Territorial Needs Assessment – Port of Bari

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Contents

Introduction

The legislative framework of reference in port matters is contained in the law of 28 January 1994, n. 84 which introduced, in replacement of the previous organizational model based on entirely public ports, a new model characterized by the separation between the planning and control functions of the territory and the port infrastructures, entrusted to the port authorities, and the traffic management functions and of terminals, entrusted to private individuals, save the public ownership of land and infrastructure.

The reform of the system of the port authorities, defined with the legislative decree n. 169 of 2016 on the reorganization, rationalization and simplification of the regulations concerning the port authorities referred to in the aforementioned law 84/1994, is grafted onto this situation and provides in particular:

1) the overcoming of the logic of the port authority understood as an administrative structure mostly coinciding with a single port structure and, therefore, the replacement of the old port authorities with new Port System Authorities (AdSP Autorità di Sistema Portuale) to which they belong more ports;

2) the consequent reduction in the number of port authorities which went from 24 to 15 and which grouped together 57 Italian ports. The Regions may request the inclusion in the System Authorities of further ports of regional importance. It is envisaged that a Port Territorial Office will be established in the ports in which a suppressed port authority was based;

3) the rearrangement of governance.

In this reference context, the Port System Authority of the Southern Adriatic Sea (AdSP MAM) was established, which includes the ports of Bari, Brindisi, Manfredonia, Barletta and Monopoli.

Description of the port area (inlcuding port statistics and future scenarios)

The port of Bari

The port of Bari is about 150 years old. Located north-west of the old city, its boundaries are included to the west by the San Cataldo pier and to the east by the new Foraneo pier (see Figure 1). The initial construction of the Bourbon pier (1853), thanks to its functionality, made it become the reference point for maritime and land trade in the province of "Terra di Bari" in the second half of the nineteenth century. With the construction on several occasions (1917, 1919, 1923 and 1938) of the "New Port", the port of Bari assumes a national and international dimension between the two

World Wars. In the 1960s, then, the "Preliminary Project of the Port Regulatory Plan" was drawn up, which represented the first model of the new operation for the Bari port.

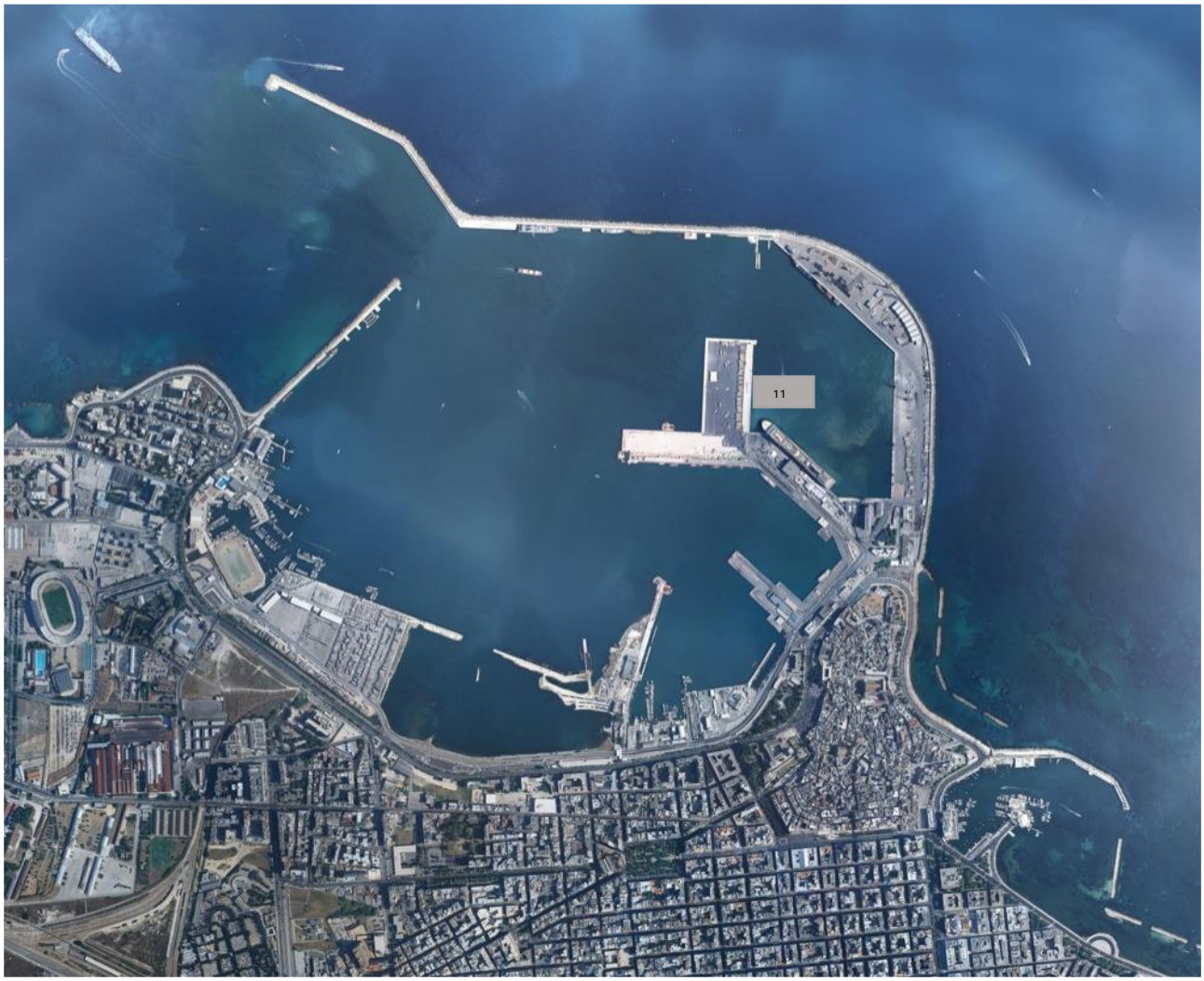

Fig. 1 – View of the port of Bari

Inside the port there are five docks: the Big Basin, the Darsena di Ponente, the Darsena di Levante, the Old Dock and the Inner Dock. The completion of the port facilities in the Pizzoli-Marisabella area has been contracted out. Currently, the portion of the Marisabella loop has been built, but not quayed.

