Territorial needs assessment for the Port of Zadar

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Contents

Introduction

Main objective of this document is development of a document Territorial Needs Assessment (TNA) for the port of Zadar by following a common methodological framework set in the document D.3.2.1. Methodology for the implementation of the territorial needs assessment. Special emphasis is given to the calculation of Carbon Footprint within the New Port of Gazenica - new passenger, cruise, ferry and Ro-Ro terminals in Gazenica where the SUSPORT pilot action D.4.2.9. Port of Zadar: Zadar installs photovoltaic and solar thermal system, as well as EE storage surfaces[1] will be implemented. TNA analysis defines the current state of the port of Zadar and also provides a first assessment of the needs related to the energy efficiency enhancement and emissions reduction. The scope of this document is to assess the state-of-the-art situation in terms of different emissions within the identified port area. This overview and an analysis will be used as the foundation for the development of the next phases of project activities and pilot action. Therefore, this introduction is divided into four sub-sections:

1. General overview of the port of Zadar and the role of the Port of Zadar Authority;
2. Connections of the New Port of Gazenica with hinterland
3. Description of the New Port of Gazenica – New passenger, cruise, ferry and Ro-Ro terminals in Gazenica
4. Sustainable development and environmental protection.

General Overview of the port of Zadar and the role of the Port of Zadar Authority

Zadar plays an important role as a transport center of Croatia, where the northern continental transport routes meet the Adriatic Sea and connect to the sea routes, the motorway (A1), the railway and airports. It is classified as a port on the comprehensive TEN-T network. Port of Zadar is located in one of the largest Croatian counties- Zadar County in the very center of the Croatian side of the Adriatic coast. The City of Zadar is an economic, administrative and cultural center of the county and fifth largest city in Croatia.

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1 Pilot activity has been modified on October 19,2020; *Zadar will install photovoltaic system integrated in canopy, as well as EE storage, e-charger, small e-car for port authorities and water collection from PV surfaces which will be used for watering green areas. Solar thermal system will not be implemented.*

Port of Zadar meets all traffic and transportation conditions and requirements at international, national and local levels. It is also an important connection between ferry terminals located along Croatian coast and along the Adriatic and Mediterranean coast. Furthermore, the ferry terminal in Zadar serves as the main link between Zadar and the islands near the city of Zadar. Significant role of the port also lies in the development and boosting of the tourist industry which is one of the key sectors of the Croatian economy.

Port of Zadar Authority is a non-profit legal entity whose founding, organization and activity is defined by the Law on maritime estate and sea ports. Activities of the Port of Zadar Authority include the following:

- Taking care of building, maintaining, managing, protection and improvement of maritime estate that represents port area,
- Building and maintaining port's infrastructure financed from budget of founders of port authority,
- Expert supervision on building, maintaining, managing and protection of port area (port infrastructure and superstructure),
- Ensuring permanent and unobstructed port traffic, technical and technological harmony and maritime safety,
- Ensuring issuing services of public interest or services for which there is no economic interest of other commercial subjects,
- Coordinating and supervising work of concessionaires running commercial activity on port area,
- Making decision on founding and managing of free zone on port area in accordance with regulations for free zones,
- Other activities defined by law.

Port of Zadar Authority is founded by the Ordinance of the Croatian Government in 1998 with jurisdiction on three port docks:

1. Passenger City Port Zadar is situated in the heart of the city and has 11 berths with maximum depth of 7,4 meters with the purpose of local and tourist traffic. It is used for passenger ships on international and domestic lines, smaller tourist vessels and fishing vessels.

2. New Port of Gazenica, Zadar
    - New passenger, cruise, ferry and Ro-Ro terminals in Gazenica. The new port has 12 berths for domestic and international traffic (ferries connecting Zadar with the islands, international vessels and cruise ships).
    - New Fishing Port Gazenica which currently consists of one shore that stretches in the direction northwest - southeast in the length of 210 m. It is currently used to accommodate fishing boats and to load and unload fish and fishing equipment.
    - Commercial Cargo Port in Gazenica is in the industrial and commercial area extending from Bregdetti Bay - Arbanasi to the small town of Bibinje in the vicinity of the passenger port. It is used for domestic and international cargo ships but can also be used for fishing vessels
3. Fishing Port Vela Lamjana-Kali which is situated in the Vela Lamjana Bay on the island of Ugljan. It is used for loading and unloading of fishing boats.

Following paragraphs will give an overview of statistics regarding passenger, cruise, ferry and Ro-Ro traffic on both locations: in the City Port Zadar and New Port of Gazenica and will also analyze cargo volumes even though Commercial Cargo Port will not be included in the carbon footprint calculations and is not directly included in the implementation of the pilot activity within the project SUSPORT by the Port of Zadar Authority. Cargo volumes will be used in order to provide a more detailed overview of the port and its operations. Therefore, the statistics regarding these terminals will be included in the following analysis: a) Passenger City Port Zadar and New passenger, cruise, ferry and Ro-Ro terminals in Gazenica and b) Commercial Cargo Port in Gazenica excluding both fishing ports from the analysis.

a) Passenger City Port Zadar and New passenger, cruise, ferry and Ro-Ro terminals in Gazenica

Port of Zadar is open for international, national and local transport on two locations: Passenger City Port Zadar and New passenger, cruise, ferry and Ro-Ro terminals in Gazenica. Figure 1 shows local lines available in the port of Zadar from both locations.

Figure 1: Local lines in the port of Zadar
Source: Jadrolinija, www.jadrolinija.hr

Figure 2 below shows currently available international lines Zadar – Ancona and domestic connection Zadar – Rijeka.

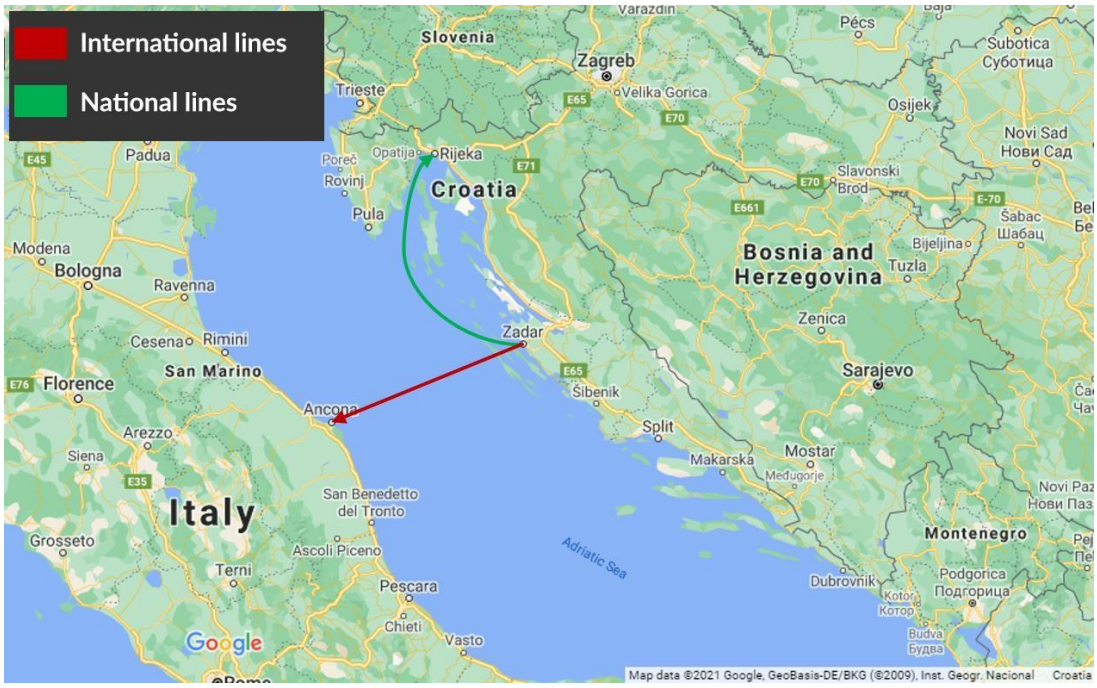

Figure 2: International and coastal lines from the port of Zadar
Source: Edited by author on Google Maps

Following table 1 indicates figures regarding domestic traffic of vehicles during the period of 5 years (from 2016 to 2020). It is clear that the current COVID-19 pandemic has triggered a decrease in total numbers for the year 2020 with a tendency to influence the decrease of passenger traffic even in 2021 depending on the health emergency situation development all over Europe and worldwide.

Year	2016	2017	2018	2019	2020
Vehicles	397.618	429.321	457.117	484.690	410.000

Table 1: Domestic traffic of vehicles in the port of Zadar
Source: Port of Zadar Authority

As shown in the Figure 3, domestic traffic of passengers has been steadily increasing during the 5-year period until 2020 when it was struck by a sharp decline in numbers of roughly 34% in comparison to the year 2019 due to the COVID-19 pandemic.

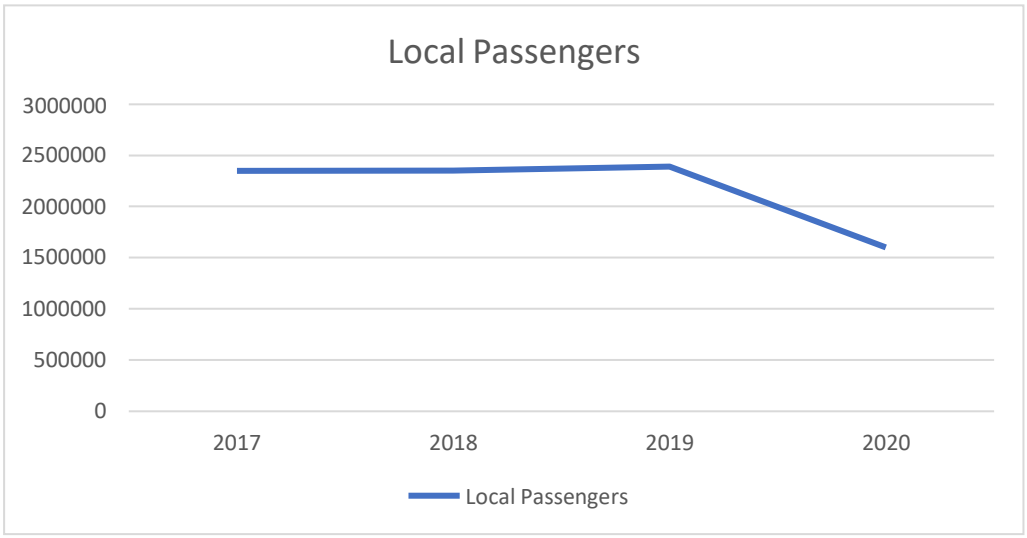

Figure 3: Domestic traffic of passengers in the port of Zadar
Source: Author based on official data from the Port of Zadar Authority

Similar situation can be seen for the international traffic of vehicles and passengers as shown in Table 2 and Figure 4 below.

Year	2016	2017	2018	2019	2020
Vehicles	5.496	8.116	8.218	7.263	618

Table 2: International traffic of vehicles in the port of Zadar
Source: Port of Zadar Authority

Figure 4 shows that the number of passengers on international travels in the port of Zadar was steadily growing from the year 2016 with registered 30.637 passengers until 2019 with 38.335 passengers. During 2020 these figures were seriously affected by the lockdown and health measures introduced in Croatia but also most countries worldwide which resulted in 1.672 passengers which is a decline of total 95%.

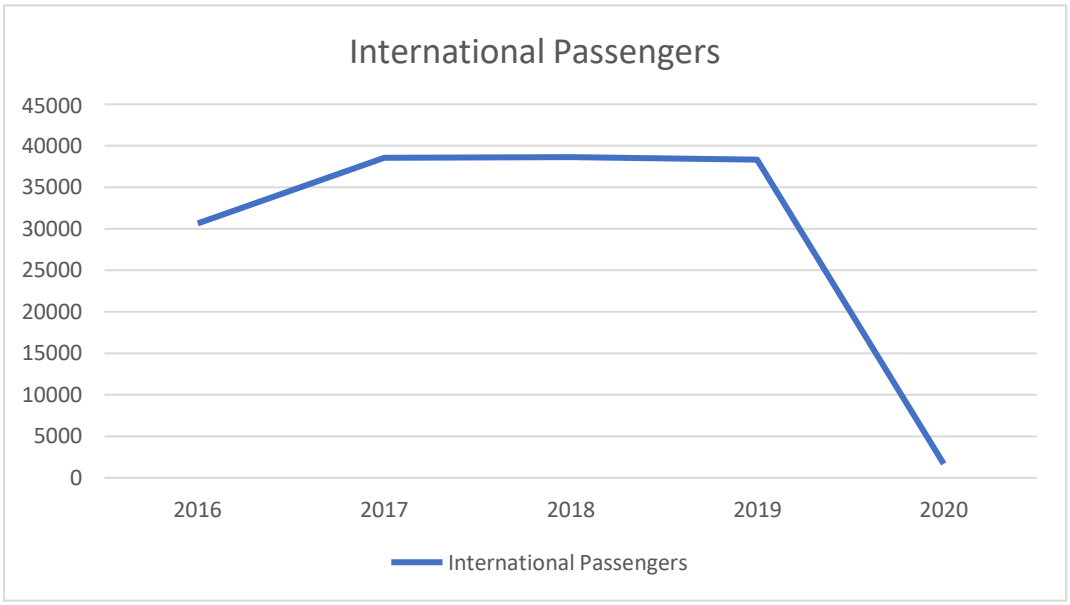

Figure 4: International traffic of passengers in the port of Zadar
Source: Author based on official data from the Port of Zadar Authority

Although in the previous years, the number of cruise passengers and calls has been in a constant rise, in 2020 the cruise ship industry has also been seriously affected by the pandemic which is also supported by the declining numbers in the Table 3. It can be concluded that this decrease almost erased the cruise ship industry in most ports all over the world and it resulted in a 99,5% decrease of the total passengers on cruise ships.

Year	**2016**	**2017**	**2018**	**2019**	**2020**
Passengers	136.462	137.667	166.528	182.682	714

Table 3: Passengers on cruise ships in the port of Zadar
Source: Port of Zadar Authority

Following Figure 5 indicates the number of calls over the years from 2016 until 2020. It is clear that cruise industry has been seriously affected by the pandemic since the number of cruise ship calls decreased from 130 in 2019 to 13 calls in 2020.

