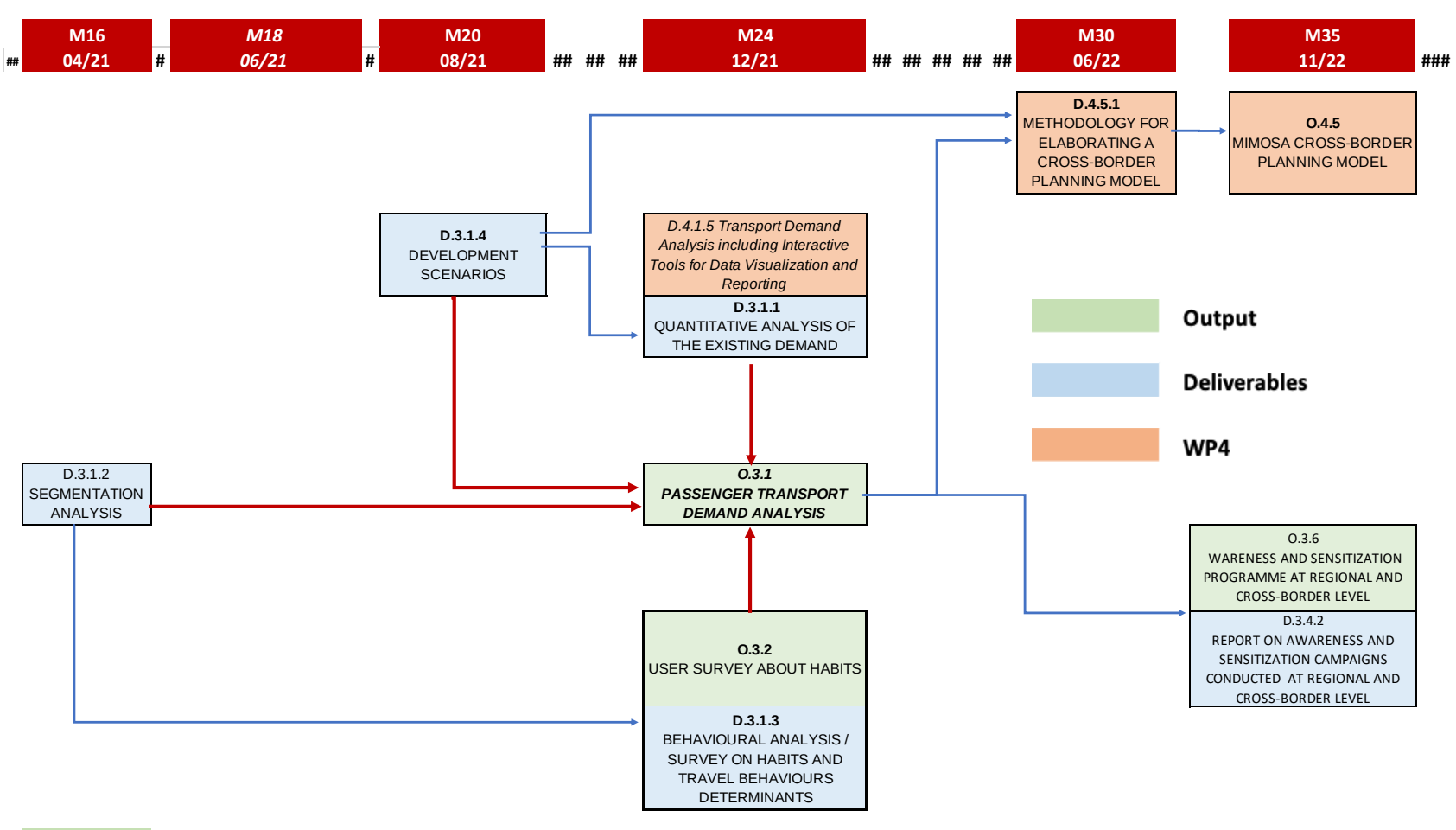
Figure 1 shows schematically the interconnections between this output and the WP3 analyses that are the subject of the mentioned deliverables, as well as the role that this output plays for further activities that will be carried out in the continuation of the project.

This document, in particular, aims at giving an overall picture, bringing together the most significant results of the analyses carried out so far and collected in the above-mentioned deliverables. The role of this document is therefore to provide a summary of the most relevant aspects that have emerged and which, as such, are candidates to be the first line of the awareness campaign, i.e. a (relatively) “quick and easy to read document” that can be disseminated to a broad class of stakeholders to raise awareness (O.3.6, D.3.4.2.) of transport sustainability issues in the programme area. it will also be used in the process of defining the methodology for the elaboration of the cross-border planning model (D.4.5.1 – O.4.5).

To the extent that over 300 pages of studies (the sum of WP3 deliverables D3.1.1., 2, 3 and 4) are summarised here, to those wishing to obtain more in-depth information on the topics dealt with in this output we recommend consulting the above-mentioned documents.

This document is organised as follows. The next section briefly describes the methods used in the four studies, while section 3 describes their main conclusions. The concluding section proposes an overall reflection aimed at defining some key points regarding the strategic objectives of the MIMOSA project.

Figure 1: diagram of the interconnections between the WP3 analysis activities, this output and subsequent activities



2. Methods and sources

The analyses carried out within WP3 made use of several sources, including both primary and secondary data. In this section methods, source and activities of the various research are summarised. Of course, more details on each analysis method can be found in each deliverable. The four deliverables are here presented starting from the quantitative aspects, including forecast, of demand, then describing those related with qualitative aspects.

2.1. Quantitative analysis of existing demand (D.3.1.1.).

The analysis carried out for this deliverable systematically collected the most relevant information on visitor flows between the two countries and organised it in such a way as to build a descriptive picture of the situation up to 2019, the last pre-pandemic year.

Figure 2: Italy-Croatia Programme area

Secondary data from the two national bureau of statistics (DSZ - Državni Zavod Za Statistiku, and Istat - Istituto Nazionale di Statistica) have been consulted. Additionally, data from OECD (Organisation for Economic Co-operation and Development) were also consulted, as they largely coincide with those provided by the Croatian national statistical office, while for the Figure for Croats in Italy the differences between the OECD data and the ISTAT data are relevant. In this case it was therefore decided to use the data provided by DSZ as they show greater consistency in the time series. Data from other bodies and agencies, such as port authorities, shipping companies and statistical offices of neighbouring countries outside the programme area, were used (see references for the full list of sources). This study is purely descriptive. Data from official sources were only aggregated and processed to obtain graphics or were geo-referenced (particularly in the case of economic and socio-demographic parameters and in that of the isochrones describing the accessibility of the main maritime nodes and the cross-border overland proximity area of the two countries), but no processing models were used that changed the nature of the original source data.

It should be noted that the data collected for this analysis consider the nationality of travellers without distinguishing between those coming from the programme area. Data on the

destination of tourists by nationality are available, but data on the area of origin are not available.

2.2. Development Scenario (D.3.1.4.)

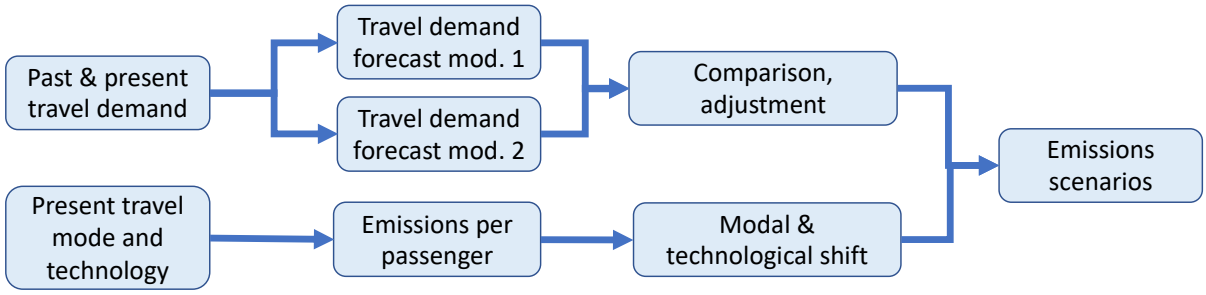
The analysis aiming at building the scenario for emissions has been developed using secondary data from official sources and applying two different models:

- an autoregressive model (time-series based forecast), based on passenger flows time series;

- an econometric model (correlation-based forecast) based on the co-variation coefficient over time between travel flows and the GDP of the two countries.

The results of the two models have been compared and found very similar. A judgmental adjustment has also been applied to the estimation, of Italian tourists flows, concerning the length of the historical series considered. This was necessary because in 2013 the data showed a discontinuity in the trend such as to affect the development of the forecast from 2020 onwards. In fact, 2013 is the year of Croatia's accession to the European Union and therefore it was decided to start the historical series from this year, although data from previous years were available, as this event is certainly a key determinant of cross-border travel demand. The overall process, together with a list of the main sources, are summarized in figure 3.

Figure 3: visual description of the summary of the method used for the forecast of travel demand in D.3.1.4. (Development scenario)



Main sources for travel flows estimation (full list in references)

DZS - https://www.dzs.hr/default_e.htm
DGE&I 2013
ENM 2021°, 2021b
EUROSTAT 2021
HTZ 2020
IMEF 2021
ISTAT – https://www.istat.it/
MTRH 2020
OECD 2018, 2021, OECD Statistics, https://stats.oecd.org/
OSN 2020
STATFOR 2021

Main sources for emission models (full list in references)

ACEA - European Automobile Manufacturers' Association (https://www.acea.auto/)
CAPA - Central Adriatic Ports Authority 2019
EEA – *European Environment Agency* (https://www.eea.europa.eu/)
EMEP/EEA. (2019). *EMEP/EEA air pollutant emission inventory guidebook - 2019 provided by*. European Environment Agency (EEA).
ICAO 2019
IMO 2018, 2021
NASPA - North Adriatic Sea Port Authority 2019

Initially, for the econometric analysis, three of the drivers considered in the scientific literature as fundamental variables related to the demand for tourist travel were taken into consideration, namely GDP, population, average age and percentage of the population with higher education. Actually, the two countries present relevant differences as for these variables (see figure 4). However, these data are not available in complete time series, and since it was found that the prediction based on the correlation with GDP taken individually was highly reliable (see figure 5), therefore it was decided to use only GDP.

Previous studies on the same topic have been taken into consideration. Two other Interreg projects, in particular, were found having dealt with scenario development analysis: the CHARGE project (Capitalisation and Harmonisation of the Adriatic Region Gate of Europe, Italy- Croatia programme; D.4.1.2 “Analysis on potential market flows ” of the Port of Venice / of the Port of Ploče” and D.4.1.3 Comprehensive report on the future scenarios of traffic flows between Italia-Croatian ports) and the MOSES project (Maritime and multimOdal transport Services based on Ea Sea-way project. D.3.3.1 Updated passenger flow analysis). Both these analyses, however, have been developed before the Covid-19 situation, which instead represented a singularity affecting the results of our study, as we will explain later on.

Figure 4: main travel demand drivers in the Italy-Croatia Programme Area

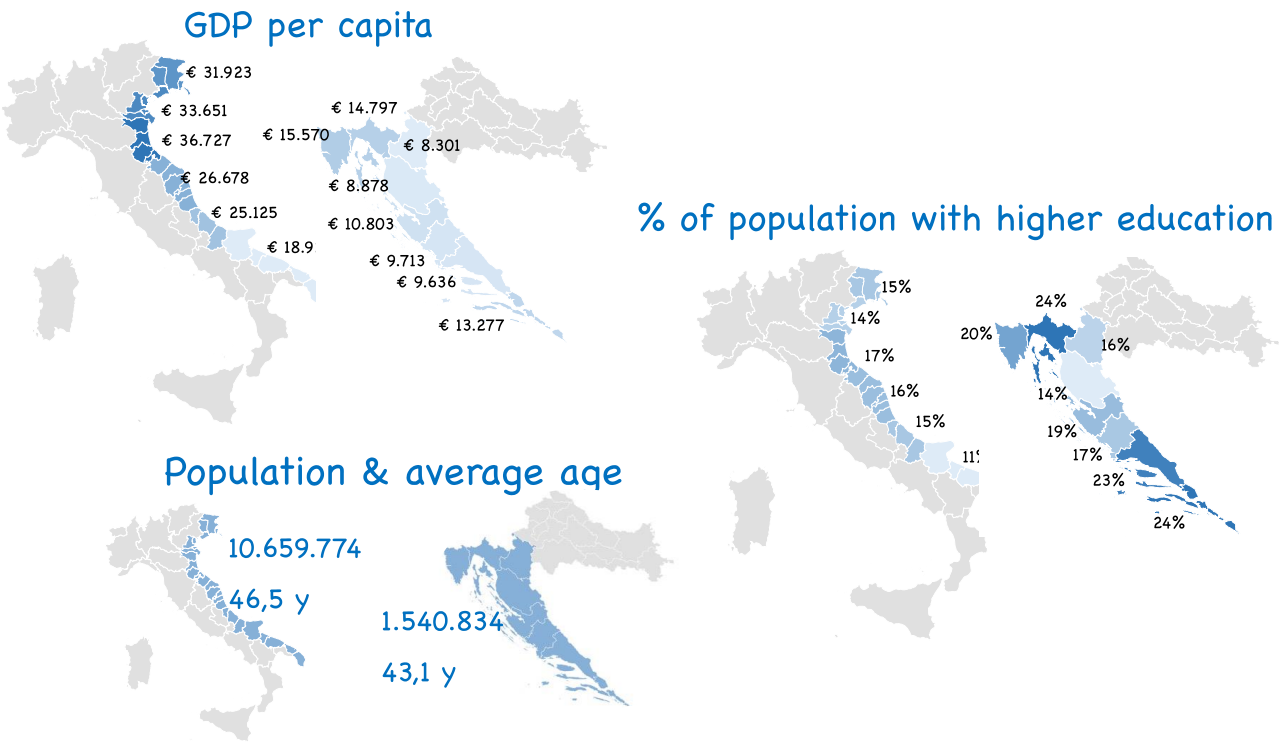
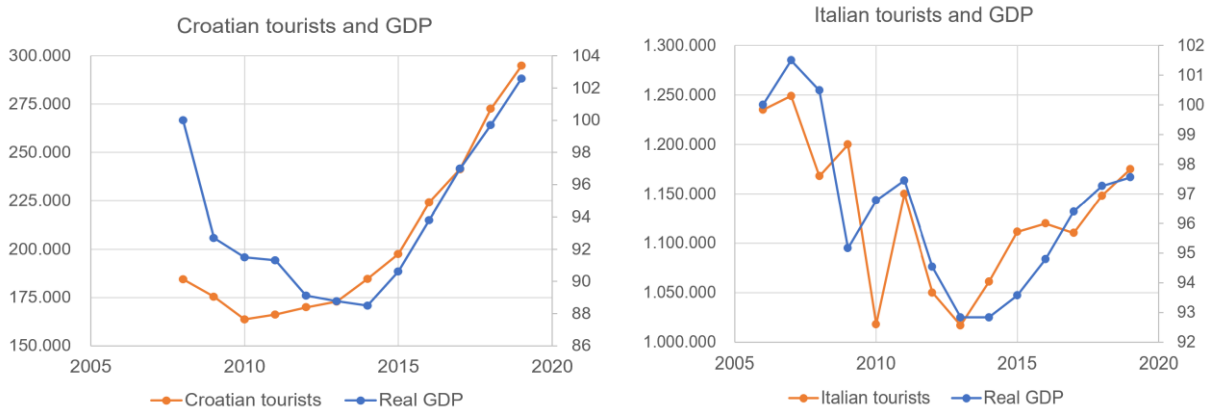


