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NEMETUN ISLAND

MARGHERITA

PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO PER LA PRODUZIONE DI ENERGIA MEDIANTE LO SFRUTTAMENTO DEL VENTO NEL MARE ADRIATICO MERIDIONALE - NEMETUN ISLAND

63 WTG – 945 MW
FEBBRAIO 2024

45 WTG – 900 MW
GIUGNO 2025

PROGETTO DEFINITIVO - SIA

GRUPPO DI PROGETTAZIONE

Progettazione e Studio di Impatto Ambientale

Indagini ambientali e studi specialistici

Studio misure di mitigazione e compensazione

Supervisione scientifica

SIA.S ELABORATI GENERALI

S.2.1 ENVIRONMENTAL IMPACT STUDY

REV.	DATA	DESCRIZIONE
00	09/25	1ª emissione

NOTE integrazione per consultazione transfrontaliera

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1 INTRODUCTION AND PROJECT LOCATION

1.1 STUDY CONTENT

The **Environmental Impact Study** it has been drawn up according to a structure that follows consolidated schemes present in the literature and in turn deduced from the regulations in force. In particular, it responds to the methodological scheme contained in Annex VII to Part II of Legislative Decree no. 152/2006 and subsequent amendments, and has been divided into three reference frameworks.

The **Policy framework** it contains an indication of laws and measures on EIA at EU, national and regional level, a description of the state of planning in the sector, distinguishing between national, regional and local plans and programmes, and the verification of the compliance of the work with the programmes described above.

The **Design Frame** provides for the territorial framework of the intervention and its precise description both in relation to the technical/design aspects and to the project actions into which it can be decomposed.

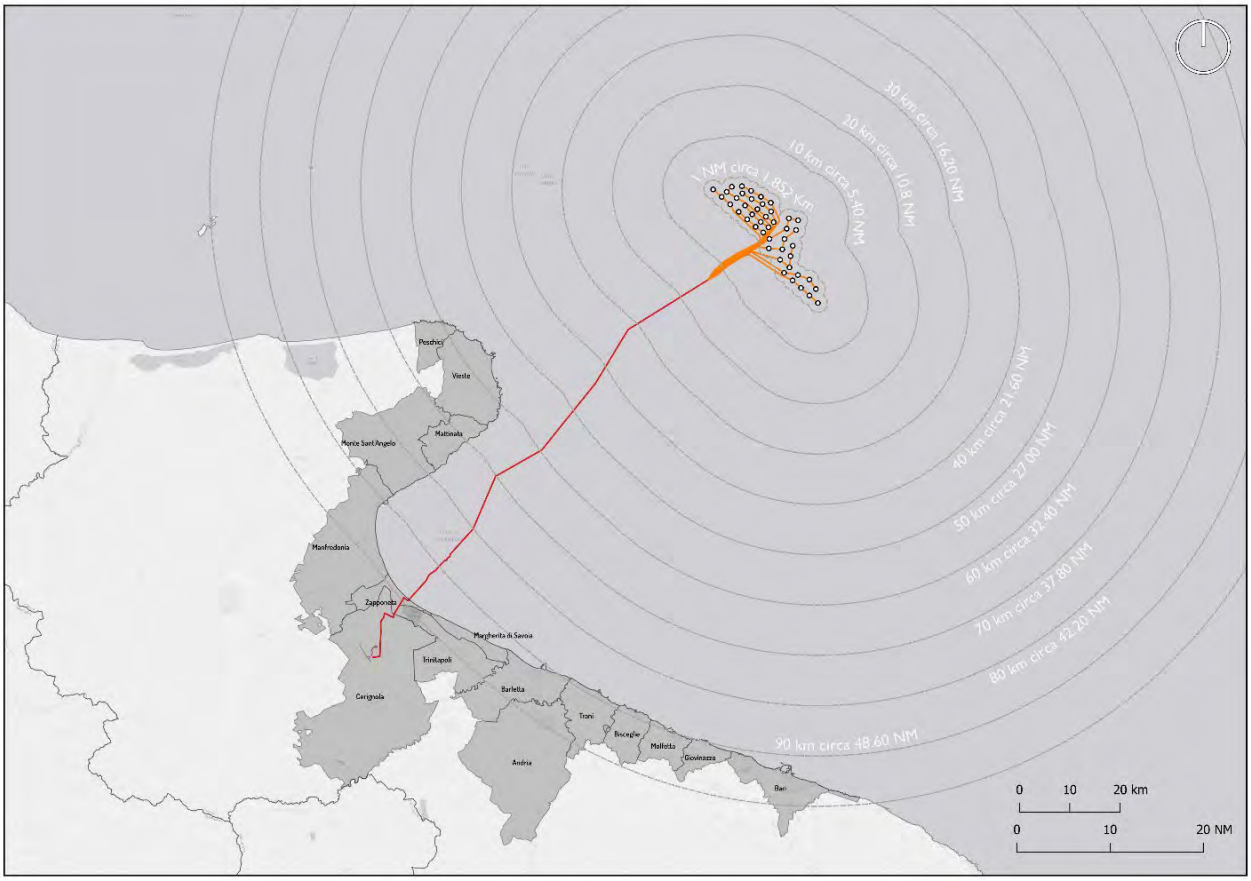
The **Environmental Frame of Reference** it contains a description of the state of the environment and the impacts of the project actions on each environmental component.

Finally, the Environmental Impact Assessment consists of the present *Study* and studies included in the Annex *R.1.1_02*.

1.2 PROJECT LOCATION- OFFSHORE WORKS

The wind farm project involves the construction of 45 wind turbines positioned in the southern Adriatic Sea in international waters on the Italian Continental Shelf and specifically in front of the coast of the municipalities of Vieste, Peschici, and Mattinata. The landing of the cable duct for the export of the energy produced is planned in correspondence with the municipality of Zapponeta.
The minimum distance from the coast is 55 km about 29.69 NM:

-	Peschici (FG)	60 km	32.39 NM
-	Vieste (FG)	55 km	29.69 NM
-	Mattinata (FG)	66 km	35.63 NM
-	Monta Sant'Angelo (FG)	82 km	44.27 NM
-	Manfredonia (FG)	93 km	50.21 NM
-	Zapponeta (FG)	98 km	52.91 NM
-	Margherita di Savoia (BAT)	93.5 km	50.48 NM
-	Barletta (BAT)	89 km	48.05 NM
-	Trani (BAT)	88 km	45.51 NM
-	Bisceglie (BAT)	87.5 km	47.24 NM
-	Molfetta (BA)	88 km	45.51 NM
-	Giovinazzo (BA)	88 km	45.51 NM
-	Bari S. Spirito (BA)	88.5 km	47.78 NM
-	Bari (BA)	90 km	48.59 NM
-	Mola di Bari (BA)	99 km	53.45 NM



Classification of the floating offshore wind farm and isodistances from wind turbines

The project area for offshore works is therefore located at a minimum distance from the coast of 55 km greater than the 4 km indicated as the minimum threshold in the "Guidelines on the design and location of renewable energy plants of the PPTR of the Puglia Region".

It was decided to identify an area located beyond the limit of territorial waters and very far from the coast in order to reduce environmental and landscape impacts and interference with existing human activities such as local fishing, ship traffic, hydrocarbon exploration and production activities, military uses and explosive sinking.

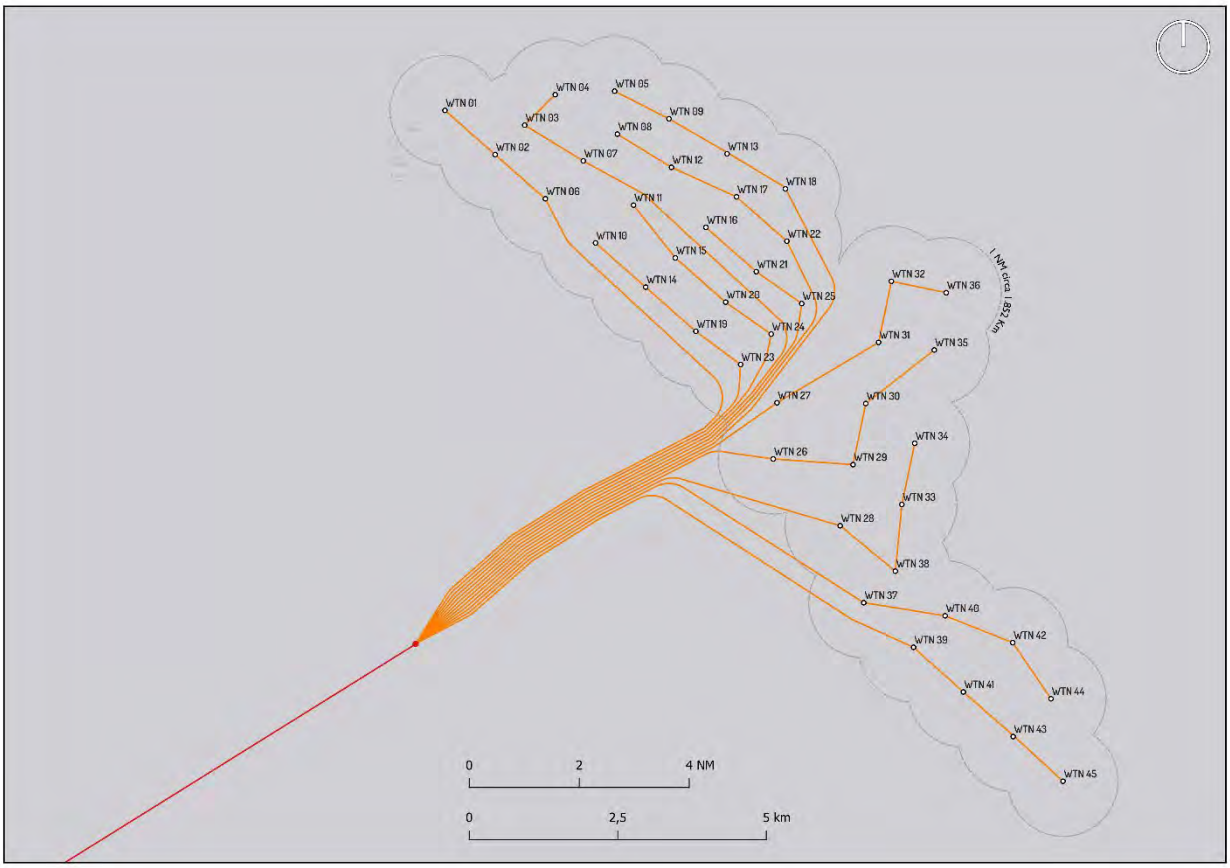
Within the chosen area, the positioning of the wind turbines has a configuration adapted to the geomorphological criticalities of the area and the need to optimize the routes of the connecting cable ducts. The wind turbines are distributed according to a radial pattern, connected radially to the offshore electrical substation through a branched system of cable ducts. The minimum distance between wind turbines is at least 1450 meters, which is more than 5 times the rotor diameter of the planned machines.

1.2.1 WIND TURBINE COORDINATES

The coordinates of the project wind turbines in the UTM WGS84 Fuso 33 reference systems are shown below:

Type of wind turbine	Turbine Name	Wind turbine coordinates	
		WGS84 Zone 33	
		X-East	Y - North
CRRC20000D260	WTN 01	641.634,816	4.670.730,037
CRRC20000D260	WTN 02	643.323,839	4.669.243,531
CRRC20000D260	WTN 03	644.317,493	4.670.234,002
CRRC20000D260	WTN 04	645.346,633	4.671.259,847
CRRC20000D260	WTN 05	647.346,478	4.671.377,849
CRRC20000D260	WTN 06	645.012,863	4.667.757,025
CRRC20000D260	WTN 07	646.290,417	4.669.030,487
CRRC20000D260	WTN 08	647.440,234	4.669.930,883
CRRC20000D260	WTN 09	649.174,395	4.670.447,768
CRRC20000D260	WTN 10	646.701,886	4.666.270,519
CRRC20000D260	WTN 11	647.981,243	4.667.542,394
CRRC20000D260	WTN 12	649.260,601	4.668.814,270
CRRC20000D260	WTN 13	651.133,331	4.669.268,626
CRRC20000D260	WTN 14	648.390,909	4.664.784,013
CRRC20000D260	WTN 15	649.391,776	4.665.768,135
CRRC20000D260	WTN 16	650.420,881	4.666.794,012
CRRC20000D260	WTN 17	651.450,057	4.667.819,825
CRRC20000D260	WTN 18	653.092,268	4.668.089,484
CRRC20000D260	WTN 19	650.079,933	4.663.297,506
CRRC20000D260	WTN 20	651.084,405	4.664.278,455
CRRC20000D260	WTN 21	652.113,546	4.665.304,300
CRRC20000D260	WTN 22	653.142,687	4.666.330,145
CRRC20000D260	WTN 23	651.586,019	4.662.180,452
CRRC20000D260	WTN 24	652.615,160	4.663.206,297
CRRC20000D260	WTN 25	653.644,300	4.664.232,142
CRRC20000D260	WTN 26	652.687,210	4.659.004,651
CRRC20000D260	WTN 27	652.810,324	4.660.894,495
CRRC20000D260	WTN 28	654.939,282	4.656.758,532
CRRC20000D260	WTN 29	655.369,902	4.658.813,907
CRRC20000D260	WTN 30	655.800,522	4.660.869,282
CRRC20000D260	WTN 31	656.231,141	4.662.924,657
CRRC20000D260	WTN 32	656.661,761	4.664.980,032
CRRC20000D260	WTN 33	657.015,970	4.657.474,060
CRRC20000D260	WTN 34	657.446,590	4.659.529,435
CRRC20000D260	WTN 35	658.104,507	4.662.669,716
CRRC20000D260	WTN 36	658.508,327	4.664.597,171
CRRC20000D260	WTN 37	655.732,254	4.654.169,090
CRRC20000D260	WTN 38	656.796,321	4.655.229,749

CRRC20000D260	WTN 39	657.408,368	4.652.668,042
CRRC20000D260	WTN 40	658.472,434	4.653.728,702
CRRC20000D260	WTN 41	659.084,481	4.651.166,995
CRRC20000D260	WTN 42	660.747,664	4.652.824,851
CRRC20000D260	WTN 43	660.760,595	4.649.665,948
CRRC20000D260	WTN 44	662.035,427	4.650.936,697
CRRC20000D260	WTN 45	662.439,402	4.648.162,489



Position of wind turbines

1.3 PROJECT LOCATION– ONSHORE WORKS

The planned onshore works are closely linked to the need to connect the offshore wind farm to the national transmission grid managed by TERNA spa. The technical connection solution indicated by TERNA with a connection estimate **Practice Code: 202201688** it provides for the plant to be connected in a double antenna at 380 kV on the future expansion of a 380/150 kV Electrical Substation (SE) of Transmutation currently under construction in the countryside of Cerignola.

The work envisaged by the TERNA Development Plan has an independent authorisation process managed by the aforementioned NTG Management Company and is motivated by grid needs that are independent of the construction of the wind farm in question. The intervention envisaged by Terna's Development Plan is already authorised and has an estimated construction time compatible with the construction time of the planned plant.

In June 2022, the company Nemetun Island Wind Srl submitted the request for connection to the national electricity grid to TERNA spa, while the request for a state-owned concession was submitted, together with the related preliminary project, in March 2023. On 9 December 2022, TERNA spa issued the connection quote, specifying the STMG connection solution with the code 202201688. The acceptance of the quote took place on July 27, 2023. After accepting and defining the power committed, a change in the connection solution was requested, obtaining a response from TERNA in April 2023. The solution thus defined has recently been transferred and registered in the name of Nemetun Island S.r.l.

Near the planned landing point in the municipality of Zapponeta, an underground joint hole will be built to transition from marine cable to land cable and from there on the cable will continue with underground laying following the existing public road network. The energy produced will then be conveyed to the electrical substation equipped with a power factor correction unit, planned inside an industrial building near the TERNA electrical substation in Cerignola and its future expansion.

