Lesson learnt from INTERMODADRIA IPA project to monitor intermodal transport system

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Contents

1. INTRODUCTION

INTERMODADRIA Project objective was the improvement of the integration of the short sea shipping transport in the logistics chains crossing the Adriatic Sea, and more specifically the provision of the best environment for the activation on intermodal rail - sea transport services between the ports and their own hinterlands. For that to be successful a clear picture of available infrastructures and policy framework for intermodality must be provided to avoid the risk that the lack of modal alternative in one of the shores will disable successful application of intermodal transportation. In that order the freight rutes analysis and infrastructural analysis were made. That analysis allow us the identification of the transport infrastructures that link the ports with the origin and destination of the freight flows.

This document will present the main results of the processes of research, data collection, study and analysis that examined the dynamics of Ferries traffic (both Ro-Ro and Ro-Pax) and container traffic in the eight ports:

- Ancona and Bari in the western coast of the Adriatic Sea,
- Rijeka, Zadar, Split, Bar and Durres in the eastern coast of the Adriatic Sea,
- Igoumenitsa in the Ionian Sea

and give an overview of the results and the possibility of improvement. It is in tune with TRANSPOGOOD project's goals which will develop through the capitalization of the main results of INTERMODADRIA IPA project.

During the research, the formulation and presentation of the results of the research were used in the appropriate combinations of the following scientific methods: the method of analysis and synthesis – the analysis of data provided in the Final report of the INTERMODADRIA IPA WP3 Freight Routes Analysis, Act. 3.3 "Activity report on ferry flows" and synthesis of said data in this report; the method of abstraction and concretization, statistical method, comparative method, descriptive method and compilation method.

This document is part of WP 3 Definition and development of the TRANSPOGOOD platform - D3.2.1 – Lesson learnt from INTERMODADRIA IPA project to monitor intermodal transport system.

2. RESULTS OF THE ANALYSIS

In above mentioned ports there is intensive traffic, mainly by Ferry, and is strongly linked to tourist flows between the two sides and to the islands and because of that is sensitive to seasonality – between May and September the traffic increase in intensity because the frequency of "touches" of the ferries increase. However, in some countries, especially in Croatia and Greece, ferries also serve for connections to the island. It is national traffic services for communication and connection within the Country, essential services for local communities.

2.1 ANCONA

The port of Ancona is leader among the ports of the middle and lower Adriatic and Ionian Seas, in both Ro–Ro and Ro-Pax traffic. In 2013, even with international economic crisis, the port of Ancona recorded a traffic of 350,000 trucks and trailers and 1.2 million passengers. Main destinations of passengers and vehicles flows from and to port of Ancona are Greece, Croatia, Albania, and Montenegro.

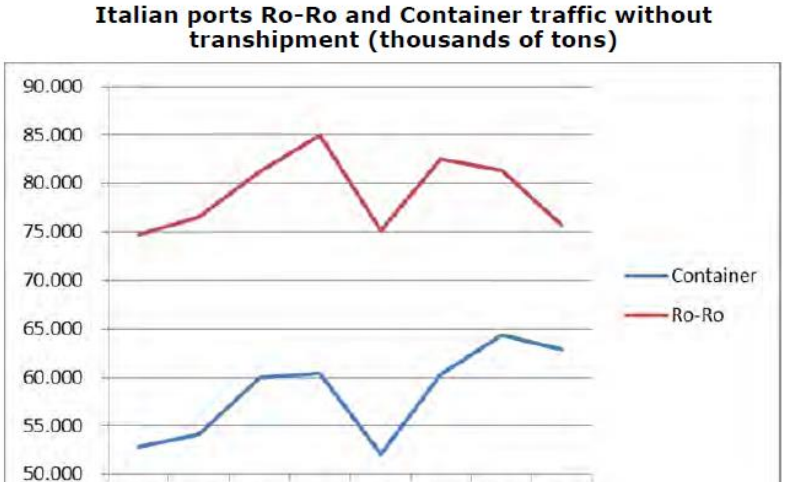


Figure 1. Italian ports Ro-Ro and Container traffic

Figure 1 shows Italian ports Ro-Ro and Container traffic without transhipments. Distribution of Maritime combined transport among Italian Ports is homogeneous. Ports of Ravenna, Ancona, Bari and Brindisi together holds 10,3% of said traffic. That means that 13,3 millions of tonnes go from Italian Adriatic ports towards South East Europe, East Med and Middle East.

Over 70% of Ro-Ro traffic that call at Port of Ancona has its origin outside area; whereas more than 80% of container traffic destination is inside the Macro Region.

The 86,5% of Ancona freight traffic on Ro-Ro come from and has its destination in Greek ports Igoumenitsa and Patras.

Table 1. Ferry flows in the Port of Ancona

Port	User/year	2009	2010	2011	2012	2013
Ancona	Passenger	1.572.407	1.654.821	1.553.757	1.172.486	1.174.054
	Vehicle	501.364	533.181	452.600	352.688	345.872

Table 1 shows Ferry flows in Port of Ancona per passenger and vehicle. In the years from 2009 to 2013 we can see decrease in number of passengers and vehicles flows from and to port of Ancona. However. The numbers are still high, and the estimation of trucks and trailers traffic development in the Port of Ancona is that the amount of 132.000 trucks/trailers in 2013 will be doubled (around 250.000) in the 2030.

The port of Ancona enjoys a strategic location with respect to routes, has the ability to accommodate the so-called fast ships (such as ships Superfast) requiring a morphological structure in favour of the port and adequate backdrops. Geographical proximity to the Dalmatian coast has determined the further successes in the connections between Ancona and Croatia.

The main drawback in this port is that for now there are no direct links to the major roads, nor forms of combined transport that can help transform the way the sea-land mode to sea-rail mode. It must therefore strengthen the assets of this type of transport. The challenge for the Port is to find out a sustainable solution to allow the trucks to join rapidly their land destination, without the negative impacts for urban area (congestion and pollution). The integration between truck and rail is a strategic solution, to reduce the transit of trucks in the urban area, to introduce new added-value services for road, rail, terminal and maritime companies with positive impacts on labor and economic activities in the Port.

Also, among the priority actions to improve the performance of services in the segment of Ro-Ro should be:

- To equip a road dedicated to transit trucks entering and leaving the port of Ancona
- To create a new maritime station, more comfortable and closer to the piers.
- To reorganize the port spaces in “Functional terms”

To conclude, the port of Ancona is one of the main passenger ports in the Adriatic Sea, with regular lines to Croatia (Split and Zadar), Albania (Durres) and Greece (Igoumenitsa and

Patras). It is located in the city center and connected to the train station by public transport. However, main drawback is that there is no forms of combined transport that can help transform the way the sea-land mode to sea-rail mode in freight traffic.

2.2 BARI

The port of Bari is situated in the South-east of Italy and traditionally considered as Europe's gateway to the Balkan Peninsula and the Middle East. The port of Bari is a multi-purpose port whose multifunctional operations can count on platforms equipped for handling all types of cargo.

According to data provided by public sources it is possible to recognise that in Port of Bari there is an intensive flow of Ro-Pax ferries transporting passengers and vehicles. The most important lines for both, traffic and passenger flows, are the ones to Albania, Greece, Montenegro and Croatia.

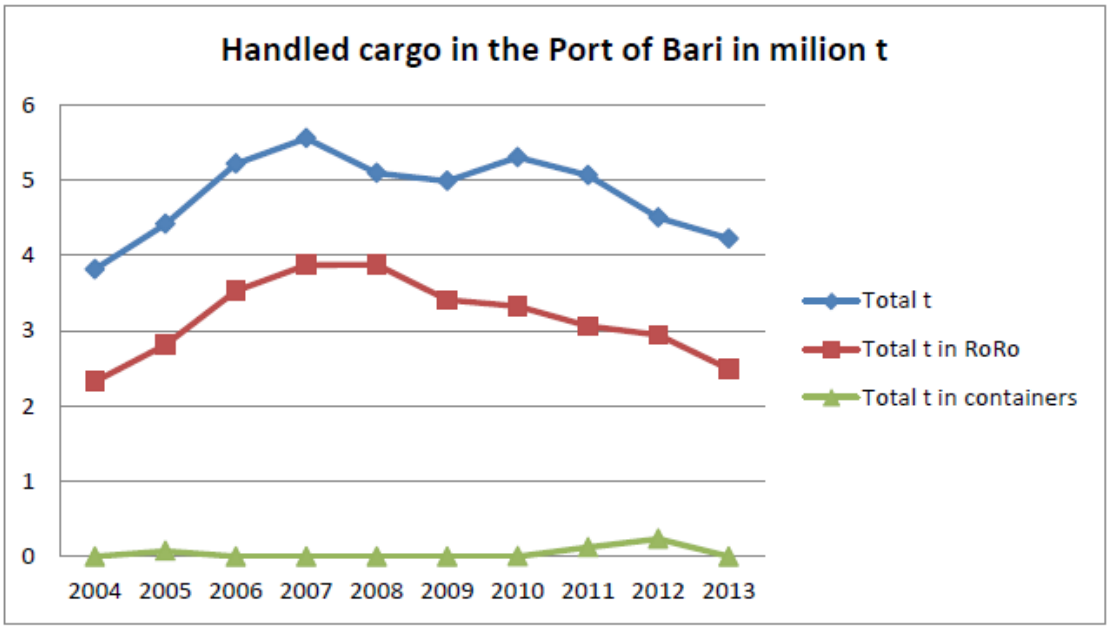


Figure 2. Cargo flows handled in the Port of Bari

Figure 2 shows cargo flows handled in the Port of Bari. According to the statistical data gathered by the Levante Port Authority, the total amount of cargo flows handled in the Port of Bari is approximately 4.5 milion t. Thereat, the Ro-Ro cargo flows have a significantly higher share than the container flows.