Figure 5: visual correlation between the number of tourists and Italy / Croatia normalized real GDPs 2006-2019 (Croatian 2008 real GDP = 100, Italian 2006 real GDP = 100)



Estimates of emissions per passenger were based on a sample of 64 typical travel, considered representative of an average journey as for length and mode. The sample has been built considering studies of tourist destinations and simulated data on typical air, ship and car routes, given the emissions per type of carrier declared by official sources (air, ship, car). The train has not been considered an option in the absence of a direct connection between Italy and Croatia and since available sources estimate the flow of visitors between the two countries using the train to be almost nil.

As the Covid-19 pandemic created a significant discontinuity in the time series, it was not possible to use 2020 traveller data as it would have distorted the results that can reasonably be expected as the effects of the pandemic diminish over time. This posed a major problem because in both econometric and autoregressive estimation, the most recent years' data have a significant weight in determining the forecast. To try to solve this problem, data for 2020 (although already available at the time of the analysis) were simulated as if the time series stopped in 2019. In addition, three different situations were assumed regarding the resumption of 'normal' travel demand, i.e., with pre-pandemic characteristics. Then, the forecast included three possible based on hypothesis about the demand recovery over time after the Covid-19 pandemic (recovery in 2024, 2025, lingering infection and recovery in 2029).

2.3. Segmentation analysis of travel demand (D.3.1.2)

A survey was carried out by means of a questionnaire aimed at investigating the previous experiences of travel between Italy and Croatia, the intention to travel to Italy / Croatia, the importance attributed to the characteristics of the trip, the destination and the services connected to it, as well as a series of socio-demographic characteristics of the respondents. Although no sensitive questions were present in the questionnaire, it has been previously

submitted for validation and approval to the Ethic Committee of the Ca' Foscari University, which found no ethical criticalities and issued a document of compliance with ethical principles.

Segmentation analysis rationale stands in the assumption that the potential demand of products and services is heterogenous as for needs and preferences. Groups of people having (for a specific product/service) similar needs and preferences are called segments. To provide products and services that satisfy specific preferences is more effective and economically advantageous than providing an undifferentiated offer, i.e. a generic offer that would be little or no satisfactory for everyone.

A series of questions were also included in the questionnaires for the implementation of analyses known as "Importance-Performance analysis", providing information about the criticality of specific services or characteristics, and "Kano model", aimed at identifying to what extent the services or characteristics investigated have in generating satisfaction or dissatisfaction in demand.

Segments have been then classified on the basis of the primary data provided by the survey. A possible alternative method (to identify segments on the basis of secondary data on variables considered to be determinants of preferences and behaviour, e.g. common-sense interest-based) was not feasible due to the absence of up-to-date statistical data. However, a systematic literature review was carried out in order to capitalise on previous studies concerning the habits of cross-border travellers in the programme area. A summary of the relevant previous studies has been included in D.3.1.2.

The survey also included a control question to monitor the actual attention and intentionality of answers and to discard questionnaires that didn't pass the check. Moreover, crossed check between related questions has been implemented, to discard those interviews showing evident inconsistent answers. The final sample size was 463, exceeding the minimum sample size by 15%. (sample's size calculated applying the Slovin's formula for a 95% confidence level to the population of the programme area).

2.4. Behavioural analysis / Survey on habits and travel behaviour determinants (D.3.1.3.)

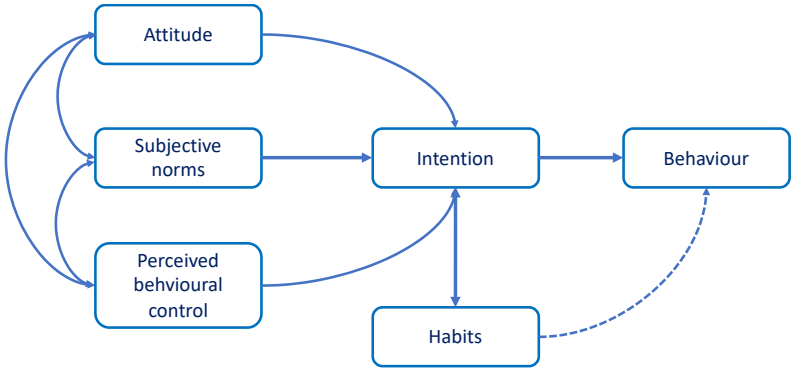
This deliverable reports the results of a study conducted through questionnaires to a numerically representative sample of the population in the programme area, supplemented by structured interviews with a range of cross-border transport operators and stakeholders. The data used are therefore primary and collected specifically for this study.

Through the questionnaires, the audience was asked questions whose answers allowed us to measure the role of some individual variables that the main descriptive models of behaviour have shown to be fundamental psychological determinants of travel choices. Such

variables are: a) Attitude - generic predisposition towards a certain activity; b) Subjective Norms - relevance to the interviewee of whether or not third parties approve of a particular behaviour; c) Perceived Behavioural Control - perception of the degree of difficulty in performing a given action; d) Habits – repeated behaviour that represents an automatic response / behaviour in a repetitive and stable context. Many studies have shown that such variables are key determinants (independent variables) of the intentions and of the actual behaviour (dependent variables). The weight that such variables have in affecting the decisions taken in a specific context (like, for instance, travel mode choice) can be assessed. The techniques for measuring these variables in individuals by means of questionnaires have been the subject of numerous studies; in preparing the study, the techniques validated in the scientific literature were strictly adhered to. We then used correlation analysis and regression analysis to determine the existence of significant relationships between such variables (assumed as independent variables) and a) intention and b) behaviour, considered as dependent variables. The relationship models underlying the study are the later development of those known as the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB), supplemented with theories relating to the role of habits, which have been shown to increase the interpretive capacity of these models. Figure 6 shows the relationships that are assumed in these two models, including the variable “habits” that has been introduced in a second step. The arrows indicate the existence of the expected relationship that can be investigated through correlation and regression analysis. For instance, Correlations between variables are then subject to interpretation based on the overall results. For example, if in the sample interviewed, with reference to a specific behaviour (e.g. using a bicycle for daily trips) there is a correlation between attitude and intention that is higher than the subjective norms and intention, this means that the individual predisposition to use a bicycle for daily trips, whether positive or negative, predominates over the relevance of the perceived approval by the reference social group.

The study developed for D.3.1.3. is therefore inferential in nature. This type of study always presents a risk of running into non-significant results, i.e. of running into the so-called 'null hypothesis', which basically consists in believing that a variable is relevant (or more relevant than the others) in determining the phenomenon when in fact it is not (or is as relevant as the other variables).

Figure 6: representation of. correlation links between behavioural determinants in TPB - TRA models with integration of the habits



Significance tests are carried out in this respect, but they do not give the certainty of avoiding the null hypothesis, only a probability. The more a low limit is placed on this probability in the test, the more results will be discarded, without having the certainty that they were in fact not significant. The generally accepted convention is that if the probability of the null hypothesis is less than 5%, the result is considered significant. Starting from this premise, all possible relationships between the dependent and independent variables for the various means of transport available between Italy and Croatia were investigated. Those results that appear particularly robust in terms of the level of correlation (Pearson's index) and the level of significance of the identified relationship (p value < 0.05) were chosen as the ones to be interpreted. A further selection was then made, considering only those relationships whose interpretation is most consistent with the state of knowledge about the behavioural determinants of travel choices, thus omitting correlations that are significant but of doubtful interpretation or lacking a logical explanation. We are aware that this procedure of selecting results and conclusions inevitably involves some discretion on the part of the researcher, but this is not arbitrariness, rather a choice oriented towards clarity and relevance, supported by the reference literature and the robustness of the statistical result.

More details about the methodology adopted in each deliverable are included in each document. The next section presents a summary of the results of the four WP3 deliverables, following the same orders adopted for describing their methods. In this document we have chosen to favour synthesis over detail, thus showing only the most relevant aspects and referring for more detailed information and precise indication of the sources of each graph to the reference deliverables.

3. Summary of WP3 deliverables related to passenger transport demand analysis

3.1. Quantitative analysis of existing demand (D.3.1.1.)

In 2019, last year before Covid-19 pandemic, almost 1,5 million tourists travelled between Italy and Croatia, the majority (80%) being Italians traveling to Croatia. (figure 8). Italian tourism in Croatia is mainly during the summer (figure 7) and concentrated in the coastal regions; four counties (Istria, Primorje-Gorski Kotar, Split-Dalmatia and Lika-Senj) receive about 78% of Italian tourists. Croatian tourism in Italy is more distributed throughout the year and also throughout the territory; six Italian regions (Veneto, Lombardy, Trentino Alto-Adige, Tuscany, Lazio, Friuli Venezia-Giulia) are the destination of about 79% of Croatian tourism in Italy (figure 7 and 8).

Tourism between the two countries has increased significantly from 2010 in both directions, and especially from Croatia to Italy (+126% from 2010 to 2019) (figure 8). For tourists of both nationalities the preferred mode of travel is the car, which in the case of Italian tourists is estimated to be used by 90% of travellers, while for Croatian tourists this percentage drops to 76%. Italians also use ships more than Croatians (7% against 2% of Croatians), while the latter use planes more (6% of travellers, against 2% of Italians) (table 1), due to the fact that among the preferred destinations of Croatian tourism there are also cities of art and natural and cultural sites that are located far from ports (figure 9).