Near the planned landing point in the municipality of Zapponeta, an underground joint hole will be built to transition from marine cable to land cable and from there on the cable will continue with underground laying following the existing public road network. The energy produced will then be conveyed to the user's Electrical Substation where the power factor correction system is housed and connected, again by means of an underground power line, to the National Transmission Grid (NTG).
In In these hypotheses, the user works for the connection consist of:

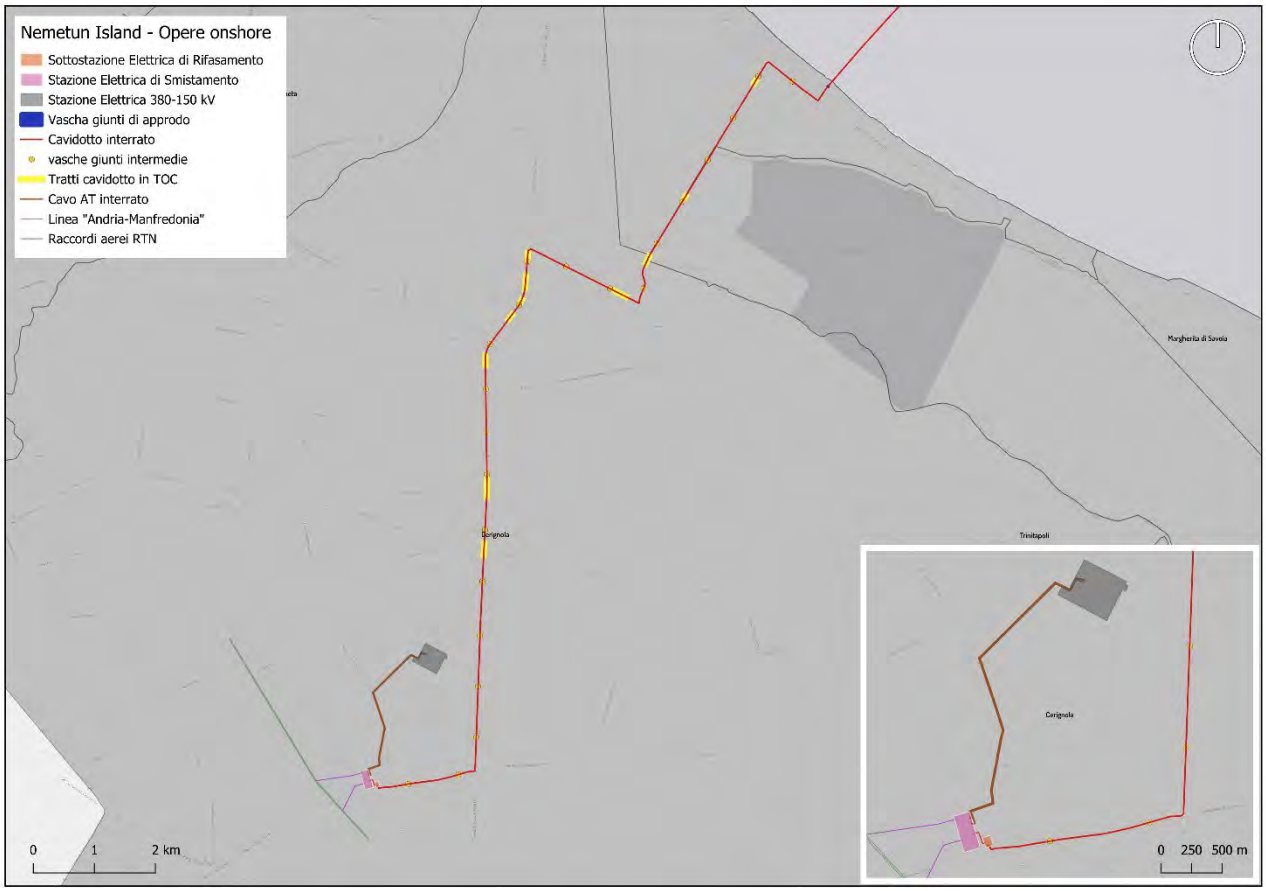
- **An Underground Transition Joint Bay**, located near the landing point in the municipality of Zapponeta, which will allow the transition from the submarine cable to the cable intended for underground laying in the onshore section;
- **An underground power line consisting of two three 380 kV cables**, extended for about 18 km, mainly located along the public road network in the territories of the municipalities of Zapponeta, Trinitapoli and Cerignola, with short transits on agricultural land. The installation will take place mainly through excavations with a fixed section, but to manage interference along the way, **11 sections laid using the excavation-free technique called "Horizontal Directional Drilling" (HDD).** The 11 sections will have variable lengths, as represented in the project documents;
- **A series of 22 intermediate Joint Bays,** located along the route of the underground cable duct with a variable distance between 700 and 950 meters. The intermediate joints will be made as part of the excavation with a fixed section planned for the laying of the power line;
- **An electrical utility substation, isolated in GIS, for sharing the stall and equipped with a power factor correction unit, dedicated to the Nemetun Island plant**, with a maximum capacity of 600 MVAr, consisting of two Shunt type reactors. The GIS Substation will be located in an industrial building located in the municipality of Cerignola, near the connection point to the NTG indicated by TERNA and represented by a new Switching Station to be built as an extension to the Cerignola Electrical Substation;
- **An underground power line consisting of a trio of 380 kV cables,** about 200 m long, for the connection of the electrical substation to the nearby new Switching Station to be built in extension to the Cerignola Electrical Substation.

In order to allow the connection of the offshore wind farm, some interventions are necessary to expand the NTG identified by TERNA in the connection estimate and which consist of:

- **A 380 kV Switching Station** - in extension to the Cerignola Electrical Substation of the TERNA unified type with air insulation and having the following configuration:
  - N. 1 double busbar system
  - N. 2 cable line stalls for SE RTN 380 kV "Cerignola 380" connection

- N. 2 parallel busbar stalls
- No. 1 TIP stall
- N. 2 stalls fully equipped for the entrance – exits on the existing 380 kV power line "Manfredonia 380 – Andria"
- N. 6 line stalls available for future network needs

- **Two 380 kV Overhead connections**, for the incoming connection – exits in a simple circuit of the new Switching Station to the existing line of the 380 kV "Manfredonia-Andria" NTG. The connections will be supported by 4 new pylons after the decommissioning of 2 existing pylons;
- **Two underground AT connections, consisting of a total of 4 triads of 380 kV cables**, approximately 2.70 km long, for the connection of the new Switching Station to the SE RTN 380 kV "Cerignola 380" under construction connected in and out to the 380 kV RTN "Foggia-Palo del Colle" line.



Summary representation of the onshore works

2 POLICY FRAMEWORK

The programmatic reference framework to be used to assess the environmental compatibility of a project consists of the following aspects:

- Reference legislation;
- Current planning status;
- Description of the project with respect to the planning and programming tools in force.
- Description of the authorization process

In this section we will analyze the aforementioned aspects and provide all the useful information to frame the intervention.

2.1 REGULATORY AND PROGRAMMATIC CONTEXT OF REFERENCE

2.1.1 OVERVIEW OF WIND ENERGY NEEDS IN ITALY

Our country has been committed for years to the pursuit of the objectives set by the European Union in the field of energy and the environment. With the Kyoto Protocol and subsequently with the Paris Agreement, the European Union and its Member States committed themselves to adopting measures aimed at combating climate change.

The main objectives to be pursued are:

- Accelerate the process of decarbonization of the energy sector (to be completed by 2050 and setting 2030 as an intermediate target);
- To promote the evolution of the energy system from a centralized structure to a distributed one based mainly on renewable energy;
- Promote energy efficiency in all sectors, in particular transport;
- Accompany the evolution of the energy system with research and innovation activities that develop suitable solutions to promote the sustainability, security, continuity and cost-effectiveness of supplies increasingly based on renewable energy in all sectors of use.

Italy is well aware of the potential benefits inherent in the widespread diffusion of renewables and in the increase in energy efficiency, related to the reduction of polluting and climate-changing emissions, the improvement of energy security and economic and employment opportunities for families and the production system, and intends to continue with conviction on this path, with an approach that increasingly puts citizens and businesses at the centre.

The Government intends to accelerate the transition from traditional fuels to renewable sources, promoting the gradual abandonment of coal for electricity generation in favour of an electricity mix based on a growing share of renewable sources and, for the remaining part, on gas.

The realization of this transition requires and is subject to the planning and construction of replacement plants and the necessary infrastructure.

The Nemetun Island project is in line with the objectives of this programmatic reference framework, the installation of an offshore wind farm off the Gargano coast would offer our country to actively participate in the decarbonization process of the European energy system, as well as allowing considerable increases in employment.

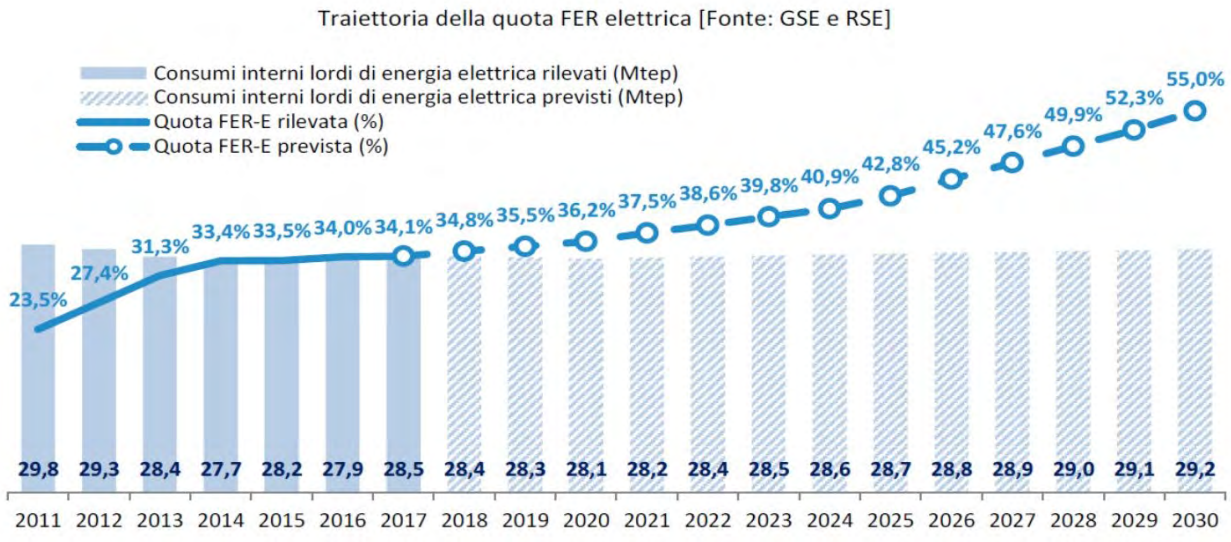
At EU level, the Climate-Energy Package (European Council of March 2007) for the first time envisaged an integrated approach between energy policies with objectives aimed at combating climate change, through the promotion of RES (renewable energy sources). With this in mind, Italy has set the goal of reaching a share of energy from RES in Gross Final Energy Consumption of 17% in 2020 and 30% in 2030.

	2018	2019	2025	2030
Numeratore, Mtep	**21.605**	**21.877**	**27.168**	**33.428**
Produzione lorda di energia da FER, Mtep	10.673	9.927	12.281	16.060
Consumi fin. FER per riscaldamento e raffrescamento, Mtep	10.673	10.633	12.907	15.031
Consumi fin. di FER nei trasporti, Mtep	1.250	1.317	1.980	2.337
Denominatore – Consumi finali lordi complessivi, Mtep	**121.406**	**120.330**	**116.064**	**111.359**
Quota FER complessiva, %	**17.8**	**18.2**	**23.4**	**30.0**

Overall RES target for 2030

Source: Integrated National Energy and Climate Plan – 2020

Italy intends to pursue a target of covering 30% of gross final energy consumption from renewable sources in 2030, outlining a path for sustainable growth of renewable sources with their full integration into the system. In particular, the target for 2030 provides for a gross final consumption of energy of 111 Mtoe, of which about 33 Mtoe from renewable sources.



Trajectory of the overall RES share

Source: GSE and RSE

The following table illustrates the evolution of the overall RES target (share of gross final consumption of energy covered by renewable sources).

	2016	2017	2025	2030
Numeratore	**21.081**	**22.000**	**27.168**	**33.428**
Produzione lorda di energia elettrica da FER	9.504	9.729	12.281	16.060
Consumi finali FER per riscaldamento e raffrescamento	10.538	11.211	12.907	15.031
Consumi finali di FER nei trasporti	1.039	1.060	1.980	2.337
Denominatore - Consumi finali lordi complessivi	**121.153**	**120.435**	**116.064**	**111.359**
Quota FER complessiva (%)	**17,4%**	**18,3%**	**23,4%**	**30,0%**

RES Targets total source ENEA

In addition, the National Recovery and Resilience Plan (PNRR), a package of investments and reforms issued in 2021, also highlights the need to direct Next Generation EU funds towards a sustainable economic recovery and which, therefore, supports the decarbonisation process and, in particular, the development of offshore wind farms.

To this end, investment plans have been developed for energy production from innovative offshore installations and the revision and **the simplification of administrative authorization procedures for renewable plants.**

To achieve Europe's target of 300 GW of installed capacity of offshore wind power by 2050, the industry needs a massive scale shift in less than 30 years, at a speed that is unprecedented in the development of other energy technologies.

The photovoltaic and wind power capacity installed in Italy until June 2023 is approximately 39.5 GW, divided as follows: 27.4 GW of photovoltaic and 12.1 GW of wind.

To date, only one offshore wind farm has been built in Taranto (30 MW), however, thanks to the improvement of floating turbine technology, which is reaching such maturity as to make it implementable even in applications where the high depth of the seabed would be a limit (e.g. Mediterranean Sea), the requests for connection of offshore wind farms are having, starting from the second half of 2019, a strong acceleration especially in the areas of the South and the Islands, given the greater availability of the primary energy source.

To date, in fact, for the offshore wind sector alone, 136 requests for connection to the high voltage electricity grid have been submitted to TERNA, for over 89 GW. For Puglia alone, there are 37 connection requests for a total of about 27 GW.

The PNIEC envisages a great growth in wind energy capacity in 2025, in which the adoption of the offshore type with a capacity of 900 MW is also envisaged, remodulated to 2.1 GW by the new PNIEC sent in draft form to Brussels. The FF55 document indicates the target at 8 GW for 2030 with 3.8 in Puglia.

The Nemetun Island offshore wind farm project, with its installed capacity of 900 MW is perfectly in line with the objectives proposed by the national energy plan and with the European decarbonisation objectives.

2.1.2 MAIN EU RULES

The main regulatory references in the EU are:

- Directive 2001/77/EC of the European Parliament and of the Council of September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market.
- Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EC.
- Directive 2009/28/EEC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, amending and subsequently repealing Directives 2001/77/EC and 203/30/EC.
- Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources and repealing, with effect from 01/07/2021, Directive 23/04/2009, no. 28 on the promotion of the use of energy from renewable sources, subsequently, theThe update of the Renewable Energy Directive (RED III), already agreed between MEPs and the Council, brings the binding share of renewables in the EU's final energy consumption to 42.5% (from 32%) by 2030, with the aim of reaching 45%.

2.1.3 MAIN NATIONAL STANDARDS

At the national level, the main measures concerning the construction of energy production plants from renewable sources or that encourage it are:

- Presidential Decree of 12 April 1996. Act of guidance and coordination for the implementation of art. 40, paragraph 1, of Law no. 146/1994, concerning provisions on environmental impact assessment;
- Legislative Decree 112/98.Conferment of administrative functions and tasks of the State to the Regions and Local Authorities, in implementation of Chapter I of Law no. 59 of 15 March 1997;
- Legislative Decree no. 79 of 16 March 1999. It transposes Directive 96/92/EC and concerns the liberalisation of the electricity market in its entire sector: production, transmission, dispatching, distribution and sale of electricity, with the aim of improving its efficiency;
- Legislative Decree no. 387 of 29 December 2003. It transposes Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. Among other things, it provides for measures to rationalise and simplify authorisation procedures for plants for the production of energy from renewable sources;
- Legislative Decree 152/2006 and subsequent amendments Environmental regulations;
- Legislative Decree 115/2008 Implementation of Directive 2006/32/EC on energy end-use efficiency and energy services and repeal of Directive 93/76/EC;
- National Action Plan for Renewable Energy (Directive 2009/28/EC) approved by the Ministry of Economic Development on 11 June 2010;
- Ministerial Decree of 10 September 2010 Ministry of Economic Development. Guidelines for the authorisation of plants powered by renewable sources. It defines the rules for the administrative transparency of the authorisation process for access to the energy market; regulates the authorisation of connected infrastructures and, in particular, electricity grids; determines the criteria and methods for inserting the plants into the landscape and the territory, with particular regard to wind farms (Annex 4 Wind farms: elements for the correct insertion of the plants into the landscape);

- Legislative Decree no. 28 of 3 March 2011. It defines the instruments, mechanisms, incentives and institutional, financial and legal framework necessary for the achievement of the objectives up to 2020 in the field of energy from renewable sources, in implementation of Directive 2009/28/EC and in compliance with the criteria established by Law No. 96 of 4 June 2010;
- SEN November 2017. National Energy Strategy – document for consultation. The document was approved by Decree of the Minister of Economic Development and Minister of the Environment of 10 November 2017;
- PNIEC January 2020 Integrated National Plan for Energy and Climate – the PNIEC has been published by the Ministry of Economic Development and sent to the European Commission. the Plan sets national targets for 2030 on energy efficiency, renewable sources and the reduction of CO emissions$_2$, as well as the objectives on energy security, interconnections, the single energy market and competitiveness, development and sustainable mobility. The document envisages the construction of at least 19,300 MW of wind farms by 2030;
- Legislative Decree no. 199 of 8 November 2021 implementing Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources.

