

# Feasibility Study on Determination of Guidelines for Entry in Port, Mooring, Berthing/Unberthing in Different Weather Conditions and with Changes in Sea and Air Values

## Project INTESA

“Improving Maritime Transport Efficiency and Safety in Adriatic”, Interreg V A – CBC  
ITALIA CROAZIA 2014-2020, CUP F71F18000120005

**Project AaCTA workshop „Good practices in decarbonization of the local road transport and opportunities for local government units“,  
Split, 22nd October 2021**

# Project INTESA

INTESA project establishes a network among the National Maritime Administrations of Italy and Croatia and main port authorities of the Adriatic Sea (Venice, Trieste, Ravenna, Ancona, Bari, Rijeka, Ploče and Split) with the scope of harmonizing and optimizing the procedures of the complete maritime transport process in order to make port and maritime transport system more efficient and safer.

## PILOT ACTION - Split Port Authority

Through the implementation of navigation aids and the consequent improvement of safe sailing, mooring and anchoring of ships in different weather conditions, the Port of Split aims at harmonizing and optimizing the procedure to enter and exit from the port and increasing port performances in bad weather conditions safeguarding safety and security requirements.

Through the INTESA Pilot Action in the Port of Split are realized:

- Selection and purchase of technical equipment for measuring weather conditions: buoys with sensors with the purpose of measuring changes in the air and sea and the different weather conditions to enable the ship safe sailing, mooring and anchoring, with the final aim of protecting the environment of the port basin.
- Educational workshops for port users: the process of ships and passengers' management in the port basin consists of a number of services that include various operators and representatives of the private and public sectors. As a result of the Pilot Action, legal guidelines (rule-book) for port's order in various weather and air-pollution conditions will be developed.

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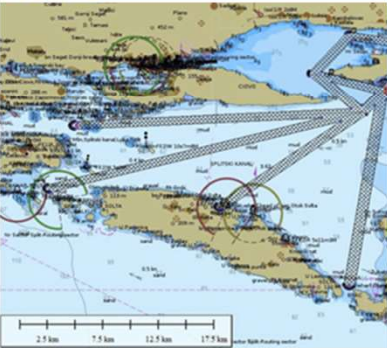
## INTRODUCTION

This Feasibility study is based on the contract between Split Port Authority (LUS) as contracting authority and the Faculty of Maritime Studies of the University of Split (PFST)

The aim of this study is to determine the guidelines for entry in port, including the guidelines for coming alongside, berthing/unberthing as well as the stay of the ship at berth, for the needs of implementation of the working package WP 3 Project INTENSA (Interreg programme of cross-border cooperation Italy-Croatia 2014-2020).

The study contents comprise the description of the navigational area and infrastructure of the Port of Split, analysis of maritime traffic, hydro-meteorological features, analysis of navigation safety and risk assessment, safety measures during maneuvering and stay of the ship at the berth position, and finally, the measures for the development of maritime traffic safety with elementary recommendations

# Port of Split



# TRAFFIC DENSITY

Marine traffic on approach to the Port of Split (AIS data from 2017)