Figure 7: distribution of the number of annual tourists over the 12 months for Italian and Croatian tourists - 2019

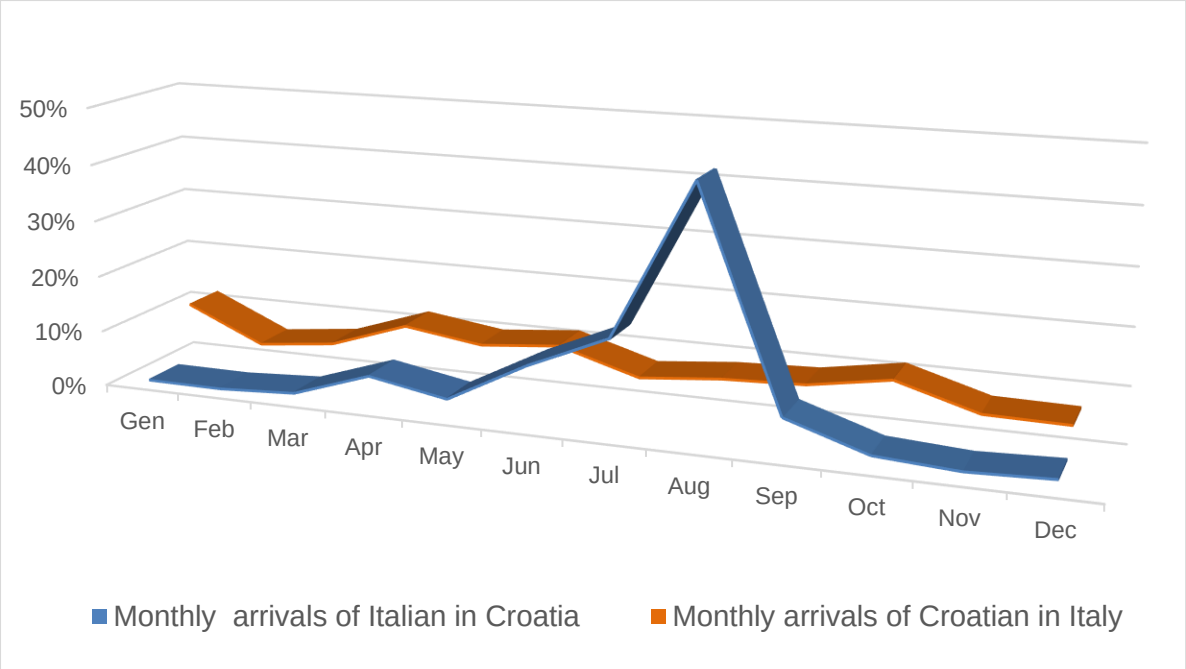


Figure 8: number of tourists, share of arrivals in destination regions/counties and percentage share of transport means used for Italy and Croatia (2019)

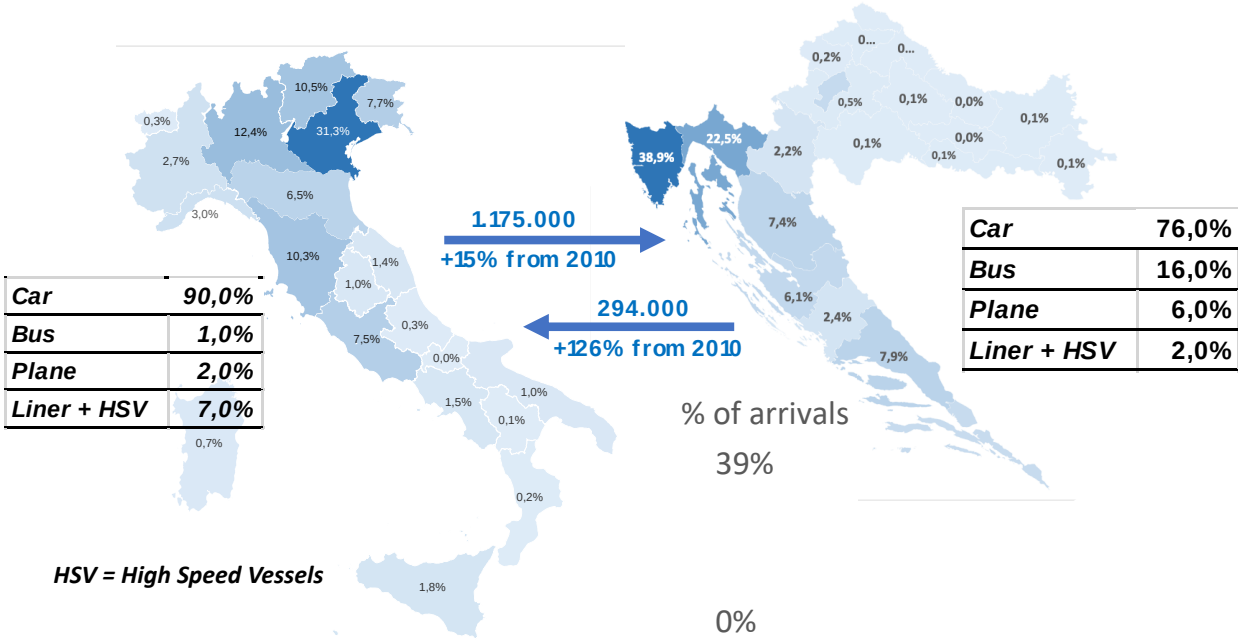
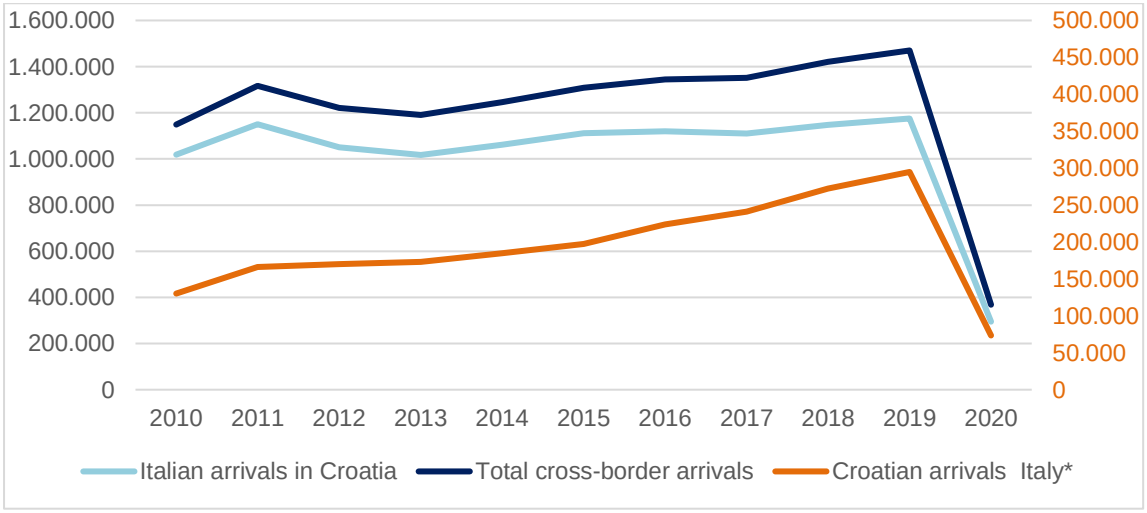


Table 1: estimate of Italians and Croatians visitors travel mode share (2019)

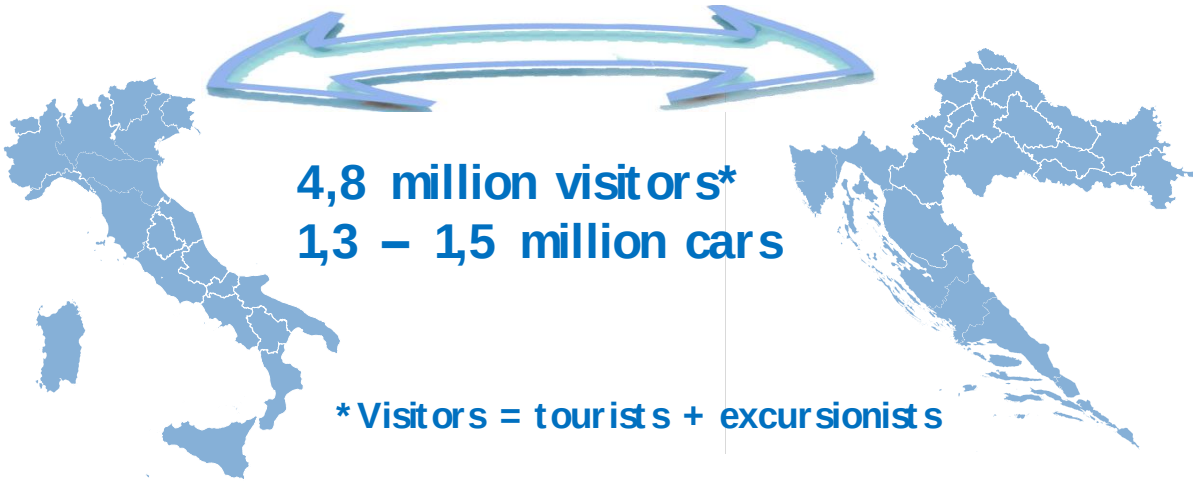
Transport mode	Italian visitors	Croatian visitors	Overall visitors (weighted average)
Car	90,0%	76,0%	88,2%
Bus	1,0%	16,0%	2,9%
Plane	2,0%	6,0%	2,5%
Liner	5,5%	1,0%	4,9%
High Speed Vessels	1,5%	1,0%	1,4%
Total	*100,0%*	*100,0%*	*100,0%*

Figure 9: cross-border arrivals 2010-2020



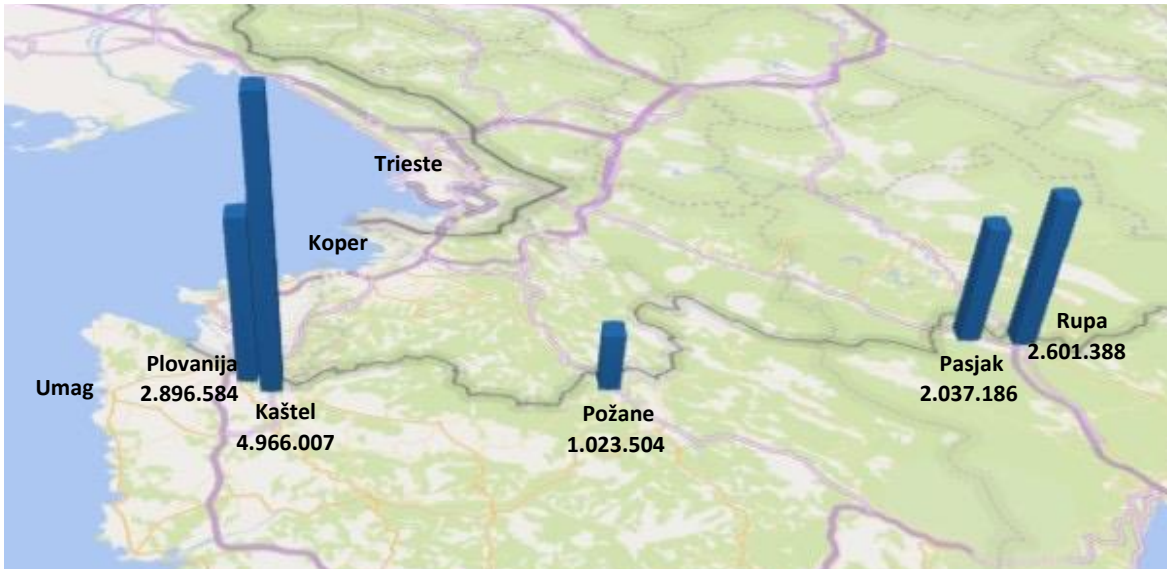
The total number of cross-border trips, however, is much higher since in addition to 'tourists' (cross-border travellers spending at least one night in the other country) 'excursionists' (cross-border travellers returning to their own country in the day) must be taken into account. A reliable estimate of this number is about 4.8 million visitors in 2019 (4.2 million Italians and about 600,000 Croatians; figure 10). It is also estimated that this flow will result in a total number of car crossings at the Croatian border of between 1.3 and 1.5 million in 2019. Italian cars, in particular, are estimated to account for about one fifth of all foreign cars crossing the Croatian border. Most foreign car traffic in Croatia passes through the border with Slovenia concentrating on five crossings where, particularly on summer weekends, long queues occur. (figure 11).

Figure 10: estimated number of total visitors (tourists + excursionists) in 2019 and car number (2015 vs 2019)



	2015	2019	Variation 2015-2019
Total foreign cars to & from Croatia	4.336.147	4.765.146	9,89%
Total coaches	39.293	34.153	-13,08%

Figure 11: number of foreign cars travelling through Croatian borders (2019)



Traffic congestion is expected to improve with Croatia's entry into the Schengen area, which is expected to happen relatively soon after the Council of Europe officially recognised in December 2021 that Croatia fully complies with the requirements of the Schengen Acquis[1]. On the other hand, the elimination of controls following entry into the Schengen area should reduce congestion locally. However, traffic congestion is only part of the environmental problem caused by extensive car use. Moreover, the problem is on an upward trend: from 2015 to 2019, the total number of foreign car transits at the Croatian border increased by just under 10% (figure 11).

The tendency to travel by bus, which in a study carried out as part of the MIMOSA project (O.3.3 – Analysis to assess the carbon footprint of passengers' choices) is much more environmentally-friendly than the car, also appears to be declining, with the number of buses dropping by 13% over the same period (figure 10).

Predictably, cross-border travel was reduced dramatically during Covid. The number of Croatian tourists in Italy in 2020 and 2021 reduced on average by 80% or more. Slightly less intense was the reduction in Italian tourists, whose number, however, in the various months of 2020 and 2021 always remained at least 70% lower than in 2019 (figure 12). Beyond the drastic drop caused by the pandemic, in 2020 the distribution of Italian tourists in Croatian destinations remained essentially the same as in 2019 and previous years.

[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).

While in 2020 there was no recovery of tourism in general in the whole programme area, in 2021 Croatia recovered better than Italy. In August 2021 (the month in which there is a peak of Italian tourists) Croatia received a -16% of foreign tourists with respect to 2019, while Italy received -31% of foreign tourists in the same period (table2). Moreover, Italian tourists in 2021 were more reluctant to travel to Croatia with respect to Central European visitors, who in 2021.