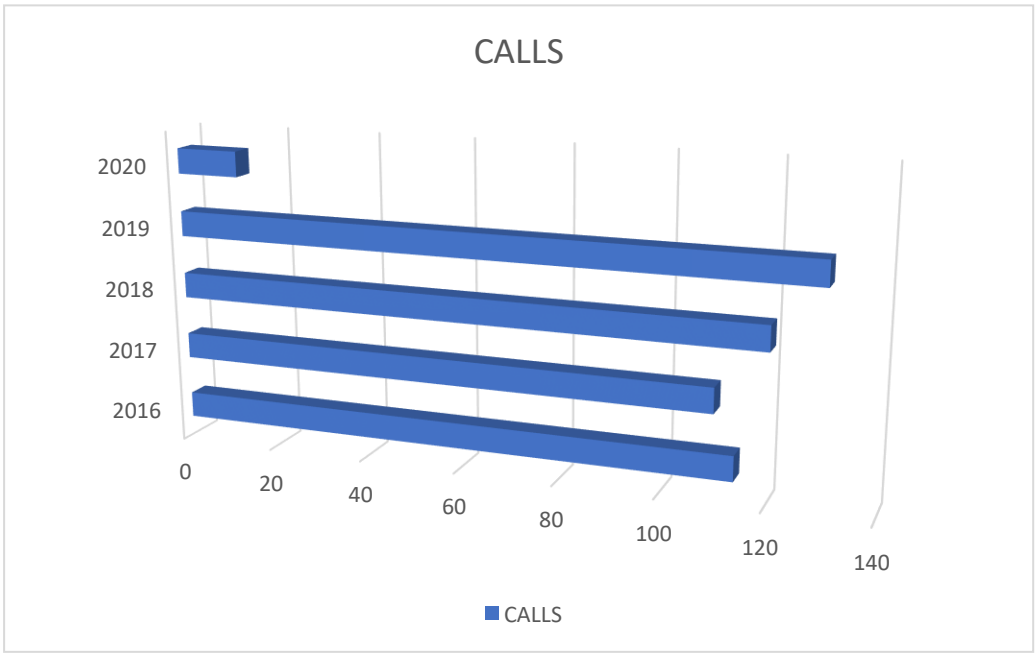

Figure 5: Calls of ships on international cruise ships
Source: Port of Zadar Authority

In 2019, Zadar was ranked as a third cruising destination in the Republic of Croatia (Figure 6) after Dubrovnik and Split and it was chosen as the world's best port at the Seatrade Cruise Awards 2019 with a tendency to increase the traffic in the following years prior to the breakout of the COVID-19 pandemic. Nevertheless, since the pandemic struck the entire cruising industry, projections are that Zadar will continue to grow as a cruising destination when the health situation allows and conditions for the international travels are met and fulfilled.

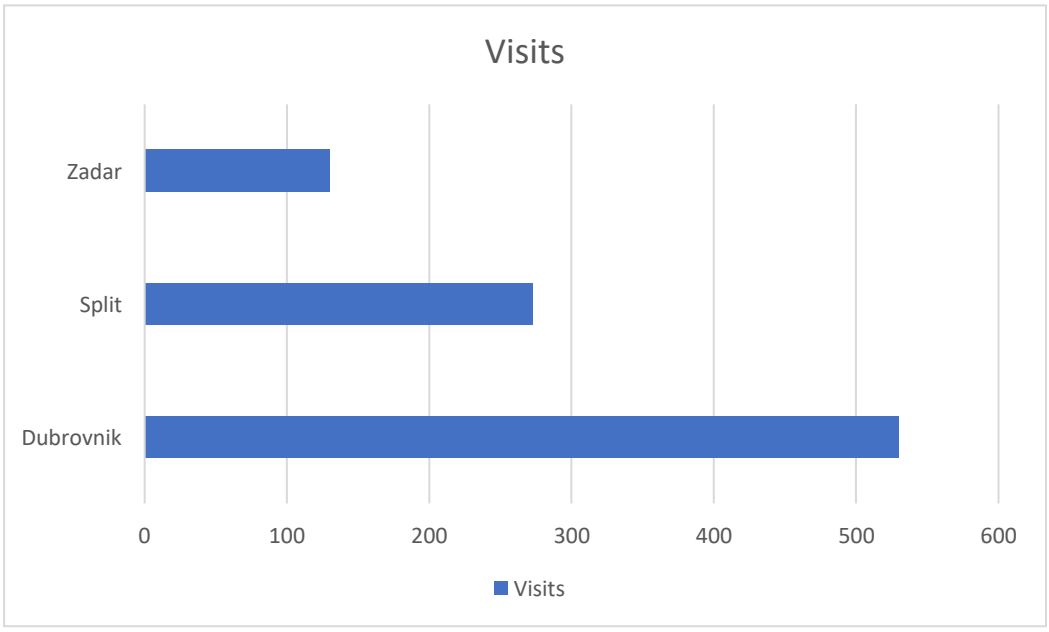

Figure 6: Top three cruising destinations in Croatia in 2019
Source: Author based on the data from Croatian Bureau of Statistics

b) Commercial Cargo Port

Commercial Cargo Port has terminals for liquid, bulk and general cargo. Figure 7 indicates the type of terminals and their location.

Figure 7: Terminals in the Commercial Cargo Port Zadar
Source: Author

As shown in Table 4, the volumes of all three types of cargo have not been affected by the COVID-19 pandemic so the positive growth trend is also expected in the forthcoming periods.

Year	Liquid cargo (t)	Bulk cargo (t)	General cargo (t)
2013	4.583	110.597	29.693
2014	44.242	157.404	16.761
2015	1.382	131.679	22.930
2016	60.908	153.653	18.785
2017	210.794	68.166	34.200

2018	230.545	82.371	11.588
2019	269.925	102.351	53.894
2020	248.864	74.563	84.382

Table 4: Volume of cargo handled by type of cargo
Source: Port of Zadar Authority

Focus of this document and the carbon footprint in the section 3 of the TNA is the New Port of Gazenica – new passenger, cruise, ferry and Ro-Ro terminals which are described in the following paragraphs.

Connections of the New Port of Gazenica with hinterland

The significance of port – hinterland connections has been recognized as one of the most important issues in port competitiveness worldwide which obviously influences the success of each port. In this light, it is important to underline that the New port of Gazenica has a great geographical position close to the city center and also has close connections to the highway A1, railway and airport. With its location in the center of the northeast coast of the Adriatic, Zadar makes an important transport link to overseas countries.

Port of Gazenica is directly connected to the modern A1 motorway through D424, a 17.6 long motorway with a four-lane access road which goes directly with no traffic lights or crossings to the port and serves as a part of an important traffic route. Figure 8 shows the position of Zadar in relation to highway and state road connections in the Republic of Croatia.

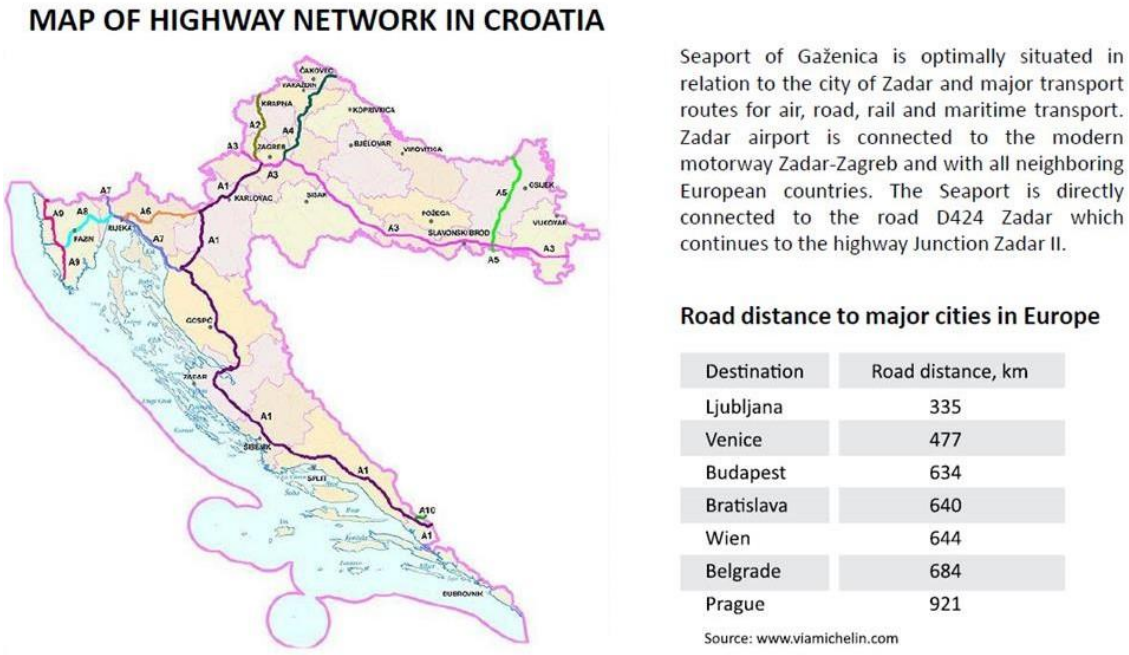

Figure 8: Connection of the A1 highway Connection 2 Zadar which goes directly to the very heart of Gazenica and facilitates transport to/from the port.

Figure 9 below shows a direct road connection to the port of Zadar which is undisturbed and allows a smooth transportation to/from the port area.

Figure 9: Highway connection in the New Port of Gazenica
Source: Port of Zadar Authority

The port is also connected with its hinterland with two railway tracks, the one from Lika and Una and the other from Zagreb. Both routes have certain restrictions regarding the speed and axial load.

- Railway track in Lika connects: Zadar-Knin-Gospic-Karlovac-Zagreb. Length of the track 424 km, axial pressure 18 Mp, maximum height 794 m.
- Railway track Una: Zadar-Knin-Bihac-Sisak-Zagreb. Length of the track 418 km, axial pressure 20 Mp, max. height 674 m.

The main railway route in Zadar County is the railway that crosses Lika and connects Dalmatia with Central Croatia through Knin. Unfortunately, the condition of the railway is not satisfactory since it is undermaintained and as such is often being a bottleneck in the transport from the port especially since there is no direct link from Zadar to Zagreb but the route goes from Zadar to Knin in order to reach Zagreb. For these reasons and inexistence of regular connections, transit time is also unsatisfactory and therefore railway transport is not competitive. Furthermore, modern highway

and regular connections influence an increase in the road transport modal share and maintain constant unsatisfactory levels of the railway usage both for cargo and passenger transport.

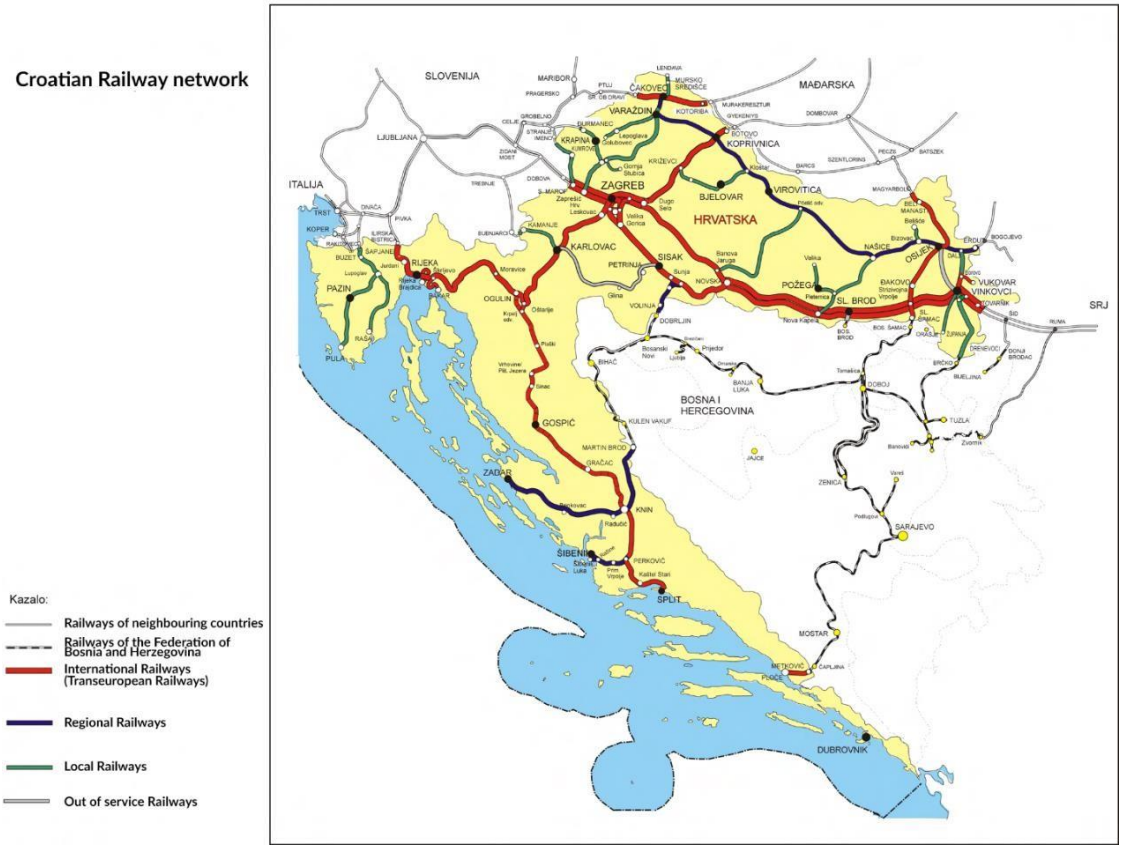

Figure 10: Croatian Railway Network
Source: Author based on the map from the Ministry of the Sea, Transport and Infrastructure

Zadar Airport is located also close to the port of Zadar in Zemunik Donji, which is only 12 km from the City of Zadar. It is located near the Zagreb-Split A1 highway Zadar 2 connection. The airport is of the 4E category and it can accept all kinds of planes, predominantly passenger planes but has also an increasing role in the cargo transport. Due to its good location, surrounding northern Dalmatian areas gravitate to it.

Description of the New Port of Gazenica – New passenger, cruise, ferry and Ro-Ro terminals in Gazenica

Subject to the pilot activity of the project SUSPORT is the New Port of Gazenica as a modern port partially opened in 2015 for all traffic with a temporary terminal building in order to disburden, relocate and provide additional capacities for ferry and cruise ships 3,5 km south from the city centre. Figure 11 shows the location of the New Port of Gazenica in relation to the city centre.

Figure 11: Location of the New Port of Gazenica
Source: Port of Zadar Authority

In 2018, a new terminal building was completed which resulted in a fascinating 24 000 m^2 of fully equipped facility. The new ferry and cruise Port of Gazenica was constructed by developing an area on land and adequate draft depth in the maritime zone by filling up the waterfront, construction of waterfront structures and piers, construction of access roads and parking lots. Gazenica enabled an increase in the traffic by providing extra berths which can now accept larger ferries, cruise and RO-RO ships. The new port has 12 berths for domestic and international traffic (ferries connecting Zadar with the islands, international vessels and cruise ships).

Purpose of berths in Gazenica under the jurisdiction of the Port of Zadar Authority is:

- Berths, 1, 2, 3, 4, 5, 6 and 7 are used for passenger ships on regular domestic lines
- Berths 8, 9, 10, 11, 12 are used for passenger ships in on international lines, where berths 8 and 9 are used for liner international shipping
- Loading and unloading of fishing boats located on the northern part of the port area (length 210m)
- Gas station – passenger port Gazenica for refueling of vehicles and vessels

Location of listed berths is indicated in Figure 12.