The port has about 27 berths, for 5,750 m of quay, with depths up to 13m; operational yards for over 740,000 m2 and warehouses for about 6,500 m2. There is also a modern terminal for cruises

and ferries and a maritime station serving ferries (mainly non-EU traffic). At the end of the works in progress for the construction of the Marisabella fill, the port of Bari will have an additional 900 m of docks with a depth of 12 m on the west side, 280 m with a depth of 8 m on the north side, 350 m with a depth of 6 m on the east side and an additional 350,000 m2 of space for goods storage and vehicle parking.

The port of Brindisi

The port of Brindisi historically stands, due to its favorable geographical position and its physical characteristics, as the natural "gate" of reference for relations with Greece, the Balkan area, Turkey and the eastern Mediterranean basin. Currently, in the network of itineraries of transnational corridors, it occupies a strategic position, constituting a crossroads and a moment of interchange of North-South relations with East-West ones.

It is possible to divide its entire composition into three parts:

- Inner port, formed by two long arms that surround the city to the north and east and which respectively take the name of "Seno di Ponente" and "Seno di Levante" (surface area: 750,000 square meters) with a prevailing military - recreational function – cruise;
- Medium port, formed by the stretch of water that precedes the access channel to the internal port (Canale Pigonati) and by the Bocche di Puglia breast which forms its northern basin. (Surface: 1,250,000 square meters) with the main commercial function;
- Outer port, limited to the south by the mainland, to the east by the Pedagne islands, to the west by the island of S. Andrea, by the Costa Morena pier and, to the north, by the Punta Riso dam. (Surface: 3,000,000 square meters) with mainly industrial functions.

The railway connections are developed through the node of the Brindisi station: with the North, along the Bari - Bologna - Milan line; with Campania and Calabria through the Taranto stretch and with the south with the extension of the Adriatic route towards Lecce and Salento.

The road connections coincide with the same itineraries: for the North, highway to Bari and then the A14; for the Ionian and Tyrrhenian regions, the SS7 up to Taranto, then the SS 106 (Ionian) towards Calabria and the highway to Potenza towards Salerno and Naples.

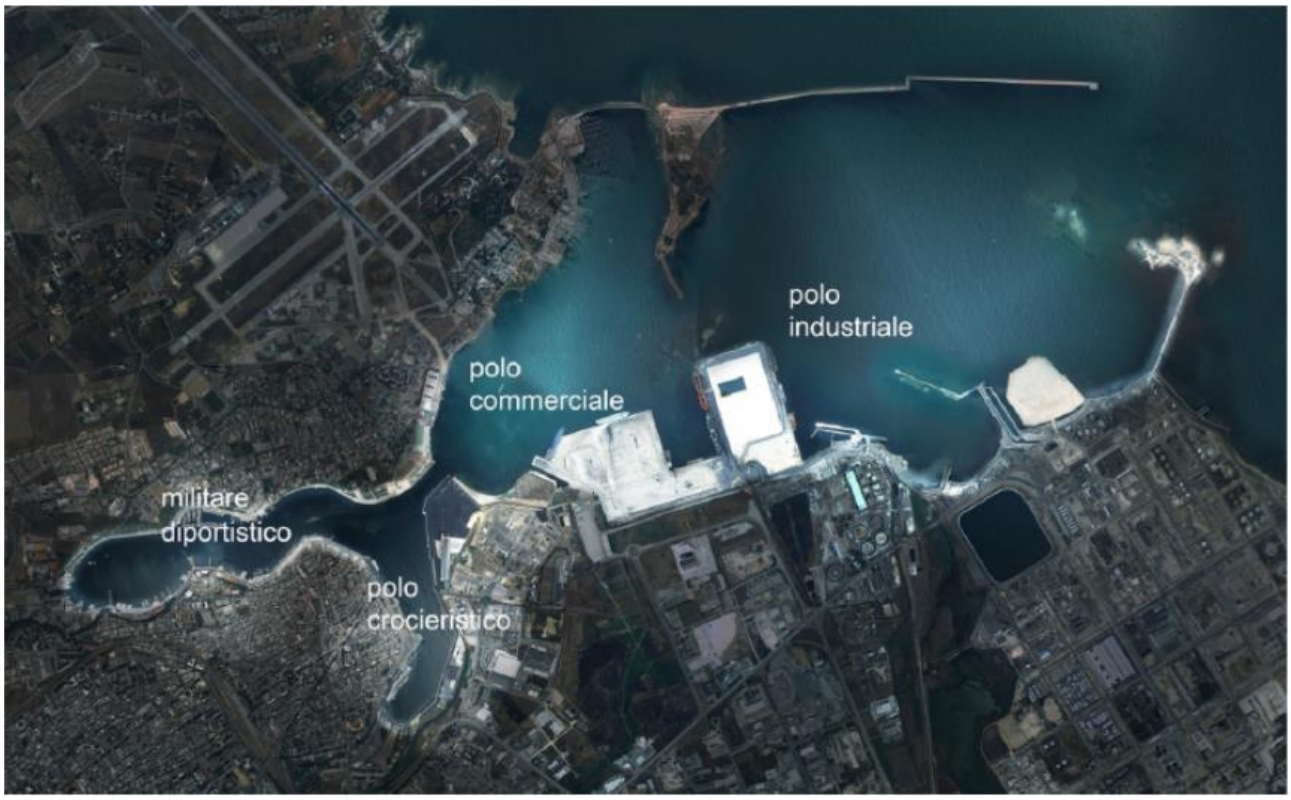

Fig. 2 – Identification of macro functional areas of the Port of Brindisi on an orthophoto map basis