Figure 12: comparison between the percentage decrease of Italian and Croatian tourists in 2020/2021 with respect to 2019

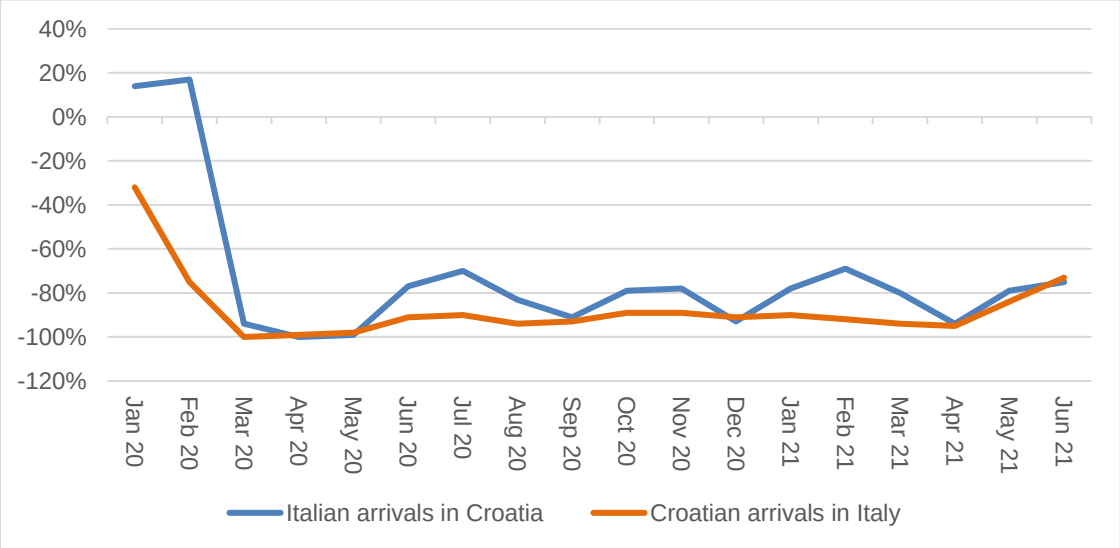


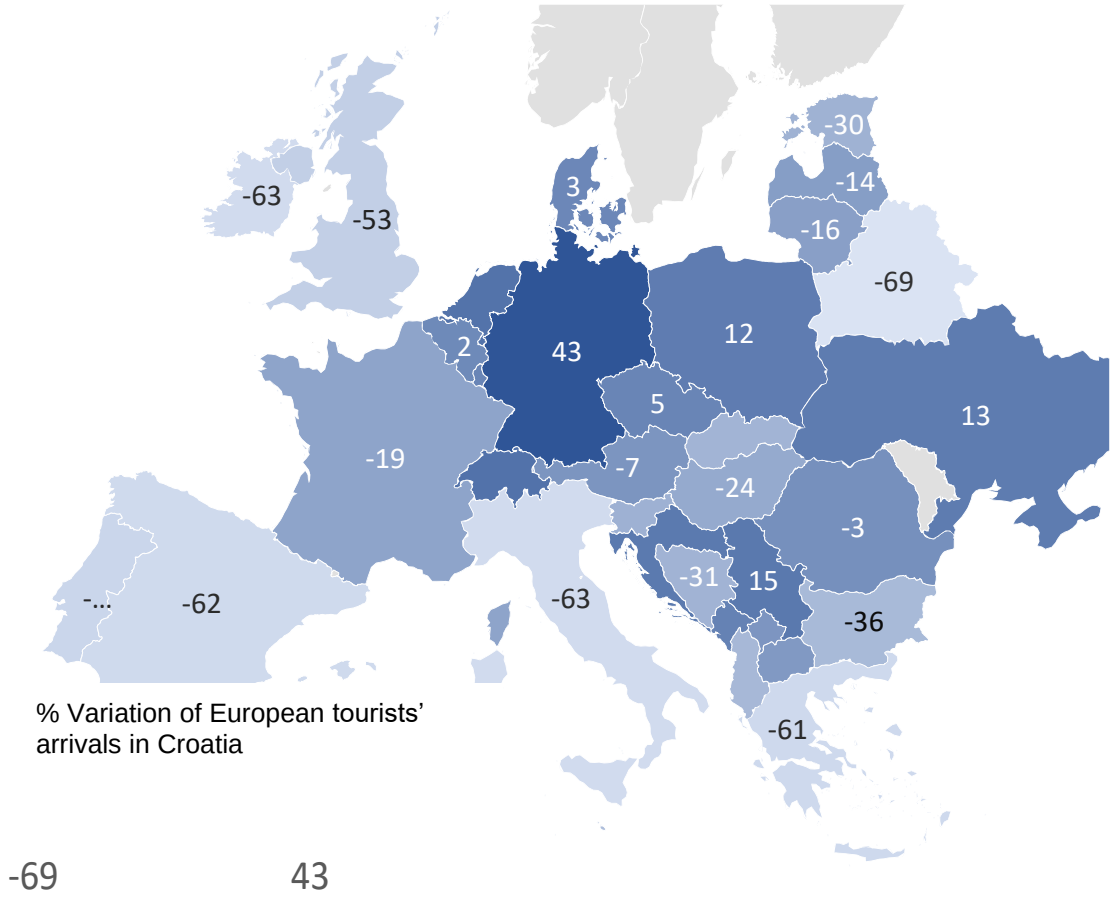
Table 2: percentage variation of the number of tourists in Croatia and in Italy with respect to the whole year 2019 and the month of August 2019.

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

Figure 13 visually compares the variation of the number of tourists' arrivals in August 2021 with respect to the same month of 2019 from different European countries. Italy shows a decrease of 63% of Italian tourists towards Croatia, while tourists from neighbouring countries generally increased, especially German tourists towards Croatia increased by 43% (figure 13). The higher drop in demand for Italian travel to Croatia is probably due to a combination two factors: availability of domestic alternatives and reluctance to face the inconveniences and restrictions linked to Covid in another country. It is not plausible, instead, that the crisis may have altered structural demand factors which, like for instance change the usefulness of the

destination for travellers (benefits sought from the trip, relevance of destination characteristics, etc.).

Figure 13: variation of the number of tourists' arrivals in Croatia from different European Countries in August 2021 with respect to August 2019

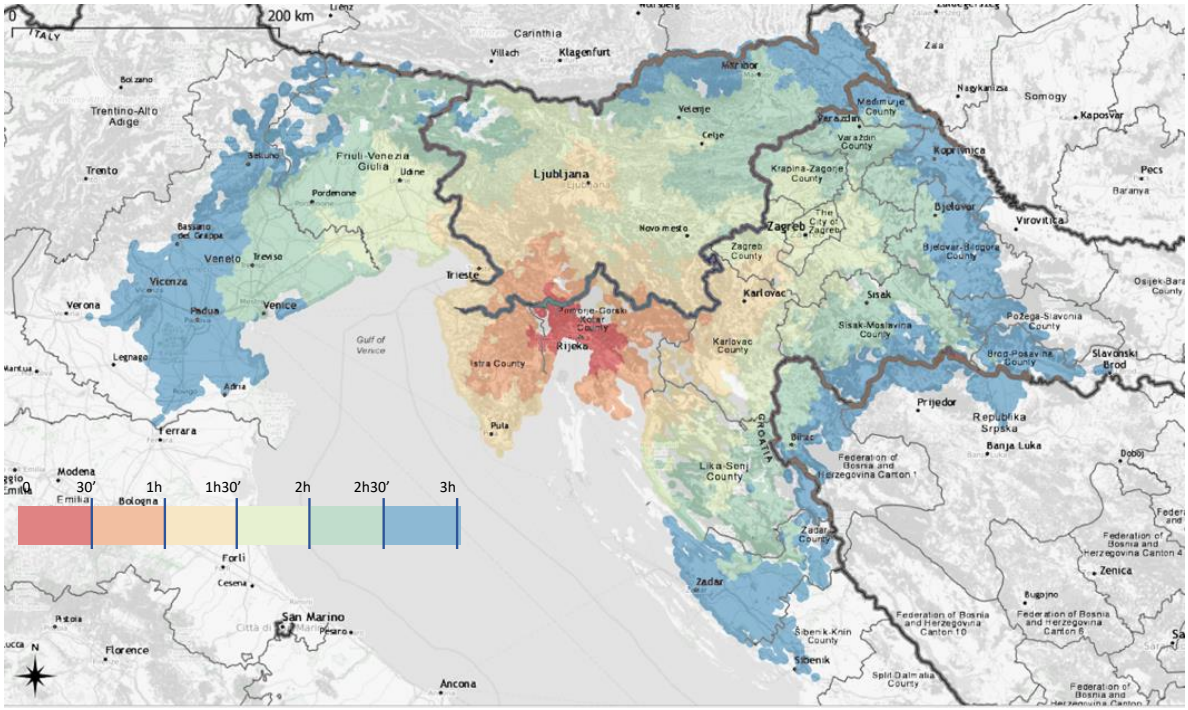


In order to figure out the possible policies for a significant reduction of car traffic a few considerations shall be done. First: excursionists (daily visitors) represent about three-quarters of overall travellers. Daily trips between from Italy to Croatia are only possible for regions in the North-East of Italy by car, bus and High-Speed Vessels (mainly from Venice and Trieste). Both Trieste and Venezia are largely within the daily-trip range to Istria and Primorje-Gorski Kotar both (the two main destinations for Italian visitors), by car, high speed vessels and, to some extent by bus (figure 14).

Second: Although there are no official data about the origin of travellers, very likely most of Italian tourists come from the regions of Northern Italy. This can be deduced from several factors, including seasonality, preferred destinations (seaside tourism) and competing destinations (apart from geographic distance, the central-western and southern Adriatic

coasts of Italy have characteristics that make them direct competitors of Croatian coastal area).

Figure 14: isochrone representation of destinations reachable by car from Rijeka (0-3 h., intervals of 30')



Consequently, the priority connections for both tourists and excursionists go from North-West of Italy towards Istria and Primorje-Gorski Kotar. According to analysis carried out in MIMOSA Output 3.3., the bus has a much lower rate of pollution per passenger than car. Double-deck coaches can transport up to 80 passengers, thus substituting on average from 15 to 35 cars, while smaller coaches can provide up to 45/50 seats, virtually taking away from the road up to 25 cars.

The opening of a railway line would, of course, have a much greater capacity and would be even more effective in reducing both car traffic and pollution. This opportunity has been studied in D.4.1.2. and D.4.1.3. of the MIMOSA project, who studied the market potential of railways connecting Istria and Rijeka with the Slovenian borders. The conclusions of these two studies indicate a clear propensity of local travellers to use the railways, which is a fundamental prerequisite for the economic viability of routes extending across the Italian border and to Trieste in particular. This is likely to significantly reduce car traffic, or at least curb its growth.

Talking about “soft measures”, a key point is that traffic congestion at the above-mentioned crossings mainly occurs on weekends during the summer months. In the case of

travellers from Italy, this is concentrated mainly in the months between June and August, unlike travellers from Croatia in Italy, who are distributed much more evenly throughout the year (figure 7). We think that a relatively quickly implemented and potentially effective measure to avoid traffic congestion is to adopt measures that disincentivise car use on weekend days and distribute it more evenly.

A further (in our opinion important) element that emerged from the analysis carried out for D.3.1.1. concerns the geographical location of the ports of connection with Croatia on the Italian side of the southern Adriatic. Presently Central and Southern Italy are served by two main ports, respectively Ancona (in the Marche region), and Bari (in the Puglia Region). These two ports are considerably distant from each other (about 4h45m by car) and leave important destination like Rome, Naples and their surroundings at the limit of their catchment area (see figure 15). The Port of Vasto, in the Abruzzo region, would be a possible boarding point falling in the middle between Bari and Ancona (about 2h35m from both of them by car) and providing an effective alternative for travellers whose origin or destination is between Lazio and Campania (fig 16). About this topic, the MIMOSA project envisages (among the rest) a preparatory action for the development of cross-border maritime connectivity of the port of Vasto, an action that is embodied in the deliverable D.5.1.2. - Set of devices to monitor traffic and allow safe access to ports in Abruzzo region (port of Vasto)

It should be noted, however, that because of its location, a possible ferry line linking Vasto with Croatia would probably not reduce the number of cars, because it would not attract those who already make the journey by car. Rather, it would increase demand, since it would enhance accessibility to areas of cultural and natural value on both sides of the Adriatic.

