

# Local action plan for the port of Split

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## Introduction

The local action plan for the port of Split is based on the common methodology developed by the Work Package Leader, the analysis of its carbon footprint in the Territorial needs assessment for the port of Split (D.3.2.12) and the Best practices analysis (D.3.2.13). This document defines long-term and medium-term measures which can help solve the issues identified and raised in the TNA. The document identifies and evaluates energy sustainability measures as well as contains important actions for energy efficiency and sustainability for the Port of Split.

Preserving the environment and the well-being of all forms of life is of great importance, and it is the reason why the concepts of sustainability and energy efficiency are being increasingly developed and used in multiple different sectors, including the transport sector. The European Union also supports these developments and is encouraging the development of green solutions within ports with the goal of reducing Carbon dioxide (CO<sub>2</sub>) and Greenhouse gases (GHG) emissions as well as final energy consumption in the transport sector as a whole, including ports. With the rise of the amount of passenger transport and freight transport in the past few years, it is more important than ever to develop environmentally friendly solutions and to reduce the overall carbon footprint of the sector.

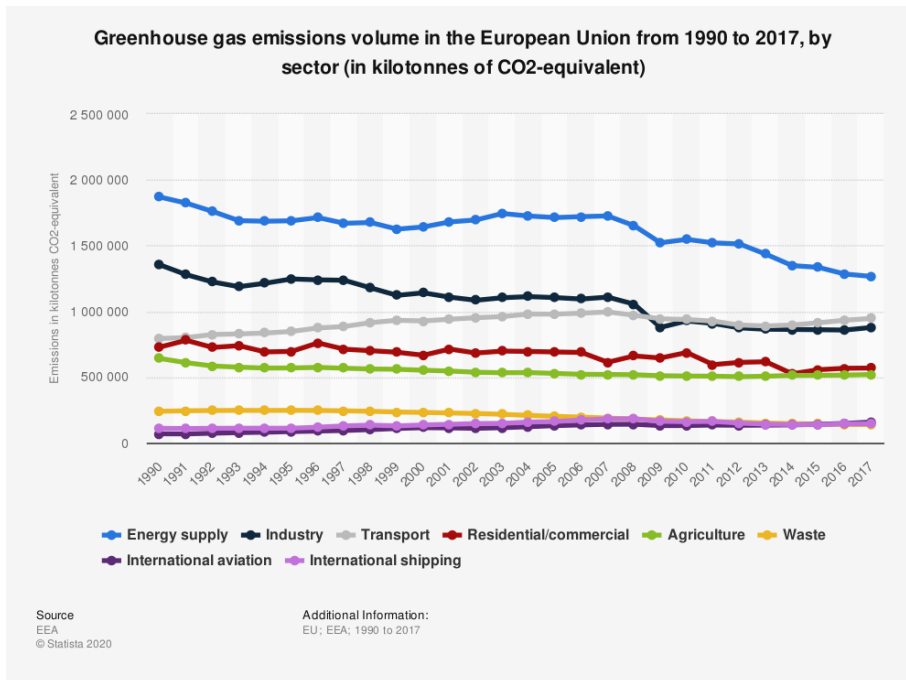


Figure 1: Greenhouse gas emissions in the EU by sector (1990 – 2017)

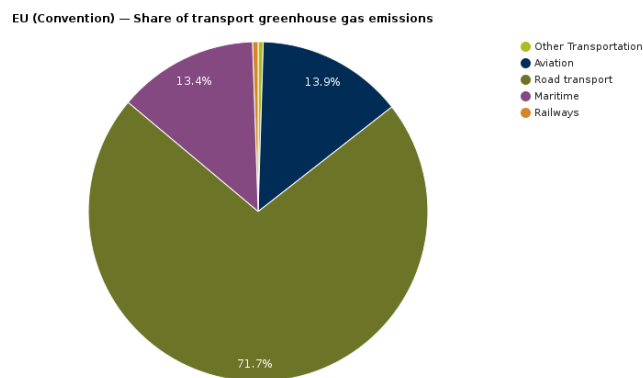
Source: EEA Statista; <https://www.statista.com/statistics/1171183/ghg-emissions-sector-european-union-eu/>