During the economical crisis in 2013, the port of Bari recorded a number of 1.700.000 passengers and about 340.000 vehicles which make for intensive touristic flow and flow traffic of vehicles. Table 2 shows passenger and vehicle flows in the Port of Bari for period from 2009 to 2013:

Table 2. Ferry flows in the Port of Bari

Port	User/year	2009	2010	2011	2012	2013
Bari	Passenger	1.961.283	1.903.535	1.951.665	1.854.217	1.700.591
	Vehicle	453.429	460.699	444.954	396.701	338.689

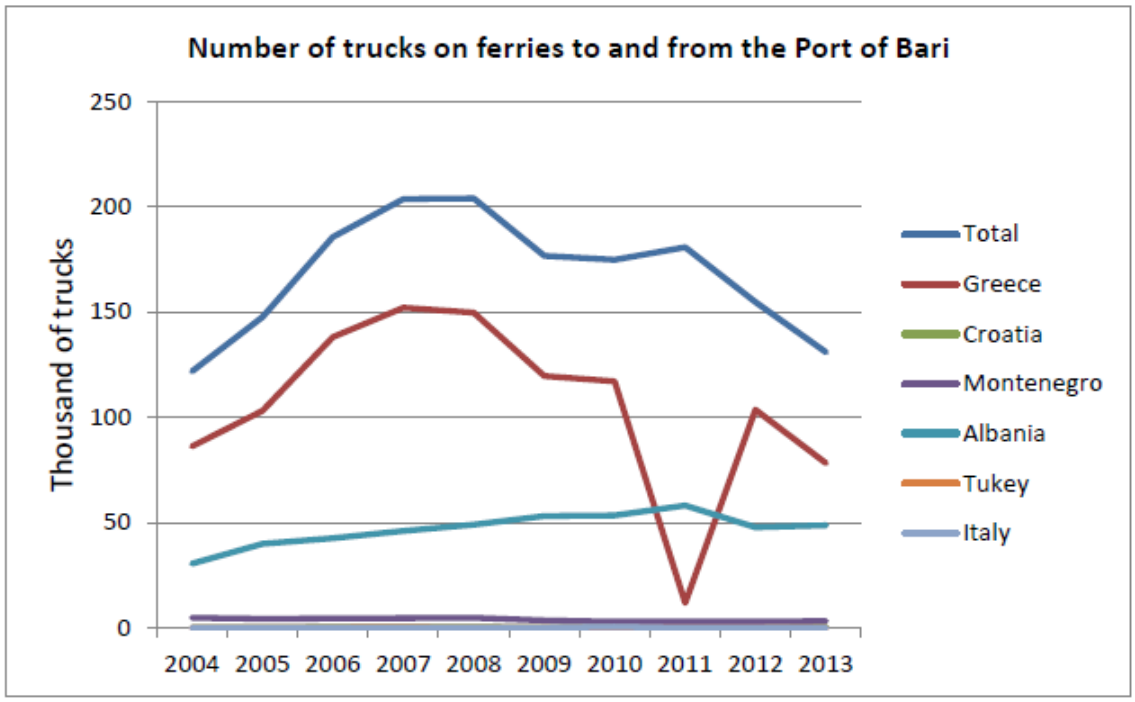


Figure 3. Ro-Ro cargo flows in the Port of Bari

If we analyse Ro-Ro traffic flows, we can see that the number of trucks handled in the Port of Bari, in 2013, was approximately 140 thousand. The rest, about 198 thousand was made from cars and buses. The flows had a significant growth between 2004 and 2008. As a consequence of the economic crisis in 2008 the flows started to decrease. The biggest decrease had flows to and from Greece.

Main gravitational areas of the Ro-Ro flows are Greece and Albania, while minor share have Montenegro and Croatia.

Levante Port Authority foresees following strategies for Port of Bari about ferry flows:

1. To support existing markets through the improvement of port's logistical accessibility, operability and broadening of value added services;

2. To attract new markets, from the neighbouring regions, through further development of Intermodality

If we are analysing container traffic of the port of Bari, we can conclude that in the period from 2004 until 2013 it has grown. In 2005, the traffic had a dramatic drop that has not changed until 2011 when the container traffic started to grow up again. The greatest increase in container traffic occurred between 2011 and 2013. The main reason for the increase was introduction of the container feeder line to Gioia Tauro. In 2013 the container traffic in the port has reached its maximum, approximately 31.5 thousand of TEUs. These results can be seen in table 3:

Table 3. Container flows through the Port of Bari

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total number of handled TEU	20.192	10.008	49	64	113	55	680	11.121	29.395	31.436
Number of empty TEU	7.165	3.479	0	0	0	49	331	8.664	20.129	24.245
Number of full TEU	13.027	6.529	49	64	113	6	349	2.457	9.266	7.191

In the total number of handled TEUs, since 2011, empty containers have a significantly higher share. The number of empty containers is 2 to 4 times higher than the number of full containers. Before the great drop in containers flows in 2005, the share was completely opposite.

Currently, the main container flow come from Albania. Minor, but increasing flows come from Greece and Turkey followed by Montenegro, Macedonia, Bulgaria, Serbia, Iraq, Iran. Containers coming from Turkey embark in Greece and disembark in Bari. Once arrived in Bari containers continue their route somewhere in Puglia or to the center of Italy. Minor flows have their destination in the North Italy.

To conclude, the port of Bari has great potential thanks to its position as the "Western end" of "Corridor 8" which connects Southern Italy to the Black Sea through Albania, Macedonia and Bulgaria. The main focus should be on the development of Intermodality that should ensure greater accessibility and lower logistics costs. This represents the main prerequisite for the further development of maritime traffic, which is proven the greatest generator and attractor of the ferry flows in the Port of Bari.

2.3 RIJEKA

The port of Rijeka is currently the largest port in Croatia. It is located on the coast of the Kvarner Bay in the northern Adriatic Sea. The port is a multi-purpose port equipped with facilities for handling almost any type of cargo, has Ro-Ro and Ro-Pax passenger terminal and container terminal.

It has strategic geo-traffic position that is a natural and most favourable access to the Adriatic Sea, to the whole Pannonian Plain and the wider European region. Port belongs to the North Adriatic ports that have traditionally gravitational area in central and eastern European countries, which widely includes central and eastern Croatia, Hungary, northern and western part of Bosnia and Herzegovina, northern part of Serbia and Vojvodina, and can include Slovenia, Austria, Slovakia and Romania.

This is mostly transit port for the Hungary (as a traditional partner of the port of Rijeka), Czech Republic, Slovakia and Austria. These Central European countries also represent a strategic transport market for the port of Rijeka. In addition, it should be mentioned that Serbia represents the most important transit market for container traffic from the Port of Rijeka. Unfortunately, current "use" of mentioned gravitational potential for ferry transport almost does not exist.

Table 4 shows passenger and vehicle flows in the Port of Rijeka for period from 2009 to 2013:

Table 4. Ferry flows in the Port of Rijeka

Port	User/year	2009	2010	2011	2012	2013
Rijeka	Passenger	257.402	230.942	213.598	197.850	203.993
	Vehicle	13.545	11.464	7.934	7.044	6.823

It can be seen that ferry flow is in constant decrease.

The port of Rijeka provides also national coastal ferry line services until port of Dubrovnik. This service connects north and south part of Croatia and it is operated by Ro-Ro and Ro-Pax ships. The service is seasonal and call various Dalmatian ports Split, Starigrad (Island Hvar) and Island Korčula.

Maritime links which is currently operational from port of Rijeka consist of three national lines:

- passenger HSC line to Island of Cres and Mali Lošinj,
- passenger HSC line to island of Rab,
- coastal ferry line Rijeka – Dubrovnik.