Representation of functional macro - areas (see Figure 2)

The Middle Port, pending the planned infrastructures related to the construction of the new moorings of S. Apollinare, in recent years has been subject to extraordinary maintenance that guarantees the continuous operation of the main docks dedicated to passenger and rolling stock traffic at Costa Morena Ovest. (passengers) where 5 berths are available and operational.

The infrastructure work was completed on the plate on the east side of Costa Morena, equipped with a railway connection, which guarantees the Commercial Port the availability of the two Quays of North Head and East Quay in close connection with the rail and road network.

The so-called commercial quay is also available. Extension that guarantees mooring to ships up to 200 meters in length.

The port has about 27 berths, for 11,278 m of quay, with depths up to 12.5 m; operational yards for over 477,613 m2.

The ports of Barletta, Manfredonia and Monopoli

Barletta

The Port of Barletta (see Figure 3) is classified as second category, first class. It hosts industrial traffic and on 21 July 2009 the first ferry line for passenger service between the ports of Barletta and Durres was activated. It is a totally artificial basin delimited by two asymmetrical and converging piers, one to the west and one to the east, 450 meters away at the entrance. The piers are placed at a minimum distance of 450 meters from each other at the entrance; the seabed is made up of sand and mud, reaching a maximum depth of 6.60 meters and allowing the landing of boats with a total length of 165 meters. The east pier is not currently operational, therefore all port operations are carried out on the west pier which is divided into four arms:

- west pier arm;
- central pier arm;
- first arm of the north wind pier;
- second arm of the north wharf.

It is one of the most popular ports on the Adriatic for its breadth of basin and safety. Thanks to the numerous industrial settlements present in the neighboring territories, the port constitutes a significant point of commercial interchange.

Currently the port is specialized in the trade of an extensive plurality of goods among which the most important from a commercial point of view are:

- solid bulk substances, such as cement, stone, sand, clay;
- solid bulk food substances, such as wheat, salt, flour;
- chemicals, such as fertilizer, polyethylene;
- liquid products in bulk, such as unleaded petrol and diesel.

Fig. 3 – View of the port of Barletta

Manfredonia

The Port of Manfredonia (see Figure 4) consists of two infrastructures:

1. The Commercial Port (Porto Vecchio), overlooking the city center, adjacent to the new privately managed tourist port.

2. The Alti Fondali Basin, or port island, located north of the town, adjacent to the vast Industrial Development Area (ASI) of Manfredonia.

The port of Manfredonia, also known as Porto Vecchio or commercial port, consists of the following main structures:

- Molo di Ponente 900 m long and 50 m wide, reserved for commercial traffic, fishing boats and service vessels. On the pier there are also some buildings serving the armed forces

(Guardia di Finanza, Harbor Master's Office, Customs office, etc.), the red light on the head and other structures for shipbuilding.

- Molo di Levante 925 m long and from a minimum of 15 m to a maximum of 40 m wide, reserved for the first 650 m only for fishing boats and for the remainder used exclusively as a breakwater dam. The pier houses the white light lighthouse at the entrance, some commercial activities (bars, fishmongers, shipbuilding) and deposits used by sailors for the storage of fishing equipment and at the head the green light, originally built in the shape of a fasces.
- Trapezoidal pier, 38 m long, 8 m wide at the head, about 120 m from the root of the Ponente pier, reserved on the south side for passenger ships serving the Tremiti Islands and for fishing boats on the other sides. On the pier there is a building that houses a commercial activity (Restaurant) and activities serving the port itself.
- Tramontana quay 445 m long parallel to the city. Fishing and armed forces ships dock on the quay.
- Cala dello Spuntone dock to the south-west of the Tramontana quay, used as a mooring for yachts (Centro Velico Gargano).
- Cala Diomede dock north-east of the Tramontana quay, used as a dock for yachts (Italian Naval League) and mooring for small boats.