Figure 12: Berths in the New Port of Gazenica
Source: Author

Different transport and traffic needs have determined the following functions of the new Terminal (Figure 13):

- Island Terminal
- Coastal Travel Terminal
- International Travel Terminal
- A Permanent border crossing for international passenger and freight traffic in maritime transport
- Tourist Cruise Terminal – Cruise Terminal (Home Port)
- Fishing Port

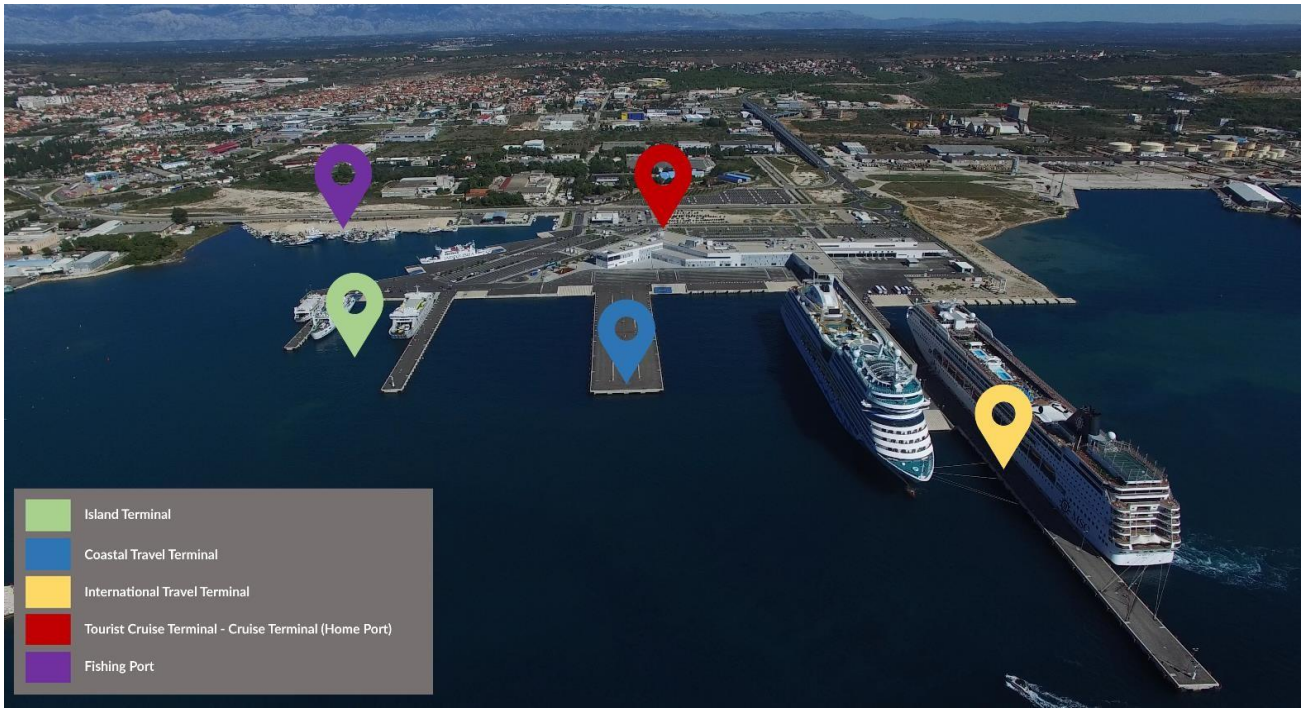

Figure 13: Map of the New port of Gazenica
Source: Author

Draft depths in the new ferry port range from 6 meters at the island terminal up to 13 meters at the cruiser berths of the international terminal.

In order to determine the importance of the New Port of Gazenica in the overall traffic of the port of Zadar, provided below are the tables and graphs explaining the share of the passenger and vehicle traffic from ferries in the New Port of Gazenica. Also, cruise statistics is explained by comparing the share of passenger traffic and calls in the New Port of Gazenica and the City Port Zadar.

Ferries on both domestic and international lines are arriving to the New Port of Gazenica while high-speed shipping lines are directed to the City Port Zadar. Therefore, Figure 14 shows the number of passengers in the New Port of Gazenica in relation to the total number of passengers on both locations including the City Port Zadar in order to determine the share of passenger traffic in the New Port of Gazenica which is the focus of the TNA and carbon footprint.

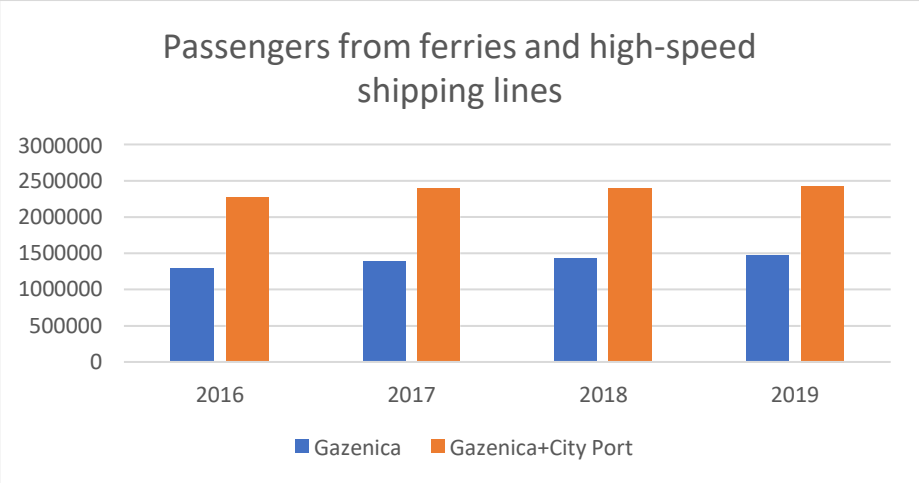

Figure 14: Passengers in the New Port of Gazenica in comparison to the total number of passengers (excluding cruisers)
Source: Author based on the Port of Zadar Authority data

It can be concluded that the total number of passengers is in constant increase since 2016. In 2019, 64% of all passenger traffic from ferries and high-speed ships (excluding cruisers) goes to the New Port of Gazenica together with 100% of all vehicle traffic (Table 5) which highlights the significance of the New Port of Gazenica in terms of passenger and RO-RO traffic.

New Port Gazenica	Vehicles

2016	403 114
2017	437 437
2018	465 335
2019	491 953

Table 5: Total number of vehicles in the New Port of Gazenica from 2016 to 2019
Source: Author based on the Port of Zadar Authority data

Following is Figure 15 which shows the number of passengers on cruisers in the New Port of Gazenica in comparison to the City Port Zadar. The graph shows that from 2016 until 2019 approximately 91% of all passengers from cruisers arrive at the New Port of Gazenica (percentage varies from 90-92% depending on the year). This confirms the importance of the New Port of Gazenica for the increase in cruise traffic.

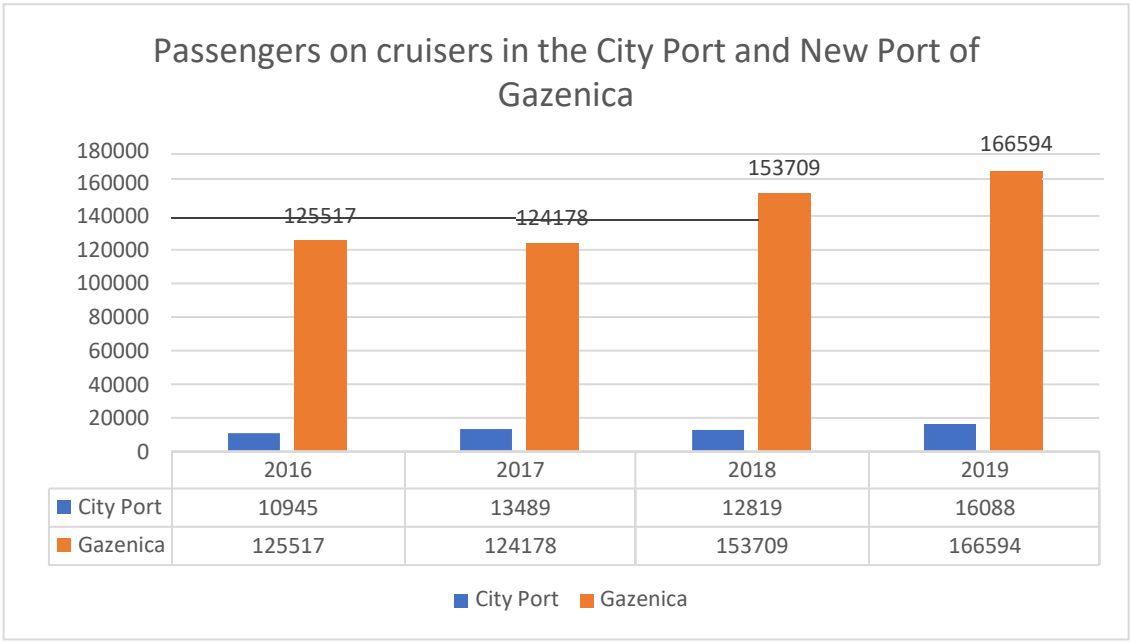

Figure 15: Cruisers in the City Port Zadar and New Port of Gazenica
Source: Author based on the Port of Zadar Authority data

Table 6 shows the number of cruise calls in the City Port Zadar and the New Port of Gazenica which supports the data from Graph 6 about the importance of the New Port of Gazenica for cruise traffic.

2016	Calls
City Port Zadar	47
New Port Gazenica	67
Total	114
2017	Calls
City Port Zadar	43
New Port Gazenica	67
Total	110
2018	Calls
City Port Zadar	47
New Port Gazenica	73
Total	120
2019	Calls
City Port Zadar	49+1 anchor
New Port Gazenica	80
Total	130

Table 6: Number of Calls in the City Port Zadar and the New Port of Gazenica
Source: Author based on the Port of Zadar Authority data

Sustainable development and environmental protection

One of the main goals of the Port of Zadar Authority is to ensure the safety of ships entering Zadar waters, taking care of the shore and port facilities and finally supporting the protection of the coast and marine environment. Energy efficiency, sustainability and environmental protection issues are tackled in several documents, policies and strategies implemented within the Port of Zadar Authority with the final goal of making the New Port of Gazenica a green port.

According to the European Parliament Resolution of 16 January 2018 on international ocean governance: an agenda for the future of our oceans in the context of the 2030 Sustainable Development Goals, maritime transport affects global climate and air quality with CO_2 and other emissions. This impact is particularly present in port cities and coastal areas and is important for public health and environmental protection. EU is therefore committed to achieving the protection and sustainable use of the oceans, seas and marine resources, emphasizing the strong maritime dimension of the Sustainable Development Goals within the Sustainable Development Goal 14: Preserving the aquatic world and marine resources for sustainable development.

In 2018, the International Maritime Organization adopted an initial strategy to reduce greenhouse gas emissions from ships with a vision which aims to phase them out, as soon as possible in this century. The strategy also directly recommends a way to reduce CO_2 emissions in line with the Paris Agreement temperature targets (IMO, 2018).

In line with the abovementioned initiatives and given that a significant increase in traffic is expected at the Gazenica passenger terminal, as well as activities in the cargo port, Port of Zadar Authority has started implementing a series of activities aimed at reducing greenhouse gas emissions and creating a sustainable transport system throughout the area with the aim of creating a green port environment.

An increasing number of ports in the EU allow liquefied natural gas (LNG) to meet the requirements of reducing CO_2 emissions and open up new business opportunities, thus increasing the number of ships that use LNG as a fuel. In the Croatian transport sector, the share of alternative fuel vehicles is still relatively small (less than 3 percent). In December 2016, the Republic of Croatia passed the Act on the Deployment of Alternative Fuels Infrastructure (OG No. 120/2016) transposing into national law the provisions of Directive 2014/94/EU of the European Parliament and of the Council of 22nd October 2014 on the deployment of alternative fuels infrastructure in the part referring to a Member State. Pursuant to the Act, a joint framework of measures for market development regarding alternative fuels in the transport sector and for deployment of adequate infrastructure is

defined in the National Policy Framework for Deployment of Alternative Fuel Infrastructure of the Republic of Croatia, which was adopted in Croatia in 2017 (OG No. 34/17). It sets minimum targets for building alternative fuels infrastructure, including filling stations, joint technical specifications for filling and supply stations, user notification requirements, as well as measures needed to achieve national targets. All other issues relating to the deployment of alternative fuels infrastructure not regulated by this Act or the NPF shall be governed by the regulations governing the areas of transport infrastructure, physical planning, spatial data infrastructure, construction, energy, energy efficiency, environmental protection, and laws establishing and defining the scope of activity of the Environmental Protection and Energy Efficiency Fund (Ministry of Environment and Energy, 2019).

National Policy Framework (2017) sets the goal that by 31 December 2030, among other coastal cities and in Zadar, the infrastructure for transshipment and supply of LNG must be available. Alternative fuels should be used to power ships which, by their navigation in any chain of national and / or international navigation, include the New Port of Gazenica as their port of call. By the end of 2021, Port of Zadar Authority will issue a call for expressions of interest for the construction of a multifuel station that should enable refueling of alternative fuels for trucks, buses and personal vehicles. Also, Croatian receiving LNG terminal (FSRU concept) was put into operation at the beginning of this year (2021) which opens a great perspective for LNG bunkering stations through the Adriatic coast. In some worldwide studies it is stated that the usage of more environmentally friendly fuels like LNG can decrease emissions from ships up to 30% and SOx emission up to 100%.

Energy Efficiency Act (Official Gazette 127/14, 116/18, 25/20) in the Republic of Croatia determines the area for efficient energy usage, issuing plans on local, regional and national level for improvement of energy efficiency and their implementation, energy efficiency measures and obligations, determining energy savings, consumer rights in the application of measures for energy efficiency and other regulations set down by the Act. Additionally, on the basis of this Act, an Ordinance on the methodology for monitoring, measurement and verification of energy savings (Official Gazette 33/20) has been approved. The main objective of this Ordinance is establishment of a system for monitoring and evaluating the success of the implementation of energy efficiency policy, achieving the goals set out in the Energy Development Strategy of the Republic of Croatia until 2030 with an outlook to 2050 and the National Action Plan, methodology for monitoring and calculating energy consumption indicators at national and sectoral level, calculating new energy savings measures as a result of energy improvement measures and the result of the application of energy services, methods for calculating new energy savings, the procedure for verifying new energy savings, as well as the methodology for drafting the an Action Plan, i.e. the Annual Plan. Regarding

the Energy Development Strategy of the Republic of Croatia until 2030 expectation is an enormous decrease of CO_2 emissions and increasing of all types of electric vehicles. All producers of electricity need to approve decreasing of emissions in each kWh and this will consequently push them to invest in renewable sources of energy.

Furthermore, Port of Zadar Authority adopted the Ship Waste Management Plan (2018) and the Ordinance on determining the class and quantity of hazardous substances from ships (2018) which defined the methods and control of handling hazardous substances in the area of operation. Also, an Ordinance on determining the class and quantity of dangerous substances that may be handled in the port, that is, that may be carried by a ship entering the port area and places in the port of Zadar where these substances will be handled (2015) also contribute to the environmental protection in the port area.

Under the concession agreement for the provision of basic port services and related economic activities in the port of Gazenica, the company Zadar International Port Operations (ZIPO d.o.o.) is obliged to take measures and activities to protect and preserve the marine environment and prevent its pollution.

Also, Port Regulations on the maintenance of order and terms of using the port area under the jurisdiction of the Port of Zadar Authority also lay down safety and security measures which contribute to the above-mentioned goals.

Lastly, Port of Zadar Authority takes part in several EU projects co-funded from European Regional Development Fund under the Interreg Program and will in the future focus more specifically on participating in the projects which support port energy efficiency and sustainability by also exploring other programs and funds which support these objectives. One of the first steps in using the opportunity of participating to such EU projects is the SUSPORT Project (Interreg Italy-Croatia) which will allow for making a step forward in supporting energy efficient solutions by producing foundations in view of documents which will be used for determining energy efficient solutions in the port area but will also support and co-finance specific solutions which will be implemented within the scope of the pilot activity of the Port of Zadar Authority.