Sector	Volume of GHG emissions (in kilotonnes of CO <sub>2</sub> -equivalent)	Percentage of GHG by sector
Energy supply	1,265,539	27,39%
Industry	877,315	18,99%
Transport	945,872	20,47%
Residential / commercial	568,900	12,31%
Agriculture	519,907	11,25%
Waste	138,866	3,01%
International aviation	158,268	3,43%
International shipping	145,765	3,15%
Total	4,620,432	100

Table 1: Greenhouse gas emissions in the EU by sector in 2017

Source: Made by the author based on the data from EEA Statista; <https://www.statista.com/statistics/1171183/ghg-emissions-sector-european-union-eu/>

Transport produced the 2nd most GHG among the listed sectors, only coming behind energy supply. A large issue here is with the modal shift, meaning that the largest amount of transport is being carried out by road vehicles which are more damaging to the environment, rather than by railway and maritime transport options which are more environmentally friendly.



Data sources:  
National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism provided by European Environment Agency (EEA)



Figure 2: Emissions of GHG by transport mode in the EU (2019)

Source: European Environmental Agency; <https://www.eea.europa.eu/data-and-maps/data/national-emissions-reported-to-the-unfccc-and-to-the-eu-greenhouse-gas-monitoring-mechanism-16>

This clearly shows that road transportation is the most used mode of transport in the EU, but it is also the largest pollutant in the transport section. The EU encourages the modal shift in the transport sector from road transport to other, more sustainable modes, such as railways and maritime transport.

As for the Port of Split, the City port of Split is the main focus of this plan. The City port of Split has an emphasis on passenger transport, as it is located in the city center and offers 3,64-kilometre-long operative coast with 27 berths. It handles the reception of passenger ships in both domestic and

international traffic, including smaller vessels intended for tourist traffic, public vessels, warships, reception of large and medium ships on cruises. The maximum depth inside the port reaches 10,5 metres, and the maximum length of the ship at berth is 320 metres. This local action plan relies on findings from the analysis of the main needs of the Port of Split, which is conducted within this document, as well as relying on the findings in the previously issued deliverables D.3.2.12 Territorial needs assessment for the Port of Split, D.3.2.13. Best practice analysis. This action plan will explore the best practices, calculate the carbon footprint of the port, and define the port's priorities in line with the regulations on the local, national and regional levels.

## SWOT analysis – weaknesses and threats tackled

This section of the document focuses on two out of four categories within the SWOT analysis made within the D.3.2.12 TNA for the Port of Split. Out of all the listed weaknesses and threats, a few will be selected, analysed and tackled by this action plan. This detailed analysis will serve as a basis for the pilot action to be implemented by the Port of Split Authority, as well as any other future actions.

The following weakness and threat will be tackled in this action plan:

- Non-existing energy efficient solutions in the port area
- An increase in cruise traffic may cause an increase in the carbon footprint

### Non-existing energy efficient solutions in the port area

Making the most out of the newly available technological achievements and solutions which support sustainability and environmental aspects is key for all modern-day institutions, especially ports. Multiple EU policies, strategies and programmes support projects and activities whose goal is to make the transport sector move towards greener solutions. The Port of Split Authority's pilot action within SUSPORT consists of installing LED light bulbs within the port, as well as mobilising stations which monitor the air quality. Replacing the current lighting system within the port with LED light bulbs contributes significantly towards reducing the amount of energy used and is the part of the pilot action which directly contributes towards neutralising this weakness. Installing the mobile stations for monitoring air quality doesn't directly contribute towards energy efficiency but towards monitoring and regulating pollution levels in the port area.