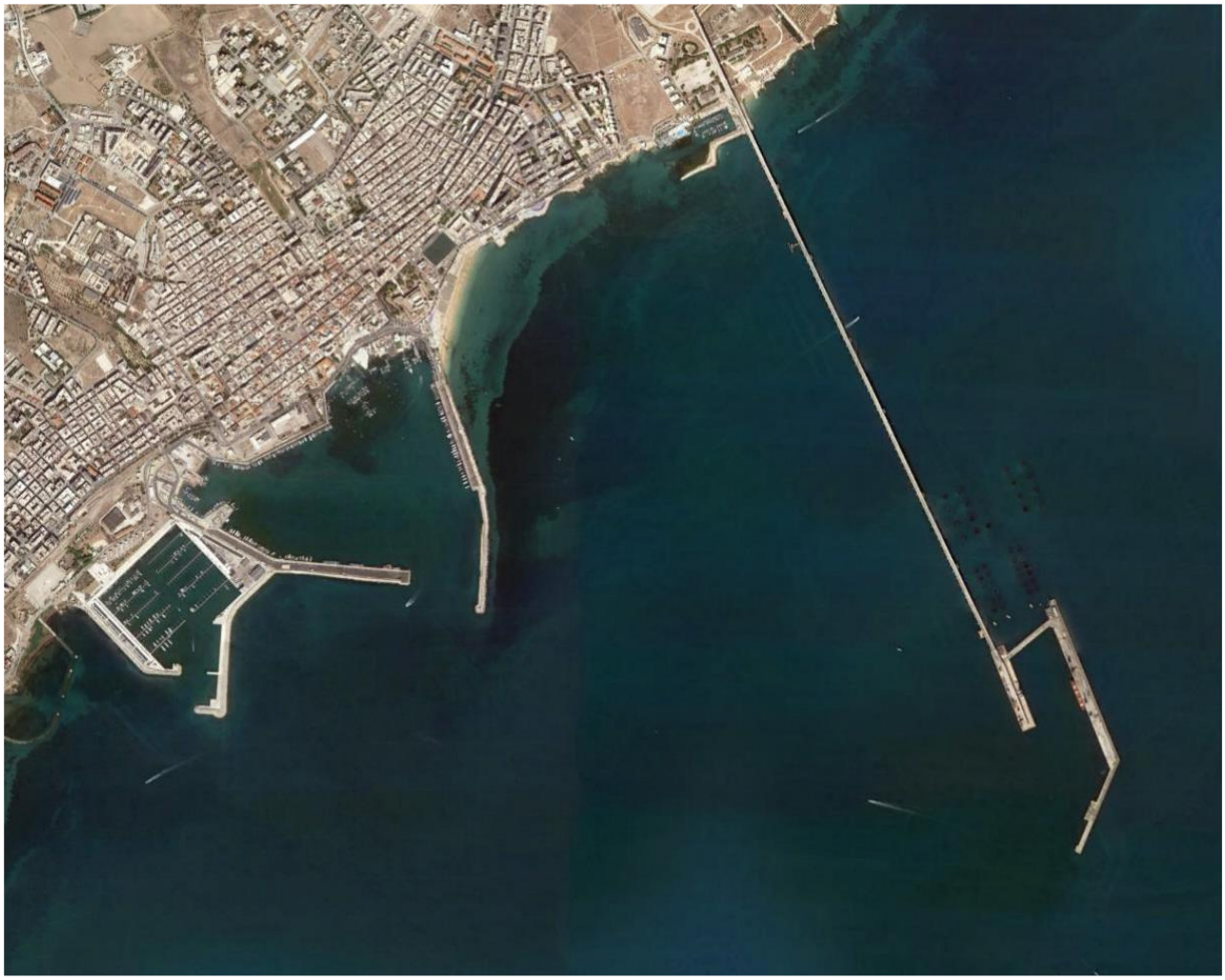

Fig. 4 – View of the port of Manfredonia

Monopoli

The port basin (see Figure 5) includes four inlets or coves:

- Old Port
- Cala Battery or Batteries
- Cala Fontanelle
- Cala Curatori

The breakwater, rooted in Punta Curatori, extends north-east, south-east; the underground, called molo Margherita, rooted in Punta Castello, extends northwards, north-westwards for 200 meters.

Both piers serve to shelter the mirror of the port from the strong storms that periodically hit from the north-east quadrant.

Fig. 5 – View of the port of Monopoli

Brief statistical summary 2019 of the ports of the AdSP MAM

AUTORITA' DI SISTEMA PORTUALE - MOVIMENTI PORTUALI
Anno 2019

Autorità di Sistema Portuale	A	B	C				A+B+C	TEU			Unità Ro-Ro	Passeggeri			
			Merci varie				TOTALE								
	Rinfuse Liquide tonn.	Rinfuse Solide tonn.	In contenitore tonn.	Ro-Ro tonn.	Altre merci varie tonn.	Totale tonn.	tonn.	"hinterland" numero	"trasbordi" numero	TOTALE numero	numero	Locali numero	Traghetti numero	Crociere numero	TOTALE numero
Mare Adriatico Meridionale	**2.942.443**	**6.048.893**	**671.485**	**5.670.212**	**204.997**	**6.546.694**	**15.538.030**	**82.742**	**-**	**82.742**	**281.722**	**-**	**1.712.648**	**768.629**	**2.481.277**
Bari	*1.146*	*1.965.124*	*666.149*	*3.421.584*	*48.018*	*4.135.751*	*6.102.021*	*82.627*	*-*	*82.627*	*166.070*	*-*	*1.192.122*	*680.021*	*1.872.143*
Brindisi	*2.165.794*	*3.009.984*	*252*	*2.248.628*	*120.273*	*2.369.153*	*7.544.931*	*105*	*-*	*105*	*115.652*	*-*	*520.526*	*86.096*	*606.622*
Manfredonia	*135.348*	*410.223*	*5.084*	*-*	*17.974*	*23.058*	*568.629*	*10*	*-*	*10*	*-*	*-*	*-*	*388*	*388*
Barletta	*324.516*	*462.808*	*-*	*-*	*17.283*	*17.283*	*804.607*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Monopoli	*315.639*	*200.754*	*-*	*-*	*1.449*	*1.449*	*517.842*	*-*	*-*	*-*	*-*	*-*	*-*	*2.124*	*2.124*

Table 1: Brief statistical summary 2019 of the ports of the AdSP MAM

Mapping out stakeholders

In the first draft of the Energy and Environmental Planning Document of the Port System of the Southern Adriatic Sea (DPEASP), there was an important involvement of the stakeholders and port operators in the phase of study and identification of the objectives, in such a way that the port communities shared the choices that will be adopted in the immediate future. In fact, the DPEASP identifies the energy-environmental sustainability objectives of the ports; the interventions and measures to be implemented to achieve the objectives; the program of interventions, even partial ones over a fixed period of time; the process of monitoring actions aimed at verifying the results achieved.