Passenger



Cargo



Tanker



Yacht



Tugs & Special



Fishing



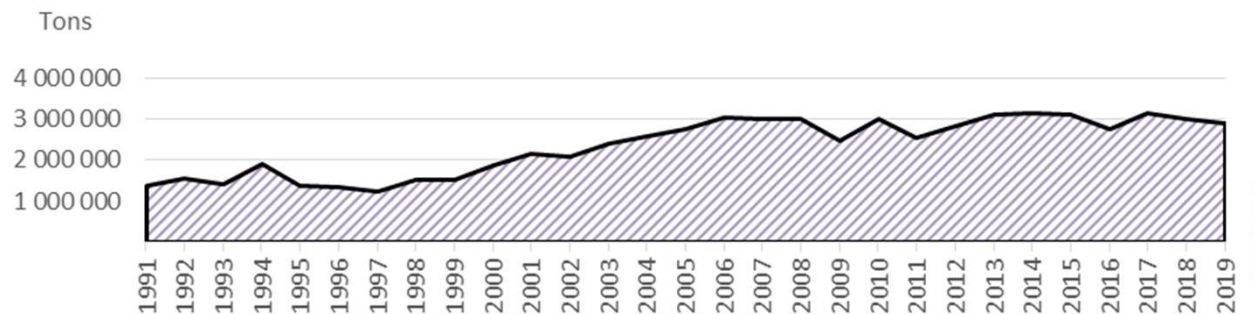
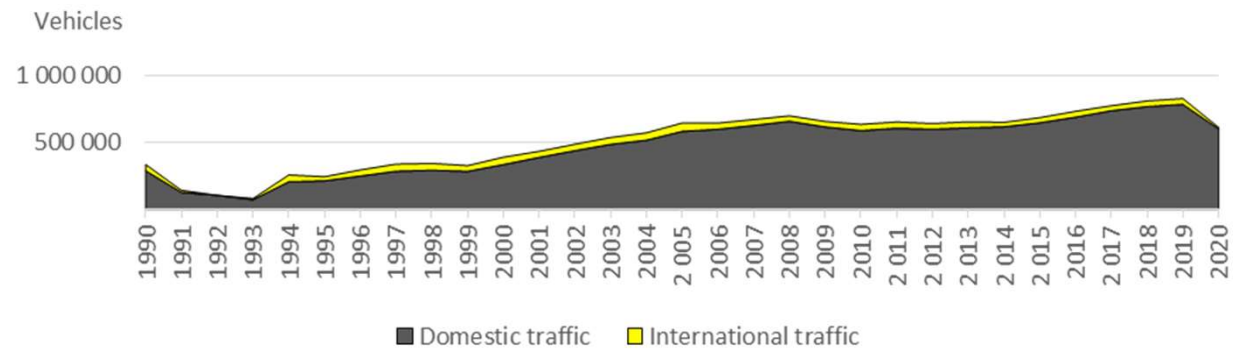
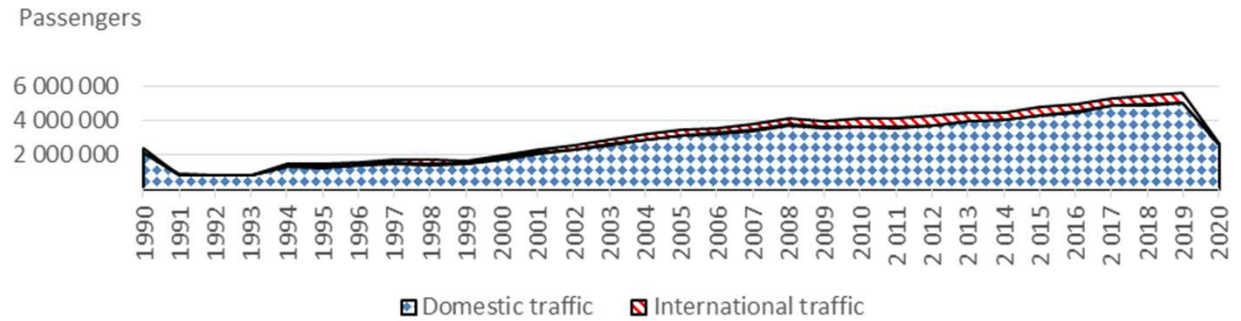
Container