2.2 NATIONAL, REGIONAL AND TECHNICAL LEGISLATION, MAIN REFERENCES

The main regulatory references followed in the drafting of the project and this report are:

- Regional Law no. 11 of 12 April 2001;
- Resolution G.R. no. 131 of 2 March 2004 Guidelines for environmental assessment in relation to the construction of wind farms in the Puglia Region;
- PEAR Puglia Region adopted by Resolution of G.R. n.827 of 08-06-2007;
- Regional Law no. 31 of 21/10/2008, rules on production from renewable sources and for the reduction of polluting and environmental emissions;
- PPTR – Puglia Regional Thematic Landscape Plan - Puglia Region;
- Guidelines for the construction of wind farms in the Apulia Region – edited by the Department of the Environment Ecology Sector of January 2004;
- Resolution of the Regional Council no. 3029 of 30 December 2010, Approval of the Regulations of the single procedure for authorizing the construction and operation of electricity production plants;
- Regional Regulation no. 24/2010 Implementing Regulation of the Decree of the Ministry of Economic Development of 10 September 2010, "Guidelines for the Authorisation of plants powered by renewable sources", identifying areas and sites not suitable for the installation of specific types of plants powered by renewable sources in the territory of the Puglia Region;
- Regional Regulation no. 29 of 30 November 2012 - Urgent amendments, pursuant to art. 44 paragraph 3 of the Statute of the Puglia Region (Regional Law no. 7 of 12 May 2004), of the Regional Regulation no. 24 of 30 December 2012 "Implementing Regulation of the Decree of the Ministry of Development of 10 September 2010 Guidelines for the authorisation of plants powered by renewable sources, identifying areas and sites not suitable for the installation of specific types of plants powered by renewable sources in the territory of the Puglia Region.";
- Regional Council Resolution no. 2122 of 23/10/2012 with which the Puglia Region provided guidelines on the assessment of the cumulative effects of environmental impact with specific reference to those produced by plants for the production of energy from renewable sources.

In addition, the electricity transmission plants and networks will be built in compliance with the CEI regulations in force on the subject, the methods of connection to the grid provided for by the GSE and

TERNA, with particular reference to the CEI 0-16 Standard, Technical connection rules for the connection of active and passive users to the HV and MV networks of electricity distribution companies.

As regards the urban framing aspects of the project, the main references are:

- PPTR Territorial Landscape Plan
- PRG of Zapponeta (FG);
- PRG of Trinitapoli (FG);
- PRG of Cerignola (FG).

2.3 DESCRIPTION OF THE AUTHORIZATION PROCESS

To identify the authorisation process envisaged for offshore wind farms, reference must be made to Legislative Decree no. 387 of 29 December 2003 which, in paragraph 3 of Article 12 of Legislative Decree no. 387/2003, "the construction and operation of electricity production plants powered by renewable sources, (...) and the related works and infrastructures essential for the construction and operation of those installations ... shall be subject to a single authorisation. (…).

According to the provisions of Decree no. 152/2006 (Consolidated Environment Act) and subsequent amendments, wind farms for the production of electricity located at sea are subject to an environmental impact assessment procedure of state competence since they are part of the list in Annex II to Part II, point 7-bis *"Offshore wind farms"*.

In January 2012, the Ministry of Infrastructure and Transport – Directorate General of Ports issued a circular, number 40 of 05/01/2012 concerning the *"Rationalization and simplification of authorization procedures for renewable energy sources - Legislative Decree no. 387 of 29 December 2003 - Article 12 as amended by art. 2, paragraph 158, of Law no. 244 of 24 December 2007 (2008 Budget)",* This document clarifies and summarizes the procedures and phases for authorizations of offshore wind farms. In particular, with regard to the State Concession phase, the preliminary and prodromal phase for the start of the authorization procedure pursuant to 387/2003 and for the Environmental Impact Assessment phase.

Legislative Decree no. 22 of 1 March 2021, converted with amendments by Law no. 55 of 22 April 2021, amended art. 35 of Legislative Decree no. 300 of 30 July 1999, paragraph 2, letter b), providing among the various competences of the Ministry of Ecological Transition (now the Ministry of the Environment and Energy Security) the "definition of the objectives and guidelines of national energy and mining policy and measures relating to them" (authorization of energy production plants under state competence, including those from renewable sources, even if located at sea).

Article 12, paragraph 3, of Legislative Decree No. 387 of 29 December 2003 was also amended by Article 23 of Legislative Decree No. 199/2021 implementing Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources and, lastly, by Art. 13 of Legislative Decree no. 17 of 1 March 2022, converted with amendments into Law no. 34 of 27 April 2022, specifically it was provided that:

"For off-shore installations, including works for connection to the grid, the authorisation shall be issued by the Ministry of Ecological Transition in agreement with the Ministry of Sustainable Infrastructure and Mobility and after consultation, for aspects related to sea fishing activities, the Ministry of Agricultural, Food and Forestry Policies, as part of the measure adopted following the single procedure referred to in paragraph 4, including the issue of the concession for the use of the maritime state".

In this section, a summary scheme of the procedure described above is defined, divided into phases:

Step-by-step outline of the permitting process for an offshore wind farm

In the following paragraphs, we want to give a more precise, albeit synthetic, description of the progress and procedures underway for the Nemetun Island project.

2.3.1 PROCEDURE FOR REQUESTING THE STATE CONCESSION

The company **Nemetun Island Wind srl** has a request for state concession submitted together with the related preliminary project on 13/03/2023. The delivery took place at the Ministry of Infrastructure and Sustainable Mobility, the Ministry of the Environment and Energy Security, and the Port Authorities of Bari and Manfredonia. The public notice was issued for twenty consecutive days in March 2023.

Following the amendments introduced by Article 23 of Legislative Decree no. 199 of 2021 to Article 12, paragraph 3 of Legislative Decree no. 387 of 2003, the Single Authorisation procedure was transferred to the Ministry of the Environment and Energy Security, while the MIT (formerly MIMS) remained responsible only for the phase of issuing the state-owned concession, subject to the positive conclusion of the authorisation phase and that relating to the environmental impact assessment.

On the basis of the results of the specialized studies carried out for the preparation of the EIA and all the technical and scientific insights conducted after the request for state concession, the project benefited from a more in-depth analysis of the data, with an improvement in the definition of the routes and the related positioning of the onshore cable duct and landings. At the end of the EIA process and in the context of the procedure already underway for the state concession and the single authorization, the areas required for the concession will be aligned with the specifications of the final version of the project, once it is approved.

2.3.2 THE NTG CONNECTION PROCEDURE

The company **Nemetun Island Wind srl** has a connection solution presented to TERNA spa, on 20/06/2022. On 9 December 2022, TERNA spa issued the connection estimate, specifying the STMG connection solution with the code 202201688. The acceptance of the quote took place on July 27, 2023. After accepting and defining the power committed, a change in the connection solution was requested, obtaining a response from TERNA in April 2023. The solution thus defined has recently been transferred and registered in the name of Nemetun Island Wind S.r.l.

2.3.3 THE SINGLE AUTHORIZATION PROCEDURE

In accordance with Ministerial Circular 40 of 2012, the request for a single authorization, according to Presidential Decree 387/2003, is submitted simultaneously and coincides with the request for a State Property Concession. As a result, the process at MASE is currently underway and will be finalized in accordance with the latest regulatory guidelines after the completion of the Environmental Impact Assessment procedure.

2.3.4 THE ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURE

As part of the procedures described above, the undersigned proceeds, with the drafting of the documentation of the final project and the Environmental Impact Assessment, to register the application for the Environmental Impact Assessment with the Ministry of the Environment and Energy Security, given that the intervention falls within the type listed in Annex II to Part Two of Legislative Decree 152/2006 at letter 7-bis, called "Wind farms for the production of electricity located at sea", and is among those included in the Integrated National Energy and Climate Plan (PNIEC), in the type listed in Annex I-bis to Part Two of Legislative Decree 152/2006, in point 1.2 called "*New plants for the production of energy and energy carriers from renewable sources, residues and waste, as well as modernization, complete reconstruction, conversion and increase of existing capacity, relating to: 1.2.1 Electricity generation: hydroelectric, geothermal, wind and photovoltaic plants (onshore and sea), concentrated solar power, energy production from the sea and production of bioenergy from solid biomass, Bioliquids, biogas, residues and waste*".

2.4 SPATIAL PLANNING AND SITES OF CONSERVATION INTEREST

2.4.1 RELATIONSHIP WITH SPATIAL PLANNING - OFFSHORE WORKS

2.4.1.1 Regional Territorial Landscape Plan (PPTR)

The document called "Guidelines on the design and location of renewable energy plants" of the PPTR provides the guidelines and requirements to be considered during the design phase and during the authorization process of plants for the production of energy from renewable sources.

The Regional Guidelines also address the issue of the development of offshore wind farms in paragraph "B1.2.3.3 Off-shore wind" which deserves to be reported in full as it constitutes an essential point of reference for all design activities both in terms of location of the plant and technological choices:

"Off-shore wind farms may be located at a minimum distance of 4 km from the coast, subject to ascertainment of the minimum wind requirements and acquisition of the authorizations under the jurisdiction of the Maritime State.

The location of off-shore plants will also not be allowed:

- in SCI sea areas and in marine protected areas;
- in correspondence with areas where the presence of posidonia and marine biocoenoses of conservation interest is found;
- in the context of the visual cones of coastal landscapes of particular value.

In consideration of the characteristics of the Apulian seabed, with particular reference to the biocoenoses present, as well as the trend of the isobates, the use of floating structures is preferred that allow the installation of wind turbines at depths greater than 60 m and that require a limited impact anchorage.

The feasibility of the plant and auxiliary works, as well as from an environmental point of view, must be verified and demonstrated from a technical point of view. In particular, the producibility of each individual plant machine must be certified by research bodies and/or accredited companies in the sector and must not be less than 2000 equivalent hours.

Investigations aimed at ascertaining the interference of submarine cable ducts with existing biocoenosis species will have to be carried out, and laying and landing techniques aimed at minimizing the impact will have to be adopted. The underground laying of submarine cable ducts is allowed only on muddy bottoms, without significant biocoenosis."

This proposal for an offshore wind farm complies with the above-mentioned provisions of the PPTR, because:

- the site respects the prescribed constraints and distances,
- the use of floating foundations is envisaged,
- the preliminary analyses carried out also confirm compliance with the minimum producibility threshold,
- The bibliographic studies analyzed suggest interferences between submarine cable ducts and the existing biocoenosis species extremely limited.

More generally, the Guidelines of the P.P.T.R. invite us to rethink the construction of wind farms in terms of a "landscape project", i.e. in a management framework, rather than its protection, with the aim of preparing a shared vision between the various actors involved in the process.

In this sense, the proposing company intends to develop an innovative business model based on the creation of social and environmental value and has defined specific compensation and enhancement measures, as described in detail in the R.6 report attached to the final project, including actions aimed at:

- the enhancement of the landscape and naturalistic heritage,
- support and training for local communities for the green economy,
- support to the research and higher education sector,
- to the promotion of creativity and the arts.

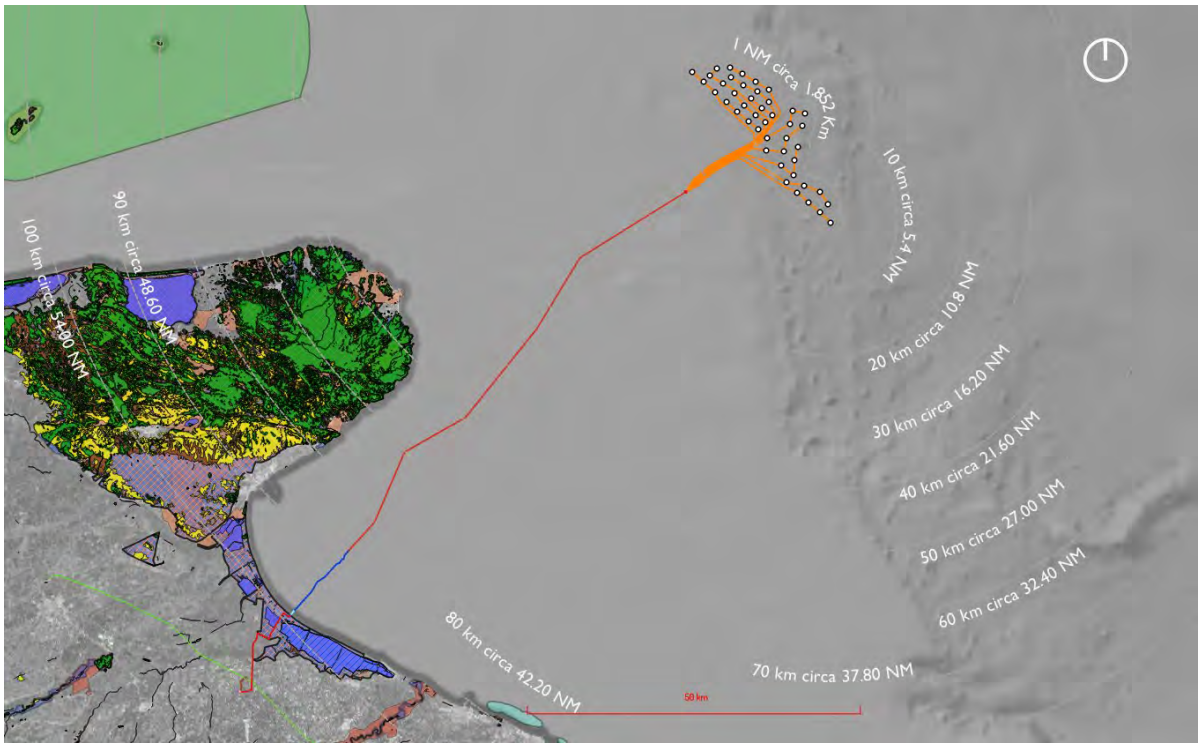
For the implementation of the aforementioned actions, specific memoranda of understanding have been signed with local and national stakeholders, such as INARCH, Legambiente, Pigment and universities.

Please refer to the documents in section 6 attached to the final project for the necessary further information.

2.4.1.2 Analysis of interferences with the PPTR of offshore works

From the exam of the Atlases of the P.P.T.R., no direct interference was found concerning landscape assets and other landscape contexts listed in the Table. However, the recently formed "Aloisa – Carapelle" "Aloisa – Carapelle" marine SPA IT9110041 not yet included in the PPTR cartography, is crossed by the last 4 km of submarine power line that arrives in Zapponeta. Please refer to the attached tables for the framing of the works on the cartography of the Landscape Plan.