Mapping out stakeholders

This section deals with the mapping of major stakeholders in the program area as a key element for their involvement in the project as well as for project results' dissemination. Port of Zadar Authority identified key stakeholders in their area. An organization is considered a key stakeholder if it can be interested in and/or influence project activities as well as if it can affect the project activities or results. Two tables are included in the TNA document for each specific port involved in the project which is in line with the provided methodology for TNA development. The first table maps stakeholders according to their influence on the project and their level of interest in the project and the second one maps them according to their involvement and role. List of all the stakeholders is provided in the Tables 7 and 8 below.

Stakeholders importance mapping

In Table 7, stakeholders are listed according to their importance in relation to their power of influence on the project and its results and based on their interest in the project and pilot activity of the Port of Zadar Authority.

	LOW *POWER OF INFLUENCE*	*HIGH*
H I G H	Marginal Stakeholders Importance = Low • Local and national media • General Public (tourists, visitors) • CRODUX derivati dva d.o.o.	Relevant Stakeholders (e.g. Institutions we would like to involve) Importance = Medium/High • City of Zadar • Zadar County • Agency for rural development of Zadar county (AGRRA) • Zadar County Development Agency (ZADRA NOVA)

INTEREST		• University of Zadar • Faculty of Maritime Studies in Rijeka • Ministry of economy and sustainable development • Zadar branch of the Croatian Chamber of Economy
LOW	Operative Stakeholders (stakeholders we must involve) Importance = Medium/High • Harbormaster`s office • Maritime police • Border police department • Customs • Jadrolinija – liner shipping company • HEP Group	Key Stakeholders (Essential to project outcomes) Importance = High • Ministry of the Sea, Transport and Infrastructure • ZIPO d.o.o. Terminal building concessionaire of passenger port • Luka Zadar d.d. - Cargo port concessionaire

Table 7: Stakeholders mapping due to importance

Stakeholders involvement strategies

In Table 8 stakeholders are listed according to their involvement in the project and pilot activity of the Port of Zadar Authority and based on their role, importance, contribution to the project, benefits and support they are providing to the project. Also actions to improve their support are indicated in order to increase their level of current support.

Stakeholder	Role	Importance	Contribution to the project	Benefits	Conflicts	Current support	Strategies to improve support
Croatian Ministry of the Sea, Transport and Infrastructure	Observer, will be included in dissemination activities	HIGH	Croatian Ministry is informed about activities to be performed within the project and has expressed high interest in the results.	Ministry supports activities to be performed within the pilot action in the port of Gazenica.	None	Informal support	Inform the Ministry about implemented activities. Include them in dissemination activities.
ZIPO d.o.o.	Observer; Concessionaire for the provision of passenger services with the use and maintenance of port facilities (infrastructure and superstructure) in the area of the port Gaženica and is obliged to take measures and activities to protect and preserve the marine	HIGH	ZIPO d.o.o. is not directly involved in implementation of project activities but as the main concessionaire has high interest in the project activities, especially pilot activity of the Zadar Port Authority	ZIPO d.o.o. will benefit from project activities and is highly interested in the pilot actions in order to be able to replicate the best practice examples within the port area under their	None	Informal support	Improve contact, inform about implemented activities. Include them in dissemination activities.

	environment and prevent its pollution.			management. They are interested in energy efficient solutions (PV and EV) and are exploring funding sources.			
Luka Zadar d.d.	Commercial cargo port concessionaire	HIGH	No contribution.	Although they are located in the cargo port which is not a subject to the project activities, know-how and best practice examples from the SUSPORT project can be used for future energy efficiency activities.	None	No support	Will be informed about project activities and invited to participate to dissemination activities.

City of Zadar	Observer, will be included in dissemination activities	MEDIUM/ HIGH	No contribution.	The City will gain energy efficient solutions which are in line with their respective objectives for increasing energy efficiency.	None	Informal Support	Contact and inform the City of Zadar about activities within the port. Include them in disseminatio n activities.
Zadar County	Observer, will be included in dissemination activities	MEDIUM/ HIGH	No contribution.	The County will gain energy efficient solutions which are in line with respective activities and an Action Plan for energy efficiency in Zadar County	None	Informal Support	Contact and inform the Zadar County about activities within the port. Include them in disseminatio n activities.
Agency for rural development of Zadar	Observer, will be included in dissemination activities	MEDIUM/ HIGH	No contribution.	AGRRA will benefit from know-how and	None	Informal Support	Contact and inform AGRRA about

county (AGRRA)				best practice examples from the SUSPORT project can be used for future energy efficiency activities.			activities within the port. Include them in disseminatio n activities.
Zadar County Development Agency (ZADRA NOVA)	Observer, will be included in dissemination activities	MEDI UM/ HIGH	No contribution.	ZADRA NOVA will benefit from know-how and best practice examples from the SUSPORT project can be used for future EE activities.	None	Informal Support	Contact and inform ZADRA NOVA about activities within the port. Include them in disseminatio n activities.
University of Zadar	Interested in project activities, will be included in dissemination activities	MEDI UM/ HIGH	No contribution, possible engagement for further analysis	University of Zadar, Maritime Departmen t is highly interested in project activities	None	Informal support	Contact and inform the University about activities within the port. Include them in

				and results with special emphasis on the pilot activity of the Zadar Port Authority.			disseminatio n activities and potential further analysis during or after the project duration.
Faculty of Maritime Studies in Rijeka	Observer, interested in project activities, will be included in dissemination activities	MEDI UM/ HIGH	No contribution, possible engagement for further analysis	Highly interested in project activities and results for their future activities	None	Informal support	Contact and inform the Faculty about activities within the port. Include them in disseminatio n activities and potential further analysis during or after the project duration.
Ministry of economy and sustainable development	Observer, interested in the sustainable development activities, will be included in	MEDI UM/ HIGH	No contribution	Know-how and best practice to be used in future projects	None	No support	Contact and inform them about project activities. Include them in

	dissemination activities			and activities.			dissemination activities.
Zadar branch of the Croatian Chamber of Economy	Interested in project activities, will be included in dissemination activities	MEDIUM/ HIGH	No contribution	Know-how and best practice to be used in future projects and activities.	None	Informal support	Contact and inform them about project activities. Include them in dissemination activities.
Harbormaster`s office	Located in the port terminal building	MEDIUM/ HIGH	No contribution	Since they are located in the port terminal building, they will have indirect benefits from the project activities.	None	Informal support	Contact and inform them about project activities. Include them in dissemination activities.
Police (border and maritime)	Located in the port terminal building	MEDIUM/ HIGH	No contribution	Since they are located in the port terminal building, they will have indirect benefits from the	None	No support	Contact and inform them about project activities. Include them in dissemination activities.

				project activities.			
Customs	Located in the port terminal building	MEDIUM/ HIGH	No contribution	Since they are located in the port terminal building, they will have indirect benefits from the project activities.	None	No support	Contact and inform them about project activities. Include them in disseminatio n activities.
Jadrolinija	Liner shipping company, located in the port terminal	MEDIUM/ HIGH	No contribution	Since they are located in the port terminal building, they will have indirect benefits from the project activities.	None	Informal support	Contact and inform them about project activities. Include them in disseminatio n activities.
HEP Group	Electric energy producer and distributor	MEDIUM/ HIGH	Will be indirectly included as electric power distributor and producer.	EV and charger will use electric power. PV systems could be clutch on	None	No support	Contact and inform them about project activities. Include them in

				grid, depending on investors			disseminatio n activities.
CRODUX derivati dva d.o.o.	Concessionaire (Gas station)	MAR GINA L/LO W	No contribution.	They are not directly interested in the project activities but indirectly since they are located in the port area.	None	No support.	Contact and inform them about project activities.
General Public	Visitors, Tourists	MAR GINA L/LO W	No contribution.	Rising awareness about energy efficient and sustainable solutions and their importance . Direct benefit from the public LED lighting.	None	No support	Will be informed about the project activities and included in disseminatio n activities.

Local and National Media	Dissemination activities.	MARGINAL/LOW	Contribution in terms of communication and dissemination activities.	Rising awareness about EE and sustainable solutions and their importance.	None	No support	Will be informed about the project and included in disseminatio n activities.

Table 8: Stakeholders involvement strategy

Carbon footprint emissions estimation – Port of Zadar

With the rising awareness of global warming and increasing efforts to mitigate global warming consequences it is important for every significant CO_2 producer (direct and indirect) to evaluate its carbon footprint and analyze possible CO_2 emission reductions.

The Port of Zadar Authority administers 4 distinct ports: Passenger City Port Zadar, New Port of Gaženica, Commercial Cargo Port and Fishing Port Vela Lamjana. The subject of this study is only New Port of Gaženica, more specifically its passenger, ferry, cruise and Ro-Ro terminal.

The GHG emissions calculation is based on Methodology for the implementation of the territorial needs assessments developed by SUSPORT project. The Tier, or calculation levels, defined by the IPCC (2006) and by the EMEP/EEA (2019) are three different levels of accuracy of the calculation or estimation of the GHG emissions relating to an area or activity. The simplest and, therefore, the most estimated and least accurate is Tier 1; the most complex and accurate is Tier 3; Tier 2 is a middle ground between Tier 1 and Tier 3. While methodology was strictly followed in general, in a number of instances input data was inadequate and/or missing, therefore additional assumptions and changes to the model were made to obtain results as close as possible to real emissions. GHG emissions were evaluated using bottom-up approach, by estimating anchor, maneuvering and moored emissions for each arrival of each ship. Due to the insufficient available data concerning ship engines, propulsion power, speed and draught, slightly modified IPCC Tier 2 methodology was used (power and draught were extrapolated from known data). Detailed calculations with graphs

and tables are indicated in the Annex I of TNA. Assumptions, input data and calculations are explained in detail for every GHG source.

Terrestrial emissions

Terrestrial emissions calculation is based on the Methodology for the implementation of the territorial needs assessments developed by SUSPORT project. While methodology was strictly followed in general, in a number of instances input data was inadequate and/or missing, therefore additional assumptions and changes to the model were made to obtain results as close as possible to real emissions. Assumptions, input data and calculations are explained in detail for every GHG source. Due to the fact that Gazenica is a new, modern port, all roads and directions are very logical, routes are optimal and there are currently no serious stationary sources of high pollution. Actual terrestrial CO2 emissions are on level **328,9 t/year** which is negligible and expected because passenger building terminal is quite modern building with installed BAT (best available technique). Speaking about future problems that may occur, it will be a great challenge to organize all services necessary for the port of Zadar as a home port which is intended by the main concessionaire ZIPO d.o.o. For that purpose, it will be necessary to organize optimal routes for service vehicles and predict enough electric power to avoid any new stationary source of pollution like diesel generators. In correlation with expected growth of cruise traffic, it will be a great challenge to organize their refueling in a way to avoid additional emissions and pollution. The best solution would be an organization of ship refueling in the area of the Commercial Cargo Port through the modern, automatic pipeline system.

GHG from electric energy

Electrical consumption in the port of Zadar for year 2019 was obtained from electricity bills. Electricity meters were read on a monthly basis; therefore, it is possible to obtain precise electrical consumption profiles throughout the year. Carbon intensity of electrical energy was obtained from annual energy report Energy in Croatia 2018. Since the report for 2019 was not published when these calculations were performed, the report for 2018 was used. Specific CO_2 emission factor per total electricity consumption in Croatia was 0.106 kg/kWh and specific CO_2 emission factor per total electricity production in Croatia was 0.148 g/kWh. Emission factor per total electricity consumption considers electricity imports in Croatia (as Croatia is significant net importer) and is a more adequate

factor for emissions calculation. The monthly profile of the CO_2 emissions that can be associated with Port of Zadar electricity consumption is presented in Figure 16. Overall GHG emissions from electricity consumption in 2019 were **139.84 tons**. The emissions profile has strong seasonal character with emissions in August almost three times larger than that in April, probably due to the very large cooling and air conditioning capacities inside the port area. It is fact that one amount of electric energy is used for the purpose of sanitary hot water and firstly the idea was to replace that system with thermal solar modules for hot water, but because of decentralized piping system it is too complex and expensive. Instead of this in next actions is predicted PV systems on the building roof which will ensure electricity with zero level emissions.

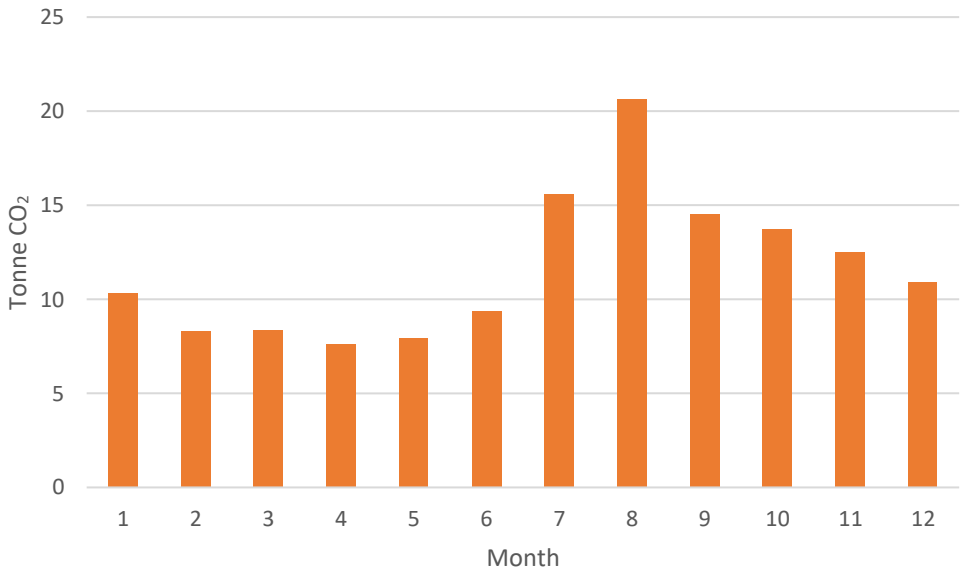

Figure 16: Monthly distribution of electricity related GHG emissions
Source: Author, based on detail calculation

GHG from heating

Office spaces, passenger areas and other terminal building rooms are heated by a central heating system with natural gas boiler. Gas consumption data is stored once per year, and overall consumption in 2019 was around 15,000 m^3. Gas lower heating value[2] is taken as 9.26 kWh/m^3 or 33.34 MJ/m^3. Average specific CO_2 emissions per MJ of CO_2 can be taken as 0.056 kg_{CO2}/MJ, converted to 1,87 kg_{CO2}/m^3. Average specific emissions of CO_2 for combustion of natural gas in literature are in range 1.85 – 2.2 kg/m^3. Overall emissions from direct combustion in the heating system for the port of Zadar in 2019 are therefore estimated as **28 tonne$_{CO2}$**.

Consumption	m^3/y	15000
Heating value	kWh/m3	9.26
	MJ/m^3	33.34
Specific emissions	$kgCO_2/MJ$	0.06
	$kgCO_2/m^3$	1.87
Overall emissions	**tonne CO_2**	**28.00**

Table 9: Natural gas related GHG emissions in 2019
Source: Author

Other direct emissions of GHG

Other direct GHG emissions in port areas are generally related to GHG leaks from refrigerant systems, cooling/heating devices and fire extinguishing systems. Cooling and air conditioning in the port of Zadar is centralized as VRV system. Unfortunately, there is no data on refrigerant gasses refilling and leakages in the port of Zadar and no GHG emissions from this source cannot be evaluated, but due to the fact that equipment is only 3 years old, an assumption is that there will be no any leaking from systems in next decade.