Liquefied gas

# CARGO TRAFFIC

Passenger, vehicle and cargo traffic



# SHIP TRAFFIC

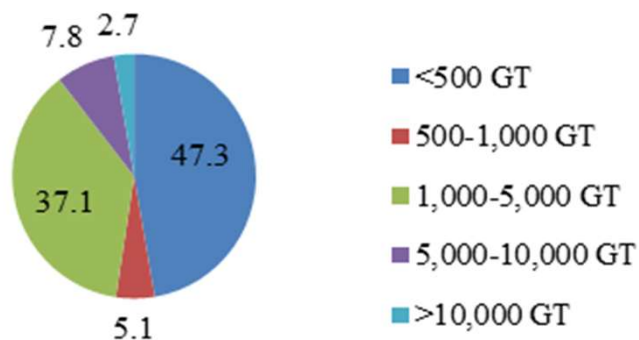
## Total ship arrivals

	City Port	Basins	Total
<b>2013.</b>	15,107	1,115	16,222
<b>2014.</b>	15,604	1,100	16,704
<b>2015.</b>	16,856	1,086	17,942
<b>2016.</b>	17,721	1,474	19,195
<b>2017.</b>	16,439	2,107	18,546
<b>2018.</b>	18,237	2,145	20,382
<b>2019.</b>	20,187	3,657	23,844

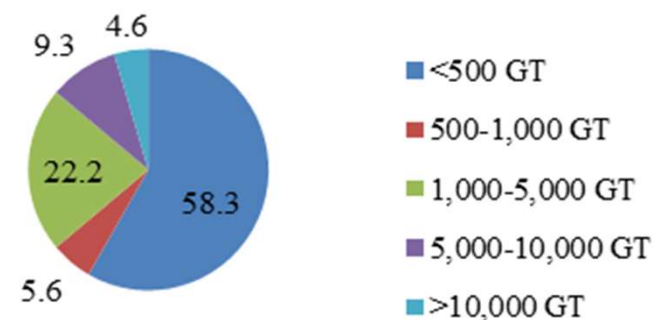
## City Port of Split – the structure of marine traffic by ship types

	2017.	2018.	2019.
Ferry line domestic traffic	9,686	13,372	14,284
Catamaran line domestic traffic	2,424		
International line traffic	258	267	238
Visit of tourist vessels of the Republic of Croatia	2,610	2,984	3,215
Visit of yachts	110	18	52
Cruise ships	234	260	282
Excursion ships	892	1,231	2,027
Seaplanes	/	/	/
Various ships (tugs, work, ...)	225	105	89
<b>Total</b>	<b>16,439</b>	<b>18,237</b>	<b>20,187</b>

City Port



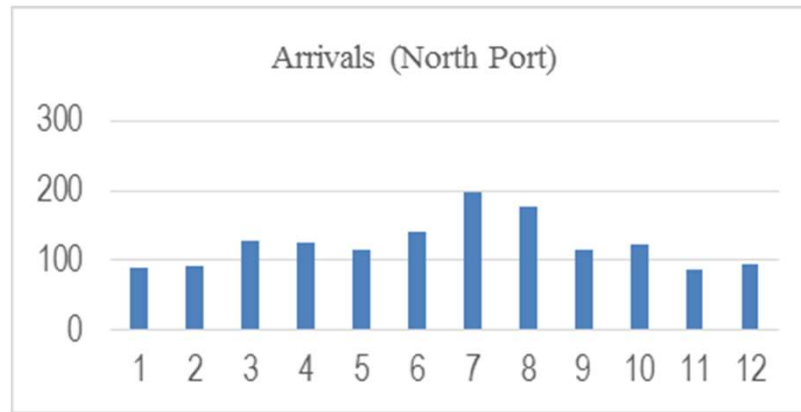
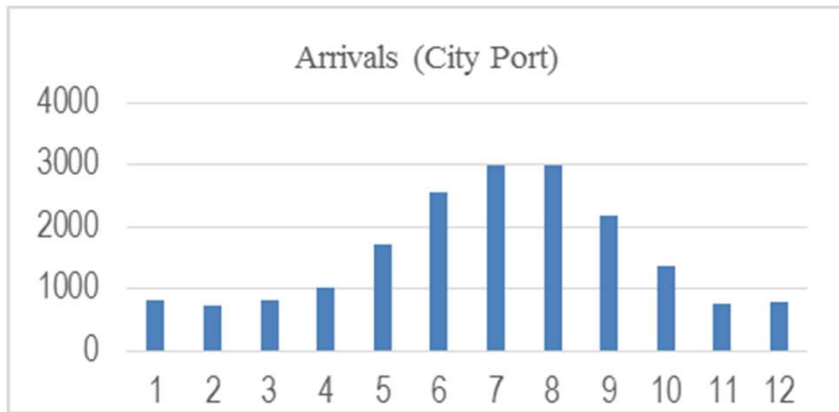
North Port