Figure 15: isochrone representation of destinations reachable by car from Ancona and Bari (0-3 h., intervals of 30')

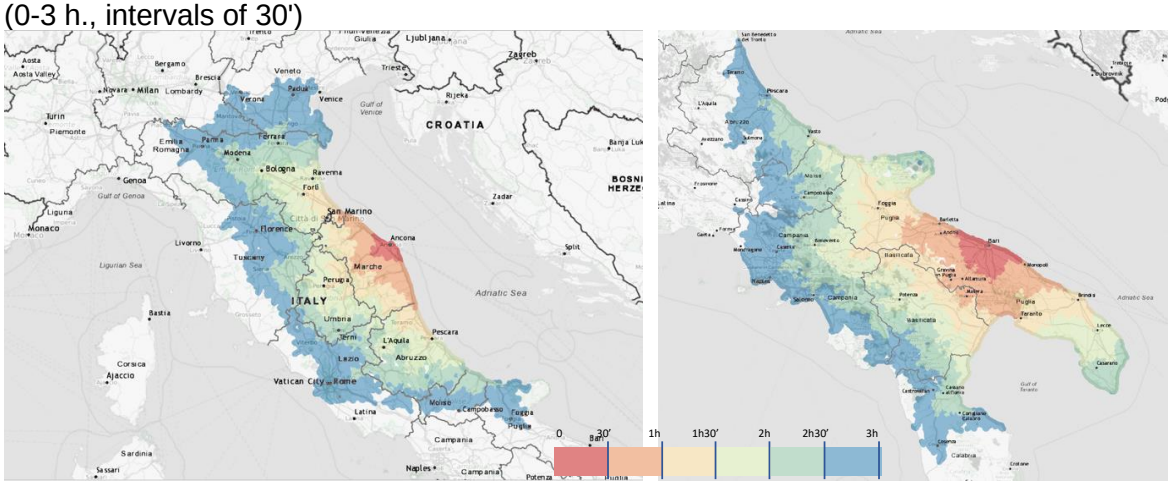
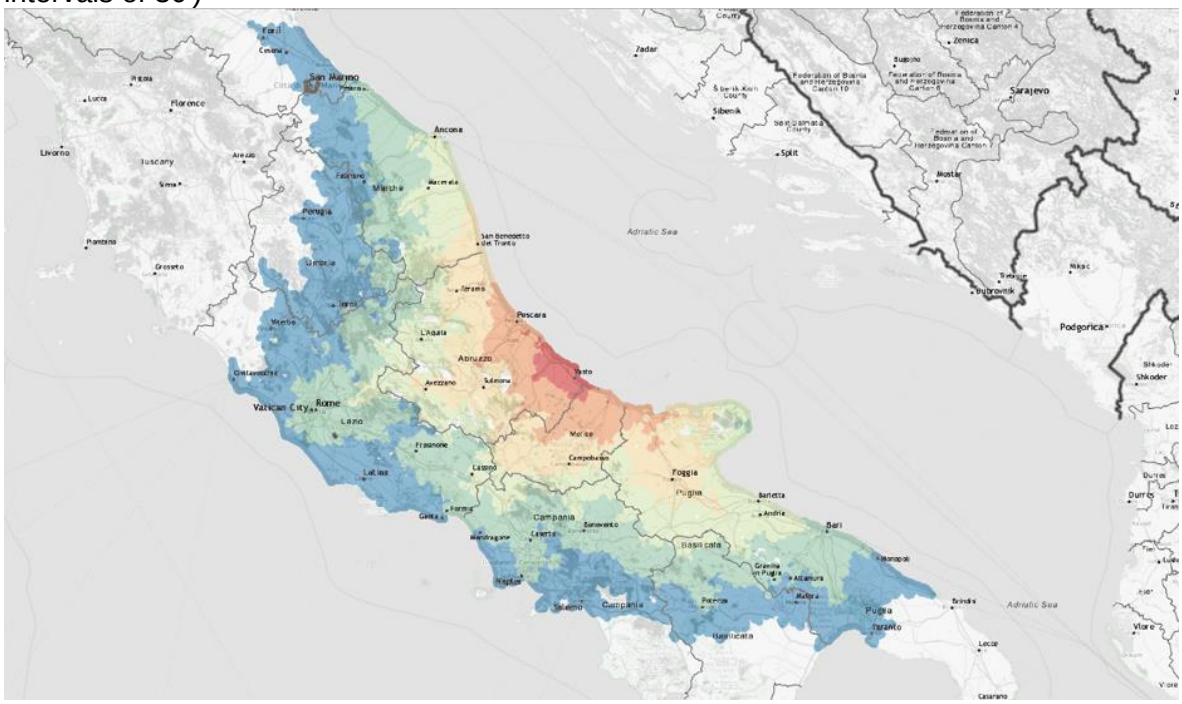


Figure 16: isochrone representation of destinations reachable by car from Vasto (0-3 h., intervals of 30')



3.2. Development Scenario (D.3.1.4.)

The goal of deliverable D.3.1.4. is to provide predictive scenarios on the development of travel demand between Italy and Croatia, as well as the impacts in terms of emissions per passenger. As can be seen from table 3, the forecasts for Italian tourists differ significantly depending on whether the regression and correlation models are applied to a time series starting before or after 2014. This is due to the fact that until 2013 (the year Croatia joined the EU) the trend in the number of Italian tourists in Croatia is uneven, while from 2014 onwards the number has been steadily increasing (table 3). Please, notice that the actual data for 2020 and 2021 have not been taken into consideration and substituted with econometric forecast, in order to preserve the hypothesis of the stationarity and ergodicity of the tourist demand over time.

According to these estimates, the yearly CO2 ascribed to cross-border travel between Italy and Croatia is 219.614 Tons., 83,5% attributable to Italian travellers. The average emissions per capita is 72,7 Kg/y. In case of no-changes (i.e.: same technology, same modal split) the expected increase in the number of travellers by 2030 would result in an increase in overall emissions of between 2,8% (low estimate) and 35% (high estimate) (table 4).

Table 3: Expected increase in the number of visitors from 2019 (as if it were unaffected by Covid pandemic) to 2030

		Italian visitors		Croatian visitors		Total	
Year	**Visitors**	**Low estimate**	**High estimate**	**Low estimate**	**High estimate**	**Low estimate**	**High estimate**
2019	Tourists	1.175.069		294.825		1.469.894	
2030		1.160.000	1.365.000	430.000	542.000	1.590.000	1.907.000
2019	Excursionists	2.750.482	3.300.579	450.986	676.479	3.201.468	3.977.058
2030		2.715.210	3.834.064	657.760	1.243.625	3.372.970	5.077.689
2019	Total	3.925.551	4.475.648	745.811	971.304	4.671.362	5.446.952
2030		3.875.210	5.199.064	1.087.760	1.785.625	4.962.970	6.984.689
2019/30 % variation		-1%	16%	46%	84%	6%	28%

Table 4 carbon footprint of travels between Italy and Croatia given present modal split, technology and distance travelled and emissions at 2030 if no modal shift and no technological improvement occur

	2019		2030			
			Low estimate		High estimate	
CO2 Emissions	**Tons CO2**	**Kg per capita**	**Tons CO2**	**Kg per capita**	**Tons CO2**	**Kg per capita**
Italian travellers	183.578	43,7	173.639	44,8	222.176	42,7
Croatian travellers	36.036	42,0	48.433	42,6	71.449	40,0
Total	219.614	43,4	222.071	44,3	293.624	42,0
			+ 1,1%		**+ 33,7%**	

As for the forecast of emissions reduction triggered by technological improvements, a series of documents and data has been taken into consideration. In a nutshell, a reduction of emission by planes of at most 13% by 2030 is assumed (ICAO 2019). Ships are assumed to reduce CO_2 emissions by 40% in comparison to 2008 (IMO 2021).

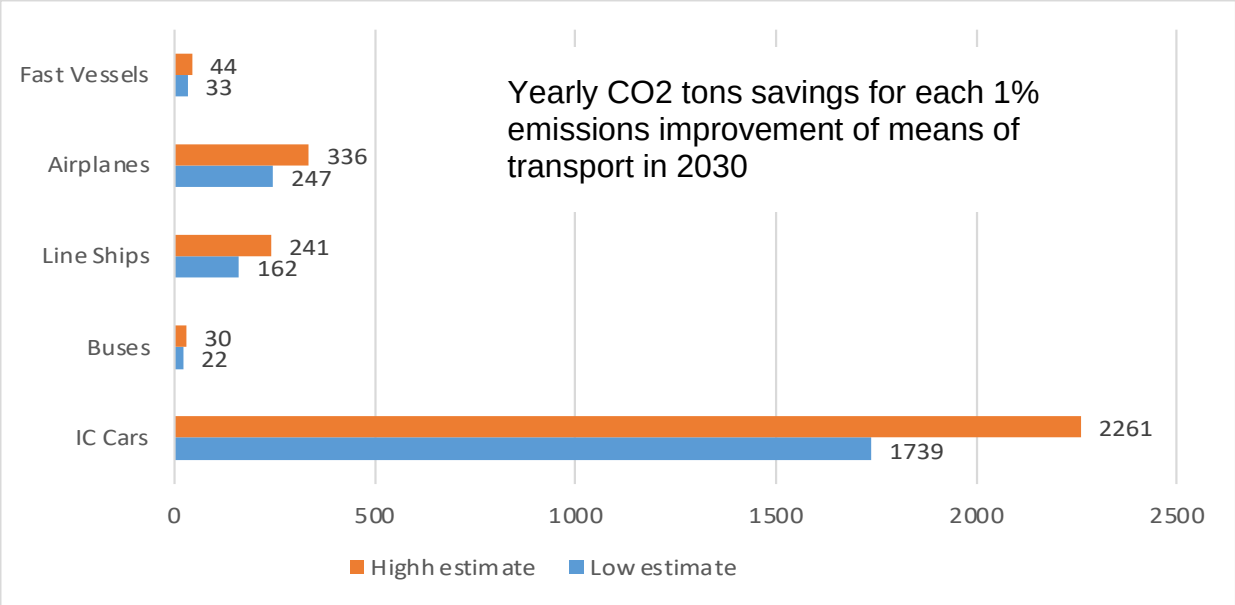
With regard to cars, the composition of the Italian car fleet by 2030 was simulated based on the current renewal rate (11,5 years the average life of a car in Italy) and the trend of new powertrains (hybrid and electric) over the last five years. In the most optimistic scenario, in case of enduring incentives, by 2030 the share of hybrid cars will be 20% and 10% for electric cars. In 2020 only 18,7% of Italian fleet meets the Euro 6 standard; by 2030 this share should have reached at least 40%. Consequently, the major reduction in emissions of car fleet would not come from the growth in the share of electrified powertrain, rather from the progressive

elimination of older cars up to Euro 5, which currently make up more than 60% of the Italian car fleet. An average value of CO_2 emissions per car has been calculated as weighted average of standard emissions. Since data for the Croatian fleet are not available, therefore it is assumed that the two fleets are similar in terms of composition ad average emissions.

From these predictions, it emerges that at the current modal split the efficiency gain of the internal combustion (IC) car provides the greatest benefit. In fact, for every percentage point of CO2 reduction of IC vehicles, total emissions decrease by more than 1.739 tons in the low growth scenario and by 2.261 tons in the high growth scenario

Of course, the overall benefit depends on the intensity of use of each mode. Planes, which have much higher emissions per passenger than the car, are however much less used and therefore their improvement has a relative lower impact on the overall reduction of emissions (fig. 17). Maritime transport deserves a separate discussion, as different types of ships have very different emissions per passenger depending on their age and type. In addition, a key role will be played by the switch to liquefied natural gas (LNG), which significantly reduces emissions and for whose large-scale use both shipping companies and ports are gearing up.

Fig. 17: yearly reduction in total CO2 emissions (tons) generated by travels between Italy and Croatia (projected to 2030) for each percentage point reduction in emissions from the various means of transport



A forecast has been attempted also for the evolution of shares of transport mode. Data and information for this forecast have been collected by interviews, previous studies and other analyses conducted for the WP3 goals (in particular, surveys for the segmentation analysis and for the impact of Covid on travel safety perception), then assuming a series of realistic

hypotheses about the future evolution of transport modes. Cars are expected to remain the most used mean of transport, and it may even increase its popularity in case the pandemic persists as they guarantee a greater level of safety from infection.

Differently, a shift from cars to buses can be observed in the future years above all among the youths and visitors without accompanying children, given a series of conditions, among the following seem particularly relevant:

- there are no further waves of pandemic infection;
- there will be a further diffusion of long-distance bus or minibus lines / rental services (following the business model of, for example, Flixbus or Go-Opti, Croatia-Bus, etc.), and related services (e.g. luggage transfer, high-comfort equipment, etc.);
- there will be an improvement of first/last mile connectivity and nodes accessibility;
- new services of (fast) vessels from and to main coastal attractors (e.g. Trieste, Venice, Rovinj, Pula, etc.), especially within a logic of increasing the attractiveness of sea travels by offering improved services, such as bicycle transportation or all-inclusive packages.

Segments identified in D.3.1.2. leave room for alternative forms of tourism, oriented towards multimodal travel that does not use cars (bike + bus, bike + ship, bike + train, etc.). That analysis suggested that this type of travel is more likely to develop for segments of young and highly educated people. However, this is unlikely to change the modal shares beyond what is shown in table 4 (See D.3.1.2, “Segmentation Analysis” for further information).

It is also assumed that the growth of cross-border mobility will create the conditions for a general increase in attractiveness of long-distance destinations that at the moment have a lower share of tourists (for instance, Croatian might increase travels towards Central and Southern Italian regions, while Italians might increase their visits in the Counties of Zadar, Split-Dalmatia, and Dubrovnik-Neretva, instead of concentrating in the North-West coastal area). Such a scenario, however, is coherent with the results of the survey developed for D.3.1.2. Further hypotheses refer to educated assumptions about excursionists travel modes.

Finally, the railway has not been taken into these scenarios due to the present lack of direct connections. However, the railway connection is among the predictable alternative for the development of Italy-Croatia connections. The MIMOSA project has investigated this topic through two preliminary analysis - D.4.1.2 and D.4.1.3.- investigating the feasibility and potential demand of the train option. Please refer to these two documents for further details

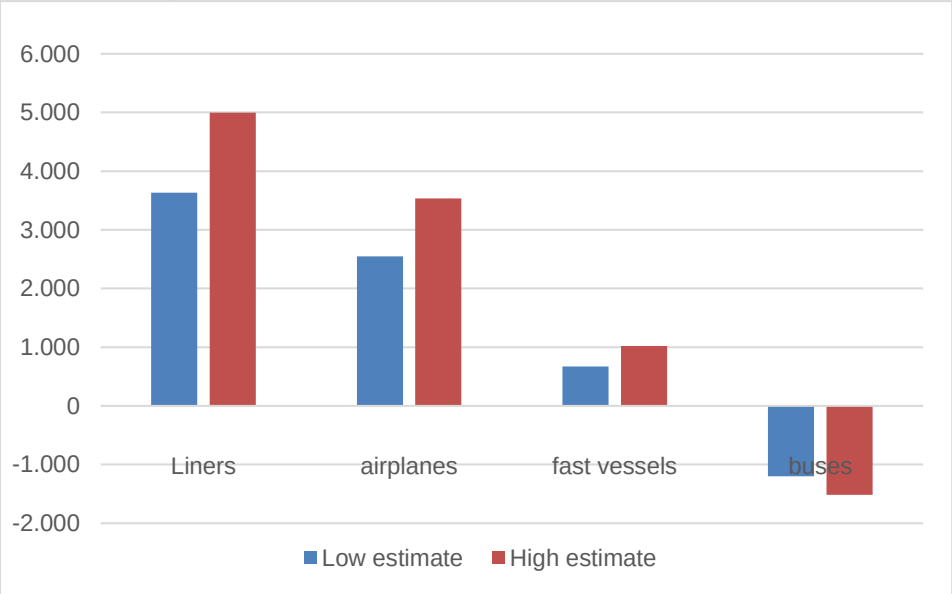
In conclusion, table 5 shows the likely scenario as for the share of alternative mode of transportation in 2030.