2 http://www.gpz-opskrba.hr/useful-information/natural-gas-quality/general-information-about-natural-gas-quality/1552

GHG from freight traffic / GHG from road vehicle

As previously indicated, the subject of this study is a passenger terminal in Gaženica port operating ferries and smaller liners. As such, there is no freight traffic in the port area, but there are other important sources of GHG emissions like road vehicle traffic inside the port area. In 2019 there were 491 953 vehicles transported through port of Zadar of which 484 690 in domestic travel and 7263 in international travel (Italy). Unfortunately, no data on vehicle types (personal vehicles, trucks, busses, bikes…) is available. Since busses and trucks have larger specific emissions than personal vehicles it is important to somehow estimate their numbers. In this analysis vehicle type distribution was assumed to be the same as in similar Croatian port of Split (twice the size of the port of Zadar, also connecting nearby islands with the major city). The shares of personal vehicles, trucks and buses are 75%, 24.5%, 0.5% respectively, resulting in 368 965, 120 528 and 2460 vehicles.

Since only available data on car traffic is an overall number of transported vehicles, average distance travelled by each vehicle traveling through the port was estimated as an approach distance from entrance to the port area to the middle of the island terminal. This path is shown in Figure 17 as a red dashed line. This average distance makes a good approximation for both arriving and departing cars as their share is also unknown. Average distance per car is 0.94 km.

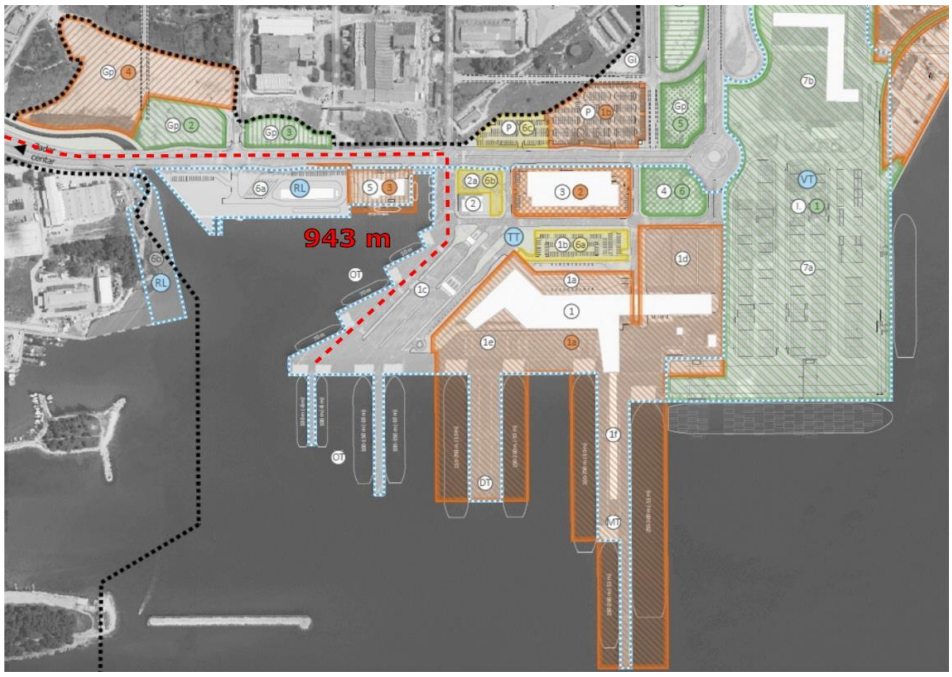

Figure 17: Average road vehicle distance in port area as red dashed curve

Source: Author base on the map from the Port of Zadar Authority

Specific CO2 emissions were assumed as 160 g/km for personal vehicles, 1323 g/km for buses and 900 g/km for trucks (HVD). Considering a very small percentage of electric cars in Croatia, all cars were treated as ICE. Overall emissions in 2019 are estimated to be 161 tonne and presented in detail in Table 10. Distribution of the road vehicle emissions is shown in Figure 18.

	Share	Number	Average emissions		Overall emissions			
Per. Veh.	75%	368965	160	g/km	55669.4	kg	55.7	tonne
Trucks	24.5 %	120528	900	g/km	102292.1	kg	102.3	tonne

Buses	0.5%	2460	1323	g/km	3069.1	kg	3.1	tonne
Fuel tank trucks		193	900	g/km			**0.68**	
Overall		492146			161030.6	kg	**161.7**	**tonne**

Table 10: Road vehicle emissions inside the port area
Source: Author

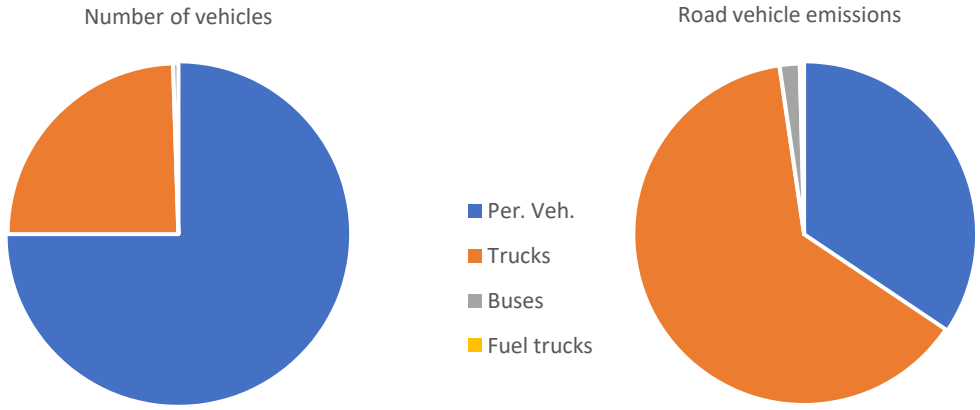

Figure 18: Share of road vehicle travelling through port of Zadar and their GHG emissions
Source: Author, based on detail calculation

Maritime emissions

Similar to terrestrial emissions, calculation for maritime emissions is based on Methodology for the implementation of the territorial needs assessments developed by SUSPORT project. While methodology was strictly followed in general, in a number of instances input data was inadequate and/or missing, therefore additional assumptions and changes to the model were made in order to obtain the results as close as possible to real emissions. Assumptions, input data and calculations are explained in detail for every GHG source. Port of Gazenica passenger terminal is the new terminal in operation since 2015 but without any serious operations regarding the cruise industry since main concessionaire ZIPO d.o.o. started operations in 2018. Major share of the overall traffic is made by ferries with significantly smaller number of cruise ship arrivals. Therefore, the number

of ferry arrivals was extrapolated from the ferry timetable. Cruise ship activity data for 2019 is inadequate as a cruise ship terminal was recently opened (there were only 82 arrivals compared to 142 planned in 2021). Unfortunately, 2019 is not a representative year for maritime emissions in Gazenica, because there was still a large percentage of ship arrivals/departures going to the old port in the center of the city of Zadar. Because of that, cruise ship arrival plan for 2021 that includes ship name and duration of the stay, was used as reference. Total number of ferry departures was estimated to 7309 while total number of cruise ship arrivals was estimated to 142.

Emissions from ships at anchor were not estimated as there is no data about ships at anchor in 2019, but it would be a challenge if the port of Gazenica became a homeport for some cruisers. In that case "shore to ship" solutions could be examined in order to avoid that actual minor 3726 t of CO_2 do not increase extremely.

Anchor phase emissions

There is no specific data about ships at anchor in 2019 and no prediction for cruise ships staying during night in 2021, what could cause emissions in the near future.

Manoeuvring phase emissions

Mooring and manoeuvring emissions for cruise ships are estimated for each arrival taking into account ship specifics and mooring duration. Ferry emissions were estimated as general emissions of each line and multiplied with the number of departures/arrivals. Manoeuvring time (t_m) was approximated by estimating manoeuvring distance inside the port area for inter-island docks (526 m), coastal docks (457 m) and international docks (353 m), and dividing it by maximum allowed speed inside the port area (5 knots). Actual power during manoeuvring was assumed as 20% of installed power for all ships (V.Knezevic et.al,2018). Installed power was obtained with thorough internet research for all ferries.

Large majority of ships in both categories use regular diesel fuel or Marine Diesel Oil. Specific engine consumption (SFOC=195 g_{Diesel}/kWh) was extracted from IMO documents for medium speed engines produced between 1984-2000, while specific emissions were extracted from the same source as 3.2 kg_{CO2}/kg_{Diesel}. Specific engine consumption for cruise ships was estimated as SFOC=175 g_{Diesel}/kWh (slow speed engine, after 2001).

Finally, overall GHG emissions for each arrival/departure was calculated as:

$$GHG(kg) = \frac{l_{d,i}(m)}{v_{man}\,(m/s) \cdot 3600} \cdot P(kW) \cdot c_{man} \frac{SFOC(g_{Diesel}/kWh)}{1000} \cdot c_{GHG} \cdot (kg_{Diesel}/kWh),$$

Where $l_{d,i}$ is manoeuvring length of each arrival/departure, v_{man} manoeuvring speed, $P(kW)$ installed engine power, c_{man} manoeuvring power factor, c_{GHG} specific emissions per kilogram of fuel.

Due to the lack of Engine power data for some cruise ships, their power was extrapolated from other ships from their gross tonnage. Available data with a plotted regression curve is shown in Figure 19. For all ships with unknown power in this category installed power was calculated as

$$P = 10681 \cdot e^{0.0000182 \cdot GT}.$$

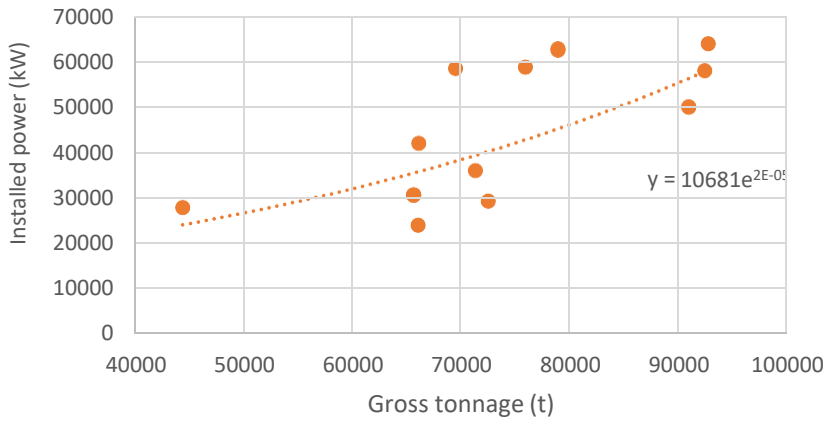

Figure 19: Ratio between gross tonnage and installed power
Source: Author, based on detail calculation

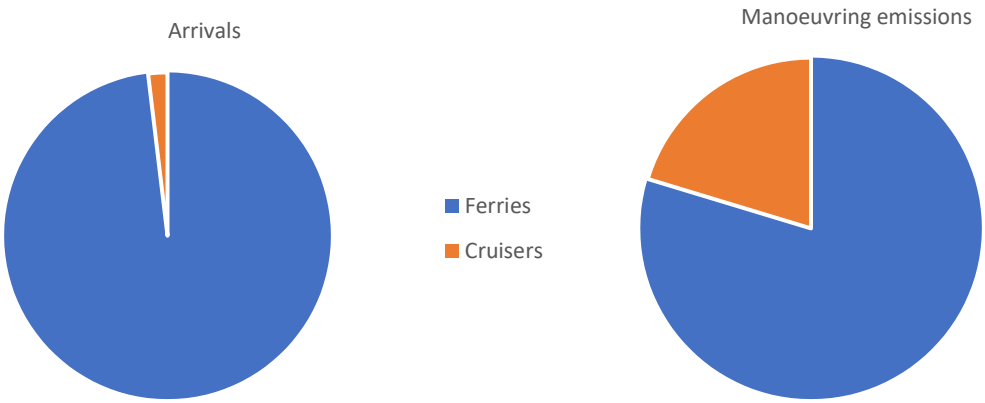

Figure 20: Share of arrivals and manoeuvring GHG emissions by ship category
Source: Author, based on detail calculation

There are five police boats stationed in the port area, but their departure frequency and power is unknown and therefore their emissions cannot be calculated, either way due to the limited size, low engine power and load during the manoeuvring their overall emission cannot have a significant effect on the overall emissions.

Mooring phase emissions

Mooring duration for each line was assumed to be the same and estimated from the ferry timetable from shortest for Zadar – Preko line of 5 min to longest one of 1 hour for Zadar – Ancona line. Mooring duration for each cruise ship is estimated from the cruise ship arrival plan.

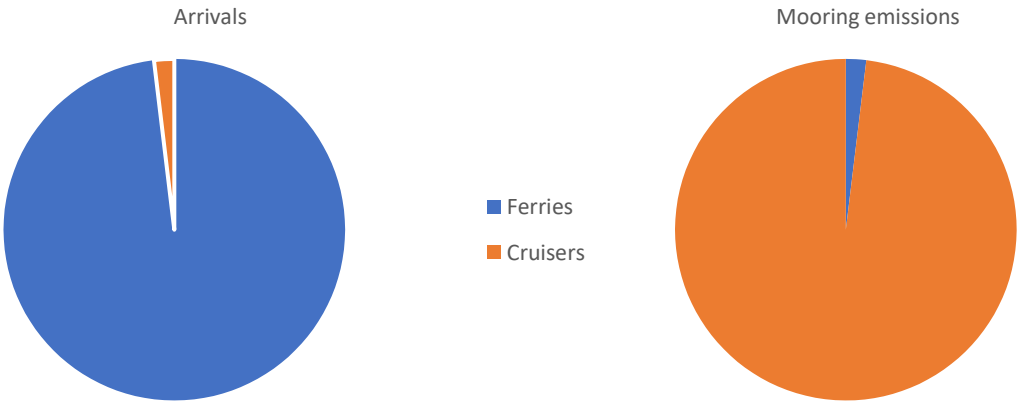

Figure 21. Mooring phase emissions by ship category
Source: Author, based on detail calculation

Overall emissions

Ships at berth represent the largest part of maritime emissions in the Port of the Zadar. Visual representation of GHG emissions by operation mode is presented in Figure 22. Mooring emissions are almost 19 times larger than maneuvering emissions. While this ratio looks extremely skewed toward mooring emissions, similar ratios can be found in other ports. Port of Gothenburg had 10 times larger emissions from mooring than from maneuvering in 2010 (Winnes et al., 2015). Small maneuvering emissions are also logical as port of Gazenica is relatively open port with very short maneuvering times. Since the city of Zadar is also a very popular cruise destination this ratio is further inclined toward mooring as cruisers have very large hoteling emissions.