Lumens / Type of bulb	220+	400+	700+	900+	1300+
Standard bulb	25W	40W	60W	75W	100W
Halogen bulb	18W	28W	42W	53W	70W
CFL bulb	6W	9W	12W	15W	20W
LED bulb	4W	6W	10W	13W	18W

Table 2: Comparison of different lightbulb types and their energy efficiency

Source: created by the author based on: <https://www.lampsone.com/blog/led-light-bulb-conversion-chart/>

### Increase in cruise traffic may cause an increase in the carbon footprint

Even though the growth of cruise traffic is good for the overall growth of any port, it brings with it a negative aspect in the form of an increase in the carbon footprint of that port. Awareness of the sea, land and air pollution is crucial for resolving the issues that arise with the increasing popularity of cruise tourism and the Adriatic Sea as a popular destination for cruise ships.

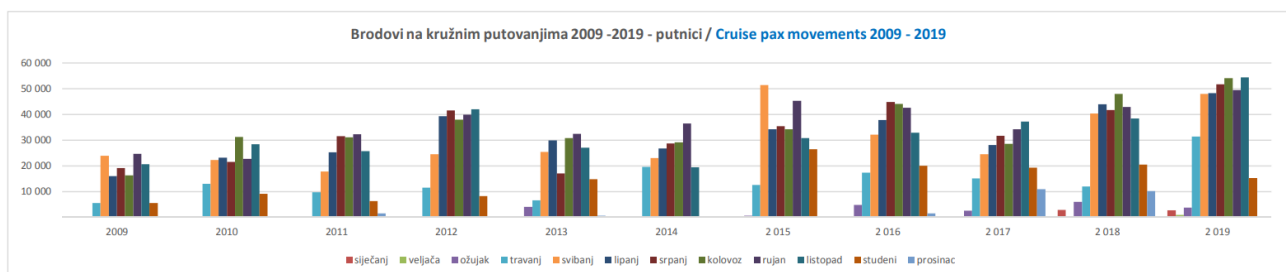


Figure 3: Passengers in cruise traffic 2009 – 2019 in the Port of Split

The chart and table above show that the total number of passengers who arrive in the Port of Split on cruise ships has more than doubled in 10 years' time. This drastic increase has engaged the need for environmental measures to reduce CO<sub>2</sub> and GHG emissions. The Port of Split Authority has responded to these needs, most notably, by introducing the Environmental Management System, to be submitted for PERS certification, which is a specific environmental management system intended for ports. The efforts to reduce the carbon footprint still continue today and the carbon

footprint increase is being countered by Port of Split Authority's pilot action, more specifically the part of the pilot action which focuses on installing the mobile stations for monitoring air quality. These mobile stations allow for continuous flow of data on the quality of air and the amount of pollution in the air. This monitoring process will allow the Port Authority to regulate the pollution levels by providing data that will make the future decision-making process for carbon footprint reduction measures easier.

## Actions for environmental sustainability and port energy efficiency

This part of the Action plan is based on the estimation of GHG emissions evaluation within the D.3.2.12 TNA for the Port of Split. The calculations within the document represent the actual situation in the port area and show potential environmental threats in the future. The main challenge in ports is to prevent pollution in all aspects, primarily air pollution in correlation to expected traffic increases in the port.

The electrification of ferries and vehicles is happening worldwide at a rapid pace. Today's leading technologies are now making it possible for ocean-going vessels to go electric, meaning that entirely battery-powered solutions are being made for ferries and vessels travelling shorter distances, while for longer routes, creating a hybrid solution is more suitable due to higher capacity needs. Stimulation of infrastructure for alternative fuels is necessary and there are plenty of funds supporting such projects. As stated in the TNA, for the Port of Split it is very important that the lack of infrastructure in case of expansion activities in the port (passenger terminal as well as economy activities) could be complementary with investments in the infrastructure for alternative fuels. The Port of Split as all other ports needs to think about ensuring power supply of ships (cold ironing) that are moored in the port for more than one day. This will open up the problem of connected power for EE in the Port of Split area. Currently, shipowners are not legally obliged to do so, so ships generally do not yet have the ability to supply EE from the shore and use MGO or HFO to power their generators (this is especially a problem of large cruisers with 3000-5000 guests where the connection power for EE is up to 12 MW).