In updating the DPEASP underway, stakeholders and port operators will also be involved in the process of identifying the energy needs and related sources of emission of the entire port area, as defined by the Port Regulatory Plan in terms of both territorial perimeters and activities, also involving companies operating in port areas:

• companies authorized by the AdSP to carry out port operations;

• companies authorized by the AdSP to carry out port services;

• companies that have received from the AdSP the concession of state-owned areas and docks included in the port area.

This involvement will be guaranteed through the administration of specific questionnaires aimed both at defining future scenarios regarding any planned activities aimed at reducing energy consumption and CO2 emissions and at defining the Carbon Footprint aimed at acquiring additional data regarding the means of transport (land and sea) and the systems and equipment used by the organizations involved within the Port System.

Stakeholders importance mapping

		POWER OF INFLUENCE	
		LOW	HIGH
INTEREST	LOW	– Customs – Border Police – Guardia di Finanza	– Ministry of Transport and Infrastucture – Coast Guard – Apulia Region – Enviromental Department Arpa – Politechnic of Bari
	HIGH	–	– Agencies – Industries – Logistic enterprises

Table 2: Stakeholders mapping due to importance

Stakeholders involvement strategies

See previous paragraph.

Stakeholder	Role	Importance[1]	Contribution to the project[2]	Benefits[3]	Conflicts[4]	Current support	Strategies to improve support
Name 1	type	...					...
Name 2							

Table 3: stakeholders involvment strategy

[1] High, medium, low
[2] Which contribution they provide to the project
[3] Which benefits they get from participating
[4] Potential, existing

Carbon footprint emissions estimation

With regard to the carbon footprint, some initial assumptions were made:

- with regard to emissions relating to electricity consumption, a precise calculation was made based on the consumption recorded in 2019;
- as regards the emissions relating to maritime traffic, estimates have been made which are detailed in the specific paragraph;
- finally, as regards the emissions relating to port operators, as specified in the previous paragraph, they have not been assessed since they will be involved in the process of identifying energy needs and related emission sources of the entire port area during the updating of the DPEASP, actually in progress.

Terrestrial emissions

Electric energy

The table below shows, broken down by port, the CO2 emissions relating to electricity consumption: they also include consumption relating to heating as the systems used are heat pump systems.

The emission factor taken into consideration is that of ISPRA which provides 277.6 gCO2 per kWh consumed.

Porto	Consumo elettrico [kWh]	tCO2 En. Elettrica
Brindisi	2542415	706
Monopoli	19068	5
Bari	2971507	825
Barletta	123281	34
Manfredonia	283306	79

Heating

See previous paragraph.

Service vehicles

As far as service vehicles are concerned, it was decided not to take them into consideration, being in very small quantities.

Port operational vehicles

See introduction to chapter Errore. L'origine riferimento non è stata trovata.

Heavy-duty vehicles

The calculations carried out to estimate the CO2 emissions emitted by the traffic of heavy land vehicles within the port areas of the ADSP MAM were developed in accordance with the EN 16258 standard. This estimate was made starting from the data provided by AdSP MAM , relating to the mass of goods, expressed in tons and the number of TEUs that were exchanged in and out of the port areas of the 5 Apulian ports under the authority of the authority.

The aforementioned standard EN 16258, for the purposes of the calculation, refers both to the tonnage of the vehicle that transports the goods, and to the type of the same, distinguishing it in bulky, medium and bulk type goods. By crossing the type of transport vehicle with the type of goods, it is possible, by means of table coefficients, to estimate the quantity of fuel consumed. In particular, the calculations referred to the following table (HBEFA 3.1; TREMOD 2010) as regards the calculation of the fuel consumed per km and ton of goods:

		Hilly		Level ground (flat)		
	Volume goods	Average goods	Bulk goods	Volume goods	Average goods	Bulk goods
Freight transport		– Diesel consumption in litre/tkm –				
Lorry < 7,5 t	0,14	0,078	0,063	0,139	0,077	0,062
Lorry 7,5 – 12 t	0,108	0,061	0,05	0,105	0,059	0,048
Lorry 12 – 24 t	0,063	0,036	0,029	0,06	0,034	0,027
Articulated lorry 24 – 40 t^{1)}	0,038	0,023	0,02	0,033	0,02	0,016
Container transport		– Diesel consumption in litre/TEU-km –				
Lorry < 7,5 t	0	0	0	0	0	0
Lorry 7,5 – 12 t	0	0	0	0	0	0
Lorry 12 – 24 t	0,24	0,26	x	0,22	0,24	0

Articulated lorry 24 – 40 t^{1)}	0,17	0,19	0,34	0,14	0,16	0,29

This table also allows you to take into account the type of road traveled. In the case in question, reference was made exclusively to the flat level typology.

Considering the fact that the routes followed by heavy vehicles are typically urban for the Apulian ports, a correction of consumption was carried out to to take this circumstance into account. The table used is shown below (HBEFA 3.1; TREMOD 2010).