Table 5: forecast of cross-border transportation mode share in 2030* between Italy and Croatia

	2019		2030 - High Est.		2030 - Low Est.	
	Italian travellers	Croatian travellers	Italian travellers	Croatian travellers	Italian travellers	Croatian travellers
Car	90%	76%	88%	73%	85%	70%
Bus	1%	16%	2%	18%	4%	19%
Plane	2%	6%	3%	8%	4%	9%
Line ships	4,5%	1,5%	4%	1%	4%	1%
Fast vessels	1,5%	0,5%	2%	1%	2%	1%
Private vessel	1%	0%	1%	0%	1%	0%

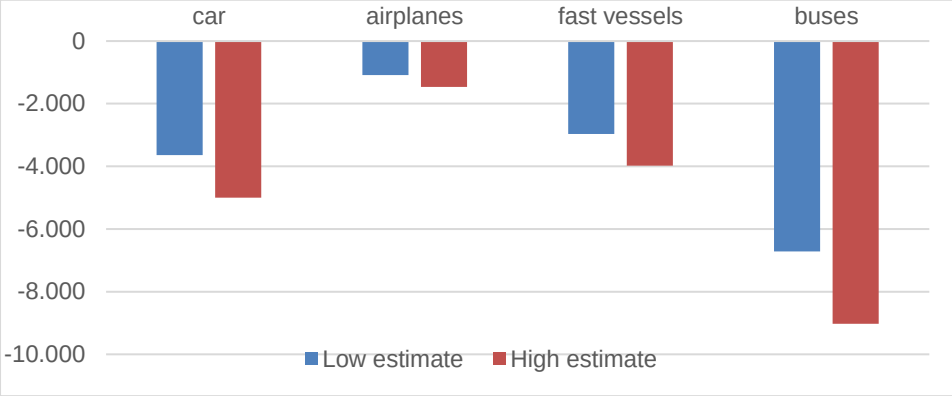
The impact of a different modal split in terms of average emission per passenger depend on the distance travelled. However, given the present technology, shifting from cars to others than buses would increase emissions instead than reducing them (figure 18). This result, however, is coherent with the results of the study conducted for the Output O.3.3.

Figure 18: yearly variation of CO2 (in tons) expected for 1% Italy-Croatia travellers shifting from cars to other means of transport at 2030 travellers flows (e.g. 1% travellers use ships/airplanes/buses instead of cars).



Same measurement was carried out with regard to the modal shift from liner ships to other modes. Liner shipping being the mode with the highest emission rate per passenger (see also Output 3.3. Analysis to assess the carbon footprint of the passengers' choices), the CO_2 changes per percentage point are all negative in this case, reaching over 9,000 tonnes of CO_2 in the high growth scenario for each percentage point of passengers using the bus instead of the liner (fig. 17).

Figure 19: yearly variation of CO_2 (in tons) expected for 1% Italy-Croatia travellers shifting from liners to other means of transport at 2030 travellers flows (e.g. 1% travellers use cars/airplanes/buses instead of liners).



This data is useful to visually understand the carbon impact of different means of transport, given current technologies. However, in the case of liners, ships and airplanes, the reduction is hypothetical since the actual reduction is not continuous, like figure 19 implies, but would occur by discrete quantities, only to the extent that the whole line (of ships or aircraft) would cease to operate. Such improvement would therefore be related to the sustainable saturation rate of vessels capacity, that according to the study conducted for the Output O.3.3 is rather low.

Finally, from the combination of alternative situations outlined in the study, a number of scenarios can be described. Starting from optimistic assumptions about improved technology over time and a less unbalanced travel mode distribution, we have envisaged three scenarios.

Scenario 1 ("conservative"): in 2030, emission reduction of 0,6% for airplanes and 12% for vessels operating on Italy-Croatia routes. Car fleet composed by 12% hybrid cars, 2% zero-emissions cars. 18% improvement in average emissions from the internal combustion car fleet (due to replacement of older cars), 10% improvement in average emissions of hybrid cars and 8% improvement in average emissions for buses. Modal shift as depicted in table 5 – High estimate.

Scenario 2 ("realistic"): in 2030, emission reduction of 0,9% for airplanes and 15% for vessels operating on Italy-Croatia routes. Car fleet composed by 16% hybrid cars, 3% zero-emissions cars, 22% improvement in average emissions from the internal combustion car fleet (due to replacement of older cars), 11% improvement in average emissions of hybrid cars and 10% for buses. Modal shift as average of the high and Low estimate depicted in table 5.

Scenario 3 ("optimistic"): in 2030 emission reduction of 1,1% for aviation and 22% for vessels operating on Italy-Croatia routes. Car fleet composed by 20% hybrid cars, 5% zero-emissions cars, 25% improvement in average emissions from the internal combustion car fleet

(due to replacement of older cars), 13% improvement in average emissions of hybrid cars and 12% improvement in average emissions for buses. Modal shift as depicted in table 5 – Low estimate

Emissions forecasted for each scenario are shown in table 6, according to the minimum and maximum number of travellers expected in 2030 (see table 3).

Table 6: forecast of emissions for the three scenarios based on travellers forecast

	2019	2030 - Scenario 1 ("conservative")		2030 - Scenario 2 ("realistic")		2030 - Scenario 3 ("optimistic")	
		Low est.	High est.	Low est.	High est.	Low est.	High est.
Total emissions (tons)	219.614	178.999	238.026	169.459	225.847	159.617	195.918
% Variation on 2019		-18,5%	8,4%	-22,8%	2,8%	-32,9%	-17,7%
Avg emissions per traveller(Kg)	47,0	36,1	34,1	34,1	32,3	32,2	28,0
% Variation on 2019		-23,3%	-27,5%	-27,4%	-31,2%	-5,6%	-17,7%

Emissions per passenger, seem set to fall in any case due to the effect of technological improvements and the fact that demand is expected to be less concentrated on different modes of travel (currently around 90% use cars). Overall emissions, however, could increase for the effect of the increasing number of travellers

In the most 'optimistic' scenario, CO_2 emissions in 2030 could be reduced by around 32% compared to today provided the following conditions:

- annual travellers remain below 5 million (not far from today's figures);
- average emissions reductions are 1,1% for aviation, 22% for vessels operating on Italy-Croatia routes, 25% for the internal combustion car fleet, 13% for hybrid cars and 12% for buses;
- car fleet will be composed by 20% hybrid cars, 5% zero-emissions cars,
- bus use for travel increases significantly (2-3 percentage points), at the expenses of cars and liners.

In our view both technological improvements and the modal shift considered are at the highest limit of what can reasonably be considered possible/feasible, and with a limited increase in travel demand. The scenario we consider realistic is the intermediate one, which envisages an average reduction in overall emissions of 10-11% by 2030, with an increase in travellers of up to one million (tourists and excursionists).

It should be noticed that the expected technological development and modal shift, taken separately, are not likely to significantly reduce emissions by 2030. Consequently, radical changes for the better could occur only with severe policies in the short term (within two to

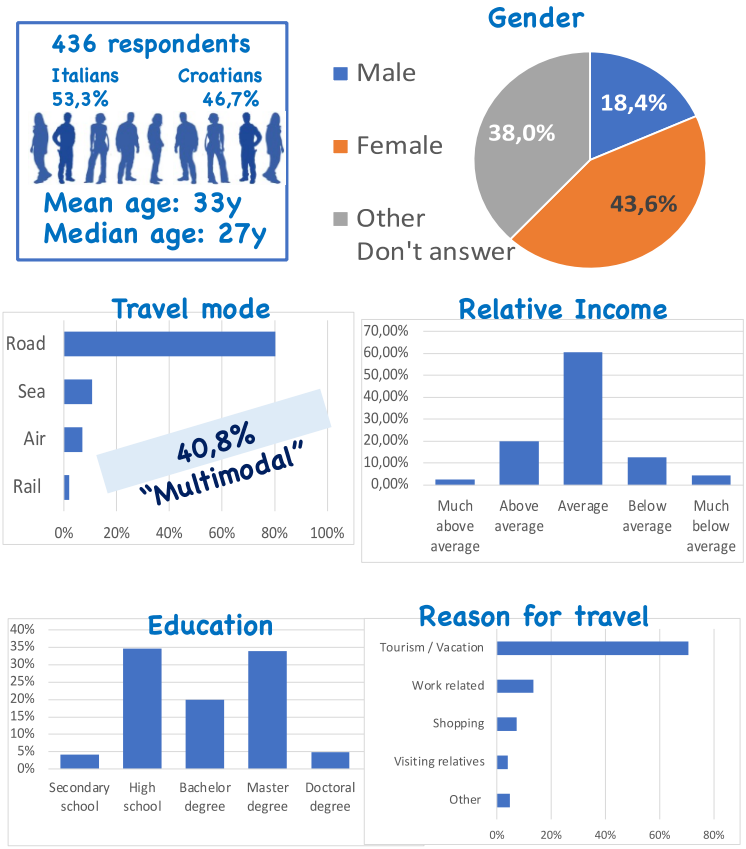
three years at most), combining restrictions (e.g. bans on the most polluting marine fuels and older cars) and new multimodal travel combinations (e.g. bus + bike with luggage transfer, fast ships + bike, etc.). This should be accompanied by an awareness and communication campaign aimed at those segments that are more inclined to alternative travel formulas, as emerged from the study on demand segmentation. These segments were found to be already relatively large and are expected to become even more important in the future, as will be explained in the next section.

3.3. Segmentation analysis of travel demand (D.3.1.2)

In this study the analysis of a sample of 463 respondents (53,3% Italians, 46,7% Croatians) identified a series of characteristics relating to the preferences of potential travellers between Italy and Croatia, which made it possible to: a) identify the benefits sought by a trip to the other country, beyond the specific motivations of the last trip made; b) identify what are considered to be the priorities as regards services and transport; c) identify certain segments characterised by preferences that could be considered the object of communication policies aimed at greater use of sustainable and multimodal transport. The main characteristics of the sample are shown in figure 19.

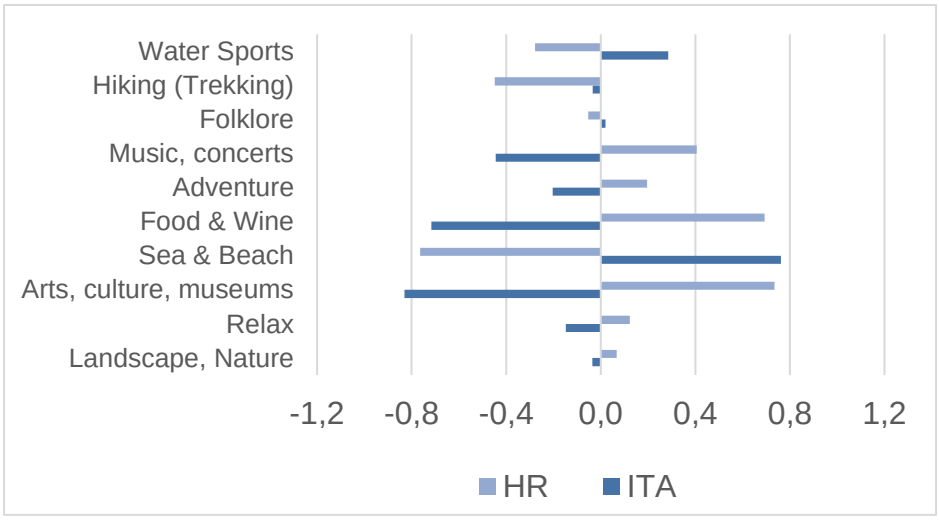
The average age of respondents is 32 years, largely inferior to the mean age of the programme area ((46 years), but this is an expected phenomenon, probably the effect of a self-selection of respondents who tend to devote themselves to the questionnaire only if they recognise a certain level of personal involvement in it, and it is typically younger people who travel most frequently. The majority of the sample (over 80%) has used the car as main mode for their last travel to Croatia or Italy, coherently with what we already knew about the dominance of car among transport modes. However, about 40,3% declared to have used more than one mode during the travel. The predominant reason for cross-border travel is tourism or vacation (71,6% overall). Business and work is the main travel reason for 13,3%, shopping for 7,3% (this reason was stated exclusively by Croatian respondents, and visiting relatives for 4,0%. The percentage of respondents that represent non-traveller (never travelled and no intention to go to Italy / Croatia) is very low: 3,9%.

Figure 19: main characteristics of the sample of the survey for the segmentation analysis



As for the characteristics sought by travellers in cross-border destinations, Italians and Croats represent two different macro-segments. While Italian travellers are mainly oriented towards coastal tourism, Croatian tourists are mainly aiming at cultural benefits. Such characterisation emerges from the answers regarding the importance assigned (on a scale of 1-5) to the characteristics of the destination. In particular, the deviation from the sample mean measured for respondents of the two nationalities expresses the diversity between the two groups in terms of preferences on characteristics. This is shown in the figure 20, in which the longer the bar, the more different is the importance assigned to that characteristic by Croatians and Italians.