Regarding GHG emissions, it has been narrowed down to several key sources of where the emissions are coming from, and those include:

- GHG from direct combustion,
- other direct emissions of GHG,
- GHG from electricity consumption,
- GHG from road vehicle freight traffic,
- GHG from ship traffic.

Each of these sources was analysed in detail in the TNA for the Port of Split, and several conclusions were made. Regarding the Port of Split, there are no GHG emissions associated with direct stationary combustion, as the port is primarily heated by heat pumps. There is, unfortunately, no available data regarding other direct emissions of GHG due to the lack of data on refrigerant gasses refilling and leakages. The two main refrigerant gasses, R410A and R32 have a large global warming potential, so it is important to acknowledge and calculate those emissions in future reports. Regarding GHG emissions from electricity consumption, it is possible to obtain precise consumption profiles throughout the year by analysing the electricity meters which are read on a monthly basis. The overall GHG emissions from electricity consumption in 2019 by the Port of Split amounted to 46,52 tonnes. GHG emissions from freight traffic are practically non-existent in the port due to it being a passenger port, however, there is a significant amount of vehicles that pass through the port area after arriving by ferry. In 2019 829,594 road vehicles passed through the Port of Split. Of those 635,755 were personal vehicles (cars, vans and bikes), 4,242 were buses and 189,597 trucks. Specific CO<sub>2</sub> 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 resulting from vehicle transport inside the port area in 2019 are estimated at 164.4 tonne

	Domestic	International	Total	GHG (t <sub>CO2</sub> )
Number of cars	599237	30673	629910	58.2
Motorbike		5845		
Number of buses	3089	1153	4242	3.2
Number of trucks	184073	5524	189597	98.5
<b>Vehicles</b>	<b>786399</b>	<b>43195</b>	<b>829 594</b>	<b>159.9</b>
18m	492			1.6
10m	1566			2.9
<b>Fuel tank trucks</b>	<b>2058</b>			<b>4.5</b>
<b>Total</b>				<b>164.4</b>

Table 3: overall of GHG emissions for road vehicles transferring and operating inside the port area

As the largest passenger port in Croatia, the Port of Split is a busy port serving all types of vessels, ranging from small tourist boats to large luxury cruisers. In 2019, there were 20,371 arrivals at the port, the majority of which were ferries and catamarans with 14,552 arrivals. GHG emissions were evaluated using a bottom-up approach, by estimating anchor, manoeuvring and moored emissions for each arrival of each ship, and the results for 2019 were as follows – the overall manoeuvring GHG emissions for all liners were equal to 871 tonne, for all tourist and excursion boats 57 tonne, and for all other vessels 53.6 tonne, out of which 48.12 tonne CO<sub>2</sub> was released by large cruisers with only 285 arrivals/departures. Mooring emissions are multiple times larger than manoeuvring emissions, amounting to 6628 tonnes for liners, 426 tonnes for excursion/tourist boats and 6997 for other vessels, out of which 6936 were caused by large cruisers.