## The traffic structure by ship size



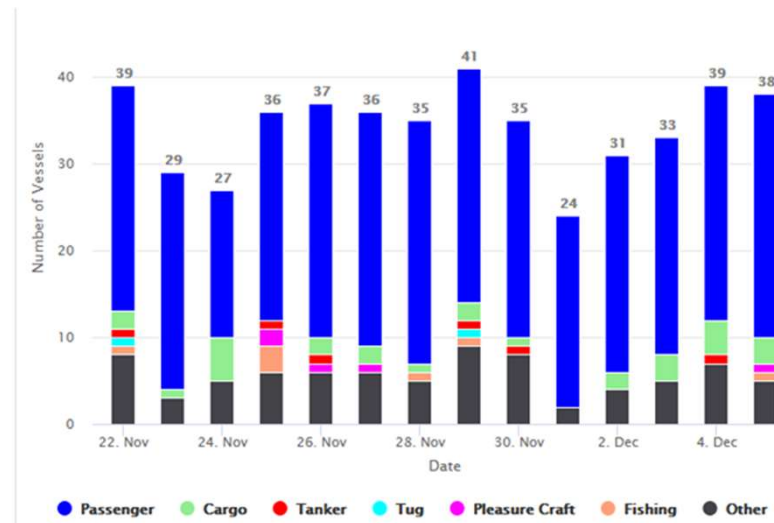
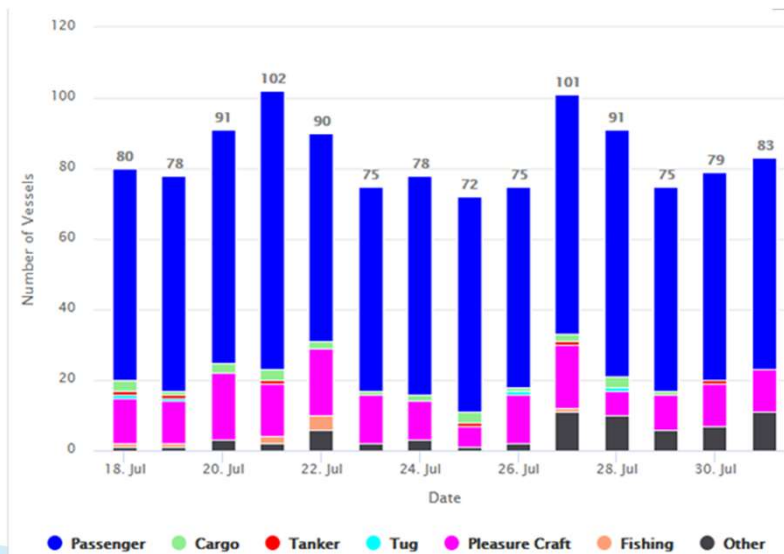
# SEASONALITY



Monthly traffic of the Port of Split in 2019

## Cruise

2019	
No. arr.	No. tourists
3	2,642
6	858
8	3,651
23	31 326
34	48 040
34	48 272
37	51 680
38	54 112
39	49 492
40	54 461
14	15 211
6	210
<b>282</b>	<b>359,955</b>