CORRECTION FACTORS FOR THE USE OF URBAN ROADS	
	Corerection Factor
Lorry <7,5 t	0,9
Lorry 7,5-12 t	1
Lorry 12-24 t	1,3
Road train/articulated lorry 24-40 t	1,4

With reference to the ESPO model tables provided by the AdSP MAM, considering the specificity of the port activities, it was assumed that all the goods were transported by vehicles exceeding 12 tons mass. In particular, in the absence of detailed data on the type of carrier and the category of goods transported, it was assumed:

- A1 and A3 type goods were considered to be equally distributed between trucks of between 12 and 24 tons and articulated lorries, in accordance with the weight coefficient of 16-18 tons attributed by AdSP MAM. We considered a type of bulk goods.
- Goods of type A43 were considered to be of type Volume, and transported by vehicles between 12 and 24 tons mass.
- The goods of type A41 and A42 were considered to be of the Average type, and transported by vehicles with a mass between 12 and 24 tons.
- Containers (TEU) were considered to be transported exclusively by articulated lorries.
- As regards the Port of Brindisi, the tons of goods belonging to category A33 (coal and lignite) are not considered in the calculation relating to the emissions of heavy vehicles as they are transported to end users by means of conveyor belts.

The average routes of heavy vehicles, provided by ADSP MAM) within the 5 port areas, are shown below, and were considered the same for incoming and outgoing vehicles:

- Bari: 3.9 km long route
- Brindisi: 3 km long route
- Manfredonia: 2.5 km long route
- Monopoli: route 0.85 km long
- Barletta: 0.9 km long route

Once the consumption in liters of diesel fuel was estimated, the following table (extracted from EN 16258) was used to trace the CO2 emissions.

	STANDARDISED ENERGY CONSUMPTION				GREENHOUSE GAS EMISSIONS (CALCULATED AS CO2 EQUIVALENTS)			
	Tank-to-wheels e_T		Well-to-wheels e_W		Tank-to-wheels g_T		Well-to-wheels g_W	
	MJ/kg	MJ/l	MJ/kg	MJ/l	kg CO_2/kg	kg CO_2/l	kg CO_2/kg	kg CO_2/l
Petrol	43,2	32,2	50,5	37,7	3,25	2,42	3,86	2,88
Ethanol	26,8	21,3	65,7	52,1	0	0	1,56	1,24
Petrol E5 (5 vol,% Ethanol)	42,4	31,7	51,4	38,4	3,08	2,3	3,74	2,8
Petrol E10 (10 vol,% Ethanol)	41,5	31,1	52,2	39,1	2,9	2,18	3,62	2,72
Diesel	43,1	35,9	51,3	42,7	3,21	2,67	3,9	3,24
Biodiesel	36,8	32,8	76,9	68,5	0	0	2,16	1,92
Diesel D5 (5 vol,-% biofuel)	42,8	35,7	52,7	44	3,04	2,54	3,8	3,17
Diesel D7 (7 vol,-% biofuel)	42,7	35,7	53,2	44,5	2,97	2,48	3,76	3,15
Compressed natural gas	45,1	n/a	50,5	n/a	2,68	n/a	3,07	n/a
Liquefied petroleum gas	46	25,3	51,5	28,3	3,1	1,7	3,46	1,9
Jet kerosene	44,1	35,3	52,5	42	3,18	2,54	3,88	3,1
Heavy fuel oil (HFO)	40,5	39,3	44,1	42,7	3,15	3,05	3,41	3,31
Marine diesel oil (MDO)	43	38,7	51,2	46,1	3,24	2,92	3,92	3,53
Marine gas oil (MGO)	43	38,3	51,2	45,5	3,24	2,88	3,92	3,49

Considering the particular type of analysis, which focuses only on consumption in the port area as better specified in the guidelines reported in paragraph 7.1.4 of the Susport D.3.2.1 TNA methodology document, we referred to consumption of type Tank to wheel.

Finally, the result of the calculation, considering the use of a blend of diesel and biodiesel at 5% (diesel D5), led to the following CO2 emissions results:

Porto	[t CO2/anno]
Bari	5111
Brindisi	4170
Manfredonia	434
Monopoli	98
Barletta	159
TOT ADSP MAM	**9970**

Railway tractors

See introduction to chapter Errore. L'origine riferimento non è stata trovata.

Other

The table below takes into consideration the emissions relating to the reintegration of the refrigerant gas, quantified in a precise manner for the port of Brindisi and estimated for the other ports in relation to the consumption of electricity.

The emission factor taken into consideration for the gas R410a (mixture 50% HFC-32/50% HFC-125) according to IPCC Fifth Assessment Report, 2014 (AR5) is equal to 1,923.5 gCO2 per kg replenished.

Overall results

The table below shows the estimates of emissions related to terrestrial sector calculated for each port and for the whole AdSP MAM.