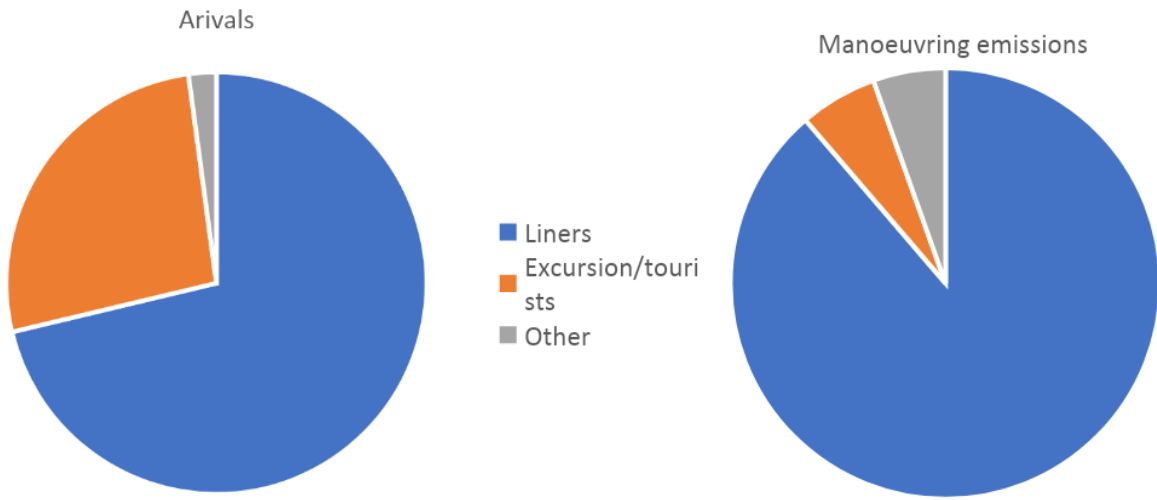


Figure 4: comparison of arrivals and manoeuvring GHG emissions by ship category

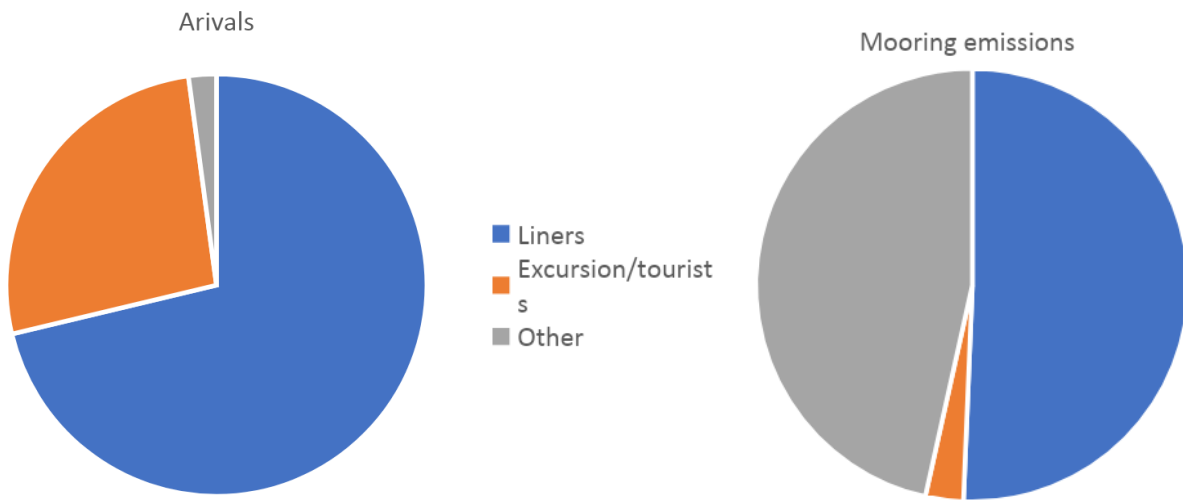


Figure 5: Mooring phase emissions compared to arrival emissions

<b>Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of Split, in 2019</b>		
<b>Category</b>	<b>t CO2eq</b>	<b>%</b>
Anchored ships	6.76	0.04
Ships manoeuvring	982.80	6.5
Moored ships	14052.5	93.4
<b>TOTAL</b>	<b>15042.0</b>	<b>100.00</b>

*Table 4: Overall of GHG emissions in maritime sector*

<b>Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of Split, in 2019</b>		
<b>Category</b>	<b>t CO2eq</b>	<b>%</b>
Electric energy	46.5	0.3
Heating	0.0	0.0
Service vehicles	0.0	0.0
Operational port vehicles	0.0	0.0
Heavy vehicles + Road vehicles	164.4	1.1
Naval port service (e.g. pilot/tug)	0.0	0.0
Railway tractors	0.0	0.0
Anchored ships	6.8	0.0
Ships manoeuvring	982.8	6.4
Moored ships	14052.5	92.1
<b>TOTAL</b>	<b>15252.9</b>	<b>100.0</b>