Emissions (tone CO2)	Arrivals	Manoeuvring	Mooring	At anchor	
Ferries	7309	178.2	72.9	0.0	
Cruisers	142	45.4	3726.2	0.0	
Sum		**223.6**	**3799.1**	**0.0**	**4022.7**
%		5.56	94.44	0	**100%**

Table 11: Ship GHG emissions inside the port of Zadar
Source: Author

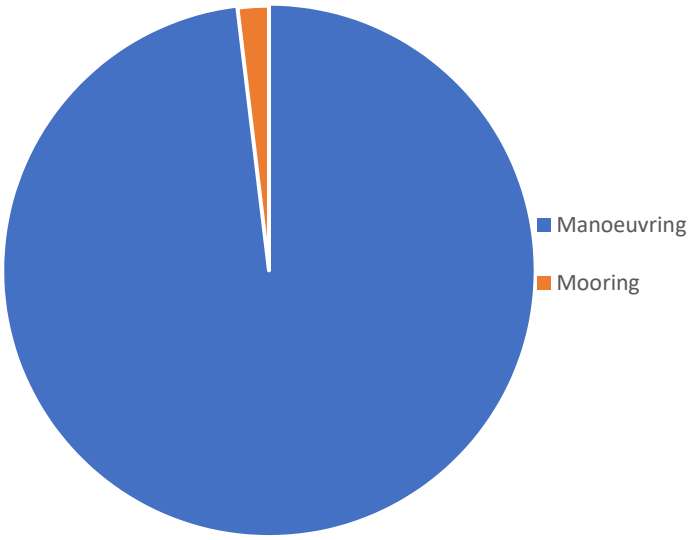

Figure 22: Share of GHG emissions by ship operation regime shows that cruisers need to be in the focus for port authorities in correlation to emissions
Source: Author, based on detail calculation

Table 12 shows that the majority of maritime emissions are coming from moored ships and there are no emissions from anchored ships because of an earlier mentioned fact that the port of Gazenica is still not a home port for any cruisers what is the main target for the concessionaire and is a great challenge for the Port of Zadar Authority to build necessary infrastructure to ensure shore to ship and avoid pollution during cruisers staying in the port more than one day.

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of Zadar, in 2019		
Category	**t CO2eq**	**%**
Anchored ships	0	0
Ships manoeuvring	223.6	5.6
Moored ships	3799.1	94.4
TOTAL	**4023.7**	**100**

Table 12: GHG emissions from maritime sector
Source: Author

In table 12 we could see that mooring emissions are spatially spread over the most port area and their distribution offers better insight in emissions sources. Emission for each dock is therefore shown in Figure 23. It is assumed that ferry Cres uses only dock 5. It can be seen that almost all mooring emissions are associated with docks 10 and 11 which are primary docks for cruise ships. All other ferry docks are associated with very small emissions. It can be concluded that 4023,7 t of CO2 is not a large amount for maritime emissions especially specific emissions per cruiser calls (predicted 197 calls in 2021) with ratio of 20,42 tCO2/cruiser.

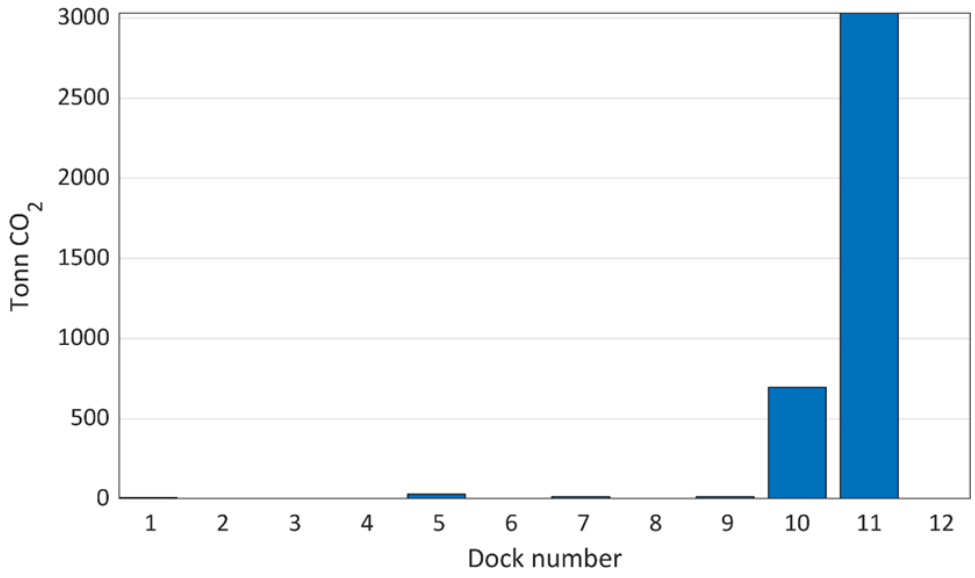

Figure 23. Mooring emissions for each dock

SWOT Analysis

SWOT analysis (Pickton and Wright, 1998) serves to identify key internal and external factors perceived as important to achieving project objectives as they stem from the current situation and previous project activities. All relevant elements are divided into two main categories:

1. Internal factors — *Strengths* and *Weaknesses*

2. External factors —*Opportunities* and *Threats*

Internal factors deal with aspects related to the organization carrying out the SWOT analysis, in the present case it is the port of Zadar. The analysis may view internal factors as strengths or as weaknesses depending upon their effect on the project objectives. Factors are derived from the previous steps of territorial need assessments, such as the examination of the programme area, the greenhouse gas inventory, stakeholder involvement and their feedback.

The external factors include stakeholders, technology, regulations and policies, cultural aspects, infrastructure, market demands. The results are presented in the form of a matrix (Table 9). The matrix is not merely a list to be compiled: important factors are examined in detail reporting how they can foster or hinder the project objective implementation.

	STRENGHTS	**WAKNESSES**
Internal Factors	- Strong maritime heritage - Strongly developed tourist industry - The new Gazenica-Zadar cruise port was chosen as the world's best port at the Seatrade Cruise Awards 2019. This should be exploited in terms of investing into energy efficiency as well - Wide range of maritime activities and services support the implementation of energy efficient technologies	- Port performance is closely related and dependant on the tourist industry and passenger traffic which is strongly affected by the COVID-19 pandemic - Non-existing long-term strategic environmental plan - Weak and unreliable intermodal connections which are recognized as environmentally more acceptable mode of transport - Inexistent system for the monitoring of port environmental impact - Electric car and sufficient EV charging stations are not available within the port area

	- Geostrategic position of the port in the center of the Adriatic Sea and the Mediterranean - Availability of other services such as airport, banks, tourist offer and sights are an additional benefit to the port operations and services - Rising trend of passenger and cruise ship travels supports the need for implementing energy efficient technologies - Potential to develop industry of super yachts and related activities supports the need for investing into energy efficient technologies - Existing road, rail, air connections which support port operations - New Port of Gazenica is dislocated from the city center in order to preserve the old town and local inhabitants from emissions and potential pollution - Terminal building uses LED lighting - Water for green areas within the port will be collected through the PV surfaces as a result of the SUSPORT pilot activity. This will result in water savings which will be estimated after the implementation - Purchase of electric vehicle together with a charger supports project activities as implementation of e-mobility is one of key project deliverables and objectives - Environmental protection contributes to economic growth which has been hindered by the COVID-19 pandemic	- Port outdoor lightning is currently using traditional metal halide lamps which use about 25%-80% more energy than modern LED street lamps and last from 3-25 times shorter than energy-efficient lightbulbs - There is no water collection system for watering green areas which results in usage of fresh water for this purpose - Rising trend of passenger and cruise ship travels will cause an increase in the greenhouse gas emissions which highlights the need for the harmonization of policies and actions to strengthen environmental sustainability and port energy efficiency at cross-border level - Low interest from stakeholders for the implementation of project pilot activity and new technologies

	- Action plan will be developed within the project SUSPORT and will be used as an added value to the energy efficiency and sustainability within the port - Annual Plan of the Port of Zadar Authority for 2021 states that supporting energy efficiency and potential installation of alternative energy stations for ships and vehicles will be explored. Usage of more environmentally friendly fuels, like LNG, can decrease emissions from ships up to 30% and SOx emission up to 100%.	
	OPPORTUNITIES	**THREATS**
External factors	- Increased interest for cruise industry supports economic growth. Furthermore, economic growth caused by improved technologies can enable better outputs with less pollution - Cruise industry worldwide is directly affected by the COVID-19 pandemic which causes a decrease in the cruise traffic and as a short-term consequence affects positively environmental dimension - Construction and modernization of rail infrastructure would contribute to modal shift from road to rail and would result in reduced usage of more polluting road vehicles	- Increased interest for cruise industry causes more emissions and highlights the need for finding solutions to tackle this environmental dimension - Cruise industry worldwide is directly affected by the COVID-19 pandemic which causes changes in the market demand and consequently negatively influences the quality of life and economic sustainability which affects negatively energy efficient and sustainable development of ports - Economic instability causes some stakeholders and concessionaires to focus more on their business models and optimization rather than investing in energy efficient technologies - Dependency on tourist traffic and cruise passengers causes additional congestions and pollution

	- Focus on energy efficient and sustainable solutions for maritime transport and port operations - Usage of EU funds in financing activities and energy efficient solutions - Raising awareness and promoting maritime transport is one of the key goals to be used for also promoting energy efficiency - Improving the accessibility of maritime passenger transport services will result in an increase in the maritime passenger transport usage but will reduce the usage of cars and will support new activities in the scope of energy efficiency and sustainability - Development and implementation of modern technologies and energy efficiency is one of the key goals in the future development of the port which is in line with project objectives - Investing in the employee education and regular trainings can also result in reduced emission volumes. Some studies have confirmed that the way of manoeuvring the ship may influence the emission volume up to 15%–18% - Existing policies and strategies support environmentally efficient and safe maritime transport which is in line with project objectives of energy efficient and sustainable technologies in ports and maritime transport in general (Transport Development Strategy of the Republic of Croatia 2017-2030, Maritime Development and Integrated	- Business environment and culture supports road transport over maritime transport which results in additional emissions - Increase in maritime and coastal activities also causes a higher risk for negative environmental impact

	Maritime Policy Strategy of the Republic of Croatia 2014-2020, National Policy Framework on Alternative Fuels)	

Table 13: SWOT Analysis

Conclusions

Overall GHG emissions in the Port of Zadar for year 2019 were 4351.6 tonne CO_2 equivalent which is minor when compared to the EU statistic. The carbon footprint calculation in the Section 3 of the TNA has proved that the New Port of Gazenica is indeed a very modern port with very low GHG emissions and satisfactory energy-efficient and sustainability performance.

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of Zadar, in 2019		
Category	**t CO2eq**	**%**
Electric energy	139.9	3.2
Heating	28	0.6
Service vehicles	0	0.0
Operational port vehicles	0	0.0
Heavy vehicles **and road vehicles**	161	3.7
Naval port service (e.g. pilot/tug)	0	0.0
Railway tractors	0	0.0
Anchored ships	0	0.0
Ships maneuvering	223.6	5.1
Moored ships	3799.1	87.3
TOTAL	**4351.6**	**100**

Table 14: Overall GHG emissions

GHG emissions in the Port of Zadar are very specific and there are no significant terrestrial GHG emissions. Shore-side emissions are produced indirectly by electrical energy consumption or directly from road vehicle traffic inside the port area and from the natural gas boilers used for heating. Terrestrial emissions make only 7.6% of overall GHG emissions in Port of Zadar, maritime emissions account up to 92.4%. Largest terrestrial GHG producer is road transport, partially due to the relatively long ferry approach inside the port area of almost 1 km, however expected emission from this category will undoubtedly decrease in the coming years due to the increasing share of electric vehicles. This trend will be heavily influenced by development of EV infrastructure on nearby islands. Table 14 represents fuel consumption and air emissions from cruise ships in Europe in 2017 (source: study transport & environment, 2019)

Number of cruise ships	Total SO_x (kt)	Total NO_x (kt)	Total PM (kt)	Total CO_2 (kt)	Total Fuel consumption (kt)
203	62	155	10	10,286	3,267

Table 15: Fuel consumption and air emissions from cruise ships

Largest part of the emissions is attributed to the large cruise ships, which is very important considering their small numbers. Enormous 85.6% of all emissions are caused only by cruisers mooring, making them an ideal candidate for any measures towards reduction of GHG emissions.

Different activities can be taken to decrease these emissions, among which shore-to-ship power supply could provide most benefit. Such systems could be installed only for cruise ship arrivals, as ferries produce relatively small mooring emissions. Considering expected raise in ETS pricing towards 65 €/t in 2030, ship operators could find further incentives for welcoming such systems.

CO_2 emission is the main greenhouse gas produced by ships and the focus of this report, but nitrogen oxides (NOx), and sulphur oxides (SOx) are also very important pollutants. CO_2 contributes to global warming by trapping heat in the atmosphere, and negatively affects marine ecosystems by increasing the acidity of seawater. Currently, CO2 emissions from international shipping amount to around 800 million tons of CO2 per year, making the shipping sector a substantial contributor to climate change. These CO2 emissions represent approximately 2-3% of total global CO2 emissions and around 97% of all GHG emissions coming from international shipping.

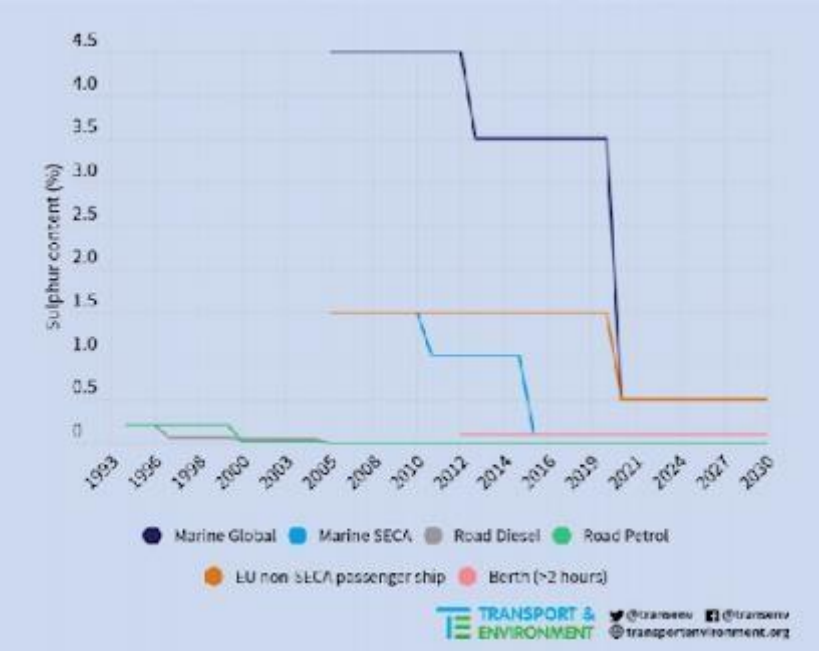

Figure 24: Sulphur standards for marine and road fuels
Source: Study transport & environment, 2019

The fact that the most frequent route Zadar-Preko could be electrified in the near future is probably the best possible project for Gazenica together with ensuring electric connection (shore to ship) for cruisers. These projects will ensure that Gazenica will keep minor emissions despite the predicted increase in all types of traffic (cruisers as well as ferries).

This Study indicates that New Port of Gazenica is not problematic in terms of emissions at the moment of this analysis. This is especially important when observing environmental impact on the surrounding areas especially the city of Zadar and its inhabitants. Given the fact that one of the main objectives when constructing New Port of Gazenica was relocation of traffic from the center of the city of Zadar, it is significant to emphasize the environmental importance of this project. Due to the fact that passenger terminals are quite modern with very well-organized traffic into the port the only challenge for the port is to ensure enough electric capacity for future growth. This electric capacity is ultimately aimed for expected cruisers staying for more than one day but also for all other types of e-vehicles: e-taxi boats and e-ferries. Great perspective is shown for installing PV panels in order to ensure green electricity in the port area. Through the SUSPORT pilot action *D.4.2.9* Port of Zadar Authority will present to the investors that ecosystem PV-batteries-chargers-e-car-

light could be completely sustainable with zero emissions. In this manner authorities need to develop all potential projects related to renewable sources of energy. Also, some light measures like education of the staff are very welcome. Some literature sources mention that the way of maneuvering the ship may influence the emission volume up to 15%–18% which is a significant percentage that should be taken into account when planning education of the staff. Seaports, as well as shipping companies, may change their procedures and introduce strict conditions of skill verification during employee hiring and professional work, in pursuit of reducing the volume of emissions at seaports. Companies may organize regular training and invest in employee education aiming at improving staff qualifications in supporting decision-making during maneuver operations. These activities may affect development of the environmental policy by the Port of Zadar Authority in order to decrease the costs of ship operation, as well as emission volume. Achieved results also proved that maritime education quality is very important to obtain the necessary qualifications for ships operators. This justifies the need to raise the quality of professional education at the universities and increase the number of practical hours on simulators for seafarers, which will enable an increase in their qualifications and attractiveness on the labor market. Moreover, the presented approach may be useful for seaports and shipping companies and may be implemented to assess the personal qualifications during the selection of staff responsible for ships' steering.