Summary of contributions to the production of greenhouse gases in the terrestrial sector, in the port of BARI, in 2019		
Category	**t CO2eq**	**%**
Electric energy	824,89	13,19%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	5.110,62	81,69%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	320,36	5,12%
TOTAL	**6.255,87**	**100,00%**

Summary of contributions to the production of greenhouse gases in the terrestrial sector, in the port of BARLETTA, in 2019		
Category	**t CO2eq**	**%**
Electric energy	34,22	16,60%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	158,62	76,95%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	13,29	6,45%
TOTAL	**206,13**	**100,00%**

Summary of contributions to the production of greenhouse gases in the terrestrial sector, in the port of BRINDISI, in 2019		
Category	**t CO2eq**	**%**
Electric energy	705,77	13,71%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	4.169,65	80,97%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	274,10	5,32%
TOTAL	**5.149,52**	**100,00%**

Summary of contributions to the production of greenhouse gases in the terrestrial sector, in the port of MANFREDONIA, in 2019		
Category	**t CO2eq**	**%**
Electric energy	78,65	14,49%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	433,71	79,89%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	30,55	5,63%
TOTAL	**542,90**	**100,00%**

Summary of contributions to the production of greenhouse gases in the terrestrial sector, in the port of MONOPOLI, in 2019		
Category	**t CO2eq**	**%**
Electric energy	5,29	5,03%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	97,88	93,01%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	2,06	1,96%
TOTAL	**105,23**	**100,00%**

Summary of contributions to the production of greenhouse gases in the terrestrial sector, in the port of AdSP MAM, in 2019		
Category	**t CO2eq**	**%**
Electric energy	1.648,83	13,45%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	9.970,49	81,33%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	640,35	5,22%
TOTAL	**12.259,66**	**100,00%**

Maritime emissions

For the purposes of calculating the emissions of maritime traffic in the AdSP MAM ports, reference was made to the available registers, divided by freight and passenger / ferry traffic, within which the following main data were available:

- Name of the ship
- Gross tonnage
- date and time of arrival at the port

- date and time of departure (data not always reported)
- Port of competence
- Passengers and embarked vehicles

Starting from these data, using databases available on the net (marinetraffic.com and others), all the information necessary to calculate the fuel consumption of the ships inside the port area in the maneuvering conditions (for an assumed time equal to 30 minutes for mooring and 30 minutes for restarting) and during the mooring period (during which the ship's auxiliary powers are considered active according to IMO (2014) - Procedure for calculation and verification of the Energy Efficiency Design Index). The data searched were:

- Engine power
- Engine fuel
- Motor operating speed
- Maximum speed of the ship in knots
- Year of construction
- type of ship
- size of the ship
- DWT of the ship
- Maximum draft

Regarding the speed of rotation of the engine, where not available, it has been assumed that it runs at medium speed. Cruise ships not equipped with slow diesel engines were all considered to be electrically powered.

In order to estimate the draft of the ships during the maneuvering phases, the TPC (tonnage per centimeter) was calculated starting from the width, length and Block coefficient of the ships in the list. For freight ships it was assumed that they traveled with an average load compared to the maximum transportable. For passenger ships, on the other hand, knowing the number of vehicles and passengers embarked, an estimate was made on their average weight, which was then used to estimate the draft.

The speed of the ships in port, indispensable for the calculation of the instantaneous power of the engines according to the Jalkanen formula reported in the calculation procedure in paragraph 7.1.5 of the Susport document D.3.2.1, was assumed to be equal to 5 knots.

In the few cases in which it was not possible to trace the date and time of departure of the freight ships from the registers, only the maneuver time was calculated for the purpose of calculating the CO2 emissions.

The calculation of the annual CO2 emissions of freight ships was carried out starting from the average daily emission for each port, calculated over a period of approximately 40 days, assuming that this type of traffic for the ports of the AdSP MAM does not have a high seasonality.

The CO2 emission coefficient was derived from IMO MEPC 66/21 / Add.1 Annex 5, and equal to 3,206 tons of CO2 per ton of fuel (Marine Diesel) used.

Anchor phase

Consumption at anchor is negligible because it is an extremely rare event that ships have to wait at anchor before entering port.

Manoeuvring phase

The table below illustrates the estimates of emissions related to maritime traffic calculated for each port for the shunting phase, broken down between freight traffic and passenger/ferry traffic.

MERCI

Porto	tCO2/anno Manovra
BARI	32,23
BRINDISI	38,81
MANFREDONIA	5,48
BARLETTA	9,51
MONOPOLI	11,68
TOTALE	97,70

PASSEGGERI - TRAGHETTI

Porto	tCO2/anno Manovra
BARI	241,89
BRINDISI	149,41
MANFREDONIA	0,19
BARLETTA	0,00
MONOPOLI	1,27
TOTALE	392,76

Mooring phase

The table below shows the estimates of emissions related to maritime traffic calculated for each port for the mooring phase, broken down between freight traffic and passenger/ferry traffic.

MERCI

Porto	tCO2/anno Ormeggio
BARI	*4.014,23*
BRINDISI	*6.612,85*
MANFREDONIA	*1.063,90*
BARLETTA	*291,66*
MONOPOLI	*885,70*
TOTALE	12.868,32

PASSEGGERI - TRAGHETTI

Porto	tCO2/anno Ormeggio
BARI	*9.657,98*
BRINDISI	*3.684,17*
MANFREDONIA	*1,05*
BARLETTA	*0,00*
MONOPOLI	*73,92*
TOTALE	13.417,12

Overall results

The table below shows the estimates of emissions related to maritime sector calculated for each port and for the whole AdSP MAM.