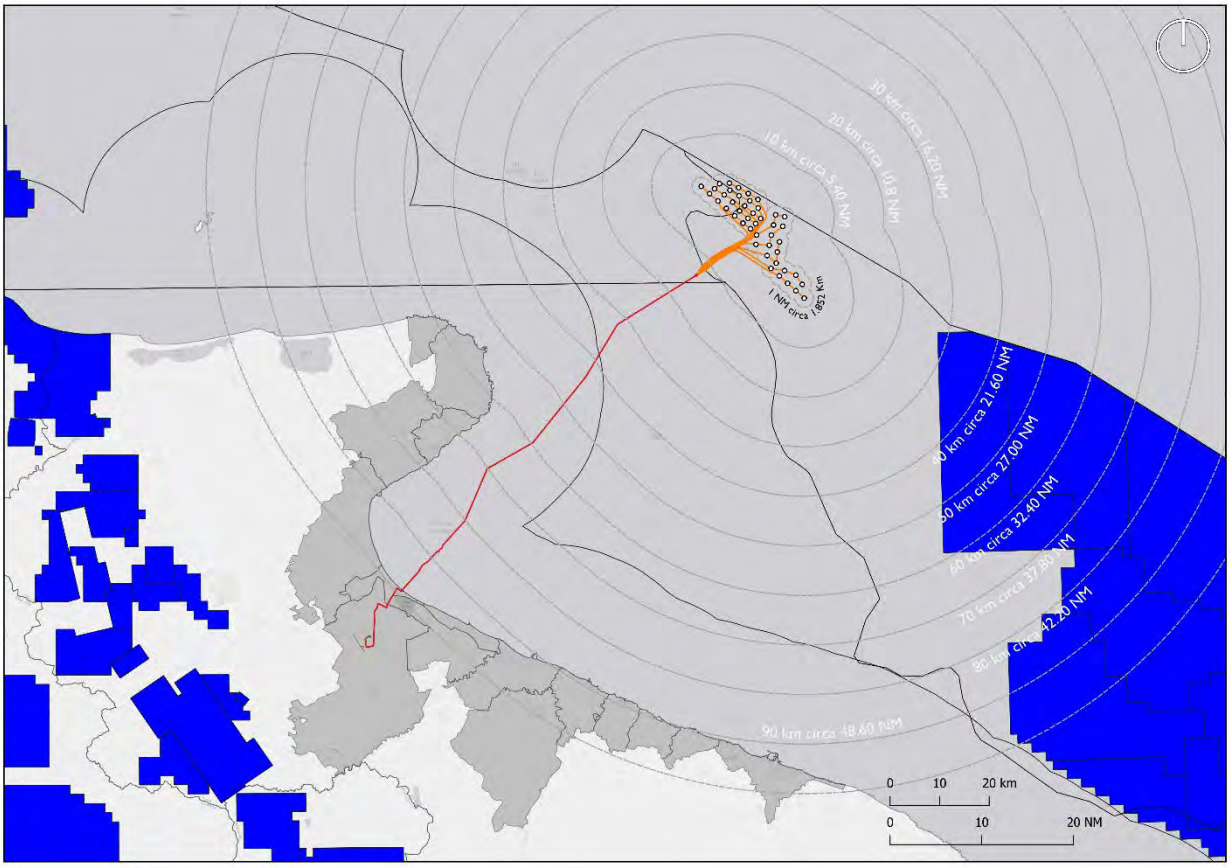
	HYDROGEOMORPHOLOGICAL STRUCTURE	ECOSYSTEM AND ENVIRONMENTAL STRUCTURE	ANTHROPIC AND HISTORICAL-CULTURAL STRUCTURE
WORKS AT SEA			
Wind turbines	---	---	---
Submarine power line (66 kV)	---	---	---
Off-Shore Electrical Substation (66/400 kV)	---	---	---
Submarine power line (400 kV)	---	---	---



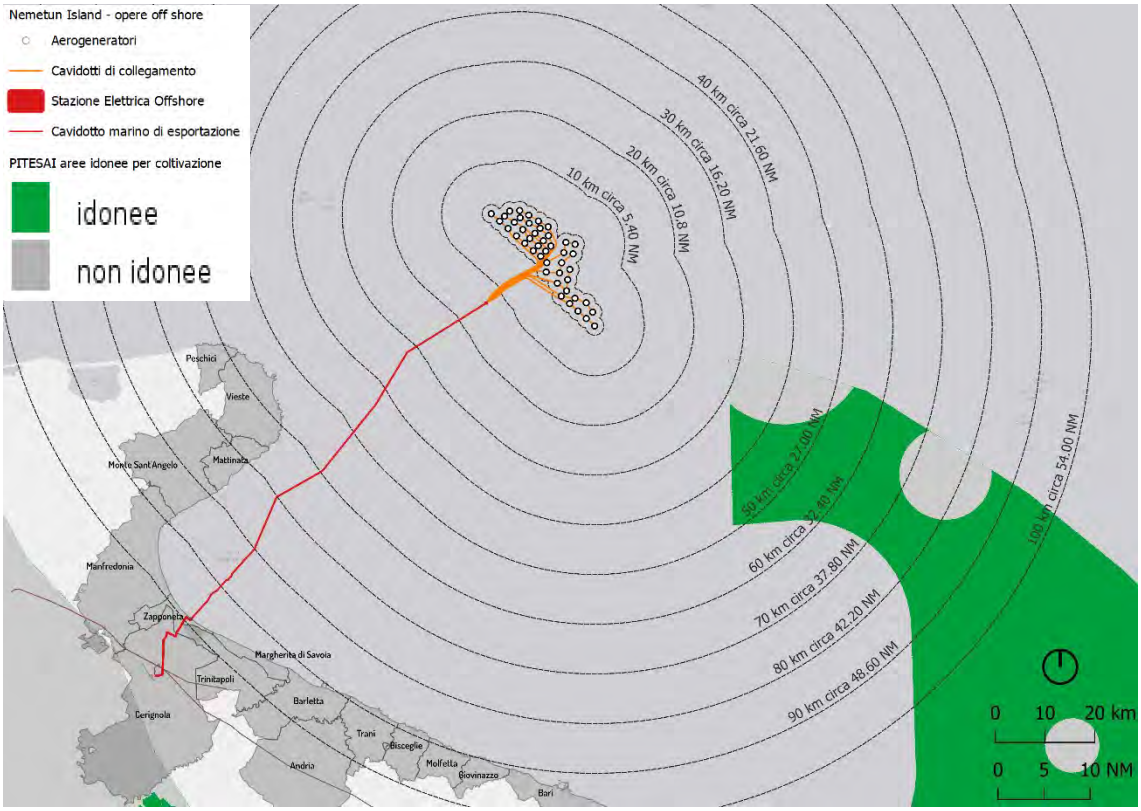
Offshore works on PPTR - Ecosystem and environmental structure – Components of the protected areas and naturalistic sites

2.4.1.3 Hydrocarbon research qualifications

In the lower Adriatic there are some existing mining titles such as hydrocarbon exploration permits and extraction concessions as well as some applications for the conferral of new mining rights. The area identified for the realization of the project is about 14 NM or 30 km away from the areas of interest for the purpose of underwater hydrocarbon exploration.



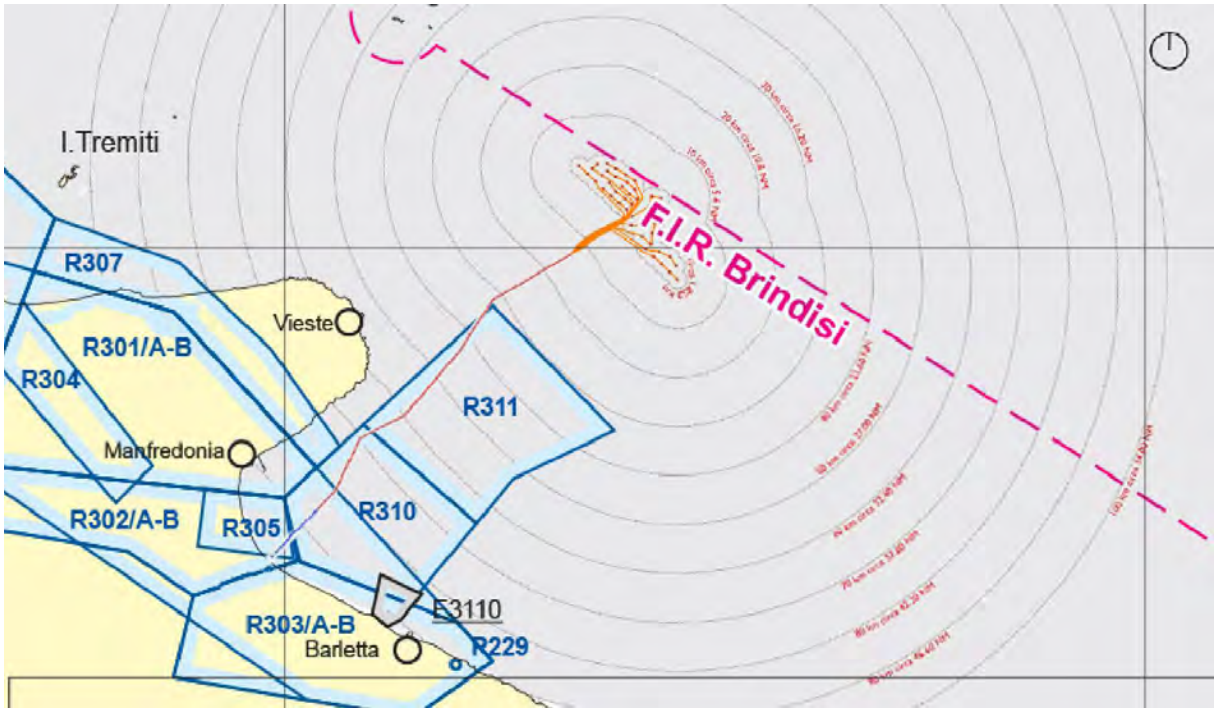
Classification of the offshore wind farm on MASE maps - Mining titles and required applications



Classification of the offshore wind farm on MASE maps - Suitable and unsuitable areas for prospecting and research activities and for hydrocarbon production activities

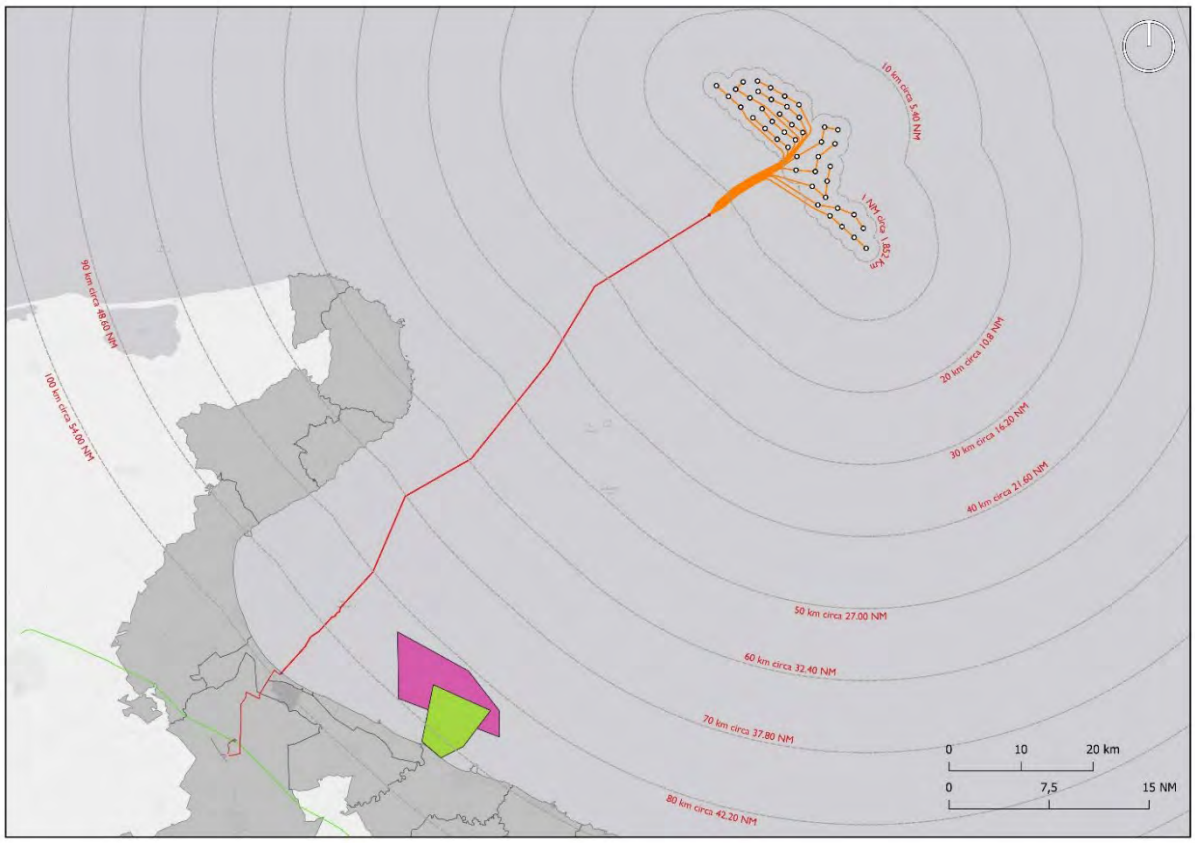
2.4.1.4 Military constraints

According to the publication "Notices to sailors of a general nature" issued annually by the Hydrographic Institute of the Navy, the area affected by the project and the connection works is located outside the so-called "Areas normally used for naval shooting exercises"; however, the route of the offshore cable duct touches some "Regulated Zones R" defined as *"Airspace of defined size, over the territory or territorial waters of a State, within which the flight of aircraft is subject to certain specific conditions"*, the operations for the construction of the marine cable will not involve the use of aircraft of any type, but operations carried out exclusively by naval means. As already happened during the field investigations, all operations at sea will be subject to a prior request for authorization and reporting to the competent command.



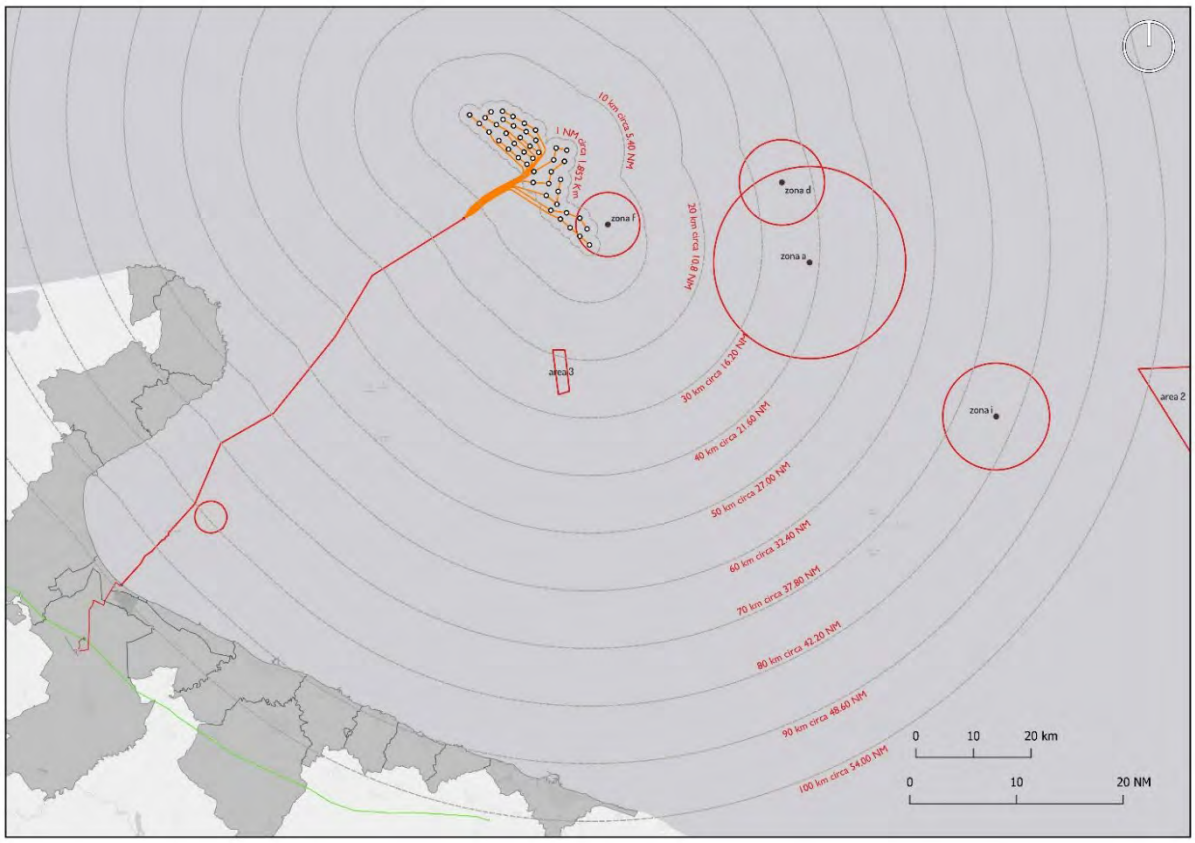
Cartography of military constraints with indication of the project area – source Notices to Mariners of a general nature Geographical Institute of the Navy – 2023

To the west of the town of Barletta there are two areas used for military exercises. In particular, one of these is identified as type E 3 zone, called E 3310 Barletta - Foce Ofanto (indicated in green on the map below) and is permanently forbidden to navigation and fishing due to the presence of unexploded shells on the bottom. The other area is classified as type T 8 and intended for Sea-Land shooting exercises (indicated in purple on the map below). Both areas are located outside the installation area of the export cable duct and the other facilities of the Nemetun Island plant.



Cartographic overlay of military constraints

The same publication of the Hydrographic Institute of the Navy offers useful information to identify areas with the possible presence of unexploded ordnance of war type in the Adriatic Sea. On the basis of the information obtained, it was possible to reconstruct an indicative map of the areas reported.