In addition port of Rijeka present home port for small passenger ships which operate as cruise ships offering usually 7 days voyages from Rijeka to nearby islands with return to Rijeka. The service is offered only during summer months (mainly from April to October). They used berths at passenger terminal. The average number of ships is 10 and the total annual number of passenger is about 11.000.

Passenger HSC services are operated as local lines connecting populated islands with the major town of Rijeka. The services receive subsidy from the state.

Coastal ferry line between the port of Rijeka and port of Dubrovnik is service which connects north and south part of Croatia. It is operated by Ro-Ro passenger ship. The service is seasonal and call various Dalmatian ports Split, Starigrad (Island Hvar) and Island Korčula.

Passenger flow from Rijeka to the islands and to the south part of Croatia from 2009 till 2013 in the following table is presented:

Table 5. Number of passengers on ferry and passenger maritime services operated from Rijeka

Itinerary	Type of service	2009	2010	2011	2012	2013
RIJEKA - SPLIT – STARI GRAD - KORČULA - DUBROVNIK	Ferry	80.534	65.897	45.323	41.350	41.081
RIJEKA – CRES – MARTINŠĆICA - UNIJE – SUSAK – ILOVIK – MALI LOŠINJ	HSC	82.218	74.306	77.930	68.802	74.351
RIJEKA – RAB – NOVALJA	HSC	94.650	90.739	90.345	87.698	88.561
	TOTAL	257.402	230.942	213.598	197.850	203.993

On the ferry line to Dubrovnik vehicles are transported as well. However, due to fact that this line is seasonal and primarily oriented to promote tourism the line is not intended to carry Ro-Ro cargo. Only trucks of smaller size, buses and personal cars are transported.

In the following table the number of vehicles on ferry line from 2009 till 2013 is presented. According to statistical data vehicles are mostly consists of personal cars:

Table 6. Number of vehicles on ferry line Rijeka – Dubrovnik

Itinerary	2009	2010	2011	2012	2013
RIJEKA - SPLIT – STARI GRAD - KORČULA - DUBROVNIK	13.545	11.464	7.934	7.044	6.823

Port of Rijeka also have Container terminal. In period from 2008 to 2013 the Port of Rijeka have experienced a decrease of traffic flows of containers. The year 2008 stands for ports as a reference to the emerging international economic and financial crisis. In table 7 is shown container flow in Port of Rijeka for years 2008-2013:

Table 7. Container flow in the Port of Rijeka

Year	2008	2009	2010	2011	2012	2013
TEU	168.777	122.743	121.490	130.055	126.680	131.310

After 2010 we can see a slight increase in number of TEUs and we can hope for more increase in the future. The containerised freight transhipped in the Port of Rijeka is currently for the area of Croatia, Bosnia and Herzegovina, Serbia and Hungary.

Conclusion: although the port of Rijeka has great geo-traffic position, it currently is not port of big significance for ferry or passenger sea transport including transport of Ro-Ro cargo. The services are national and local, primarily oriented to passenger traffic. For container traffic, there is great potential, but port must work on attraction of new markets.

2.4 ZADAR

The port of Zadar is situated in the middle of the eastern coast of the Adriatic Sea. It has been recently completely renewed and upgraded. The port has very good road connection to the hinterland due to direct access to the highway. It is connected with a modern highway Zadar-Split, Zadar-Zagreb, and from Zagreb with all European neighbouring countries: Slovenia, Italy, Hungary and Serbia. It also has airport situated only 12 km far from the port.

The port is divided in two sections: one is located in the city centre, and the other in the area southerly from the city centre at the port of Gaženica (3,5 km south of the city of Zadar). The new port in the area of Gaženica is passenger and ferry terminal.

This is mostly passenger port, with cargo transportation limited only to ferry line Zadar – Ancona (Italy).

Passenger flow can be divided in the two flows: international and local passenger flow. International flow have again, only one line Zadar – Ancona, while local passenger flow is related to several domestic lines between the port of Zadar and various islands in coastal area.

The ferry line from Zadar to Ancona is operated by one Ro-Ro passenger vessel, while local lines are operated by ferries, passenger high speed crafts and classical passenger vessels.

Ferry line to Ancona is primarily oriented to transport of cargo on trucks and trailers during winter time and to passengers (tourists) during summer season.

Table 8 shows passenger and vehicle flows in the Port of Zadar for period from 2009 to 2013:

Table 8. Ferry flows in the Port of Zadar

Port	User/year	2009	2010	2011	2012	2013
Zadar	Passenger	2.195.204	2.227.800	2.214.734	2.181.817	2.217.160
	Vehicle	349.546	328.403	331.129	323.454	326.514

It can be seen that Port of Zadar did not experience a big drop in ferry flows. The reason is mainly because of constant local ferry lines with populated islands as will be seen in table 10.

Table 9 shows number of transported vehicles on ferry line Zadar – Ancona for the period from 2009 till 2013:

Table 9. Number of vehicles on ferry line Zadar - Ancona

Year	2009	2010	2011	2012	2013
Vehicles	16.056	13.727	13.747	9.691	6.886

Although the Port of Zadar did not experience a big drop in number of passengers in the period from 2009 to 2013, number of vehcel on line Zadar – Ancona did decrease. The number of vehicles has been varied from 16.056 vehicles in 2009 to 6.886 vehicles in 2013. Corresponding to the line number reduction, number of vehicles has been rapidly decreased.

Local ferry and passenger lines connect port of Zadar, as most important and biggest town, with populated islands in the area. Non-commercial lines (all lines except one ferry line) are financial supported by the states. On ferry lines, only small trucks with the limited quantity of cargo intended for local population (wood, cement, oil products, food products…) are usually transported.

Passenger and vehicles flow from Zadar to the near islands from 2009 till 2013 is presented in the following table:

Table 10. Number of passengers on ferry lines operated from Zadar

Line		2009	2010	2011	2012	2013
ZADAR - IST - OLIB - SILBA - PREMUDA - MALI LOŠINJ	Passengers	28.430	23.359	24.707	25.696	24.568
	Vehicles	6.612	5.711	6.130	6.451	6.617
ZADAR - PREKO	Passengers	1.615.439	1.657.065	1.617.167	1.606.123	1.642.286
	Vehicles	260.154	146.537	247.624	244.473	247.800
ZADAR - SESTRUNJ - ZVERINAC - MOLAT - IST	Passengers	20.900	16.369	17.497	15.865	17.548
	Vehicles	4.757	4.351	5.116	4.151	4.373
BRBINJ - ZADAR	Passengers	145.453	141.325	141.480	141.555	148.480
	Vehicles	49.434	47.772	47.709	49.263	51.381
ZADAR - BRŠANJ - RAVA	Passengers	29.086	21.708	21.043	23.852	30.125
	Vehicles	10.095	8.568	8.249	8.568	9.090
TOTAL	Passengers	1.839.308	1.859.826	1.821.894	1.813.091	1.863.007
	Vehicles	331.052	312.939	314.828	312.906	319.261

Cargo transportation is limited only to ferry line Zadar – Ancona. Cargo includes trucks, buses and personal cars. The data on cargo flows are available for the period from 2009 till 2013:

Table 11. Number of trucks on ferry line Zadar-Ancona

Years	2009	2010	2011	2012	2013

Number of trucks	2.438	1.737	2.554	857	367

It can be seen that the truck traffic has been rapidly decreased. The numbers have been varied from 2.438 trucks in 2009 to 367 trucks in 2013. Although, the number was decreased due to line reduction (The ferry line has been operational whole year till 2011 while from 2012 the ferry line have been operational only during summer season from April till October (7 months) and in 2013 from June till September (4 months). The service is operated on daily basis during summer season and operated 4 times per week during winter season.), economic recession and strong influence by the ferry lines which connects neighbouring Port of Split with Ancona caused presented big decrease in truck traffic.

In conclusion, the Port of Zadar is recently completely renewed and upgraded and has good road connections. For now, it has a low number of international maritime lines, but it is very important for local passenger flow.

2.5 SPLIT

The Port of Split is located on the Adriatic Sea coast in a bay protected by the Split peninsula and a string of islands. The Port of Split is one of the most important centres for local and international ferry and passenger traffic in the Adriatic Sea.

Split is the second largest city in Croatia and is important cultural, tourist, industrial and commercial centre of Dalmatia. The city of Split, with its heritage and 1.700 years of tradition has become unavoidable destination of cruising vessels in the Mediterranean.

As of 2011, the port ranks as the largest passenger port in Croatia and the third largest passenger port in the Mediterranean.