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of BARI, in 2019		
Category	**t CO2eq**	**%**
Anchored ships	0,00	0,00%
Ships manoeuvring	273,52	1,97%
Moored ships	13.643,10	98,03%
TOTAL	**13.916,62**	**100,00%**

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of BARLETTA, in 2019		
Category	**t CO2eq**	**%**
Anchored ships	0,00	0,00%
Ships manoeuvring	9,51	3,16%
Moored ships	291,66	96,84%
TOTAL	**301,16**	**100,00%**

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of BRINDISI, in 2019		
Category	**t CO2eq**	**%**
Anchored ships	0,00	0,00%
Ships manoeuvring	188,22	1,80%
Moored ships	10.297,01	98,20%
TOTAL	**10.485,23**	**100,00%**

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of MANFREDONIA, in 2019		
Category	**t CO2eq**	**%**
Anchored ships	0,00	0,00%
Ships manoeuvring	5,68	0,53%
Moored ships	1.064,95	99,47%
TOTAL	**1.070,63**	**100,00%**

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of MONOPOLI, in 2019		
Category	**t CO2eq**	**%**
Anchored ships	0,00	0,00%
Ships manoeuvring	12,95	1,33%
Moored ships	959,62	98,67%
TOTAL	**972,57**	**100,00%**

Summary of contributions to the production of greenhouse gases in the maritime sector, in the port of AdSP MAM, in 2019		
Category	**t CO2eq**	**%**
Anchored ships	0,00	0,00%
Ships manoeuvring	489,88	1,83%
Moored ships	26.256,34	98,17%
TOTAL	**26.746,21**	**100,00%**

Emissions summary

The grand total of emissions for each port and for the whole AdSP MAM is shown in the table below.

Table of the overall percentage ratios of all GHG Emissions from the Port of BARI in 2019		
Category	**t CO2eq**	**%**
Electric energy	824,89	4,09%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	5.110,62	25,33%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	320,36	1,59%
Anchored ships	0,00	0,00%
Ships manoeuvring	273,52	1,36%
Moored ships	13.643,10	67,63%
TOTAL	**20.172,49**	**100,00%**

Table of the overall percentage ratios of all GHG Emissions from the Port of BARLETTA in 2019		
Category	**t CO2eq**	**%**
Electric energy	34,22	6,75%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	158,62	31,27%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	13,29	2,62%
Anchored ships	0,00	0,00%
Ships manoeuvring	9,51	1,87%
Moored ships	291,66	57,49%
TOTAL	**507,30**	**100,00%**

Table of the overall percentage ratios of all GHG Emissions from the Port of BRINDISI in 2019		
Category	**t CO2eq**	**%**
Electric energy	705,77	4,51%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	4.169,65	26,67%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	274,10	1,75%
Anchored ships	0,00	0,00%
Ships manoeuvring	188,22	1,20%
Moored ships	10.297,01	65,86%
TOTAL	**15.634,75**	**100,00%**

Table of the overall percentage ratios of all GHG Emissions from the Port of MANFREDONIA in 2019		
Category	**t CO2eq**	**%**
Electric energy	78,65	4,87%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	433,71	26,88%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	30,55	1,89%
Anchored ships	0,00	0,00%
Ships manoeuvring	5,68	0,35%
Moored ships	1.064,95	66,00%
TOTAL	**1.613,53**	**100,00%**

Table of the overall percentage ratios of all GHG Emissions from the Port of MONOPOLI in 2019		
Category	**t CO2eq**	**%**
Electric energy	5,29	0,49%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	97,88	9,08%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	2,06	0,19%
Anchored ships	0,00	0,00%
Ships manoeuvring	12,95	1,20%
Moored ships	959,62	89,03%
TOTAL	**1.077,80**	**100,00%**

Table of the overall percentage ratios of all GHG Emissions from the Port of AdSP MAM in 2019		
Category	**t CO2eq**	**%**
Electric energy	1.648,83	4,23%
Heating	0,00	0,00%
Service vehicles	0,00	0,00%
Operational port vehicles	0,00	0,00%
Heavy vehicles	9.970,49	25,56%
Naval port service (e.g. pilot/tug)	0,00	0,00%
Railway tractors	0,00	0,00%
Other	640,35	1,64%
Anchored ships	0,00	0,00%
Ships manoeuvring	489,88	1,26%
Moored ships	26.256,34	67,31%
TOTAL	**39.005,88**	**100,00%**

SWOT Analysis

SWOT Analysis Objective: Sustainable development of the AdSP MAM ports				
Helpful to achieving the objective			*Harmful to achieving the objective*	
	Punti di forza - Strengths		**Punti di debolezza - Weaknesses**	
Internal origin (attributes of the organization)	1	Good level of infrastructure in the port areas, in particular as regards Bari and Brindisi	1	Definition of guidelines of the Green Public Procurement for AdSP
	2	Institutional and social partnership	2	Existing constraints, in particular for the port of Brindisi
	3	Intermodal potential for the location of port areas near major roads and railways	3	Awareness, at all levels of AdSP, of the principles of sustainability
	4	Adoption of DPEASP according to ministerial guidelines	4	
	5	Started process for the definition and certification of the Energy Management System and Environmental Management System	5	
	Opportunità - Opportunities		**Minacce - Threats**	
External origin (attributes of the environment)	1	Availability of economic resources assigned for strengthening and development interventions	1	Delays in the authorization process for the realization of new investments
	2	Recognition of the Customs Free Zone in the port area of Brindisi	2	Risk of impact of the energy transition and decarbonisation on port traffic
	3	Port areas included within the Special Economic Zones	3	High political/social conflict in the territories on environmental issues
	4	Presence of large companies in the rear port area of Brindisi and Manfredonia	4	Impact of the COVID-19 pandemic on port traffic
	5	Presence of small and medium-sized business districts in the rear port area of Bari, Barletta and Monopoli	5	Difficulty in directing the activity of port operators towards sustainable development

Conclusions

This document, similarly to the DPEASP, is representative of an overall situation of the System Authority in constant evolution: therefore this document must also be subject to continuous revision. Furthermore, as previously specified, some data relating to the carbon footprint have been estimated: these data will be subject to more precise evaluation during the updating phase of the DPEASP.