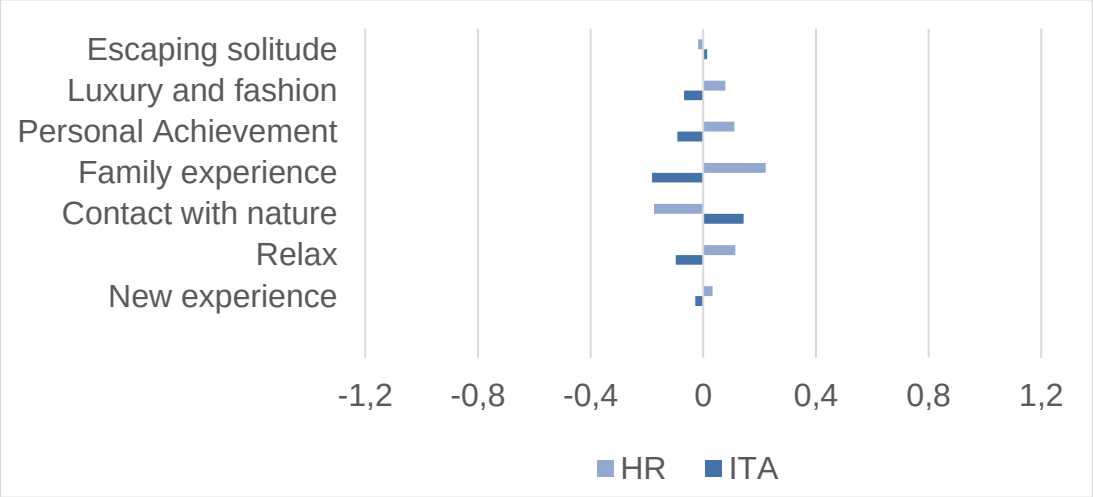
Figure 20. Deviations from the sample mean value of the importance attributed to the characteristics of the destination by country of origin.



The figure 21 shows instead the differences between the two groups in the evaluation of the importance of the benefits sought by cross-border travel and in this respect Italians and

Croats are much more similar to each other. The information drawn from this is that the characteristics sought after in the destination are different for Italians and Croats (beach tourism rather than art and culture) but both assign importance to aspects that make the trip enjoyable. This can be seen in figure 22 which reports the average importance (on a scale 1-5) assigned to the sample to a list of possible travel benefits, together with a measure of variability of opinion (the standard deviation of the answers). The two most important categories (landscape/nature and relaxation) are also the ones on which there is most agreement in the overall sample surveyed. This means that these characteristics are sought after independently from the choice of the destination. Other aspects with a rating significantly higher than neutrality (Arts, culture & museums, Sea & Beach, and Food & Wine), however, as a whole are less shared in the sample, given that Italians and Croatians have different goals in travelling to the other country.

Figure 21: deviations from the mean value of the benefits importance by country of origin



The analysis also identified priorities for travel-related services. This analysis was carried out using the model known as the "Kano model", extended using an indicator created specifically for this study. This indicator weights the answers according to the degree of "need" that respondents attribute to the services and attributes indicated in the questions (see D.3.1.2 for details about the methodology for the calculation of the indicator). Results are shown in table 7. The need for maritime cruises to adopt technologies that reduce environmental impacts and the accessibility for people with motor disabilities have, by far, the highest priority in our sample, followed by islands accessibility and by the development of cross-border public transport.

Figure 22: Importance and variability of opinion on the importance of characteristics of the destination

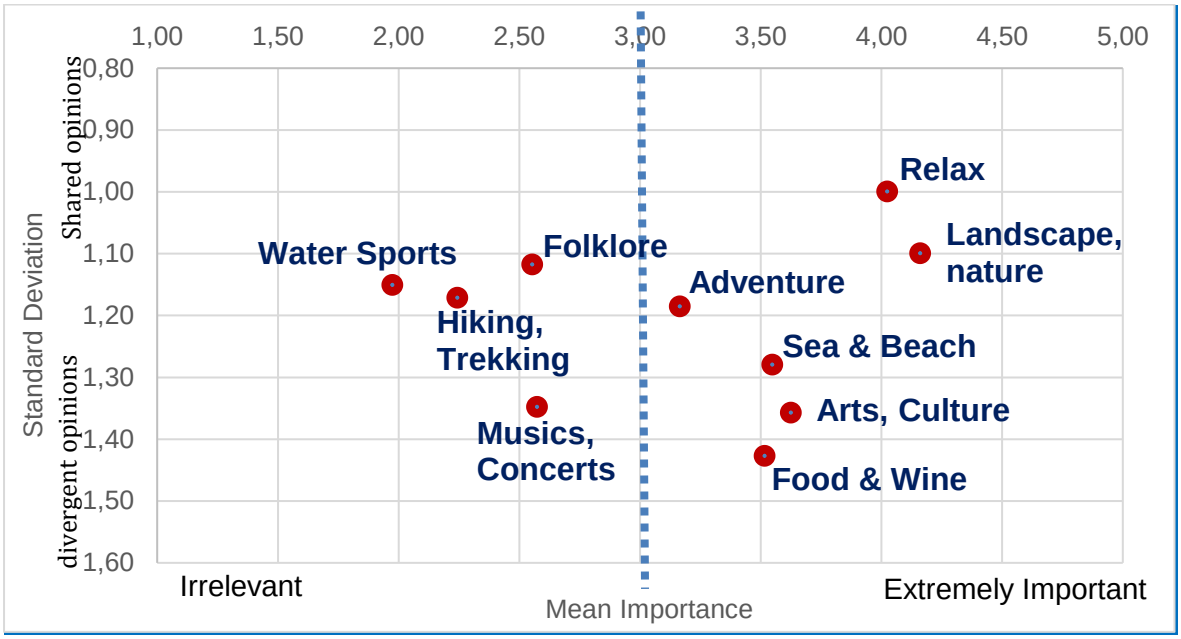


Table 7: priorities about travel aspects emerging from the Kano analysis

	P **Priority index***	**Ranking (1st = 100)**
Sustainable maritime cruises	0,634	100
Guaranteed accessibility for the disabled	0,616	97
Islands increased accessibility	0,474	75
Whole trip feasible with public transportation	0,426	67
All travel info on single App	0,389	61
Free bike rental	0,305	48
Only pedestrian and 0 emissions vehicles area	0,305	48
Whole travel feasible by train	0,298	47
Door to door luggage service	0,221	35
Area closed to vehicles	0,135	21

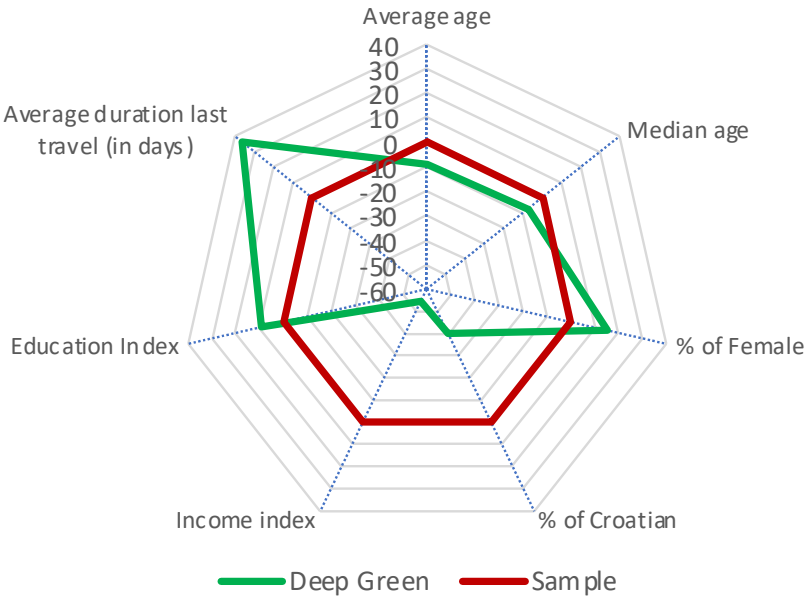
* The method for the calculation of the priority index is detailed in D.3.1.2

Through the descriptive analysis of the data from the survey, the D.3.1.2. provides a series of insights into aspects that are or might be relevant in order to define policies and plans to improve the overall sustainability of travel choice.

A key step into this direction is given by the identification of key-segments of travellers relevant for improving the sustainability of transport policies and to orient behaviour towards more sustainable travel choices. By cross-referencing the answers given to a series of questions aimed at understanding attitudes towards cars and alternative mobility, three key segments

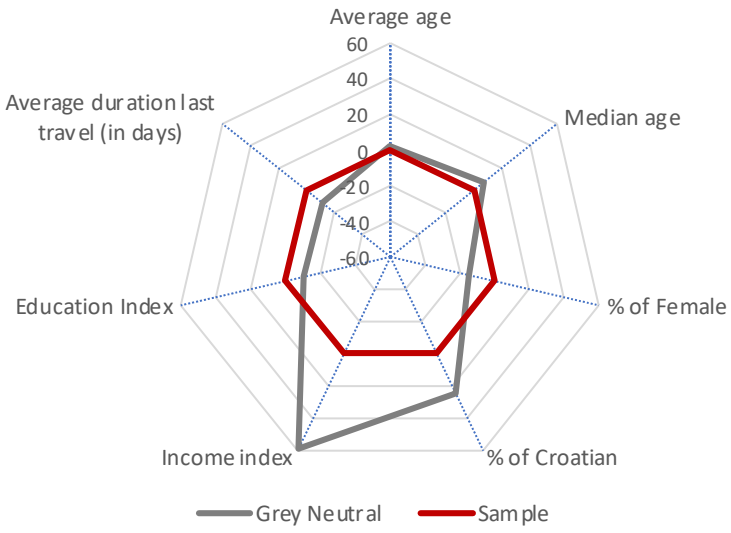
have been identified and labelled “Deep Green”, “Neutral Grey” and “Easy & Comfortable”. These segments are here briefly described; for an in-depth description please see D.3.1.2.

Figure 23: characteristics of the “Deep Green” segment compared to the whole sample



The “Deep Green” segment (figure 23) is made up of people who have a decidedly favourable orientation towards the adoption of public transport, traffic restriction measures and alternative mobility, especially towards the availability of free bicycle rental. It is a segment of young people, predominantly women, and more rooted among Italians than among Croats. They stay longer than average, their level of education is significantly higher than that of the sample and their income level is significantly lower. In our sample they represent 17,1% of those actual Italy-Croatia travellers.

Figure 24: characteristics of the “Neutral Gray” segment compared to the whole sample



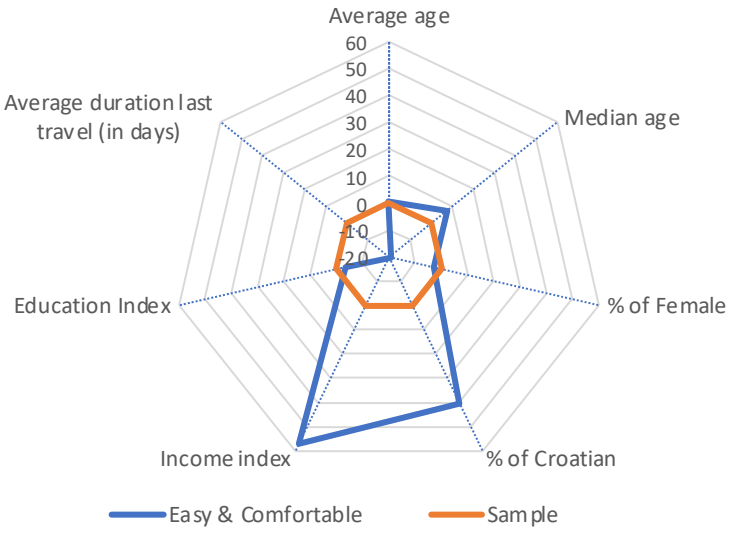
Opposite to the “Deep Green” is the definition of the “Neutral Grey” segment (figure 24) This segment is made up by people, against traffic restrictions and neutral or ill-disposed towards public and alternative mobility. This group represents the bigger part of our sample (29.4% of actual cross-border travellers), and it is characterised by a strong predominance of the use of private mobility, a clear opposition towards traffic limitations and little or no interest in the

availability of other means of transport. As for the demographic data of this sample, it is mainly made up of people of Croatian origin whose average age is higher, whose income is much higher than the average in their country, have a slightly lower level of education and stay abroad for a slightly shorter period than the average.

While “Deep green” represent the typical target for awareness campaigns and communication to boost the use of alternative travel modes, “Neutral Grey” are supposedly resistant to any form of soft measure.

The third segment, labelled “Easy & Comfortable”, is made by demanding and high-income travellers, whose answers to selected questions in the questionnaire show that they are strongly seeking comfort and ease in travel operations.

Figure 25: characteristics of the “Easy & Comfortable” segment compared to the whole sample



20.1% of actual cross-border travellers in our sample were identified among those who expresses a strong appreciation of services that can make the journey easier and more comfortable.