The port contains several terminals for cargo and passengers. The following terminals are used for ferry and passenger traffic:

- the City port of Split - handles yachts, fishing vessels, passenger ships, navigation safety craft, sailing ships, tugboats and ferries.
- Resnik-Divulje passenger terminal - designed to facilitate transfer of ship passengers to the Split Airport, located just 950 metres away from the airport.

Port area in the city centre is mainly intended for accommodation of ferries and passenger vessels.

The Port of Split has one international ferry line to Ancona (Italy) and several local passenger and ferry lines to neighbouring islands (islands of Brač, Šolta, Hvar, Vis, etc.). The ferry line from Split to Ancona is operated by several Ro-Ro passenger vessels. Currently the service is

maintained by two ferry operators. Local lines are operated by ferries, passenger high speed crafts and classical passenger vessels.

Table 12 shows passenger and vehicle flows in the Port of Split for period from 2009 to 2013:

Table 12. Ferry flows in the Port of Split

Port	User/year	2009	2010	2011	2012	2013
Split	Passenger	4.067.533	4.125.595	4.211.053	3.957.211	4.268.235
	Vehicle	71.914	85.178	55.300	16.631*	48.474

*Partially available

The current port facilities for ferry and passenger traffic are not adequate and efficient for existing ferry and passenger flows. Although, the majority of berths are for the most part suitable for accommodation of existing size of ships the new build modern ships and possible new services require modernization of berths (in term of length and draught).

There is a plan for moving all international ferry traffic to the north port of Split (approximately five kilometres from the existing city port of Split) which will enables much more flexibility for adequate road connection and terminal area. The north Port of Split has almost direct connection to highway and relatively big area for terminal operations.

Local ferry and passenger lines connect Port of Split, as most important and biggest town in the area, with populated islands in the area. Non-commercial lines (all lines except one ferry line) are financial supported by the states. On ferry lines, only small trucks with the limited quantity of cargo intended for local population (wood, cement, oil products, food products …) are usually transported.

Ferry lines to Ancona are primarily oriented to transport of cargo on trucks and trailers during winter and to transport of passengers (tourists) during summer season. The line is currently operational whole year with decreased intensity during winter.

Cargo transportation is limited only to ferry line split – Ancona. Cargo includes trucks, buses and personal cars. The maximum average weekly volume of traffic by Ro-Ro passenger ships from Split has been reached in 2012 and accounted to 89 trucks per week. Total amount of trucks has been growing in the four year period till 2012 (53% growth), but the economic recession and reduction of lines in 2013 decreased the number of transported trucks and consequently the cargo quantity. The data on cargo flows for the period from 2009 till 2013 is presented in next table:

Table 13.Number of trucks on ferry line Split-Ancona

Years	2009	2010	2011	2012	2013
Number of trucks	3.010	3.071	4.070	4.628	3.822

The ferry line is basically oriented to transport trucks during winter time. Next Figure shows cargo flow from Split to Ancona for the period 2009-2013 by months:

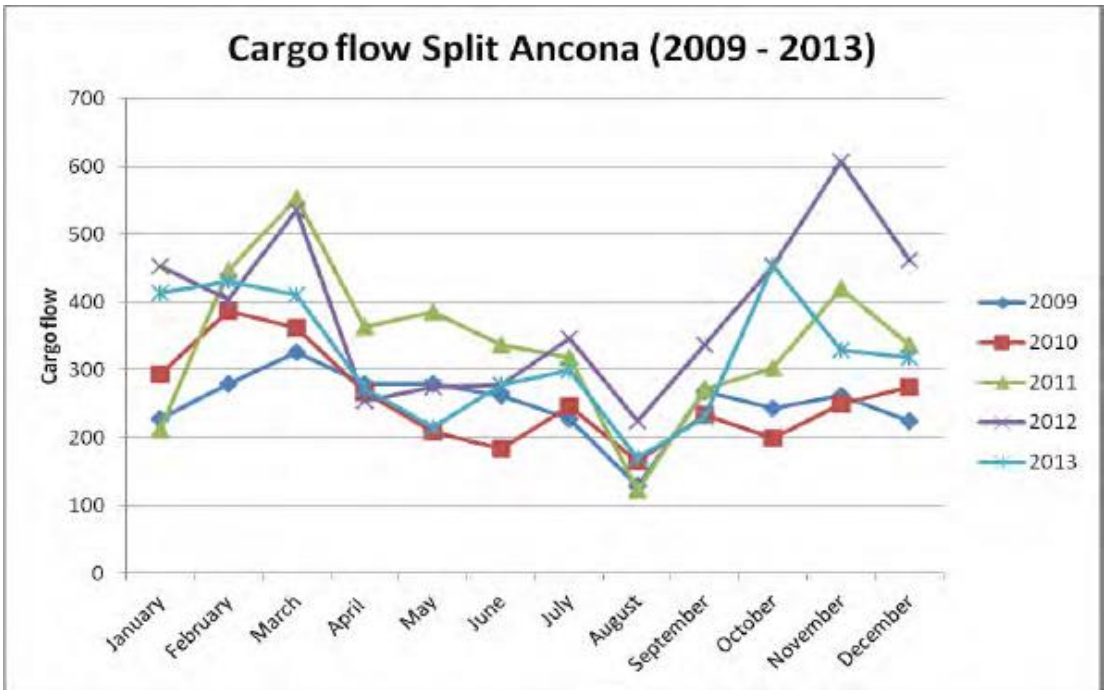


Figure 4. Cargo flow from Split to Ancona by months

It can be noted that in 2012, total cargo flow by truck reached a record if five years period is compared. As mentiond before, the Port of Split has one international ferry line to Ancona (Italy) and several local passenger and ferry lines to neighbouring islands (islands of Brač, Šolta, Hvar, Vis, etc.). Table 14 show number of transported vehicles on ferry line Split – Ancona for the period from 2009 till 2013:

Table 14.Number of vehicles on ferry line Split - Ancona

Year	2009	2010	2011	2012	2013
Vehicles	14.991	14.253	14.304	12.003	8.926

Over the past five years there has been a substantial decrease of total vehicles. Although the frequency of ferry service from Split to Ancona is much higher than the frequency on the line between Zadar and Ancona the total number of vehicles is decreasing. The main reason for

such tendency is economic recession which decrease demand in the hinterland area, especially in the area of Bosnia and Herzegovina. It is not expected that the demand increase in the following years.

Similarly to the aforementioned for Port of Zadar, local ferry and passenger lines connect Port of Split, as most important and biggest town in the area, with populated islands in the area. Non-commercial lines (all lines except one ferry line) are financial supported by the states. On ferry lines, only small trucks with the limited quantity of cargo intended for local population (wood, cement, oil products, food products …) are usually transported.

Local passengers flow from Split to islands in Split area from 2009 till 2013 is presented in the following table:

Table 15. Local passengers flow from Split to islands in Split area

Line	2009	2010	2011	2012	2013
VIS - SPLIT	41.825	40.886	41.309	39.630	40.730
LASTOVO - VELA LUKA - HVAR - SPLIT	44.257	41.832	42.960	42.237	40.837
DRVENIK VELI - DRVENIK MALI - TROGIR - SPLIT	7.175	7.900	8.308	8.504	7.367
SPLIT - SUPETAR	333.511	314.200	316.024	314.198	321.827
SPLIT - STARI GRAD	138.793	136.105	141.292	138.678	141.947
SPLIT - ROGAČ	53.901	53.008	55.536	55.173	55.395
TOTAL	619.462	593.931	605.429	598.420	608.103

The busiest line is between Split and Supetar (island Brač as the closest and most populated island). This line is of great importance because it accounts 46% of total ferry traffic from Port of Split. The second line by importance and size is Split - Starigrad (island of Hvar) which accounts 18% of total domestic ferry traffic.

It should be noted that Port of Split is one of the most important cruise destination on the eastern Adriatic coast (after Dubrovnik) with more than 250 calls per year with more than 200,000 cruise passengers.

The Port of Split also have a container terminal. Although, the container traffic is increasing due to commercial efforts, this still does not change the fact that the Port of Split is and will stay a port of local significance for the nearby gravitational area with limited possibilities to develop much further. The vicinity of other container ports such as Ploče and Rijeka, with almost the same gravitational area and even better inland connections (especially road

connection) does not provide the port of Split with the opportunity to grow as a container port. The terminal infrastructure and superstructure satisfy the needs for container transhipment of existing and potential future container traffic volume. Container flow in the Port of Split is shown in next table:

Table 16. Container flow in the Port of Split

Year	2008	2009	2010	2011	2012	2013
TEU	7.157	5.412	5.574	6.123	6.045	5.082

Conclusion: the Port of Split is not very important cargo port, but it is of most importance in passenger transport. As a result of its geographical position, outback and great number of populated islands in coastal area port of Split has widespread local ferry lines network. It is also important in tourist passenger flow as one of main cruising destination in Adriatis Sea.