## International Liner

TOTAL
10
8
9
20
26
28
31
44
27
17
9
9
<b>238</b>

Daily number of arrivals in the Port of Split – July/December 2019

# SMALL VESSEL TRAFIC

Number of registered ships in total (2020): 540

Number of registered boats in total (2020): 6.176

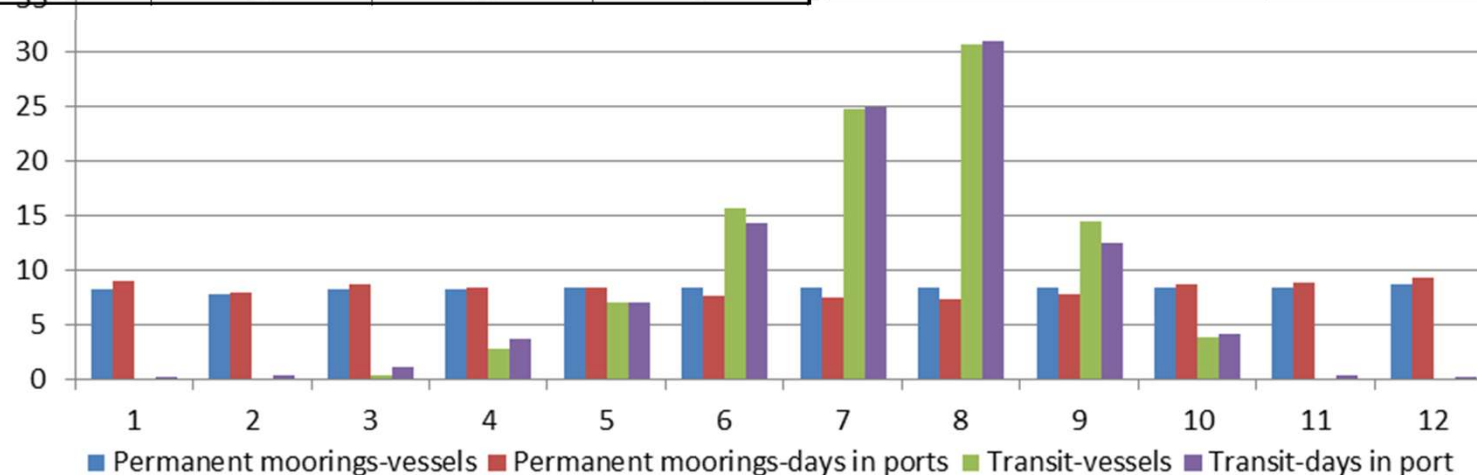
Number of registered yachts in total (2020): 1.070



Number of vess. in transit in nautical tourism ports/with a permanent berth (2019)