*Table 5: Overall of total GHG emissions*

What these figures and tables show is that the majority of GHG emissions, as expected, come directly from ship traffic, more precisely manoeuvring and mooring, with other sources of GHG being relatively negligible in comparison, with only electrical energy consumption and road vehicle traffic producing significant amounts. The largest percentage of emissions is contributed by large

cruise ships, as almost 40% of all emissions are caused by large cruiser ships mooring. Different activities can be taken to significantly decrease these emissions, among which shore-to-ship power supply, also known as cold ironing, could provide the most benefit, but this kind of project would need to be supported through EU funds.

From the analysis above, it is possible to conclude that the priority areas for the Port of Split are the following:

- Carbon footprint reduction
- Monitoring environmental impact
- Institutional Strengthening
- Education and training of staff
- Internal regulative framework

### Carbon footprint reduction and monitoring environmental impact

The participation in the SUSPORT project provides multiple direct and indirect benefits to the Port of Split Authority, which include improvements in the quality of port services and implementing a higher level of environmental protection and energy efficiency. The first two priority areas listed above will be tackled by the Port of Split Authority's pilot action within SUSPORT. The GHG emissions from ships mooring and manoeuvring will not be directly tackled within the project, but it is important to bring these issues to light, as the Port of Split Authority is continuously engaged in implementing measures to reduce its carbon footprint.

Replacing traditional metal halide light bulbs with energy efficient LED light bulbs in the whole port area will significantly reduce the usage of electric energy and the emissions coming from electric energy. The currently used lighting system uses significantly more energy (25% or more) than the modern LED lamps, and lasts significantly shorter than energy-efficient lightbulbs, resulting in more common and higher replacement expenses.

As previously mentioned, the Port of Split currently does not have monitoring stations for controlling the air quality in the port area, and have always resorted to using external services, such as the Annual report on air quality testing in the area of measuring station of the Port of Split Authority. In order to precisely report on emissions in the port area on their own, a monitoring

system needs to be introduced to the port. As part of its pilot action within SUSPORT, the Port of Split Authority will install mobile stations to monitor air quality. These new stations will enable the Port Authority to gather data independently and will contribute towards precise monitoring and regulating pollution levels in the port area. They will allow for continuous flow of data about the levels of air pollutants, as well as enabling the precise identification of their source on a regular basis.

### **Institutional Strengthening, education and training of staff**

Whenever new innovations and technologies are introduced in the port, it is important to educate staff on what has been brought in, as well as why it was brought in. It is of utmost importance to train staff on how to properly handle, use and understand these new tools. In the past few years, the Port of Split Authority has implemented the Project of Institutional Strengthening and Assistance for the Implementation of Environmental Management System, which has provided institutional strengthening by preparing its first five-year business plan, and has educated staff and management about the International Financial Reporting Standards. With the Port of Split Authority aiming to promote eco-friendly mobility, this Environmental Management system will be submitted for PERS certification. This system has been recognised as needed in the Port of Split as sources of different kinds of emissions, including air and sea emissions, emissions of noise and environmental impact related to waste management have been identified in the city port of Split. This is also where the Port of Split Authority's pilot action within SUSPORT comes in, by installing mobile monitoring stations, staff will new tools at their disposal which they will first have to learn how to use and get adjusted to. Organising regular trainings and educating employees about new technologies and innovations that have been introduced in the port, or that will be introduced improves staff qualifications and keeps the entire staff up to date on all important news within the port. Environmental education and raising awareness of environmental issues helps encourage the development of a green corporate culture. With the introduction of Ship Waste Management Plan in 2020, the port staff were educated on how to properly handle any waste or residue from ships. Constantly gaining know-how and staying on top of new innovations being brought in the port is crucial to ensuring the successful implementation and maximisation of the benefits brought by those innovations and technologies.