2.6 BAR

The Port of Bar is Montenegro's main sea port. Currently, the Port of Bar is operating significantly below its designed capacity.

The passenger terminal in the Port of Bar is located in the most northern part of the port. Although it is officially classified as a passenger terminal, it is in fact a ferry terminal or a Ro-Pax terminal.

Presently, there are only two ferry lines connecting the passenger terminal at the Port of Bar with the Italian ports of Bari and Ancona. The ferry line Bar – Bari operates throughout the year, while the ferry line Bar – Ancona operates from July to September.

The number of passengers and vehicles are shown in table 17 for the period 2009-2013:

Table 17. Ferry flow in the Port of Bar

Port	User/year	2009	2010	2011	2012	2013
Bar	Passenger	73.443	68.400	60.142	53.390	43.561
	Vehicle	21.990	18.441	15.011	12.648	11.909

The cargo turnover in Ro-Ro ships in the same period is shown below:

Table 18. Cargo turnover in the Port of Bar

Year	2009	2010	2011	2012	2013
Cargo (t)	1336	1564	2293	2648	2146

Container flow in the Port of Bar is shown in table 19:

Table 19. Container flow in the Port of Bar

Year	2008	2009	2010	2011	2012	2013
TEU	43.708	34.692	30.477	34.722	30.798	33.009

Although both terminal access roads and the main North-South axis run through town, road accessibility of the terminal (and local hindrance) can be qualified as acceptable with the existing amount of traffic, as the main streams are diverted along the edges of the town and road capacity is sufficient.

There is no railway link to the passenger terminal, which Bar Port Authority does not consider a weakness with the present cargo types and volumes.

To conclude: the Port of Bar do not utilize its potential and capacity. The port has to acquire new markets to which it would cater. The announced building of Belgrade–Bar motorway and proposed reconstruction of Belgrade–Bar railway would thus mark a breakthrough in attracting the Serbian, and thus the Central European market.

2.7 DURRES

The Port of Durres is the most important, attractive and equipped of all Albania. In port of Durres there is an intensive flow of passengers: in 2013 there was 717.399 passengers. Main destinations of passenger flows toward Europe are with Italy (Ancona and Bari) and for the internal areas of all Albania, Kosovo, Macedonia.

Also the flow traffic of vehicles is intensive. In 2013 there were 215.701 units. Main destinations of vehicles flows toward Europe are with Italy (Ancona and Bari) and for the internal areas of all Albania, Kosovo, Macedonia.

Table 20 shows passenger and vehicle flows in the Port of Durres for period from 2010 to 2013:

Table 20.Ferry flows in the Port of Durres

Port	User/year	2010	2011	2012	2013
Durres	Passenger	834.040	853.748	798.524	717.399
	Vehicle	267.269	252.081	245.840	215.701

Although we can see slight decrease in Ferry flows in the Port of Durres, in general, the volume of cargo handled at the Port of Durres has been growing. This increase was mainly in container processing. As a result of the global crisis which has gripped the economy in general, the Port of Durres has reflected a slight increase being more positive. The table 21 show freight volume by ferries in period 2010 to 2013, which is in slight decrease. Table 22 show the container traffic in the same period which is on the rise, and finally, table 23 show total freight volume growth for the said period.

Table 21. Freight volume by ferries

Year	2010	2011	2012	2013
Freight volume (t)	730.690	745.066	699.426	710.249

Table 22. The container traffic in the Port of Durres

Year	2010	2011	2012	2013
TEU	71.612	78.327	83.194	109.054
Freight volume (t)	968.501	1.023.261	1.105.179	1.510.429

Table 23. Total freight volume in the Port of Durres

Year	2010	2011	2012	2013
Freight volume (t)	1.699.191	1.756.111	1.749.059	2.042.450

Looking at the above tables, the Container traffic at the Port of Durres is increased in the years of 2009 till 2013, especially in 2013 with the concessionaire contract of the container terminal with the “Container Durres Shipping” company.

In recent years, Albania went through radical changes from political and economic autarchic system, of full closure to relations with neighbouring countries, to market economy which generated an intensive and dynamic evolution of all Albanian society. This means contacts, exchanges, new relations and business with neighbouring and European countries.

The intensive mass flow migrations from Albania to the European countries and all over the world facilitated, supported and encouraged above mentioned contacts and exchanges.

In all these phenomena, the Port of Durres had and has a strategically central role, under all points of view.

Conclusion: Albania is new, young, dynamic, growing Country and economy. It is not a surprise that statistical and economic performances of Port of Durres during last years are positive. We can probably expect more growth in next few years.

2.8 IGOUMENITSA

Igoumenitsa is the chief port of Thesprotia and Epirus, and one of the largest passenger ports of Greece, connecting northwestern Mainland Greece with the Ionian Islands and Italy. It is situated on easternmost end of the Gulf of Igoumenitsa in the Ionian Sea.

Over the last years, the port exhibited its own O/D maritime shipping schedules utilizing suitable Ro-Ro and Ro-Pax (truck and passenger ferries). The port developed this ability mainly due to its geographic position at the northwest of Greece and the "Egnatia" Motorway, running across the North of Greece, creating and enabling vast freight loads through its vertical axes such as Albania, FYROM, Bulgaria, Turkey, Black Sea and Middle East to be directed to the Port of Igoumenitsa. Currently the port dominates in the intermodal O/D shipping flow market (especially passenger flows and truck), predominantly servicing with suitable ferries all Adriatic Italian ports.

Table 24 shows passenger and vehicle flows in the Port of Igoumenitsa for period from 2009 till 2013:

Table 24. Ferry flows in the Port of Igoumenitsa

Port	User/year	2009	2010	2011	2012	2013
Igoumenitsa	Passenger	2.805.482	2.830.273	2.651.460	2.277.327	2.492.032
	Vehicle	992.242	971.913	937.643	802.249	829.100

Currently, the Port of Igoumenitsa is mainly servicing Ro-Pax and occasionally Ro-Ro vessels. The shipping line connections served by the port are both the main Italian ports like Brindisi, Bari, Ancona and Trieste, including inland ferry lines, servicing the islands of Corfu, Paxoi, Cephalonia and the port of Patras.

In this respect the recorded vehicle and passenger departures from the port of Igoumenitsa towards the main Italian ports are shown below:

Table 25. Departures towards main Italian ports

Years/ destinations		2008	2009	2010	2011	2012	2013
ANCONA	Passengers	201.162	240.582	265.374	243.834	173.850	176.723
	Vehicles	72.996	88.240	95.337	88.631	66.770	65.970
VENICE	Passengers	64.121	63.211	68.711	70.806	37.882	35.942
	Vehicles	26.485	25.169	28.478	29.656	16.040	14.933
BARI	Passengers	118.127	112.653	131.454	110.832	98.967	87.693
	Vehicles	53.712	51.895	56.301	50.106	46.653	34.035
BRINDIZI	Passengers	93.669	103.215	97.231	114.270	101.305	110.986
	Vehicles	39.979	40.651	38.851	43.571	39.347	47.516
TOTAL	Passengers	477.079	519.661	562.770	539.742	412.004	411.344
	Vehicles	193.172	205.955	218.967	211.964	168.810	162.771

The decline and fluctuations of the above shown flows are attributed to the prevailing economic crisis. By the same token, the vehicle and passenger arrivals to the Port of Igoumenitsa from the above mentioned Italian ports, together with the recorded flow fluctuations, are shown on the following table:

Table 26. Arrivals to the port of Igoumenitsa from the main Italian ports

Years/ destinations		2008	2009	2010	2011	2012	2013
ANCONA	Passengers	250.261	282.932	301.094	271.496	196.820	205.108
	Vehicles	101.916	112.374	112.166	103.487	77.703	79.614
VENICE	Passengers	70.412	65.044	67.457	67.964	35.007	31.716
	Vehicles	32.494	29.336	29.642	28.822	15.886	14.566
BARI	Passengers	145.633	139.020	139.173	118.033	96.975	88.264
	Vehicles	70.549	65.451	65.847	57.751	53.077	39.601
BRINDIZI	Passengers	95.023	81.946	105.641	110.335	111.197	122.475
	Vehicles	44.613	33.904	41.017	43.140	43.629	51.722
TOTAL	Passengers	561.329	568.942	613.365	567.828	439.999	447.563
	Vehicles	249.572	241.065	248.672	233.200	190.295	185.503

The hinterland areas contributing to the passenger and vehicle accumulation and transport to and from Italy from and to various Greek origins and destinations are mainly of British, French, Netherland, German and Italian origin in terms of the main tourist and cargo flow on the European, Western side and the Balkans, Turkey, Black Sea and Middle East on the Eastern side.