Areas with possible presence of war ordnance in the Adriatic Sea

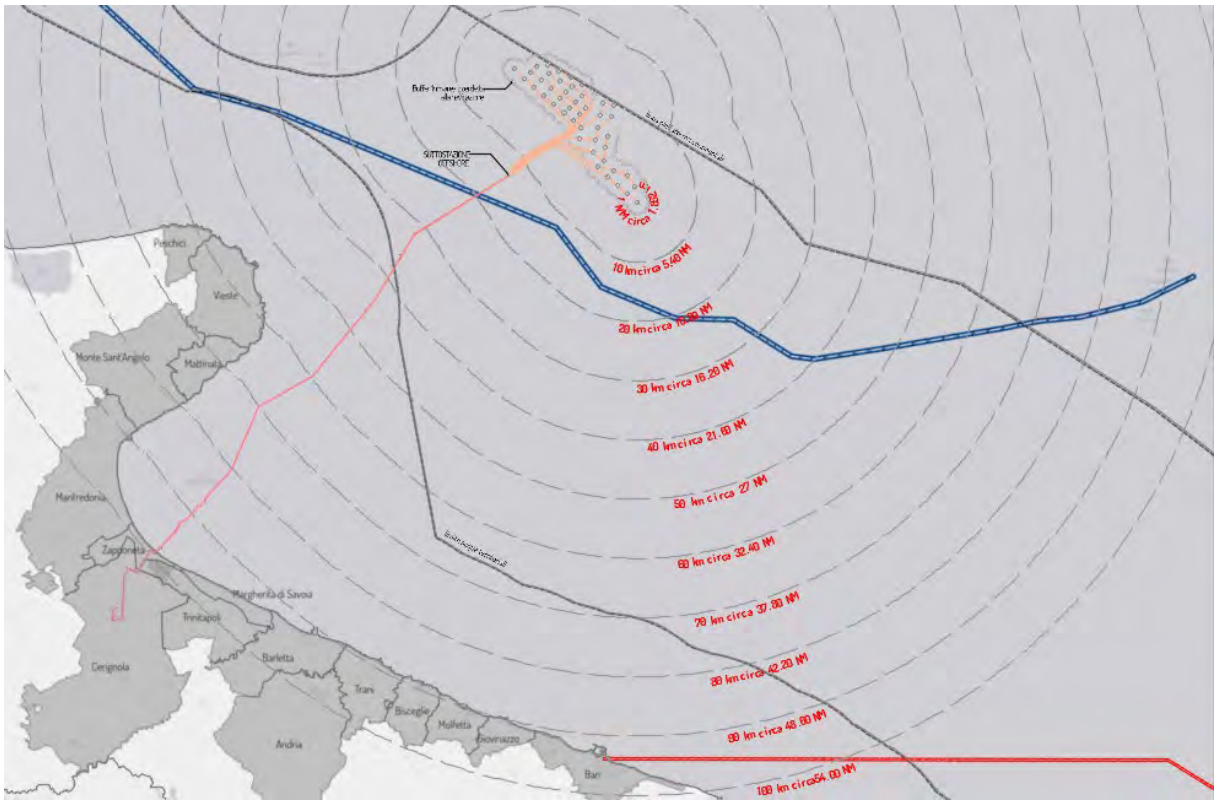
Some areas of attention are graphically interfering with the bodies of water affected by the Nemetun Island offshore wind farm, however, it should be noted that:

- From the analyses conducted through the use of Side Scan Sonar and Sub Bottom Profiler for the geognostic investigations of the wind farm, there is no evidence of the presence of unexploded ordnance in the areas of the plant.
- All phases relating to direct investigations on the seabed and the construction of the plant will be preceded by activities of identification and reclamation of any unexploded ordnance of war, to be authorized and carried out in accordance with the regulations in force on the subject.

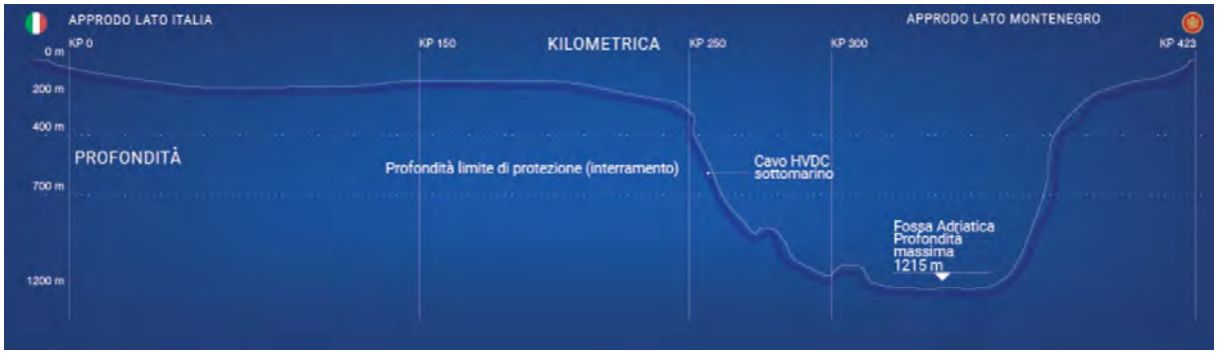
2.4.1.5 Interference with other linear works in the area

With regard to the possible interference of offshore cable ducts with other infrastructures in the area, it is worth mentioning the possible intersection of the export cable duct with the route of the MON cable duct. ITA. The route, indicated in the following cartography, was extracted from public data, and shows a possible intersection between the section being laid and the power line that is currently under construction.

Any possible interference will be managed within the construction site according to the indications of the project and the regulations in force on the subject, subject to specific authorizations and agreements with the managing bodies to minimize the possibility of disruptions or interruptions in operation.



Linea elettrica MON. ITA and the Nemetun wind farm Island



Linea Elettrica MON. ITA. schematic section

The MON. ITA is a project of importance within the European Union, aimed at creating an exchange of electricity between Montenegro and Italy. This infrastructure consists of two submarine cables, each 423 km long, positioned under the waters of the Adriatic at maximum depths of 1,215 meters. In addition to these, there are 22 km of underground cable, 16 of which are in Italy (from the coastal landing point to Cepagatti station) and 6 in Montenegro (from Budva to Kotor station).

The route of the power line is located at a minimum distance of about 6.5 nautical miles (12 km) from the wind turbines of the Nemetun Island plant, thus ensuring the absence of direct interference on the operation of the international network. Other gas transport infrastructures are located at distances of more than 60 nautical miles, also in this case interference from the plant and the processes can be excluded.

2.4.1.6 Environmental framework of the areas

The area of interest has been the subject of a detailed study aimed at characterizing the areas from a constraint and environmental point of view, building a reference framework useful for defining the

preliminary design with particular reference to the definition of the route of the power line and the work plan of the oceanographic studies to be carried out at sea.

As a preliminary step, the publications and reports of the Ministry of Agricultural, Food and Forestry Policies ("The state of fishing and aquaculture in the Italian seas" edited by S. Cautadella and M. Spagnolo in 2012), the results of the Ipa Adriatic POWERED Project already presented in the introduction and the studies carried out by the Puglia Region on the *Posidonia oceanica* and on marine bioconstructions (BIOMAP) which have contributed to building a large and documented body of scientific data used for the perimeter of the Apulian sea SCIs.

In 2012 the Ministry of Agricultural, Food and Forestry Policies promoted the publication of the book "The State of Fishing and Aquaculture in the Italian Seas" edited by S. Cautadella and M. Spagnolo as part of the project "Program for a publication on the state of fishing in Italy – code 6G24". The book provides a snapshot of fisheries and aquaculture, and in its second chapter, the "Environmental Characterization of Fishing Areas" is presented. Below are some excerpts from this publication useful for framing the marine areas overlooking Puglia from an ecological point of view.

"The Lower Adriatic shows substantial differences in the northern and southern portions; in the first is located the Gulf of Manfredonia, with a wide continental shelf (distance between the coast line and 200 m equal to about 45 nautical miles) and a slightly steep escarpment; in the second, however, the isobaths are close together, so much so that the depth of 200 m is already reached about 8 miles from Capo d'Otranto. As will be seen later, this different physiognomy is reflected in the characteristics of biocoenoses and fishery resources.

The edge of the continental shelf (shelf-break) is located at a depth of about 160-200 m and is engraved by the heads of canyons that develop orthogonally to the line of the continental escarpment. These incisions in the bottom constitute preferential routes for the transfer of sediments towards the abyssal plain, especially where they are closer to the coast line.

The distribution of marine flora and fauna, as well as the main ecological characteristics of the basin, is linked to environmental and morphological differences.

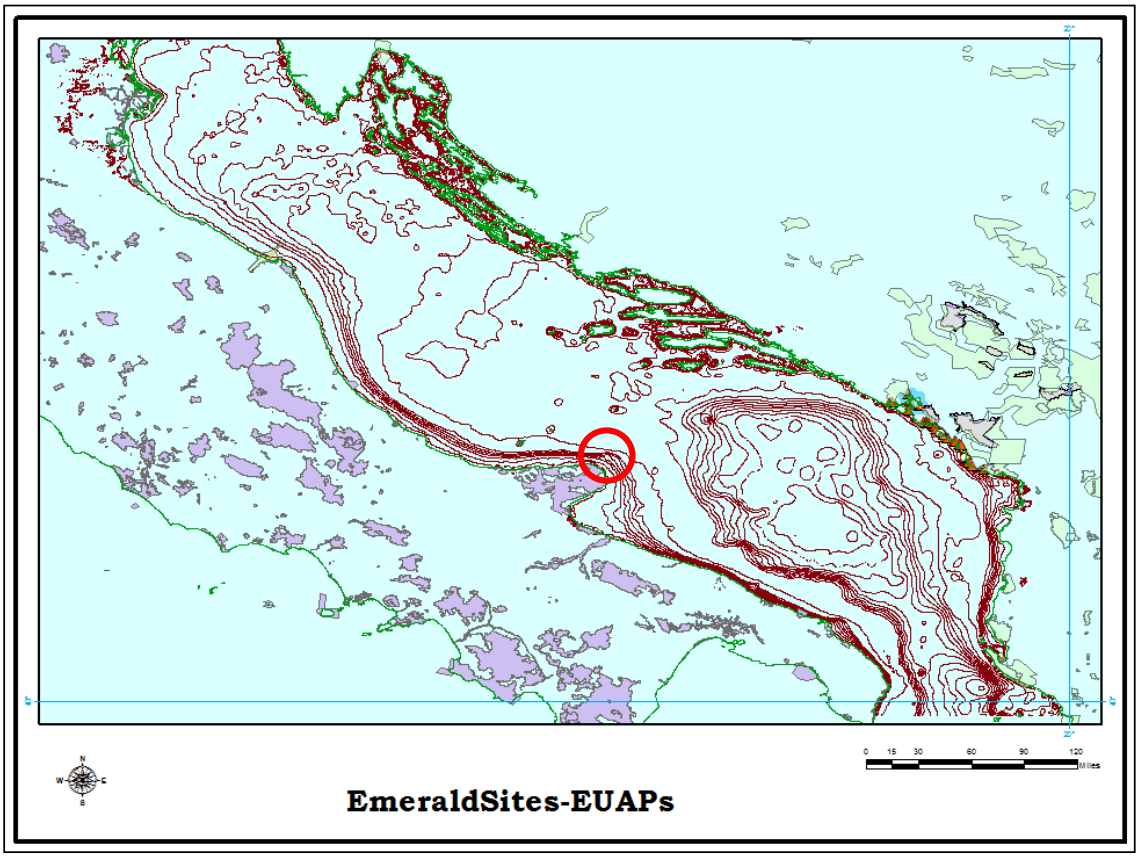
The contributions of nutrient-rich material from the rivers and streams that flow in the area north of the Gargano (Fortore river, Saccione stream) greatly influence the nature of marine sediments and consequently the existing benthic communities.

On the continental shelf, the bottom is not very steep and almost exclusively sedimentary in nature. As the distance from the coast increases and the bottom slowly slopes, together with the reduced hydrodynamics, the mud gradually takes over, favoring the establishment of muddy sand communities. The area of the Gulf of Manfredonia, protected from the direct effect of the W-SAd-C current due to the presence of the Gargano promontory, is subject to hydrodynamic conditions that facilitate sedimentation and enrich the waters with nutrients, resulting in the presence of shellfish beds of commercial interest. In particular, in the areas closest to the coast, the biocoenoses of the Well-Calibrated Fine Sands (SFBC) prevail (figure 2.15) characterized by the bivalves Chamelea gallina (common clam) and Acanthocardia tuberculata (hearts), while towards the open sea the sediments of organogenic origin (maërl bottoms and precoralligenous bottoms) are populated by Venus verrucosa (sea nut) and Laevicardium oblungum (Vaccarella et al., 1996).

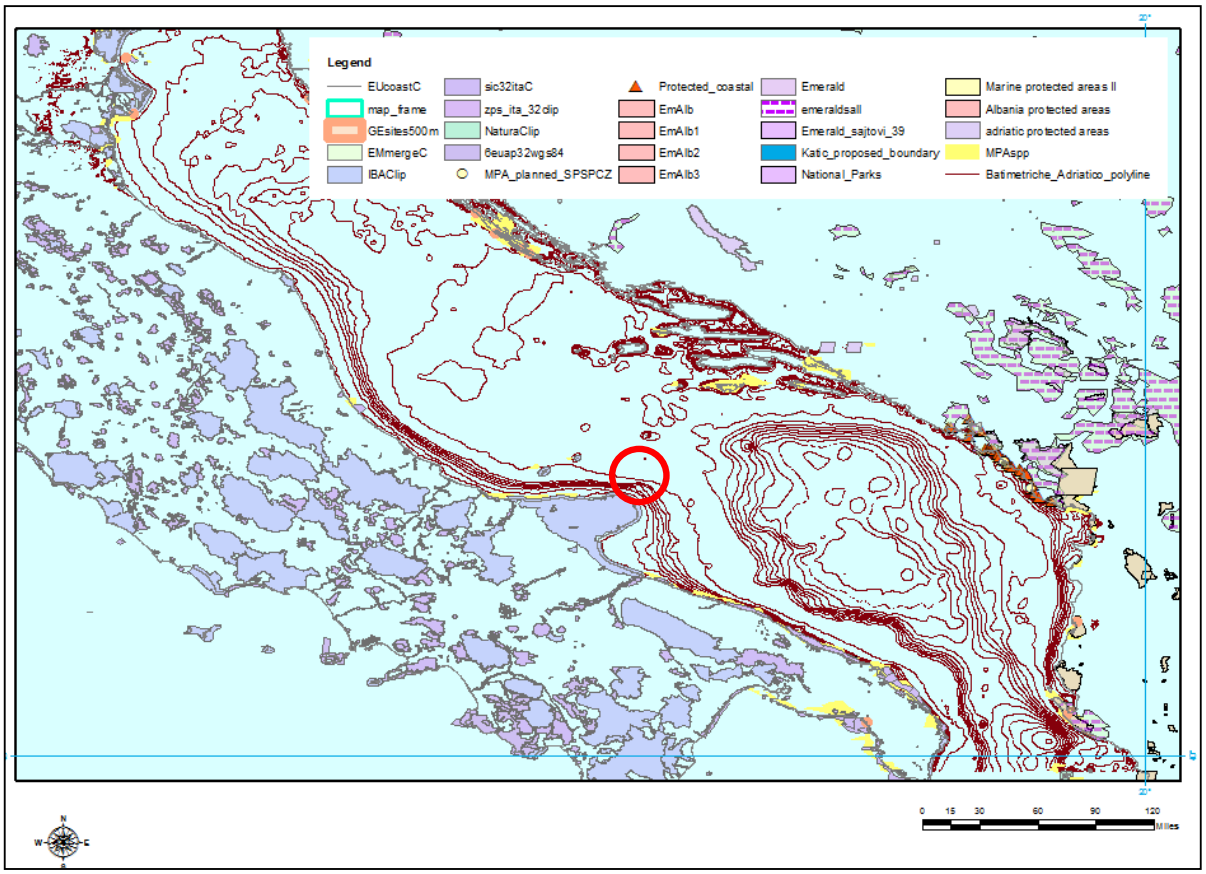
Off the coast of Bari the biocoenoses of the Coastal Detrital (DC) and the Offshore Detrital (DL) are settled on relict sediments, to which fine detritus-organogenic materials have been added. In the coastal area between Bari and Brindisi, from the shoreline to the open sea, there are rocky bottoms mainly colonized by the photophilic algae (AP) biocoenosis, short sandy stretches up to 5-6 m deep, Posidonia oceanica meadows, coralligenous (already at 12 m and up to 22 m) and finally Coastal Terrigenous Mud (VTC). In the stretch of coast between Brindisi and Otranto, the infralittoral is characterized by a narrow strip of Well-Calibrated Fine Sands (SFBC) which is followed by an extensive strip of posidonia settled both on "matte"

and on sand and, in some stretches, also on rocky substrate. In this area the largest extension of Posidonia has been detected, just over 3 km (CRISMA, 2006a).
In the "intermatte" areas, stretches of biocoenosis similar to a "precoralligenous" are identified. The coralligenous is present up to 40-50 m and then replaced by Coastal Terrigenous Mud (VTC) bottoms characterized by the gastropod Turritella communis. In the southern Adriatic the lower limit of Posidonia never goes beyond 25 m of depth, while the upper limit is often around 6-7 m and in rare cases it seems to reach even lower waters, such as in an area south of S. Cataldo (Lecce) (CRISMA, 2006a)."