## Internal regulative framework

The Ordinance on determination of class and quantity of hazardous material which might be handled in the port, i.e. which may be on board at ship's arrival in the port of Split and points in the port of Split where dangerous goods may be handled was enacted in 2014 by the management board of the Port of Split Authority. This Ordinance sets the class and quantity of hazardous material which may be handled, i.e. which may be on board at ship's arrival in the port and points in the Port of Split where dangerous goods may be handled. In 2016, the Ordinance received an update, most importantly regarding the points of handling hazardous materials of the IMDG Code class 3 (flammable liquids) in the City Port Basin.

CLASS according to IMDG Code	NAME OF HAZARDOUS MATERIAL	QUANTITIES
Class 1	Explosives	10 tons
Class 2	Gases under compression, liquefied or dissolved under compression	500 tons
Class 3	Flammable liquids	60.000 tons
Class 4.1	Flammable solids	10.000 tons
Class 4.2	Spontaneously combustible agents	10.000 tons
Class 4.3	Agents which develop flammable gases in contact with water	500 tons
Class 8	Corrosive (astringent) material	500 tons
Class 9	Other hazardous material	3. 000 tons
CLASS according to IMSBC Code	Coal	10.000 tons

*Table 6: IMDG Classes and quantities of hazardous material which may be handled in the Port of Split*

In 2020 the management board of the Port of Split Authority has adopted the Ship Waste Management Plan which regulates the acceptance and handling of ship accumulated waste and residues in the area under the management of the Port of Split Authority. This plan also regulates the protection of the marine environment from the discharge or dumping of ship-generated waste, and regulates the protection against land pollution of the area under the management of the Port Authority. The waste from ships must be treated in a manner that avoids: hazard to human health, hazard to flora and fauna, pollution of water, sea, soil and air above the prescribed limit values, uncontrolled disposal and incineration, explosion or fire, noise and unpleasant odours, appearance and reproduction of harmful organisms and development of pathogenic microorganisms, and the disturbance of public peace and order. As the Port of Split records an increase in ship traffic of all vessel types, the needs of shipowners for waste management increase as well. The currently available capacities of existing devices fully meet the port users' requirements for waste collection.

MARPOL Annex #	Description of waste	Type and capacity of receiving facilities / per day
MARPOL Annex 1	Oily bilge water	Vacuum tank – 100 m <sup>3</sup> / 17 m <sup>3</sup>
	Oil residues (sludge)	Vacuum tank – 100 m <sup>3</sup> / 17 m <sup>3</sup>
	Oily tank washings (slops)	Vacuum tank – 100 m <sup>3</sup> / 17 m <sup>3</sup>
	Scale and sludge from tanker cleaning	Vacuum tank – 100 m <sup>3</sup> / 17 m <sup>3</sup>
	Oily mixtures containing chemicals	Vacuum tank – 100 m <sup>3</sup> / 17 m <sup>3</sup>
MARPOL Annex 2	Chemicals/NLS	ADR truck – 10 m <sup>3</sup> / 17 m <sup>3</sup>
MARPOL Annex 3	Harmful substances carried by sea in packaged form	ADR truck – 5 000 kg
MARPOL Annex 4	Sewage	Vacuum tank – 100 m <sup>3</sup> / 17 m <sup>3</sup>
MARPOL Annex 5	Category A - Plastics	Container truck (7 m <sup>3</sup> ), box truck (10 m <sup>3</sup> ), mechanical arm truck (100 m <sup>3</sup> / 5 m <sup>3</sup> )
	Category B - Food waste	Truck with closed tanks 120 and 240 litres – 50 m <sup>3</sup> / 10 m <sup>3</sup>