Furthermore there is a significant amount of vehicle and passenger flows, through the domestic port platform of Igoumenitsa, representing over 60% of the above mentioned flows with Italian ports. For the island of Corfu and the islet of Paxoi, medium sized Ro-Pax vessels and sizable ferryboats have been utilized.

The ferry flows from and to Patras and Cephalonia via the interconnected Port of Igoumenitsa are serviced via the same Ro-Ro and Ro-Pax ferry lines to and from Italy.

Container handling equipment through a designated Container Terminal and handling equipment such as, cranes, silos and other handling apparatus don't currently exist. Therefore the port management and truck embarking and disembarking personnel, do not undertake such handling procedures of unescorted containers, other than trucks and trailers. However the current container handling services were increasingly developed and managed during the course of the past 60 years, by trucks and trailers, utilizing RO-PAX vessels, or other maritime shipping lines, handling the port's shipping service operations.

Referring to the Origin and Destination of merchandises to and from the South East European countries, the Igoumenitsa has already developed over the past years constantly increasing and important shipping O/D flows with FYROM and Bulgaria either directly or through the port of Thessalonica, acting as a loading and unloading freight node. There are additional container O/D flows from Serbia, Albania and Romania, although until today, these do not reach the high volumes and the continuity of those originating or destined to FYROM and Bulgaria regions. Therefore a large percentage of O/D flows of merchandises headed towards the port of Igoumenitsa, are domestically trafficked directly through the "Egnatia" Motorway, or via the intermodal port of Thessalonica, while the ports of Kavala and Alexandroupolis contribute small and seasonal O/D commercial through their interconnection with these countries and with local producers, heading towards the port of Igoumenitsa. Next table shows container traffic in the Port of Igoumenitsa for the period 2009-2013:

Table 27. Container traffic in the Port of Igoumenitsa

Year	2009	2010	2011	2012	2013
TEU	212.679	251.097	234.863	220.910	221.821

Conclusion: Port of Igoumenitsa has good geographic position at the northwest of Greece and the "Egnatia" Motorway. The "Egnatia" Motorway has significantly enhanced the connection with Thessaloniki and Turkey and shortened the required travelling time from and to the Turkish border by several hours. Thanks to that, port has vast freight traffic, as well as good tourist passenger flow and local passenger flow.

3. LESSON LEARNT

This document presents the analysis made for 8 ports:

- Ancona
- Bari
- Rijeka
- Zadar
- Split
- Bar
- Durres
- Igoumenitsa

All of this ports are important for intermodal transport system in Adriatic and Ionian Seas. The ports of the two shores of the Adriatic and the Ionian Seas are nodes of a dense network of transit and trade fuelled mainly by Ferry; both type Ro-Ro and Ro-Pax. The table below shows Ferry flows in Adraitic and Ionian Sea basin distinguished per year and users for the period of 2009 till 2013:

Table 28.Ferry Flows in Adriatic and Ionian Sea

Port	User/Year	2009	2010	2011	2012	2013
BAR	Passenger	73.443	68.400	60.142	53.390	43.561
	Vehicle	21.990	18.441	15.011	12.648	11.909
DURRES	Passenger	N/A	834.040	853.748	798.524	717.399
	Vehicle	N/A	267.269	252.081	245.840	215.701
ANCONA	Passenger	1.572.407	1.654.821	1.553.787	1.172.486	1.174.054
	Vehicle	501.364	533.181	452.600	352.688	345.872
RIJEKA	Passenger	257.402	230.942	213.598	197.850	203.993
	Vehicle	13.545	11.464	7.934	7.044	6.823
BARI	Passenger	1.961.283	1.903.535	1.951.665	1.854.217	1.700.591
	Vehicle	453.429	460.699	444.954	396.701	338.689
SPLIT	Passenger	4.067.533	4.125.595	4.211.053	3.957.211	4.268.235
	Vehicle	71.914	85.178	55.300	16.631*	48.474
ZADAR	Passenger	2.195.204	2.227.800	2.214.734	2.181.817	2.217.160
	Vehicle	349.546	328.403	331.129	323.454	326.514
IGOUMENITSA	Passenger	2.805.482	2.830.273	2.651.460	2.277.327	2.492.032
	Vehicle	992.242	971.913	937.643	802.249	829.100
TOTAL	Passenger	12.932.754	13.875.406	13.710.187	12.492.822	12.817.025
	Vehicle	2.404.030	2.676.548	2.496.652	2.157.255	2.123.082

*Partially available

Despite economical crisis that reduced the disposable income of households, and therefore the number of passengers and vehicles carried by ferry, shipping companies did not abandon routes and connections. For some routes, shipping companies reduced the frequency of travel, of the services provided and in some cases to reduced lines to a few months per year service delivery.

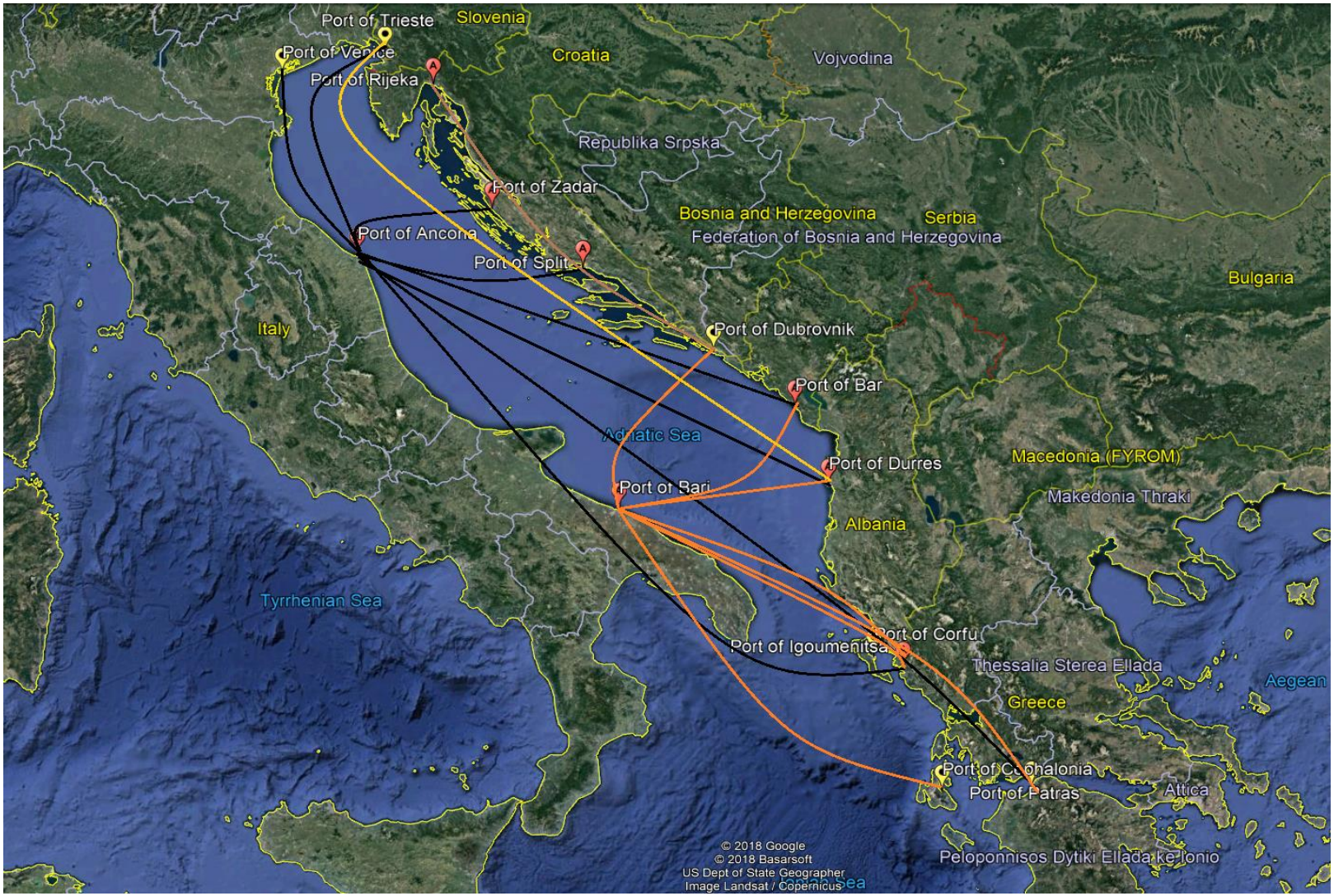
Table number 29 shows analysed ports and destination ports of their ferry routes:

Table 29. Ports and their ferry routes.