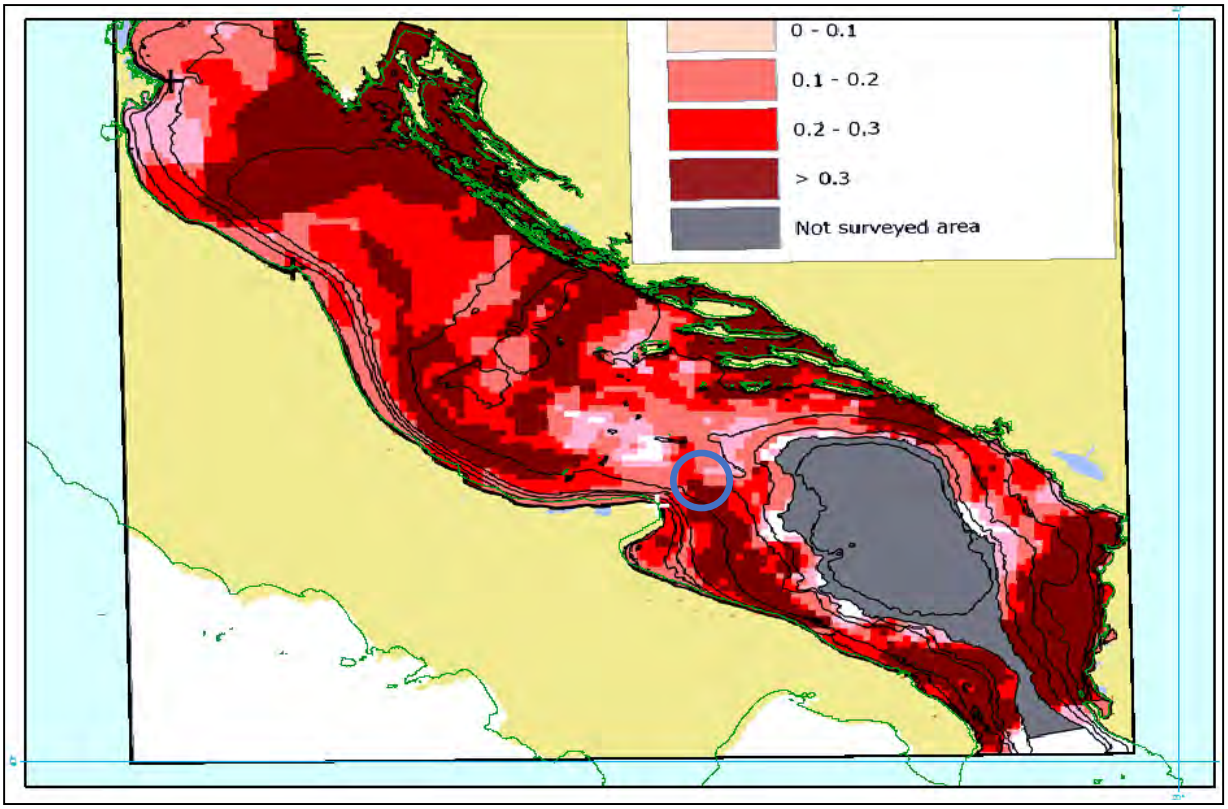
Further elements were collected by analyzing the final report of WP5 of the Powered project from which thematic maps were extracted relating to the following environmental components flora, fauna and ecosystems: birdlife, marine mammals, marine reptiles (turtles), elasmobranchs, benthic communities, fish, bivalves and protected species. **An initial analysis shows that the project areas are far from protected areas, on the seabed affected by the presence of wind turbines there are no meadows of *Posidonia oceanica* and coralligenous. The area in the project does not interfere with the areas highlighted in the cartography referring to birds. As far as marine fauna is concerned, it should be remembered that offshore wind farms represent a de facto marine protected area and therefore the positive impacts during the operation phase are certainly greater than any negative impacts during the construction phase.**



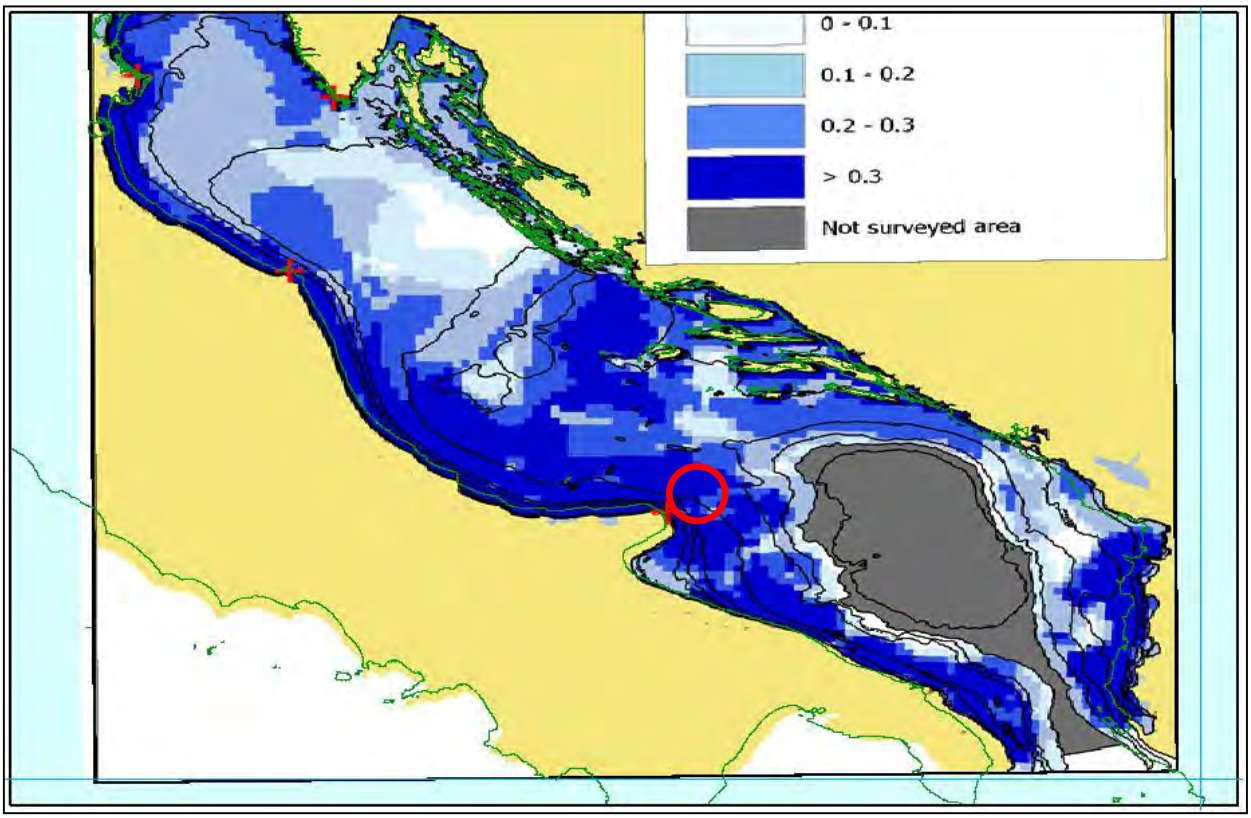
Protected Areas - Emerald Network – Powered IPA Project – WP5 Final Report



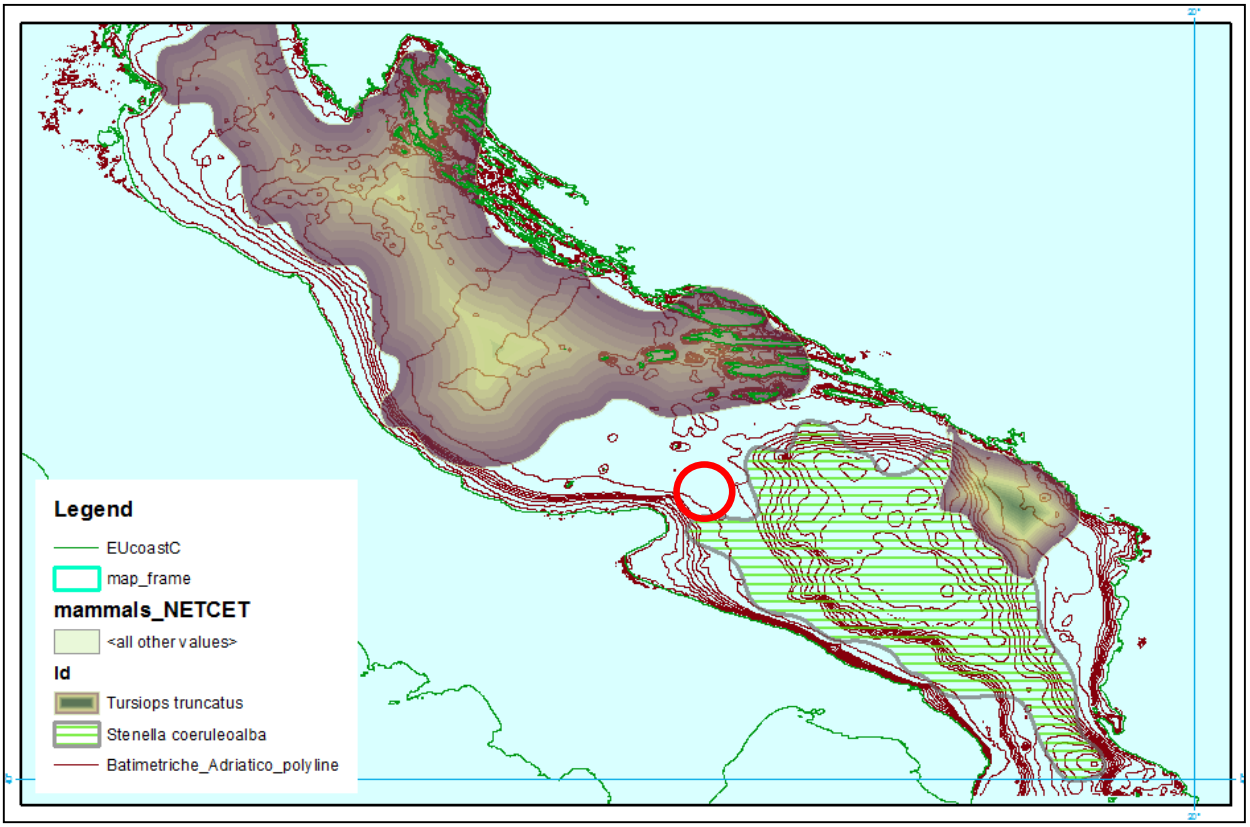
Protected Areas in the Adriatic Sea – Powered IPA Project – WP5 Final Report



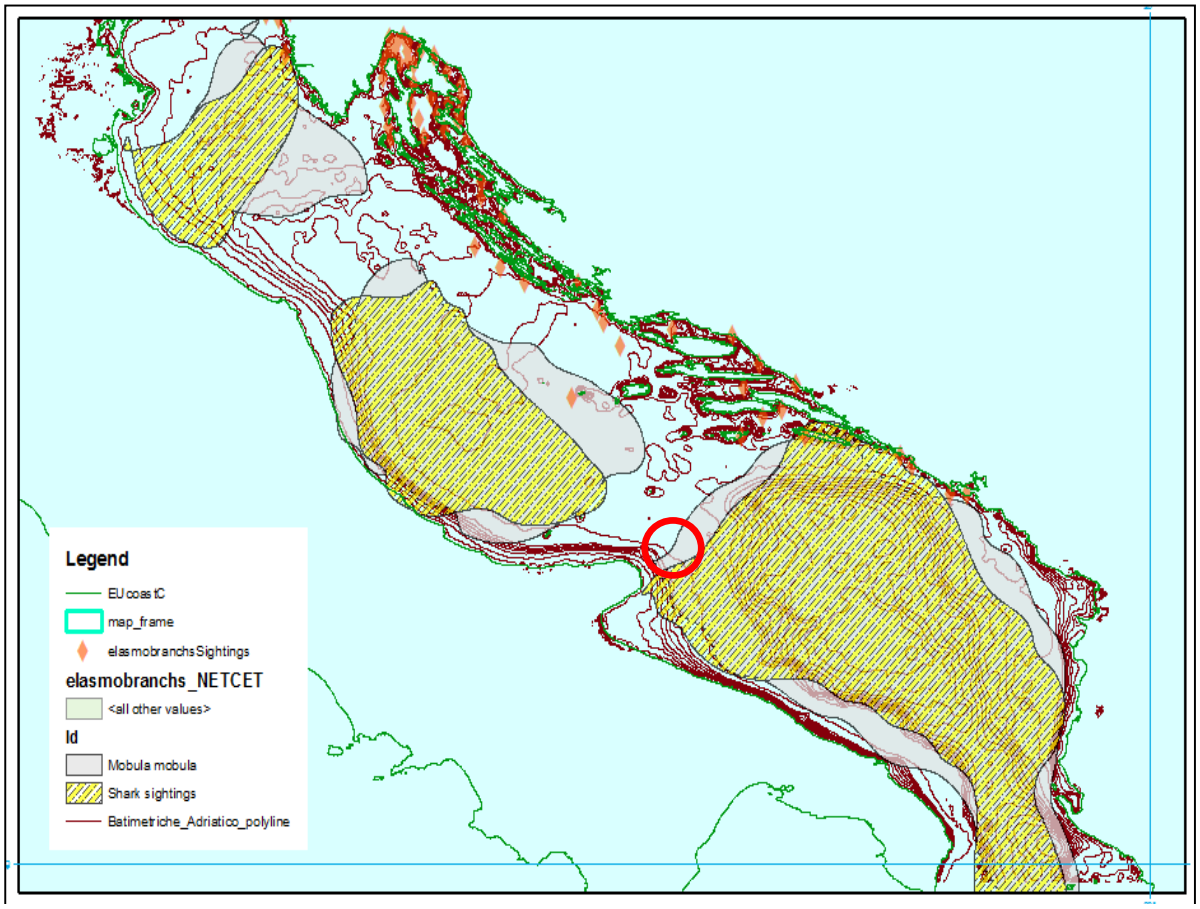
Spawning Areas – Powered IPA Project – WP5 Final Report



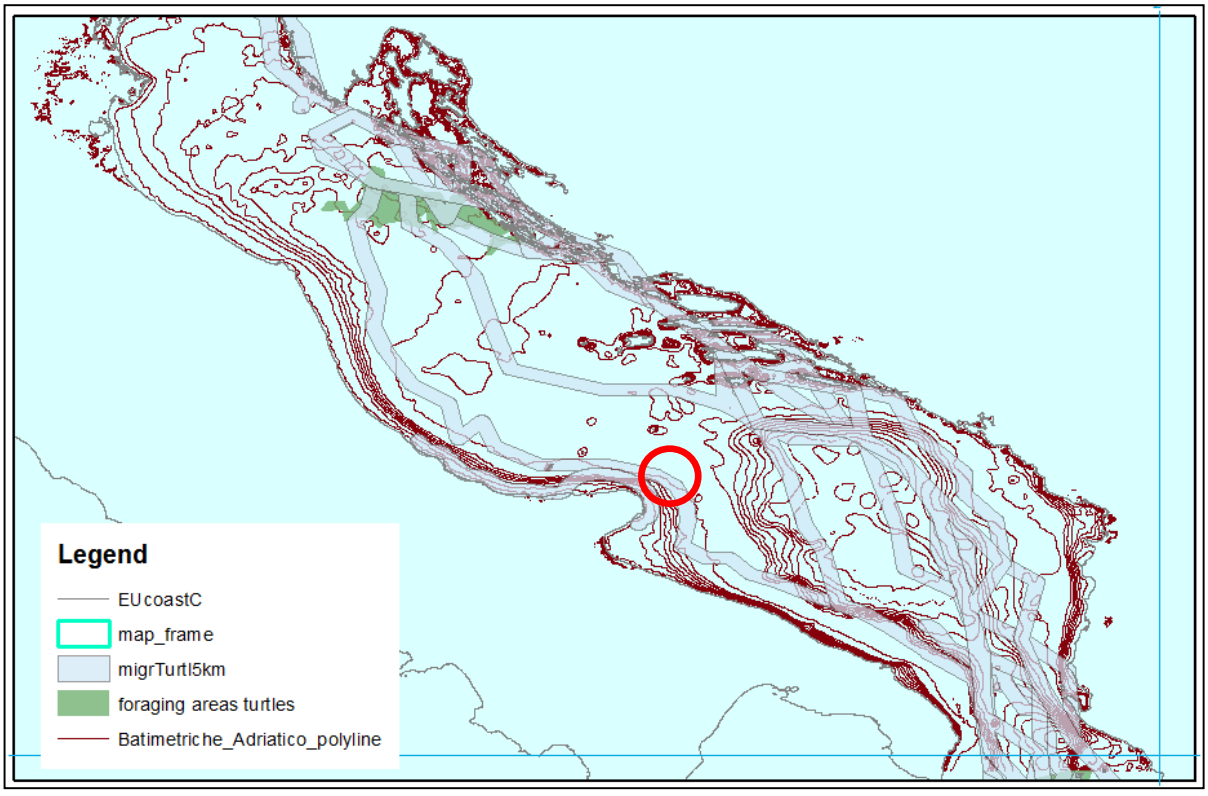
Growth areas of juveniles – Powered IPA Project – WP5 Final Report