	Category C - Domestic waste	Container truck (7 m <sup>3</sup> ), box truck (10 m <sup>3</sup> ), mechanical arm truck (100 m <sup>3</sup> / 5 m <sup>3</sup> )
	Category D - Cooking oil	Truck – 10 000 kg
	Category E - Incinerator ashes	ADR truck – 5 000 kg
	Category F - Operational waste	ADR truck, different kinds depending on waste – 500 kg, 5 000 kg or 10 000kg
	Category G – By-products of animal origin not for human consumption	Truck with closed tanks 120 and 240 litres - 50 m <sup>3</sup>
	Category H – Fishing gear	ADR truck – 5 000 kg
	Category I – Waste	ADR truck – 5 000 kg
	Category J – Cargo residues (mpm-HME)	Vacuum tank, ADR truck – 100 m <sup>3</sup> / 5 000 kg
	Category K – Cargo residues (HME)	Vacuum tank, ADR truck – 100 m <sup>3</sup> / 5 000 kg
MARPOL Annex 6	Ozone-depleting substances	ADR truck – 5 000 kg
	Exhaust gas-cleaning residues	ADR truck – 5 000 kg

Table 7: Type and capacity of waste collection facilities in the Port of Split Authority managed area

## Time frame and possible sources of funding

Possible sources of funding for the Port of Split Authority's activities include:

- FZOEU - National Environmental Protection and Energy Efficiency Fund - In accordance with the provisions of the Environmental Protection Act, the Fund is established for the purpose of securing additional resources for the financing of projects, programmes and similar activities in the field of conservation, sustainable use, protection and improvement of the environment.
- INEA - INNOVATION AND NETWORKS EXECUTIVE AGENCY - INEA's main objective is to increase the efficiency of the technical and financial management of the programmes it manages. There are a few different programs appropriate:
  - Connecting Europe Facility (CEF)
  - Parts of Horizon 2020 – Smart, green and integrated transport + Secure, clean and efficient energy
  - The Innovation Fund
  - Legacy programmes: TEN-T and Marco Polo 2007-2013
- INTERREG Programmes – European Regional Development Fund (ERDF):
  - Cross-border Cooperation Programmes
  - Transnational Cooperation Programmes
  - Interregional Cooperation Programmes
- State budget
- Private investors - concessionaires

Tasks	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Carbon footprint reduction										
SUSPORT pilot action										
Monitoring environmental impact										
SUSPORT pilot action										
Institutional Strengthening										
Implementation of EMS										
Implementation of PERS										
Education and training of staff										
Internal regulative framework										
Ordinance on handling hazardous material										
Ship waste management plan										

Figure 6: Gantt of the listed solutions and measures from Chapter 3

## Consistency with environmental sustainability and energy efficiency policies

- National action plan for renewable energy sources to 2020,
- Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues,
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy,
- Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive),

- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives,
- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC,
- Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning,
- Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency,
- Initial IMO Strategy on reduction of GHG emissions from ships,
- A European Strategy for Low-Emission Mobility,
- A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy,
- The European Strategic Energy Technology Plan (SET Plan),
- A European Green Deal,
- Resolution on the European Green Deal,
- Resolution on climate change – a European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy in accordance with the Paris Agreement,
- Long-term low greenhouse gas emission development strategy of the EU and its Member States,
- The Communication from the Commission to the EU Parliament and the Council COM 2002/595 of 20.11.2002 An EU strategy to reduce atmospheric emissions from seagoing ships in which it invited Port Authorities to impose, encourage or promote cold ironing,
- Directive 2012/33/UE on the sulphur content of marine fuels,
- Directive 2005/35/CE of 07.09.2005 on ship-source pollution and on the introduction of penalties for violations,

- Commission Recommendation of 08.05 2006 on the promotion of the use of cold ironing for ships at berth in Community ports close to residential areas,
- Directive 2008/50/CE on ambient air quality and cleaner air for Europe,

## Conclusion

Port of Split is a passenger port, and as such, most of the GHG emissions in a port of Split are directly related to ship traffic, specifically manoeuvring and mooring. Other sources of GHG emissions are negligible with only significant amounts produced indirectly by electrical energy consumption or directly from road vehicles traffic inside the port area. This action plan is investigating the potential to lower the GHG emission and enhance energy efficiency in the port of Split in the mid-term and long-term period.