Therefore, we can generally conclude that New Port of Gazenica hasn't got any serious CO_2 emissions, but the Port of Zadar Authority needs to be ready for e-mobility and ensure enough electric capacity in the port area. Figure 25 below gives an overview of calculated emissions in the New Port of Gazenica for each berth.

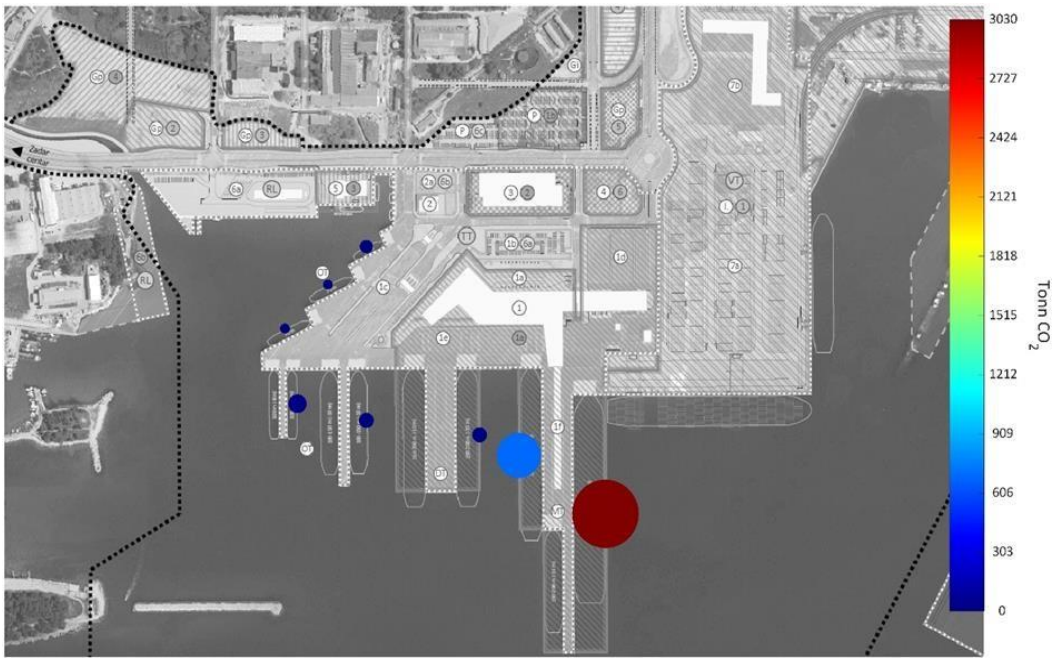

Figure 25: Mapped emissions for all berths
Source: Author

Taking into consideration statistics and comparison with other EU ports it can be concluded that there is no significant data for CO2 emissions which could be used except the data that EU citizens in average produces around 7t of CO2 per year (source: EUROSTAT, 2018). Specific emission per passenger and hour represents only **0,6 tCO2**/passenger&hour. This is a very good result because ratio is without ferry passengers (only 182 682 passengers from cruisers are calculated). Another specific emission per worker (115 workers responsible for variety operations within the port is daily average) represent also very low **37,8** t of CO2 per year.

Rank	Country	Ship CO_2 (Mt)	Comparison	CO_2 from passenger cars (Mt)	
1	Netherlands	19.9	larger	16.7	Total national car fleet
2	Spain	17.1	larger	12.2	Cars from Top 30 cities (municipalities)
3	UK	14.2	larger	13.9	Cars from Top 17 cities (incl. Greater London area)
4	Italy	13.7	larger	13.5	Cars from 4 large provinces (Rome, Milan, Turin, Bologna)
5	Germany	12.3	larger	9.4	Cars from Top 10 cities (incl. state of Berlin and Hamburg)
6	Belgium	10.0	comparable	11.7	Total national car fleet
7	France	9.8	larger	9.6	Cars from Top 10 cities and 1 large region (Grand Est)
8	Greece	6.6	Equal to 2/3	10.7	Total national car fleet
9	Sweden	6.0	larger	4.3	Cars from Top 30 cities (communes)
10	Norway	5.4	comparable	5.4	Total national car fleet
11	Finland	3.9	larger	2.3	Cars from Top 10 cities
12	Denmark	3.6	Equal to 2/3	5.0	Total national car fleet
13	Portugal	2.9	larger	2.8	Cars from Top 8 cities
14	Poland	2.9	larger	2.7	Capital region (Warsaw)
15	Ireland	1.6	comparable	1.7	Cars from three large cities (Dublin, Cork, Limerick)
16	Latvia	1.5	larger	1.4	Total national car fleet
17	Lithuania	1.4	Equal to 1/2	2.6	Total national car fleet
18	Estonia	1.4	larger	1.4	Total national car fleet
19	Croatia	1.3	Equal to 1/3	3.2	Total national car fleet

Figure 26 : CO2 from ships vs. emission from the national car fleet
Source: Transport & Environment, December 2019

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ANNEX I

CALCULATION OVERVIEW

TNA (7.2)

		Electric energy	Heating	Service vehicles	Port operational veh.	Heavy-duty veh (Road veh)	Railway tractors	Others
Terrestrial:	t_{CO2}/Y	**138,84**	**28,00**	0	0	**161,0306217**	0	0

		Ship waiting time at sea	Ships manoeuvring:	Moored ships
Maritime:	t_{CO2}/Y	0	223,6	3799,1
Overall:	t_{CO2}/Y			

Diesel DOV	42,7	MJ/kg
Diesel CO2	3,2	kg_CO2/kg_g
SOC MSD	**0,195**	kg_g/kWh
SOC LSD	**0,175**	kg_g/kWh

All ships
Cruisers

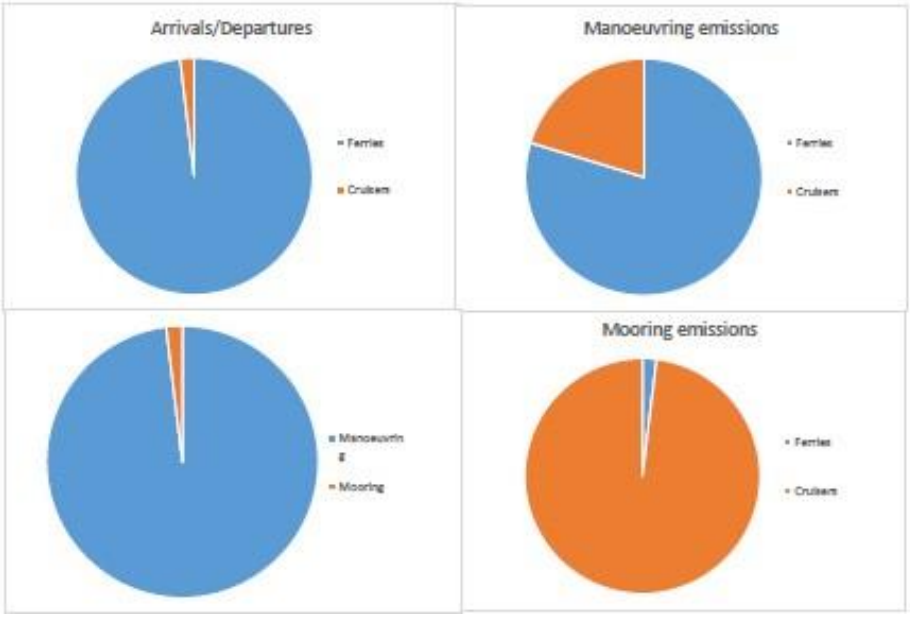
Max speed	5	knots	2,572 m/s
Power coeff manoeu	**0,2**		

Generator co	Liners	0,205718824	25,9
	Cruise	0,217527387	27,8
	Excursi	0,1	
	Other	0,211977985	26,9
Generator lo	Liners	0,3	
	Cruise	0,64	
	Excursi	0,3	
	Other	0,3	

139,9	3,2
28	0,6
0	0,0
0	0,0
161	3,7
0	0,0
0	0,0
0	0,0
223,6	5,1
3799	87,3
4351,5	100

Emissions (t	Arrival	Manoeuvring	Mooring	At anchor	
Ferries	7309	178,2	72,9	0,0	
Cruisers	142	45,4	3726,2	0,0	
Sum		223,6	3799,1	0,0	**4022,7**
%		5,559470276	94,44052972	0	**100%**

16,98732524



COMBUSTION EMISSIONS

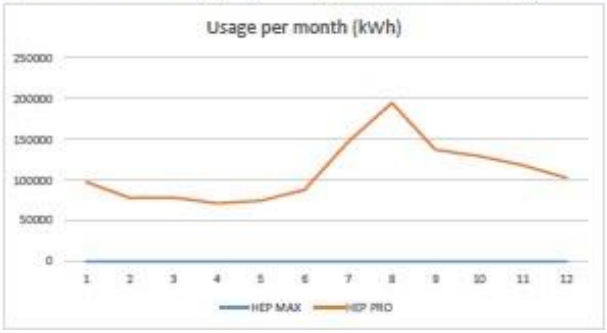
all combustion emissions are coming from heating

Natural gas		
Consumption	m^3/y	15000
Heating value	kWh/m3	9,26
	MJ/m^3	33,34
Specific emissions	$kgCO_2/MJ$	0,06
	$kgCO_2/m^3$	1,87
Overall emissions	tonne CO_2	28,00

ELECTRIC ENERGY

			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	total
HEP MAX		kWh	210	187	222	205	212	207	217	190	170	177	171	174	2342
HEP PRO	higher	kWh	53817	42258	42732	37980	39516	56013	100002	135102	89073	78606	69426	58251	
	lower	kWh	43659	35871	35769	33555	35274	32133	46821	59325	48003	50622	48642	44469	
	total	kWh	97476	78129	78501	71535	74790	88146	146823	194427	137076	129228	118068	102720	1316919
Overall		kWh	97686	78316	78723	71740	75002	88353	147040	194617	137246	129405	118239	102894	1319261
CO2 emissions		kg	10354,72	8301,50	8344,64	7604,44	7950,21	9365,42	15586,24	20629,40	14548,08	13716,93	12533,33	10906,76	139841,67
		tonn	10,354716	8,301496	8,344638	7,60444	7,950212	9,365418	15,58624	20,6294	14,54808	13,71693	12,53333	10,90676	139,841666

specific emission factor CO2 (kg/kWh) divided by total amount of used el. energypo in Croatia, 2018. **0.106** kg/kWh ENERGIJA U HRVATSKOJ 2018



FERRIES

	Power (kW)	Number of departueres (2019)	Manoeuvring emissions	Manoeuvring emissions 2019 (kg)	Mooring time/dep (h)	Mooring emissions (kg)
Vladimir Nazor	2386	133	33,871	4504,829753	0,25	3055,216335
Cres	1616	5751	22,940	131929,2296	0,083333333	29825,19943
Mate Balota	1969	162	27,951	4528,110673	0,25	3071,005666
Brač	1764	822	25,041	20583,85438	0,25	13960,15645
Sis	2388	389	33,899	13186,8245	0,25	8943,423795
Zadar (Ancona)	7000	52	66,611	3463,755314	1	14017,84527
Ferries overall		7309		178,1966042 tonn		72,87284695

Departure path length	Island terminal	526,6 m
	Costal terminal	457 m
	International	353 m

CRUISERS

CRUISER	Predicted berth	Date	Arrival	Departure	Duration	Duration (h)	BT	Company	Power (kW)	Man. emissions (kg)	Moor. emissions (kg)	number
SPIRIT OF DISCOVERY	11/Gaženica	20.03.2021.	8:00	17:00	9:00	9,00	58119	Saga Cruises	25678,11942	219,2867914	18017,22	1
MSC OPERA	11/Gaženica	28.03.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	2
MSC LIRICA	11/Gaženica	29.03.2021.	8:00	18:00	10:00	10,00	65591	MSC Cruises	30600	261,318818	23856,32	3
MSC OPERA	11/Gaženica	04.04.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	4
AIDABLU	11/Gaženica	07.04.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	5
MSC MUSICA	10/Gaženica	10.04.2021.	9:00	18:00	9:00	9,00	92409	MSC Cruises	58000	495,310178	40696,07	6
AIDABLU	11/Gaženica	10.04.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	7
MSC OPERA	11/Gaženica	11.04.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	8
MSC LIRICA	11/Gaženica	13.04.2021.	8:00	15:00	7:00	7,00	65591	MSC Cruises	30600	261,318818	16699,42	9
MV Hamburg ?	Gaženica?	13.04.2021.	13:00	23:00	10:00	10,00	15000	Plantours	10840,17614	92,57326851	8451,20	10
AIDABLU	11/Gaženica	17.04.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	11
MSC OPERA	11/Gaženica	18.04.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	12
AIDABLU	10/Gaženica	21.04.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	13
AIDABLU	10/Gaženica	24.04.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	14
MSC OPERA	11/Gaženica	25.04.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	15
AZURA	11/Gaženica	27.04.2021.	8:00	17:00	9:00	9,00	115055	P&O Cruises	80186,82664	684,7819202	56263,60	16
RHAPSODY OF THE SEAS	11/Gaženica	29.04.2021.	7:00	18:00	11:00	11,00	78878	RCCL	62400	532,8854529	53512,99	17
AIDABLU	10/Gaženica	01.05.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	18
MSC OPERA	11/Gaženica	02.05.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	19
AIDABLU	10/Gaženica	05.05.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	20
AIDABLU	11/Gaženica	08.05.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	21
ARTANIA	10/Gaženica	08.05.2021.	8:00	17:00	9:00	9,00	44348	Phoenix Reisen	27840	237,7488854	19534,11	22
MSC OPERA	11/Gaženica	09.05.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	23
Silver Spirit	Gaženica?	13.05.2021.	8:00	18:00	10:00	10,00	36009	SilverSea Cruises	16501,30131	140,9183188	12864,71	24
MSC ORCHESTRA	11/Gaženica	14.05.2021.	13:00	19:00	6:00	6,00	92409	MSC Cruises	50980,29803	435,3631119	23847,10	25
AIDABLU	10/Gaženica	15.05.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	26
MSC OPERA	11/Gaženica	16.05.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	27
AZURA	11/Gaženica	17.05.2021.	8:00	17:00	9:00	9,00	115055	P&O Cruises	80186,82664	684,7819202	56263,60	28
AIDABLU	11/Gaženica	20.05.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	29
AIDABLU	11/Gaženica	22.05.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	30
MSC LIRICA	11/Gaženica	23.05.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	31
SEVEN SEAS MARINER	11/Gaženica	25.05.2021.	7:00	16:00	9:00	9,00	48075	Regent Seven Seas Cruises	21004,97354	179,378917	14738,27	32
Celebrity Constellation	11/Gaženica	28.05.2021.	7:00	16:00	9:00	9,00	90940	Celebrity Cruises	50000	426,9915327	35082,82	33
AIDABLU	11/Gaženica	29.05.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	34
Marella Explorer 2	11/Gaženica	30.05.2021.	8:00	18:00	10:00	10,00	72458	Marella Cruises	29250	249,7900467	22805,83	35
MSC LIRICA	11/Gaženica	30.05.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	36
AIDABLU	11/Gaženica	03.06.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	37
Mein Schiff 5	11/Gaženica	04.06.2021.	7:00	19:00	12:00	12,00	98785	TUI Cruises	57914,00541	494,5757988	54180,97	38
Seabourn Ovation	Gaženica 8?	04.06.2021.	10:00	18:00	8:00	8,00	41865	Seabourn Cruise Line	18551,65948	158,4280303	11570,57	39
AIDABLU	10/Gaženica	05.06.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	40
VOLENDAM	10/Gaženica	06.06.2021.	8:00	17:00	9:00	9,00	61214	Holland America Line	27317,82023	233,2895586	19167,72	41
MSC OPERA	11/Gaženica	06.06.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	42
Mein Schiff 5	11/Gaženica	07.06.2021.	9:00	22:00	13:00	13,00	98785	TUI Cruises	57914,00541	494,5757988	58696,05	43
Mein Schiff 5	Gaženica	11.06.2021.	10:00	18:00	8:00	8,00	98785	TUI Cruises	57914,00541	494,5757988	36120,65	44