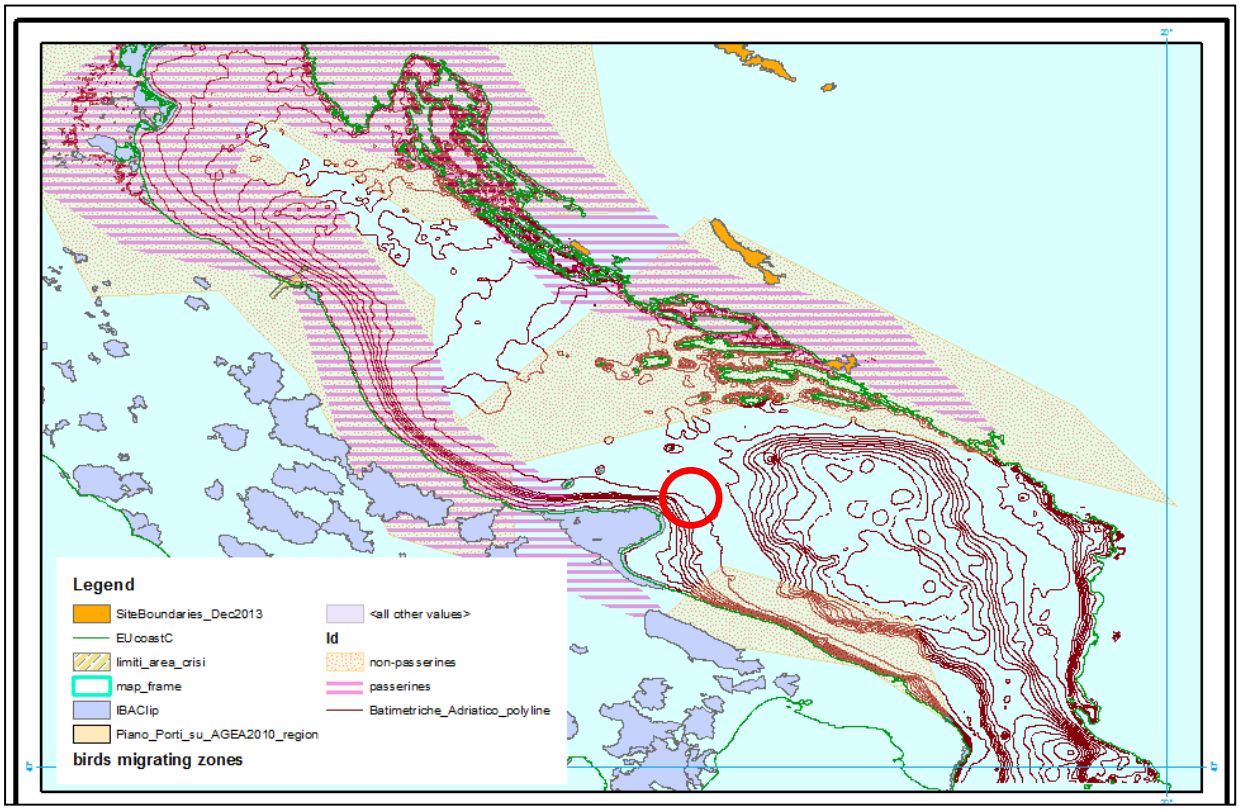
Marine Mammals - Powered IPA Project – WP5 Final Report



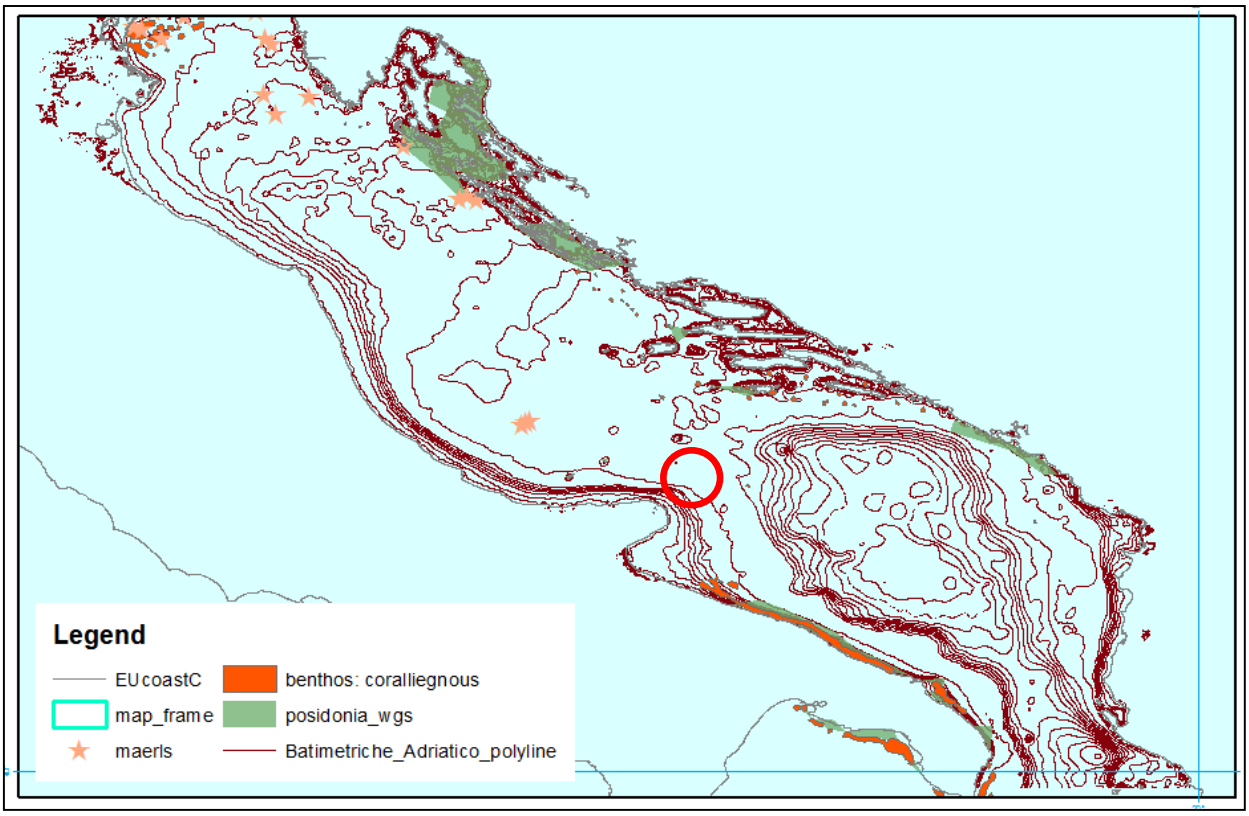
Elasmobranchs - Powered IPA Project – WP5 Final Report



Turtles - Powered IPA Project – WP5 Final Report



Birds - Powered IPA Project – WP5 Final Report



Benthic Habitats - Powered IPA Project – WP5 Final Report

After this preliminary analysis based on the studies carried out as part of the POWERED project that involved the entire Adriatic basin, the possible impacts of the planned works were analyzed in more detail

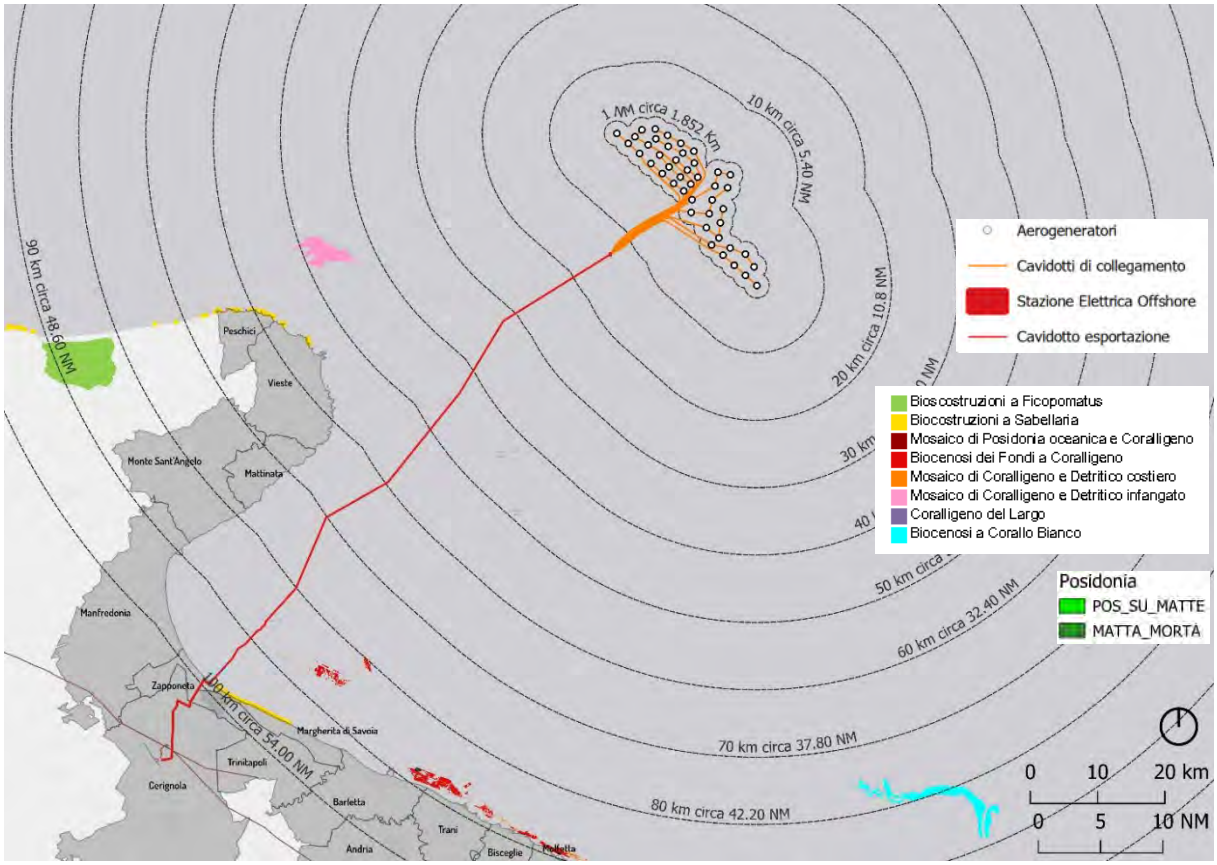
in consideration of the studies carried out by the Puglia Region on the *Posidonia oceanica* and on bioconstructions.

The data produced by the project "Inventory and Cartography of the Posidonia Meadows in the Maritime Compartments of Manfredonia, Molfetta, Bari, Brindisi, Gallipoli and Taranto" carried out by the Consortium for Applied Research and Technological Innovation in Marine Sciences – CRISMA, with the participation of the Molfetta Fishing Shipowners Association – ASSOPESCA were analyzed and the GIS cartography produced was used. From the cartographic superimposition, it is evident that the wind farm and the connecting works are far from the *Posidonia oceanica*.

The preliminary design activity took into account the results of the studies carried out as part of the BIOMAP project – Marine bioconstructions in Puglia – promoted by the Puglia Region in order to map the marine bioconstructions present along the Apulian coasts by verifying their species composition, conservation status and impacts to which the bioconstructions are subjected.

The term "Marine Bioconstructions" defines those environments characterized by the superimposition of biological structures that can grow one on top of the other to form real "cliffs" sometimes even a few meters high. Within the category "marine bioconstructions" in Puglia, in addition to the "coralligenous" proper, it is worth mentioning the presence of two other types of bioconstructions (over 200 meters deep), formed by the so-called white corals, located in the area of Santa Maria di Leuca and in the Canyon off the city of Bari and the reefs formed by the polychaete *Sabellaria spinulosa*, located in the Gargano area at surface bathymetry (10 meters deep).

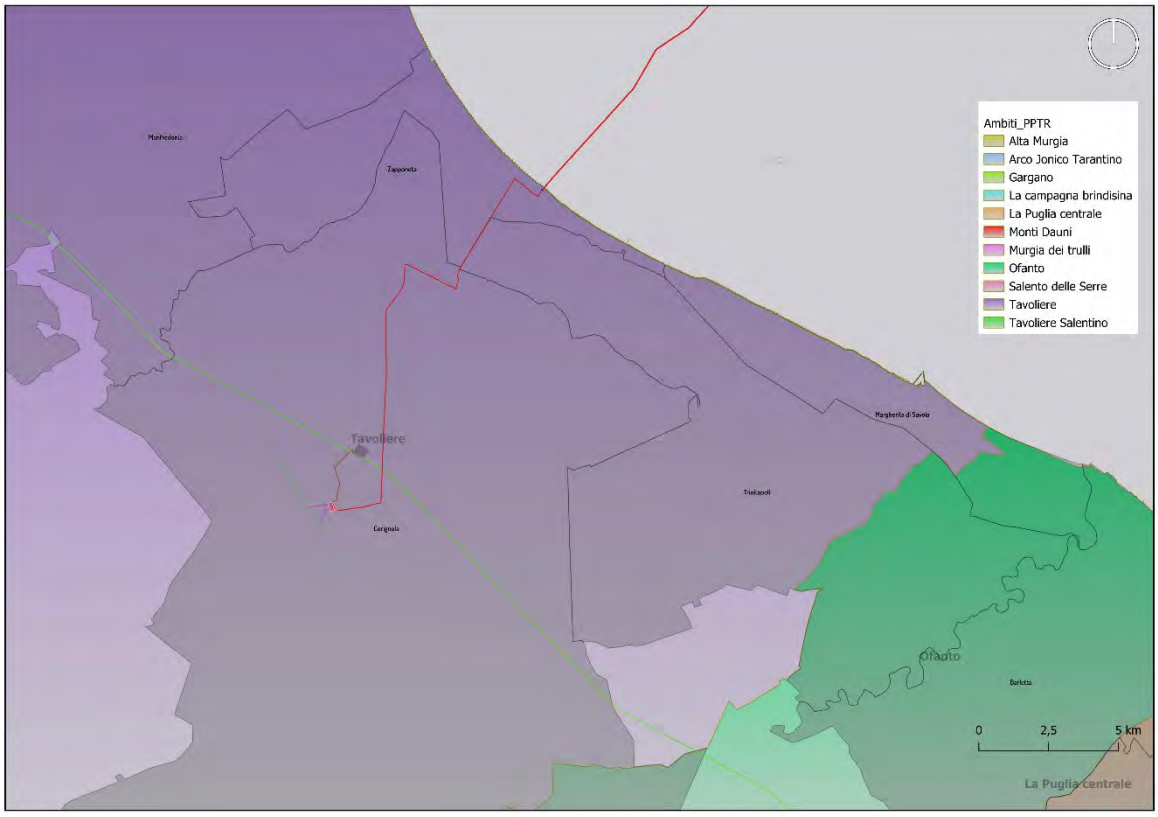
The research lasted over 2 years and produced a GIS cartography of the census carried out. From the cartographic superimposition, it is evident that the wind farm and the connection works are far from the area affected by the presence of coralligenous.