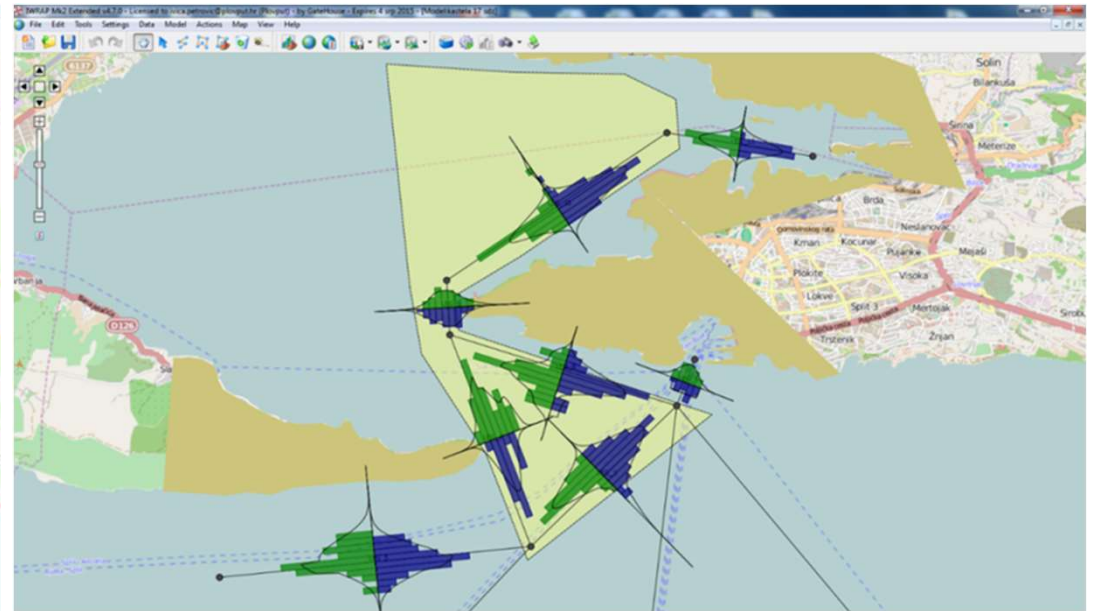
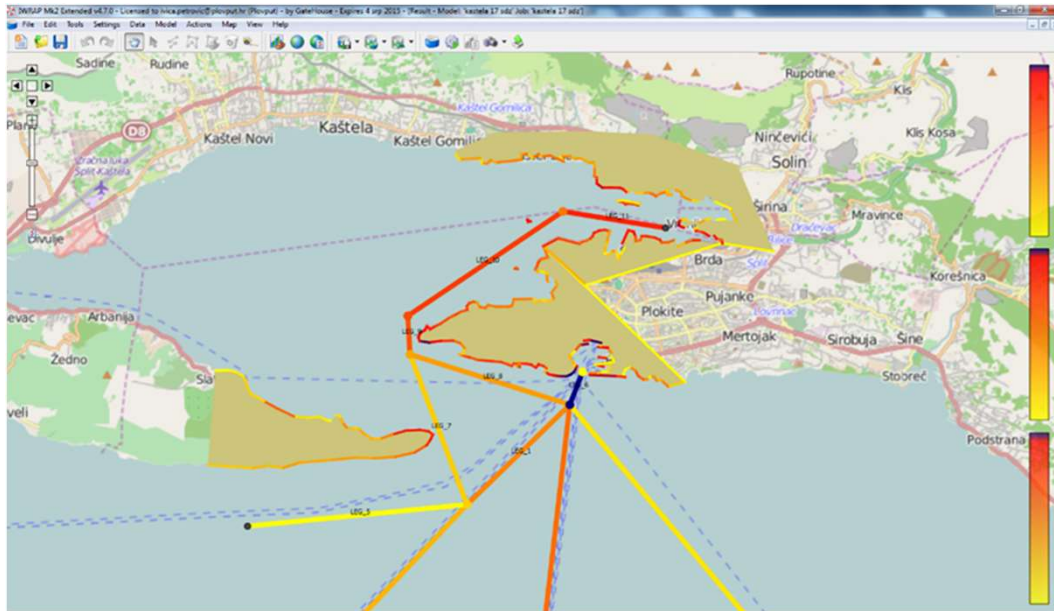
	Total	Motor yachts	Sailing boats	Other
<b>Total Croatia</b>	204,858	60,303	132,318	12,237
Total Croatia moored at sea	20,2412	58,892	131,373	12,147
<b>Split-Dalmatia County</b>	55,633	10,803	40,818	4,012
Moored at sea	55,343	10,693	40,697	3,953
Land	35 290	110	121	59

	Total	Motor yachts	Sailing boats	Other
<b>Total Croatia</b>	14,249	7,249	6,330	670
Total Croatia (moored at sea)	12,100	5,613	5,935	552
<b>Split-Dalmatia County</b>	2,064	673	1,178	213
Moored at sea	1,697	439	1,096	162
Land	367	234	82	51



Monthly dynamics (%) of the number of vessels and days of stay in nautical tourism ports (Croatia) in 2019

# RISK ASSESMENT



- Loss of control due to engine/rudder failure
- The impact of strong winds on loss of control, or mooring breaks
- Groundings
- Collisions
- Fires, etc.