COUNTRY	ANALYZED PORT	PORT OF DESTINATION	COUNTRY
ITALY	ANCONA	SPLIT	CROATIA
		ZADAR	
		DURRES	ALBANIA
		PATRAS	GREECE
		IGOUMENITSA	
		BAR	MONTENEGRO
		VENICE	ITALY
		TRIESTE	
ITALY	BARI	DURRES	ALBANIA
		IGOUMENITSA	GREECE
		PATRAS	
		CEPHALONIA	
		CORFU	
		BAR	MONTENEGRO
		DUBROVNIK	CROATIA
CROATIA	RIJEKA	DUBROVNIK	CROATIA
		CRES AND MALI LOŠINJ	
		RAB	
CROATIA	ZADAR	ANCONA	ITALY
		LINES TO LOCAL ISLANDS	CROATIA
CROATIA	SPLIT	ANCONA	ITALY
		LINES TO LOCAL ISLANDS	CROATIA
MONTENEGRO	BAR	BARI	ITALY
		ANCONA	
ALBANIA	DURRES	BARI	ITALY
		TRIESTE	

		ANCONA	

Picture 1 is geographic display of analysed ports, ports that have maritime links with them and routes that exist between ports. Lines that connects ports are not accurate representation of maritime links, they just show which ports are connected.



Picture 1. Ports and their links

If we are looking at container flows in this geographical area in the period 2008 -2013, we will se that the ports of Ancona, Bari and Durres recorded an increasing flow of container traffic, in terms of the sum of those in and out of those full and empty. Contrary to them, ports of Rijeka, Split, Bar and Igoumenitsa have experienced, but with different intensity and gradually, a decrease of traffic flows of containers. The year 2008 stands for these ports as a reference to the emerging international economic and financial crisis. This could be seen in next table:

Year/Port	Rijeka	Split	Bar	Igoumenitsa	Durres	Ancona	Bari	Total
2008	168.777	7.157	43.708	284.573	46.798	102.151	113	687.623
2009	122.743	5.412	34.692	212.679	68.622	105.503	55	575.637
2010	121.490	5.574	30.477	251.097	71.614	110.395	680	611.747
2011	130.055	6.123	34.722	234.863	78.327	120.874	11.121	638.418
2012	126.680	6.045	30.798	220.910	83.194	142.213	29.395	660.980
2013	131.310	5.082	33.009	221.821	109.054	152.394	31.436	702.858

It could be seen that an overall container flow in this area is actually increased in observed period. We have decrease in 2008 and 2009, but after that we can see small but steady increase, and in 2013 there is increase of 2,22% in comparison to 2008.

CONCLUSION

By studing analysis made for INTERMODADRIA IPA project, we can come to few conclusions:

1. All of above mentioned ports have established ferries lines. Some have more than the others, but all have some lines. That alredy established lines can be used to promote better connection between the ports of the middle and southern Adriatic and Ionian Seas.
2. The ferries in use are mainly of two types: the Ro-Ro and Ro-Pax. The first is designed and built for transporting wheeled loads such as cars, trucks or rail cars. The Ro-Pax acronym indicate that a ferry service also carries passengers. In the Adriatic and Ionian Seas are active both of these two types of ferries. They operate indifferent and from north to south, from east to west and vice versa, with international traffic and with great intensity on lines and domestic routes for connecting the ports with the islands which are numerous and populated on the eastern side of the Adriatic (Croatia) and the Ionian Sea (Greece).
3. The frequency of the "touches" of the ferries on international routes and domestic increases considerably during the summer for the rise in passengers tied to tourism and in some cases disappear in winter (i.e. the connection between Ancona and Zadar and vice versa).
4. Although many ports have experienced a decrease of traffic flows of containers, it could be seen that an overall container flow in this area is actually increased in observed period.
5. The lines do exist, but there is little to no information exchange between the different actors in the transport logistics chain (shippers, logistic providers, transport operators and authorities etc.)
6. By increasing information exchange between key logistics stakeholders we can find the best solution of transport services (e.g., best price of combined transport, lower emissions of entire chain, eprocurement tools for maritime transport services, higher bi-directional load factor)

NEW STATISTICAL DATA

Table 30. Passengers flow in Adriatic and Ionian Sea

Port	2014	2015	2016
Bar	40.000	39.000	38.000
Bari	1.083.000	1.005.000	881.000
Ancona	1.052.000	979.000	963.000
Zadar	1.792.000	1.873.000	2.111.000
Split	3.506.000	3.992.000	4.258.000
Rijeka	150.000	125.000	120.000
Igoumenitsa	2.544.000	2.532.000	N/A

Izvor: http://ec.europa.eu/eurostat

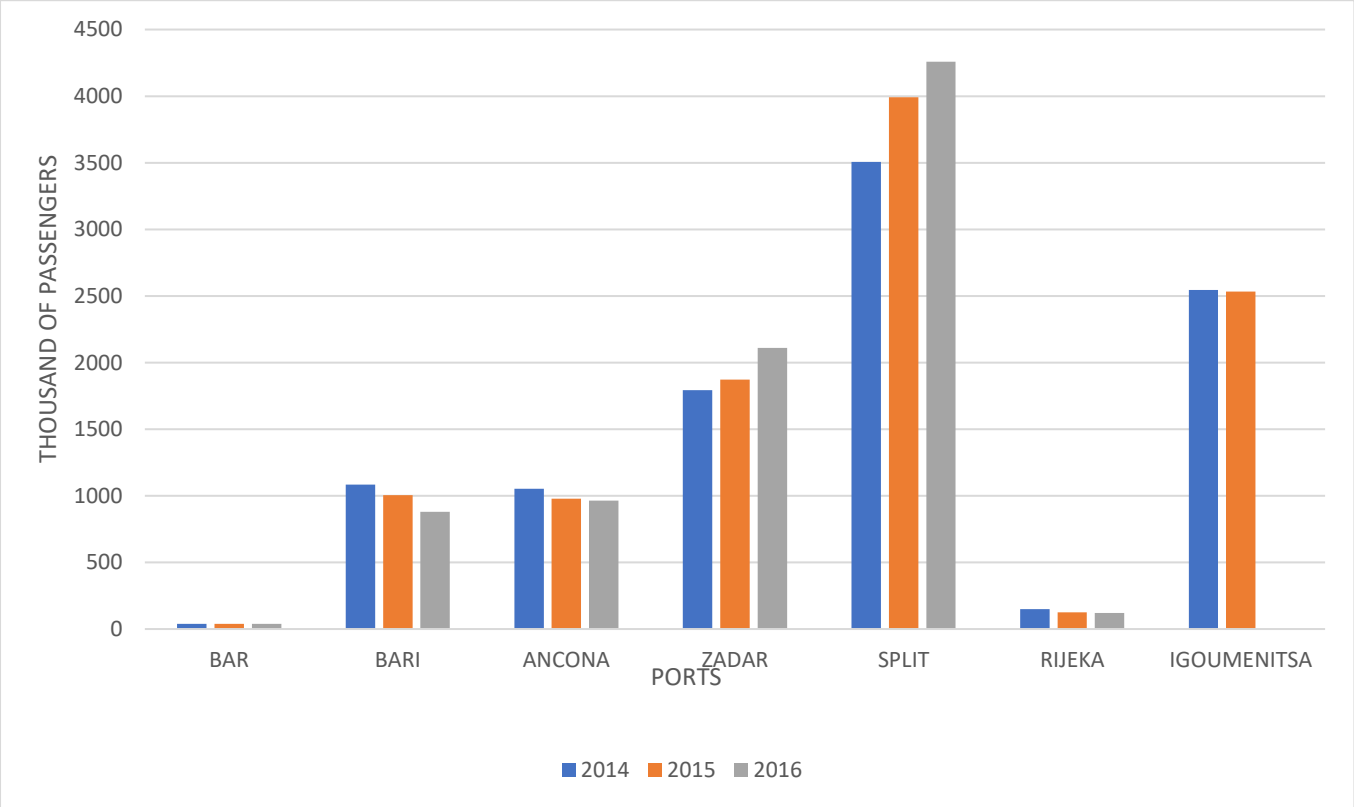


Figure 5. Passengers flow in Adriatic and Ionian Sea by ports and yea

Table 31.Gross weight of transported goods quarterly for period 2014-2017

Port/Quartet	2014q1	2014q2	2014q3	2014q4	2015q1	2015q2	2015q3	2015q4	2016q1	2016q2	2016q3	2016q4	2017q1	2017q2	2017q3
Rijeka	574.000	538.000	568.000	611.000	827.000	786.000	686.000	618.000	524.000	614.000	590.000	601.000	618.000	683.000	627.000
Split	506.000	738.000	741.000	518.000	560.000	844.000	604.000	443.000	476.000	762.000	446.000	431.000	571.000	573.000	613.000
Igoumenitsa	548.000	670.000	732.000	790.000	666.000	863.000	747.000	676.000	571.000	849.000	872.000	821.000	687.000	800.000	N/A
Ancona	952.000	1.143.000	1.059.000	1.187.000	1.071.000	1.140.000	1.221.000	1.157.000	1.188.000	1.150.000	1.153.000	1.027.000	1.130.000	1.345.000	N/A
Bari	989.000	757.000	763.000	1.187.000	788.000	1.107.000	822.000	1.087.000	1.333.000	1.153.000	993.000	1.216.000	1.602.000	1.281.000	N/A