CRUISERS (cont'd)

AIDABLU	10/Gaženica	12.06.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	45
Norwegian Spirit	11/Gaženica	12.06.2021.	9:00	19:00	10:00	10,00	75904	NCL	58800	502,1420425	45841,55	46
Celebrity Constellation	11/Gaženica	13.06.2021.	10:00	18:30	8:30	8,50	90940	Celebrity Cruises	50000	426,9915327	33133,77	47
MSC OPERA	11/Gaženica	13.06.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	48
AIDABLU	11/Gaženica	14.06.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	49
AIDABLU	11/Gaženica	19.06.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	50
MSC OPERA	11/Gaženica	20.06.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	51
Marella Discovery 2	Gaženica	21.06.2021.	8:00	17:00	9:00	9,00	69472	Marella Cruises	58500	499,5800933	41046,90	52
AIDABLU	11/Gaženica	26.06.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	53
AURORA	11/Gaženica	27.06.2021.	9:00	18:00	9:00	9,00	76152	P&O Cruises	36829,50333	314,5177216	25841,65	54
MSC OPERA	11/Gaženica	27.06.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	55
AIDABLU	11/Gaženica	01.07.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	56
Mein Schiff 5	11/Gaženica	02.07.2021.	7:00	19:00	12:00	12,00	98785	TUI Cruises	57914,00541	494,5757988	54180,97	57
Seabourn Ovation	Gaženica II?	02.07.2021.	10:00	18:00	8:00	8,00	41865	Seabourn Cruise Line	18551,65948	158,4280303	11570,57	58
AIDABLU	10/Gaženica	03.07.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	59
Norwegian Spirit	11/Gaženica	03.07.2021.	8:00	17:00	9:00	9,00	75904	NCL	58800	502,1420425	41257,39	60
Silver Moon	Gaženica II?	03.07.2021.	9:00	19:00	10:00	10,00	40700	SilverSea Cruises	18124,40269	154,7793297	14130,11	61
Marella Explorer 2	11/Gaženica	04.07.2021.	8:00	18:00	10:00	10,00	72458	Marella Cruises	29250	249,7900467	22803,83	62
MSC OPERA	11/Gaženica	04.07.2021.	8:00	18:00	10:00	10,00	65591	MSC Cruises	30600	261,318818	23856,32	63
AIDABLU	10/Gaženica	10.07.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	64
Celebrity Infinity	11/Gaženica	10.07.2021.	9:30	18:30	9:00	9,00	90940	Celebrity Cruises	50000	426,9915327	35082,82	65
MSC OPERA	11/Gaženica	11.07.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	66
AIDABLU	10/Gaženica	17.07.2021.	9:00	17:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	67
ZUIDERDAM	11/Gaženica	17.07.2021.	8:00	17:00	9:00	9,00	82820	Holland America Line	42083,64751	359,387223	29528,26	68
SEVEN SEAS MARINER	10/Gaženica	18.07.2021.	8:00	18:00	10:00	10,00	48075	Regent Seven Seas Cruises	21004,97354	179,578917	16375,86	69
AZURA	11/Gaženica	18.07.2021.	8:00	17:00	9:00	9,00	115055	P&O Cruises	80186,82664	684,7819202	56263,60	70
AIDABLU	11/Gaženica	24.07.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	71
MSC OPERA	11/Gaženica	18.07.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	72
Norwegian Spirit	11/Gaženica	20.07.2021.	9:00	18:00	9:00	9,00	75904	NCL	58800	502,1420425	41257,39	73
Amadea	11/Gaženica	22.07.2021.	9:00	15:00	6:00	6,00	28856	Phoenix Reisen	14301,71192	122,1341979	6689,92	74
WESTERDAM	11/Gaženica	23.07.2021.	8:00	17:00	9:00	9,00	82820	Holland America Line	42083,64751	359,387223	29528,26	75
Celebrity Constellation	10/Gaženica	23.07.2021.	7:00	16:00	9:00	9,00	90940	Celebrity Cruises	50000	426,9915327	35082,82	76
AIDABLU	10/Gaženica	24.07.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	77
Marella Explorer 2	10/Gaženica	25.07.2021.	8:00	18:00	10:00	10,00	72458	Marella Cruises	29250	249,7900467	22803,83	78
MSC OPERA	11/Gaženica	25.07.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	79
AIDABLU	11/Gaženica	28.07.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	80
Mein Schiff 5	11/Gaženica	30.07.2021.	7:00	19:00	12:00	12,00	98785	TUI Cruises	57914,00541	494,5757988	54180,97	81
Seabourn Ovation	Gaženica/Split	30.07.2021.	10:00	18:00	8:00	8,00	41865	Seabourn Cruise Line	18551,65948	158,4280303	11570,57	82
AIDABLU	11/Gaženica	31.07.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	83
MSC OPERA	11/Gaženica	01.08.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	84
AZURA	11/Gaženica	02.08.2021.	8:00	17:00	9:00	9,00	115055	P&O Cruises	80186,82664	684,7819202	56263,60	85
ROTTERDAM	11/Gaženica	03.08.2021.	7:00	15:00	8:00	8,00	99836	Holland America Line	59144,2423	505,0818134	36887,94	86
ZUIDERDAM	11/Gaženica	05.08.2021.	8:00	17:00	9:00	9,00	82820	Holland America Line	42083,64751	359,387223	29528,26	87
AIDABLU	10/Gaženica	07.08.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	88
Celebrity Constellation	11/Gaženica	08.08.2021.	10:00	18:30	8:30	8,50	90940	Celebrity Cruises	50000	426,9915327	33133,77	89
MSC OPERA	11/Gaženica	08.08.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	90
AIDABLU	11/Gaženica	12.08.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	91
AIDABLU	11/Gaženica	14.08.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	92
MSC OPERA	11/Gaženica	15.08.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	93

CRUISERS (cont'd)

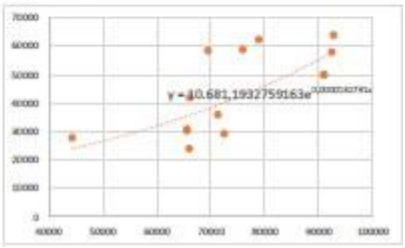
SEVEN SEAS MARINER	10/Gafenica	16.08.2021.	7:00	17:00	10:00	10,00	48075	Regent Seven Seas Cruises	21004,97354	179,378917	16375,86	94
AIDABLU	11/Gafenica	21.08.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	95
MSC OPERA	11/Gafenica	22.08.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	96
AIDABLU	11/Gafenica	26.08.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	97
Mein Schiff 5	11/Gafenica	27.08.2021.	7:00	19:00	12:00	12,00	98785	TUI Cruises	57914,00541	494,5757988	54180,97	98
Seabourn Ovation	Gazenica 3?	27.08.2021.	10:00	18:00	8:00	8,00	41865	Seabourn Cruise Line	18551,65948	158,4280303	11570,57	99
AIDABLU	11/Gafenica	28.08.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	100
Marella Explorer 2	10/Gafenica	29.08.2021.	8:00	18:00	10:00	10,00	72458	Marella Cruises	29250	249,7900467	22803,83	101
WESTERDAM	11/Gafenica	30.08.2021.	8:00	17:00	9:00	9,00	82820	Holland America Line	42083,64751	359,387223	29528,26	102
MSC OPERA	11/Gafenica	03.09.2021.	13:00	19:00	6:00	6,00	65591	MSC Cruises	30600	261,318818	14313,79	103
AIDABLU	11/Gafenica	04.09.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	104
MSC OPERA	11/Gafenica	05.09.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	105
Silver Moon	Gazenica?	07.09.2021.	9:00	19:00	10:00	10,00	40700	SilverSea Cruises	18124,40269	154,7793297	14130,11	106
AIDABLU	11/Gafenica	08.09.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	107
ZUIDERDAM	11/Gafenica	10.09.2021.	8:00	17:00	9:00	9,00	82820	Holland America Line	42083,64751	359,387223	29528,26	108
AIDABLU	11/Gafenica	11.09.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	109
MSC OPERA	11/Gafenica	12.09.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	110
Celebrity Constellation	11/Gafenica	17.09.2021.	7:00	16:00	9:00	9,00	90940	Celebrity Cruises	50000	426,9915327	35082,82	111
AIDABLU	11/Gafenica	18.09.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	112
MSC OPERA	11/Gafenica	19.09.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	113
AIDABLU	11/Gafenica	23.09.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	114
Mein Schiff 5	11/Gafenica	24.09.2021.	7:00	19:00	12:00	12,00	98785	TUI Cruises	57914,00541	494,5757988	54180,97	115
Seabourn Ovation	Gazenica 3?	24.09.2021.	10:00	18:00	8:00	8,00	41865	Seabourn Cruise Line	18551,65948	158,4280303	11570,57	116
AIDABLU	11/Gafenica	25.09.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	117
MSC LIRICA	11/Gafenica	25.09.2021.	8:00	18:00	10:00	10,00	65591	MSC Cruises	30600	261,318818	23856,32	118
MSC OPERA	11/Gafenica	26.09.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	119
Marella Explorer 2	10/Gafenica	26.09.2021.	8:00	18:00	10:00	10,00	72458	Marella Cruises	29250	249,7900467	22803,83	120
Silver Moon	Gazenica?	01.10.2021.	8:00	18:00	10:00	10,00	40700	SilverSea Cruises	18124,40269	154,7793297	14130,11	121
AIDABLU	11/Gafenica	02.10.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	122
Celebrity Constellation	11/Gafenica	03.10.2021.	10:00	18:30	8:30	8,50	90940	Celebrity Cruises	50000	426,9915327	33133,77	123
MSC OPERA	11/Gafenica	03.10.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	124
AZURA	11/Gafenica	06.10.2021.	8:00	17:00	9:00	9,00	115055	P&O Cruises	80186,82664	684,7819202	56263,60	125
AIDABLU	11/Gafenica	07.10.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	126
AIDABLU	10/Gafenica	09.10.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	127
Queen Victoria	11/Gafenica	09.10.2021.	8:00	18:00	10:00	10,00	90049	Cunard Line	48629,93292	415,2913919	37912,78	128
MSC OPERA	11/Gafenica	10.10.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	129
AIDABLU	10/Gafenica	16.10.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	130
ZUIDERDAM	11/Gafenica	16.10.2021.	8:00	17:00	9:00	9,00	82820	Holland America Line	42083,64751	359,387223	29528,26	131
SEVEN SEAS MARINER	Gafenica	17.10.2021.	7:00	17:00	10:00	10,00	48075	Regent Seven Seas Cruises	21004,97354	179,378917	16375,86	132
Marella Explorer 2	10/Gafenica	17.10.2021.	8:00	18:00	10:00	10,00	72458	Marella Cruises	29250	249,7900467	22803,83	133
MSC OPERA	11/Gafenica	17.10.2021.	10:30	18:00	7:30	7,50	65591	MSC Cruises	30600	261,318818	17892,24	134
Amadea	11/Gafenica	18.10.2021.	8:00	20:00	12:00	12,00	28856	Phoenix Reisen	14301,71192	122,1341979	13379,85	135
AIDABLU	11/Gafenica	21.10.2021.	8:00	18:00	10:00	10,00	71304	Aida Cruises	36000	307,4339036	28066,25	136
AIDABLU	11/Gafenica	23.10.2021.	10:00	18:00	8:00	8,00	71304	Aida Cruises	36000	307,4339036	22453,00	137
MS RIVIERA	11/Gafenica	29.10.2021.	8:00	18:00	10:00	10,00	66084	Oceania Cruises	42000	358,6728875	32743,96	138
MSC LIRICA	11/Gafenica	06.11.2021.	8:00	18:00	10:00	10,00	65591	MSC Cruises	30600	261,318818	23856,32	139
MS Marina	11/Gafenica	10.11.2021.	8:00	18:00	10:00	10,00	66000	Oceania Cruises	24000	204,9559357	18710,84	140
COSTA DELIZIOSA	11/Gafenica	19.12.2021.	8:00	17:00	9:00	9,00	92720	Costa Cruises	64000	546,5491619	44906,01	141
COSTA DELIZIOSA	11/Gafenica	31.12.2021.	8:00	1:00	17:00	17,00	92720	Costa Cruises	64000	546,5491619	84822,46	142

CRUISERS (cont'd)

45,44513816 3726,202167 tonn

All ships			GT				
SPIRIT OF DISCOVERY	1	25678,11942	58119				
MSC OPERA	2	30600	65591				
MSC LIRICA	3	30600	65591				
AIDABLU	4	36000	71304				
MSC MUSICA	5	58000	92409				
MSC OPERA	6	30600	65591				
MV Hamburg ?	7	10840,17614	15000	Departure path length	International	353 m	
AZURA	8	80186,82664	115055				
RHAPSODY OF THE SEAS	9	62400	78878				
ARTANIA	10	27840	44348				
Silver Spirit	11	16501,30131	36009				
MSC ORCHESTRA	12	50680,29803	92409				
SEVEN SEAS MARINER	13	21004,97354	48075				
Celebrity Constellation	14	50000	90940				
Marella Explorer 2	15	29250	72458				
Mein Schiff 5	16	57914,00641	98785				
Seabourn Ovation	17	18551,65948	41865				
VOLENDAM	18	27317,82023	61214				
Norwegian Spirit	19	58800	75904				
Marella Discovery 2	20	58500	69472				
AURORA	21	36829,50933	76152				
Silver Moon	22	18124,40269	40700				
Celebrity Infinity	23	50000	90940				
ZUIDERDAM	24	42083,64751	82820				
Amadea	25	14301,71192	28856				
WESTERDAM	26	42083,64751	82820				
ROTTERDAM	27	59144,2423	99836				
Queen Victoria	28	48829,93292	90049				

30600	65591
30600	65591
36000	71304
58000	92409
30600	65591
62400	78878
27840	44348
50000	90940
29250	72458
58800	75904
58500	69472
50000	90940
42000	66084
24000	66000
64000	92720



ROAD VEHICLES