# WEATHER

Jač. (Bf)	0	1	2	3	4	5	6	7	8	9	10	11	12	zbroj
brz. (m/s)	0,0-0,2	0,3-1,5	1,6-3,3	3,4-5,4	5,5-7,9	8,0-10,7	10,8-13,8	13,9-17,1	17,2-20,7	20,8-24,4	24,5-28,4	28,5-32,6	32,7-36,9	
N		14,7	12,9	4,2	1,5	0,4	0,1	0,0						33,9
NNE		13,0	16,3	8,6	6,4	4,0	1,7	0,6	0,2	0,1	0,0			50,9
NE		21,4	55,2	53,8	54,1	36,7	12,1	3,2	1,0	0,3	0,0			237,7
ENE		15,8	49,9	25,9	6,4	2,2	0,4	0,0						100,7
E		12,2	18,3	9,1	1,7	0,2	0,0							41,6
ESE		8,9	12,8	12,9	11,6	5,5	1,7	0,5	0,1					54,0
SE		12,2	15,4	21,6	36,2	30,6	17,1	4,3	0,4	0,0				137,9
SSE		7,3	5,9	2,3	1,8	2,2	1,6	0,5	0,0					21,5
S		15,2	14,2	2,7	2,0	1,9	0,9	0,3	0,1					37,3
SSW		10,5	12,5	1,7	1,3	1,2	0,8	0,3	0,0					28,3
SW		28,2	61,5	17,1	1,7	0,6	0,3	0,0						109,4
WSW		18,1	25,4	20,2	2,3	0,0								66,1
W		4,0	6,9	2,4	0,3	0,0								13,6
WNW		3,1	6,1	0,8	0,0									10,1
NW		10,5	20,9	4,6	0,4									36,3
NNW		6,4	5,0	1,2	0,3	0,1								12,9
C	7,6													7,6
zbroj	7,6	201,5	339,3	189,1	128,2	85,4	36,7	9,8	1,9	0,4	0,1	0	0	1000



Waves from SW winds-City (inner) basin

- Most dominant impact of winds
- Average currents up to 0,5 kn, waves up to 1 m, but can reach 2m and above (North Port and outer berths of City Port)
- Fog – up to 2 days yearly (max 7)

# DIVISION ON SPECIFIC AREAS

## City Port

- Inner berts
- Outer berths

## Northern Ports

- Vranjic-Solin basin
- Tanker terminal
- Stinice area

# CITY PORT

- exposed to heavy traffic of smaller vessels, especially during the summer season;
- extremely high seasonality of ship traffic;
- exposed to NE wind gust;
- no prescribed boundary conditions for maneuvering and stay of the ship at berth position;
- some inner berths exposed to S-SW waves;
- outer berths exposed to waves of open sea

# NORTH PORT

- extremely exposed to strong gusts of NE winds;
- limited depths, limited maneuver areas, increased risk of grounding;
- no prescribed boundary conditions for maneuvering and stay of the ship at berth position;
- the traffic of smaller vessels is an aggravating factor, especially on approaching area
- the Vranjic-Solin basin is very narrow and, considering the direction of extension, extremely dangerous for maneuvering in conditions of northern winds
- unfavorable berth of the ship on the tanker terminal, inadequate position of the bollard and proximity of the shallows;
- insufficient number of stronger tugs.
- Project Stinice-new berths are planned to disburden Ro-Ro traffic from the City Port, this will increase density and change the structure of traffic in this area

# CONCLUSION

To improve the level of maritime safety, and having in mind the further growth of the traffic of the port of Split, the following is proposed:


- adopt a new Ordinance on the terms and methods of maintaining order in the port which will define the boundary conditions for maneuvering and stay of the ship at berth position. Also, regulate the use of tugs;
- have at disposal additional tugs of appropriate power;
- mark waterways with additional optical and electronic signs;
- check continuously the depths and ensure their maintenance;
- improve the maritime traffic monitoring system;
- improve the system of communication between all stakeholders (actors) in navigation safety;
- ensure that smaller vessels comply with the prescribed rules;
- establish a system for automatic monitoring of the state of the sea, wind, and currents;
- assign at least two buoys for monitoring waves in real-time, one in front of the City Port, the other at the approach to the North Port.