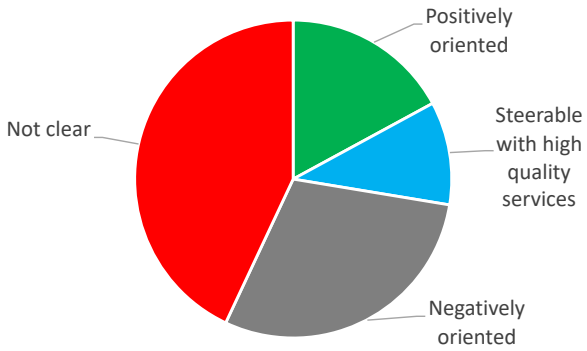
Compared to the overall sample, they are in line with the sample as for age, gender distribution and education, but are significantly more Croatians, their average income is much higher than the average in the country of origin and the length of stay is significantly shorter than average.

Although in this segment the use of alternative means to the car is not a discriminating variable, due to the classification criteria adopted, a part of this type of traveller might consider alternative means to the car for a particularly pleasant travel experience. In fact, this is a transversal segment to the other two (which are instead complementary to each other and therefore do not overlap). The 17.9% of respondents classified in this segment are also included the Deep Green segment while the 29.9% belong also to the Neutral Grey segment. The remaining 52.2 per cent of this segment (i.e. about 10.5 per cent of the sample) might be tempted to give up their car in return for high-quality travel services.

A summary of these considerations is shown in Figure 26. More than 17% of the sample has a favourable predisposition towards alternative means and is therefore the ideal target for soft measures and communication campaigns. A further 10% are oriented towards comfortable and high-quality travel experiences, and in this sense the car is a competitor to alternative transport insofar as the latter does not offer the desired level of comfort. 29.4% of travellers, on the other hand, can hardly be induced to give up the car.

For the majority of travellers, however, (43%) there is no clear attitude in favour or against alternative transport. This group is the most likely to be effectively involved in awareness campaigns, as it is possible to assume that at least part of them might be sensitive to behavioural change measures.

Figure 26: distribution of the respondents in the sample based on overall orientation towards means of transport other than car

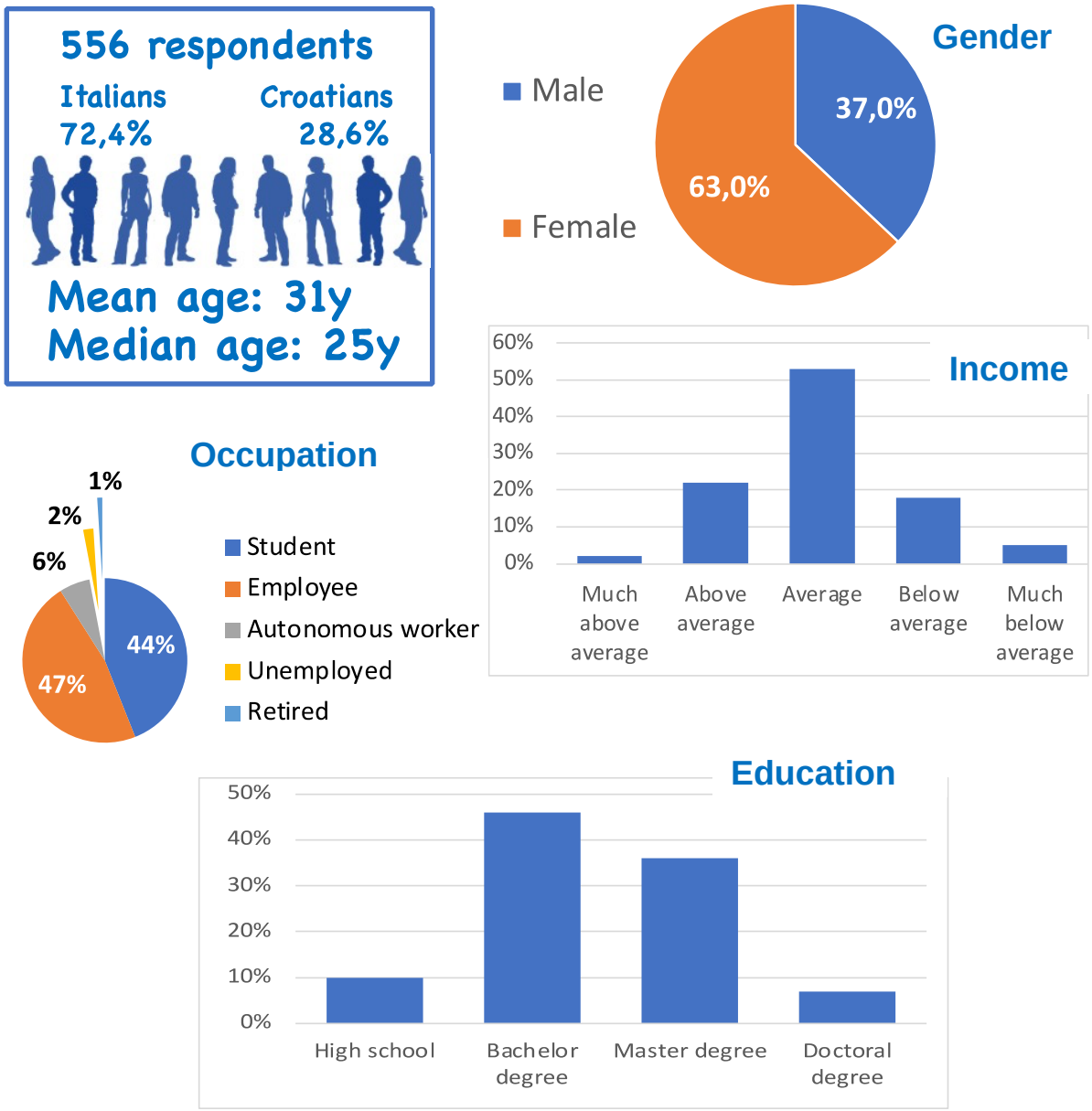


Positively oriented	17,1%
Steerable with high quality services	10,5%
Negatively oriented	29,4%
Not clear	43,0%
Total sample	*100,0%*

3.4. Behavioural analysis / Survey on habits and travel behaviour determinants (D.3.1.3.)

The study on habits and behavioural determinants aims to understand which individual variables are most correlated with travel mode choices in order to fine tune policies aimed at creating the conditions for a greater propensity of the public to use sustainable means and intermodal travel. A sample of 566 respondents participated to the survey; the main features of the sample are described in figure 27

Figure 27: main characteristics of the sample of the survey for the behavioural analysis



The main results of the behavioural analysis, as presented in the concluding remarks of D.3.1.3., are here reported.

Statement 1: **environmental issues are not considered as a relevant driver by a large majority of respondents**. The data that brings out this aspect is the general low or no correlation between per personal norms (feelings of moral obligation to perform or refrain from specific actions) and the intention or actual behaviour. A possible high and significant correlation between personal norms and intention would have indicated the existence of some kind of ethical or moral obligation towards aspects of sustainability such as to at least reflect

on the use of one travel modality rather than another, but this in our study it does not occur. However, this result is consistent with evidence in literature: even greener profiles are less attentive to sustainability when it comes to holidays or activities that are not performed on a routinary basis, this being the case of trips between Croatia and Italy.

Related policy implications. Communication policies towards end users that focus on the need to reduce environmental impact are less effective than communication that promotes themes of innovation in travel modes and themes of innovative services. For example, promoting a bus + bike alternative route because it is less polluting would have a lower impact than promoting the advantages in terms of comfort and quality of the travel experience. As far as possible *behavioural change policies* are concerned, it is therefore crucial that actions are tailored to the needs of well-identified segments and not to generic users. For instance, inducements and awareness campaigns based on sustainability claims could be effective with a minoritarian group within what has been labelled as the Deep Green segment in the analysis of segmentation (Deliverable 3.1.2), composed of youngsters with higher education. Outside such segment, which is already sustainability-oriented, behavioural change policies based on creating awareness on environmental impact are unlikely to be effective, since "already aware" subjects oriented towards car use would not change their habits. Rather, it is necessary to orient behaviour towards the re-evaluation of the functional aspects of travel that are more consistent with sustainability objectives.

Statement 2: **positive attitudes towards more sustainable travel modes often fail to translate into actual behaviours**. This result emerges from the fact that the prevalent positive and significant correlation between attitude and intention is higher than the correlation with behaviour. We interpret this to mean that travellers have a positive predisposition towards intermodality and/or transport modes that could represent an alternative to private cars: that is, “they would like” to opt for that specific option. Data signal a relevant attitude-behavior gap, which is probably due to the scarce availability of convenient alternatives: I might for instance be willing to take a coach or a train for my journey, but perhaps there are no stops close to my city of residence, or to the final destination of the trip.

Rel*ated policy implications:* more intermodal-oriented segments of travellers need to be given the opportunity to convert intentions into concrete behaviour. The implementation of new multimodal services goes in this direction, but for them to be effective it is necessary to identify the segments in question precisely, to understand their needs and actual size, to understand the real economic viability of the initiatives.

Statement 3: **habits are stronger for people driving with private cars**. The correlation between habits and intention, as well as habits and behaviour is higher for car than for any

other travel mode. This mean that once car-related habits develop they become a barrier to the effectiveness of communication, awareness campaigns and behavioural change-oriented soft-measures in general. On the bright side, respondents show a low resistance to change in general, so that they should not be considered as opposing *a priori* new options.

Related policy implications: this condition represents an actual problem for policy makers, since typical communication/awareness and behavioural change actions have little or no effect. The most problematic situations (typically, the large car traffic congestion that occurs on weekends in July and August at the border crossings between Croatia and Slovenia) should be addressed with targeted disincentives that help dilute traffic, such as differentiated tariffs according to the period of passage. The aim of long-term action must be to avoid the emergence of habits, and in this sense the most effective tools are the growth of alternative modes of travel, accompanied by communication campaigns aimed at young people

Statement 4: **the Covid-pandemic might act as a double-sided sword**. The pandemic constituted a significant discontinuity. Its strong negative impact on the perceived safety of using a shared vehicle is likely to result in a further strengthening of private car travel, rather than a 'window of opportunity', intended as the opportunity for introducing effective measures of behavioural change. Realistically, the dominant habit towards cars will be further strengthened.

Related policy implications: Rebuilding confidence in public transport will only be possible over time and with the end of the pandemic and the return to normality goes beyond the boundaries of mobility policies and is only linked to the end of the pandemic. Until then, caution is required in using the traditional communication tools as means of behavioral change since the risk of generating distrust towards travellers is particularly high, also in light of the social conflict that has arisen on issues related to the pandemic, which have exacerbated the debate on prevention measures. On the other cohesive hand, actions and pilots, such as those of the MIMOSA project, which were developed at the height of the pandemic, help increase awareness of the existence of alternative modes of travel more effectively than traditional communication would, moreover counteracting mistrust.

4. Concluding remarks

Each one of the studies presented in MIMOSA WP3 deliverables summarised in this document has investigated a particular aspect of the demand. Beyond the specific conclusions of each study, the main aspect we think should be enhanced is that overall emissions from cross-border travels are expected to increase, mainly due to the joint effect of an increase in the number of travellers. However, such increase can be mitigated and, in theory, even

cancelled or reversed through the joint effect of technological improvement and modal shift induced by new services and behavioural change. In this regard, several elements suggest that there is room for the adoption of car-dependence reduction policies both at the local and cross-border level. A crucial role in this sense is played by the first-last mile connection with main ports and in particular with Istria, Primorje-Gorski Kotar and Croatian islands, which represent the destination of the majority of Italian tourists. On the other hand, improving the connectivity of Italian and Croatian ports might reduce significantly the number of cars travelling between the two Countries, but this would not provide a pollution reduction in absence of a significant technological shift that reduce vessels emissions.

As a whole, to improve the sustainability of transport between Italy and Croatia it is therefore necessary to adopt a multi-dimensional approach, integrating soft and hard measures, pursuing both behavioural change and technological improvement, and adopting a cross-border model for transport planning aiming at the optimisation of measures bot at the local/regional and international level. The possible realisation of a transnational railway connection between Trieste and the eastern regions of Croatia, which has been studied in the WP4 of the MIMOSA project, represents one of the most important opportunities, especially in the light of the experience of the CROSSMOBY project (INTERREG Italy-Slovenia Programme) which demonstrated the effectiveness of a railway connection in increasing the permeability of borders without increasing or even reducing car traffic.

In this context, the absolute importance of pilots emerges as indispensable tools not only for field-testing possible solutions, but also because they make it possible to develop innovative skills and to disseminate to both public and stakeholders the vision of international cohesion that is a fundamental part of the programme. Indeed, it is not only in the end result that pilots create better opportunities for cross-border integration (as, for instance, in the construction of a new link), but also during the phases of its implementation, which necessarily require addressing operational (technical, legal, etc.) issues from a cross-border rather than a purely regional/national perspective. The pilots are therefore the 'dress rehearsal' of the dialogue, as well as of the realisation that is intended to last.

In conclusion, in our opinion the agenda of the next steps regarding the analysis of travel demand between Italy and Croatia should perhaps make a shift from the general framework, already explored in this and previous INTERREG projects, towards two main investigations: first, the identification of the impact of specific policies for the regulation of visitors' flows, like for instance differentiated transit charges according to the time of the week or year, traffic limitation in certain areas, facilitations for the use of sustainable means and intermodal travel, etc. Second, analysis of the potential demand for specific services, alternative travel modes,

new lines, new terminals, etc., according to different possible business models. The forthcoming entry of Croatia into the Schengen area offers many opportunities in this sense, but at the same time will almost certainly lead to an increase in visitor flows, which will raise the bar even higher for the challenge of creating sustainable transport.

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