Izvor: http://ec.europa.eu/eurostat

Table 32.Gross weight of transported goods yearly for period 2014-2017

Port/Year	2014	2015	2016	2017 (partly)
Rijeka	2.291.000	2.917.000	2.329.000	1.928.000
Split	2.503.000	2.451.000	2.115.000	1.757.000
Igoumenitsa	2.740.000	2.952.000	3.113.000	1.487.000
Ancona	4.341.000	4.589.000	4.518.000	2.475.000
Bari	3.696.000	3.804.000	4.695.000	2.883.000

Izvor: http://ec.europa.eu/eurostat

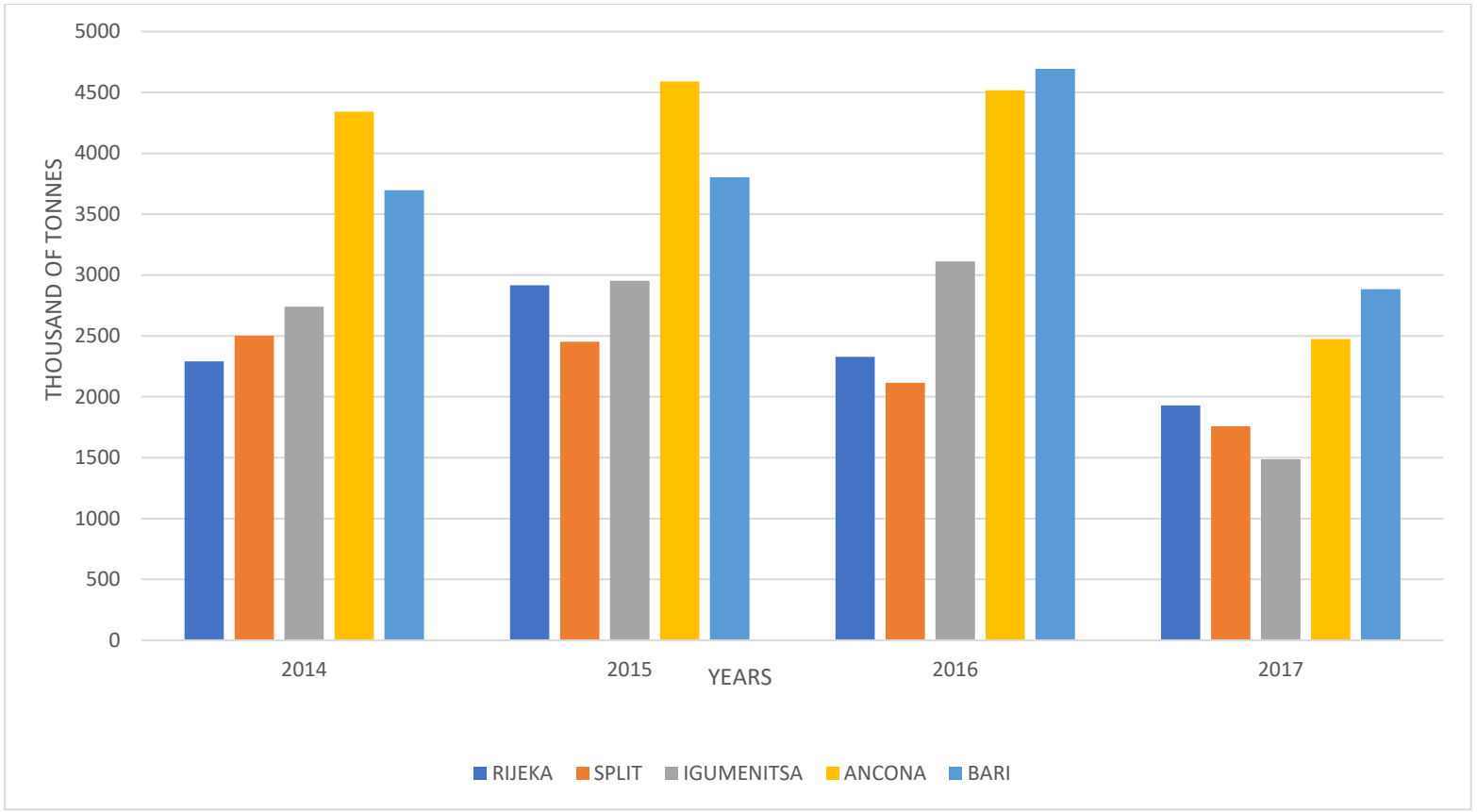


Figure 6.Gross weight of transported goods

Table 33.Volume of containers transported to/from ports in TEU

Port/Year	2014	2015	2016	2017q1-q3
Rijeka	118.374	152.736	175.885	156.236
Split	6.335	8.347	9.287	7.050
Ancona	203.562	209.439	223.892	N/A
Bari	27.094	38.231	77.117	N/A

Izvor: http://ec.europa.eu/eurostat

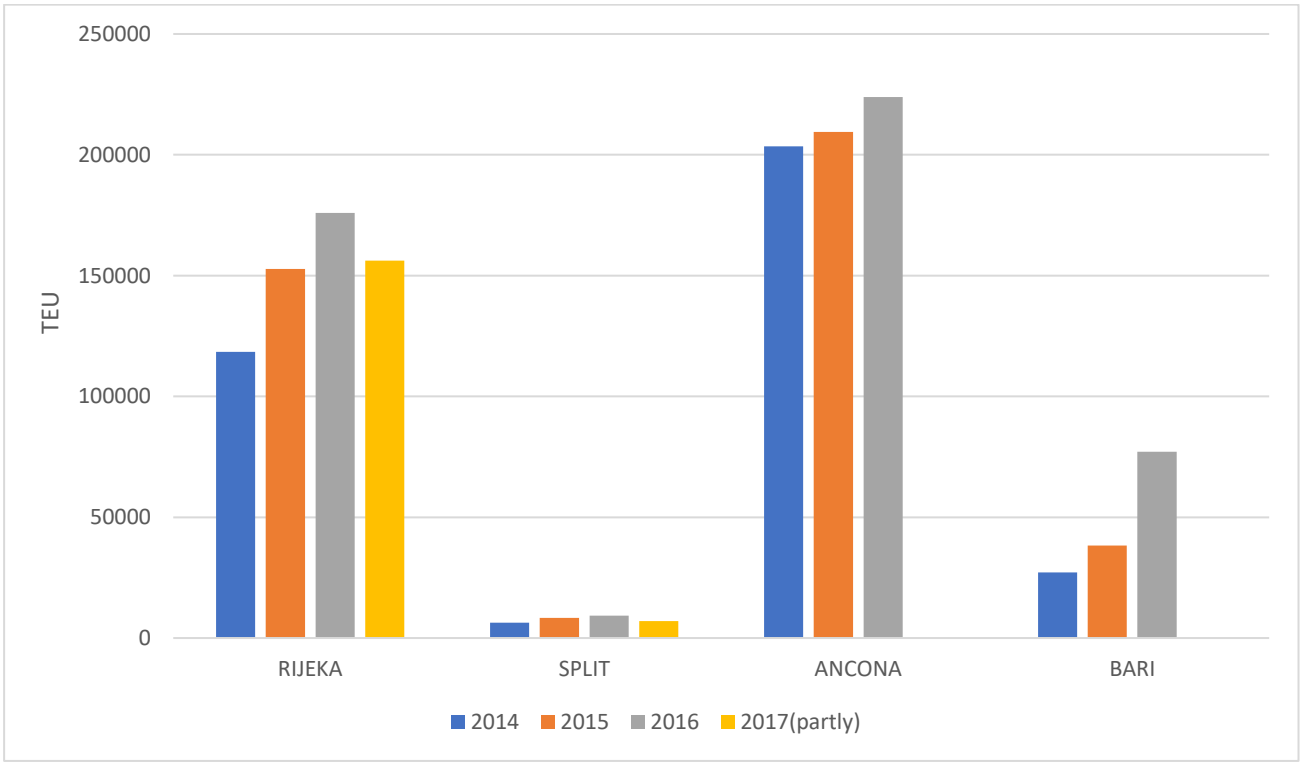


Figure 7. Volume of containers transported to/from ports in TEU

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