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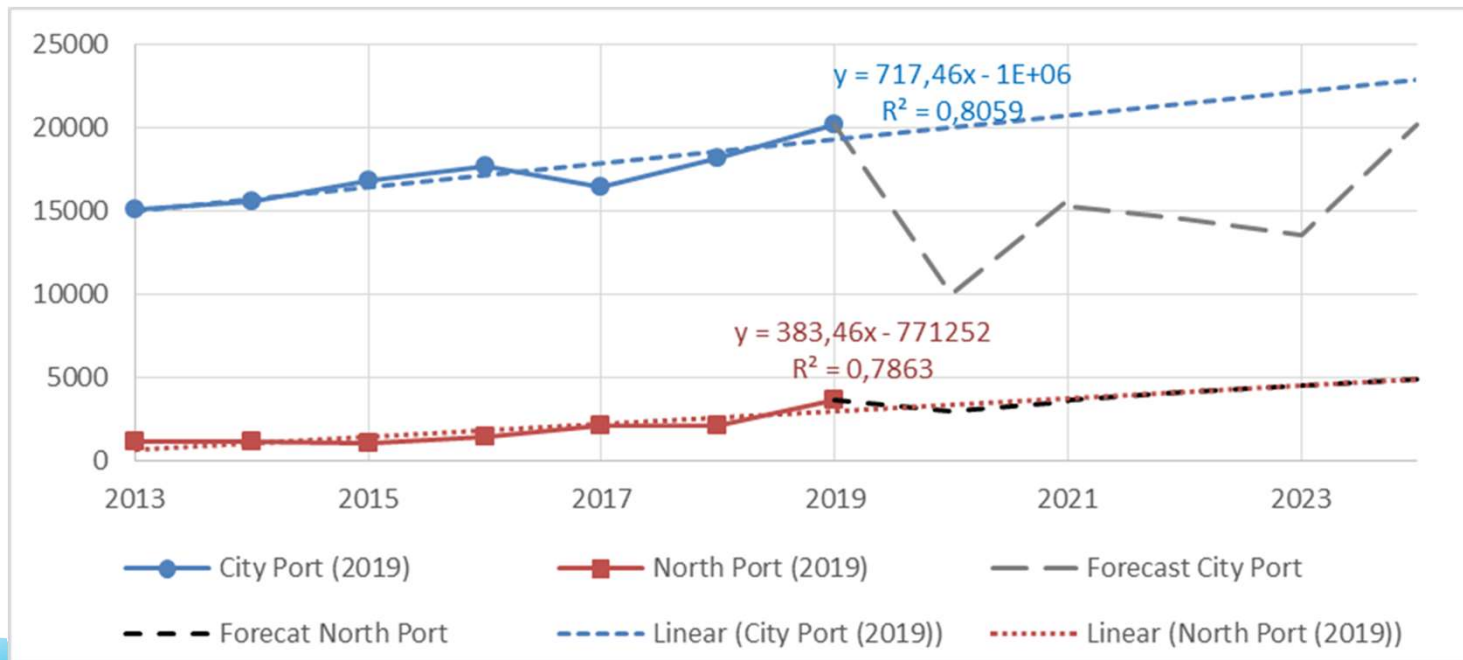
 [www.pfst.hr](http://www.pfst.hr)

# THANK

# YOU

## Decline in traffic in 2020

- Number of ship arrivals 44% (domestic ships), 25%(foreign ships)
- Total boats (individual) in foreign trade 29%
- Total passenger traffic 62% (arrivals), international 91%
- Total vehicle traffic 26% (arrivals), international 79%
- Cruise traffic 100%
- Cargo loaded (51% increased), Cargo discharged (12% increased)
- Number of tourist arrivals (Split) 65%
- Number of vessels in transit in nautical ports 49% (SDŽ County)
- Number of permanently moored vessels in nautical ports 0% (SDŽ County)



Growth trend of port traffic (ship arrivals)