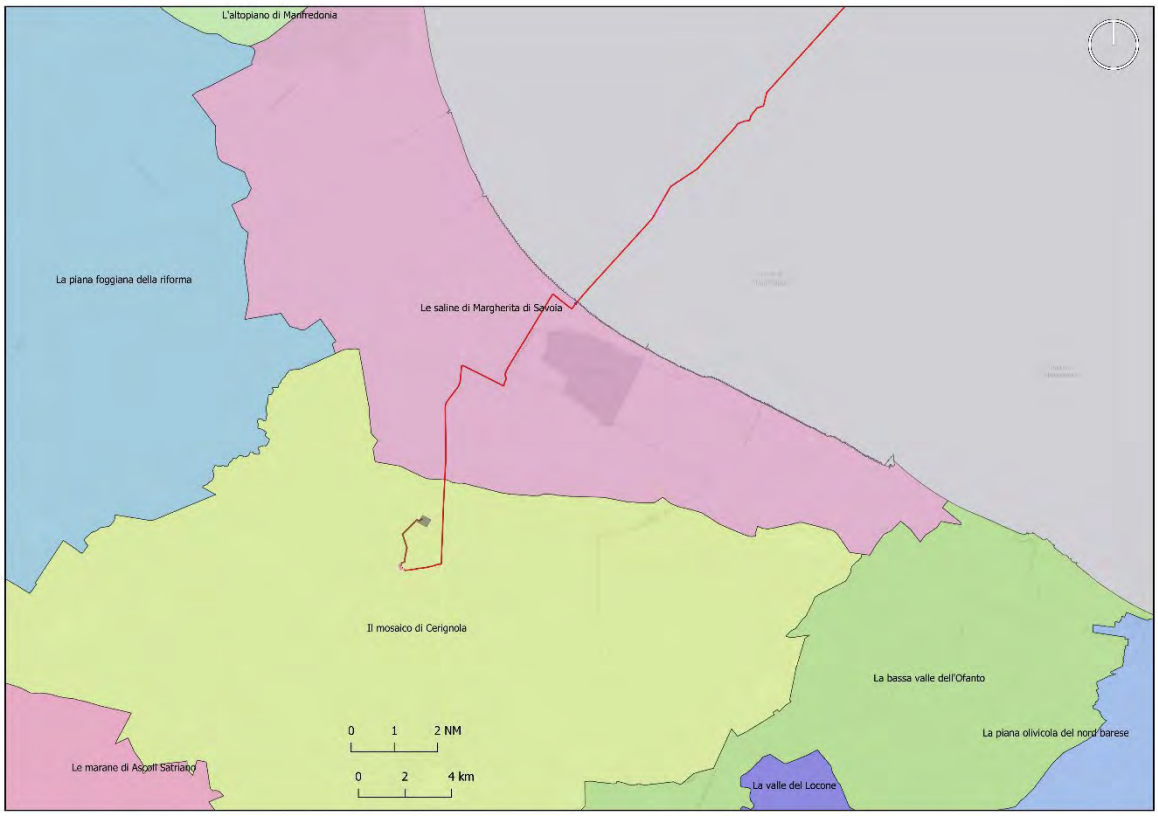
Framing of the wind farm on the mapping of marine biocoenoses – CRISMA

2.4.1.7 The Coastal Landscape

The onshore works relating to the project interventions fall mainly within the landscape area no. 3 "Tavoliere", and more precisely in the territorial and landscape figures called "The salt pans of Margherita di Savoia" and "The mosaic of Cerignola".



PPTR territorial areas



PPTR territorial figures

The territorial figure number 3.4 of the Margherita di Savoia Salt Pans it extends from the foothills terrace to the north to the Salt Pans of Margherita di Savoia and the mouth of the Ofanto to the south. This is the coastal landscape of the Capitanata, a place of the most significant phases of the history and of the regional hydraulic economy, which has seen, first, the exploitation of the resources offered by the wetlands, then the enormous transformations of hydraulic reclamation, and currently a desire for naturalistic protection.

The territorial figure number 3.3 of the Cerignola Mosaic belongs to the landscape of the agrarian mosaic of the southern Tavoliere develops on the territory between the Ofanto river and the Carapelle stream, around the large agricultural center of Cerignola, which with the radial of roads that branch off from the center, organizes the territorial figure. Some of these axes are prolonged, becoming important territorial connections (for example the axis with Canosa, which crosses the Ofanto). Along the route from Foggia, the monotonous landscape of the low and flat plain of the central plateau moves progressively, giving rise to very slight hills dotted with vineyards, which represent the cornerstones of the historical agricultural system.

The visual reference points change in this figure: leaving the Gargano plateau behind, the heights of the Murge can be glimpsed to the south and, on the extensive horizons of vines and olive trees, the compact center of Cerignola stands out, around which the agricultural mosaic is characterized by the geometry of the agricultural plot that is structured in a radial pattern, with an increasingly dense mesh as you approach the urban edge.

The stretch of Adriatic coast affected by the plant consists of about 300 km, and falls within the following coastal landscapes:

- Area 1 – Gargano - UC 1.2 "The Gargano coast"

- Area 3 – Tavoliere - UC 3.1 "The system of coastal wetlands of the Capitanata"
- Area 4 – Ofanto - UC 4.1 "At the mouth of the Ofanto"
- Area 5 – Central Puglia - UC 5.1 "The festoon of the coastal cities of Central Puglia"

In the *ES.8.1_01* chapter 4.1.8.2 of the SIA contains a summary description of the structural characteristics of the areas of interest, based on sections A of the Area Sheets attached to the PPTR and divided by hydro-geo-morphological, ecosystemic-environmental and anthropic and historical-cultural structure.

In particular, the stretches of Adriatic coast along which the plant is located are mainly part of the coastal landscape identified in the PPTR documentation as *UC 1.2 The Gargano coast and UC 3.1. The system of coastal wetlands of the Capitanata.* The latter in particular presents the SCI areas that are crossed by the project works:

- SPA IT9110041 "Aloisa - Carapelle" which includes 4 km of offshore cable duct;
- SPAS IT9110038 "Marshes near the Gulf of Manfredonia" and SAC/SCI IT9110005 "Wetlands of the Capitanata" in which they are located 8 km of underground cable duct section.

As part of the Environmental Impact Study, various inspections were carried out along the Adriatic coast by carrying out a photographic survey of the coastal landscape, which then merged into the documents of series *S.6_ Compensation and Enhancement Measures*.

2.4.2 RELATIONSHIP WITH TERRITORIAL PLANNING - ONSHORE WORKS

2.4.2.1 Analysis of interferences with the PPTR of onshore works

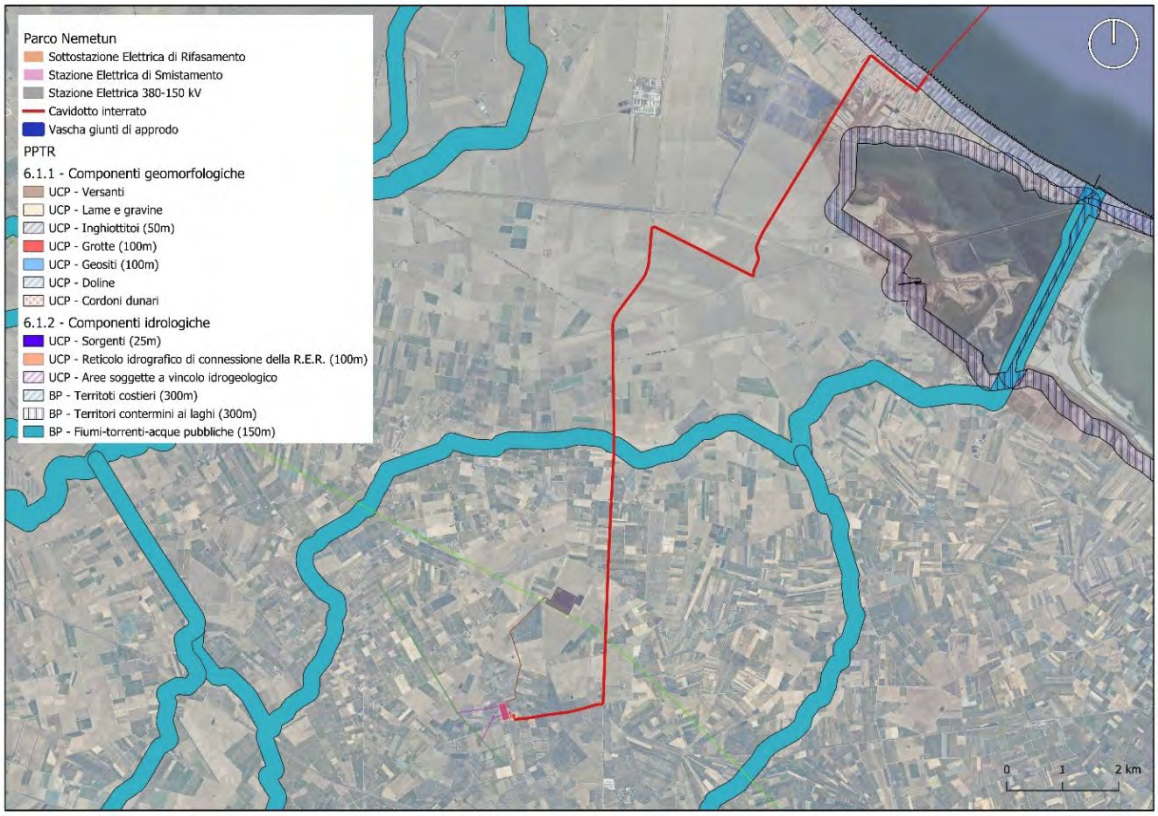
From the exam of the Atlases of the P.P.T.R., as can be seen from the images below, the Direct interference concerning landscape assets and other landscape contexts listed in the Table. Please refer to the attached tables for the framing of the works on the cartography of the Landscape Plan.

The compatibility of the planned works has also been assessed in greater depth in the Environmental Impact Assessment.

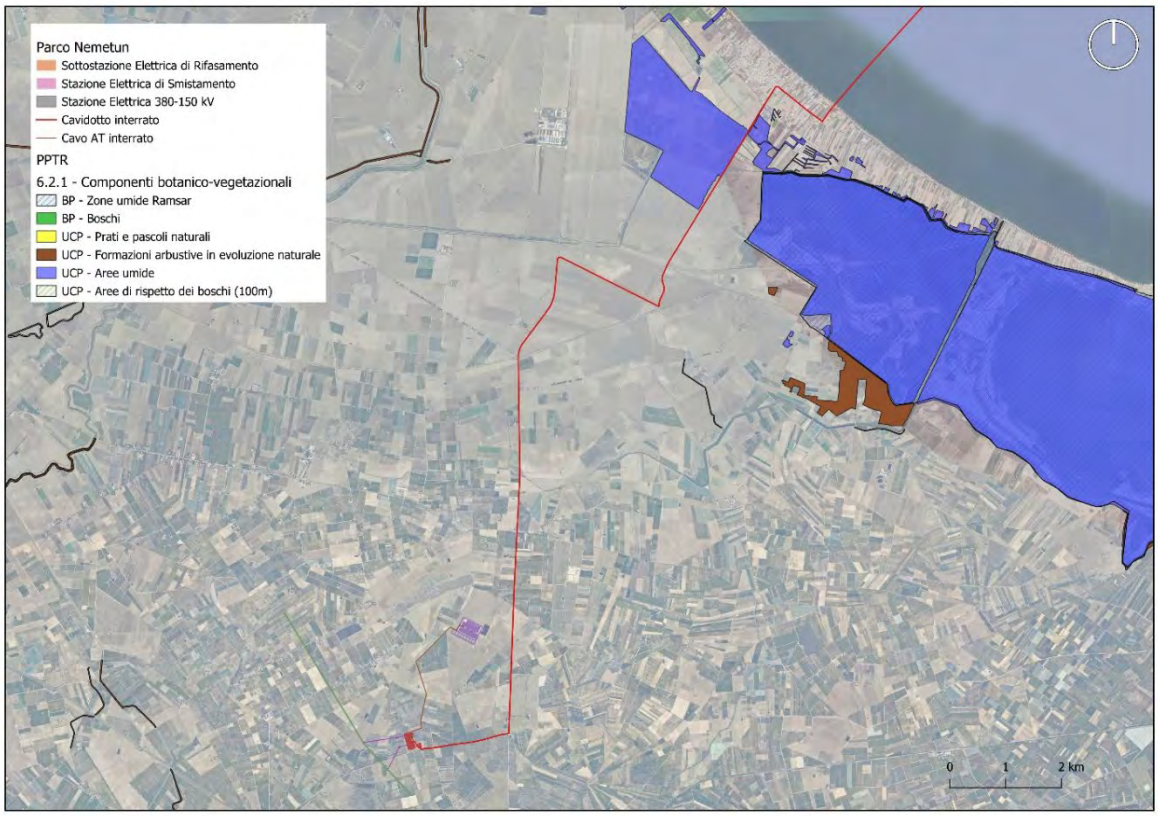
Please refer to the contents of the *T.1.3.2_01_ Onshore Works Framework - Planning Constraints* for a graphic detail that allows a greater depth of the cartographic excerpts shown here.

	HYDROGEOMORPHOLOGICAL STRUCTURE	ECOSYSTEM AND ENVIRONMENTAL STRUCTURE	ANTHROPIC AND HISTORICAL-CULTURAL STRUCTURE
GROUND WORKS			
Joint Bay *Interference with PPTR*	BP – Coastal Territories	UCP – Sites of naturalistic importance	----
Joint Bay *PPTR compatibility check*	Underground works on agricultural land and existing roads to be subject to environmental authorization	Underground works on agricultural land and existing roads to be subject to environmental authorization	
Underground power line 380 kV *Interference with PPTR*	BP – Coastal Territories BP - Rivers-streams-public waters (150m)	UCP – Wetlands UCP – Sites of naturalistic importance	UCP - settlement stratification - sheep track network and related buffer zone UCP - Roads with landscape value UCP - buffer area - areas of archaeological interest
Underground power line 380 kV *PPTR compatibility check*	Installation with HDD technology	Installation on existing road infrastructures in embankment	Installation on existing road infrastructures in embankment
Electrical substation of GIS users and power factor correction group *Interference with PPTR*	----	----	----
Electrical substation of GIS users and power factor correction group *PPTR compatibility check*	----	----	----
380 kV Switching Station *Interference with PPTR*	----	----	UCP - settlement stratification - sheep track network and related buffer zone
380 kV Switching Station *PPTR compatibility check*	----	----	Installation on existing road infrastructures in embankment
380 kV overhead connections for connection to the 380 kV RTN line Andria Manfredonia *Interference with PPTR*	----	----	UCP - settlement stratification - sheep track network and related buffer zone

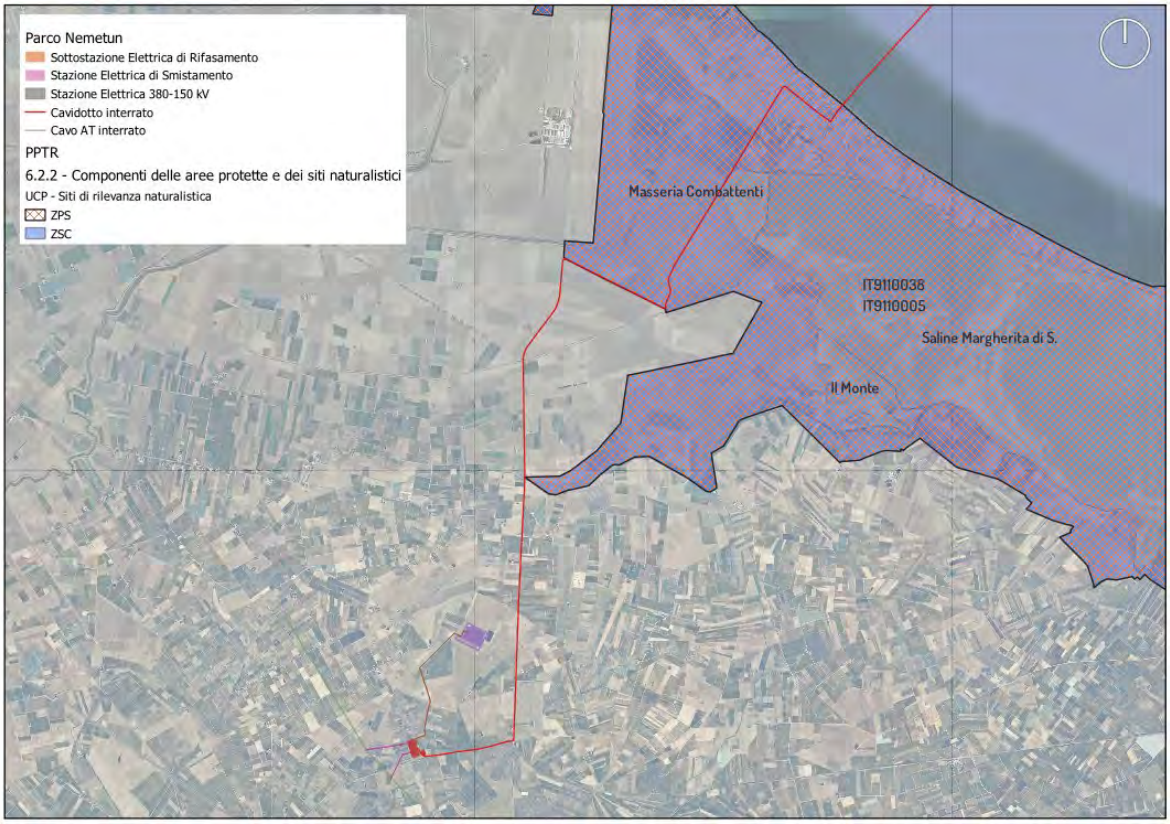
380 kV overhead connections for connection to the 380 kV RTN line Andria Manfredonia *PPTR compatibility check*	----	----	Apparent intersection



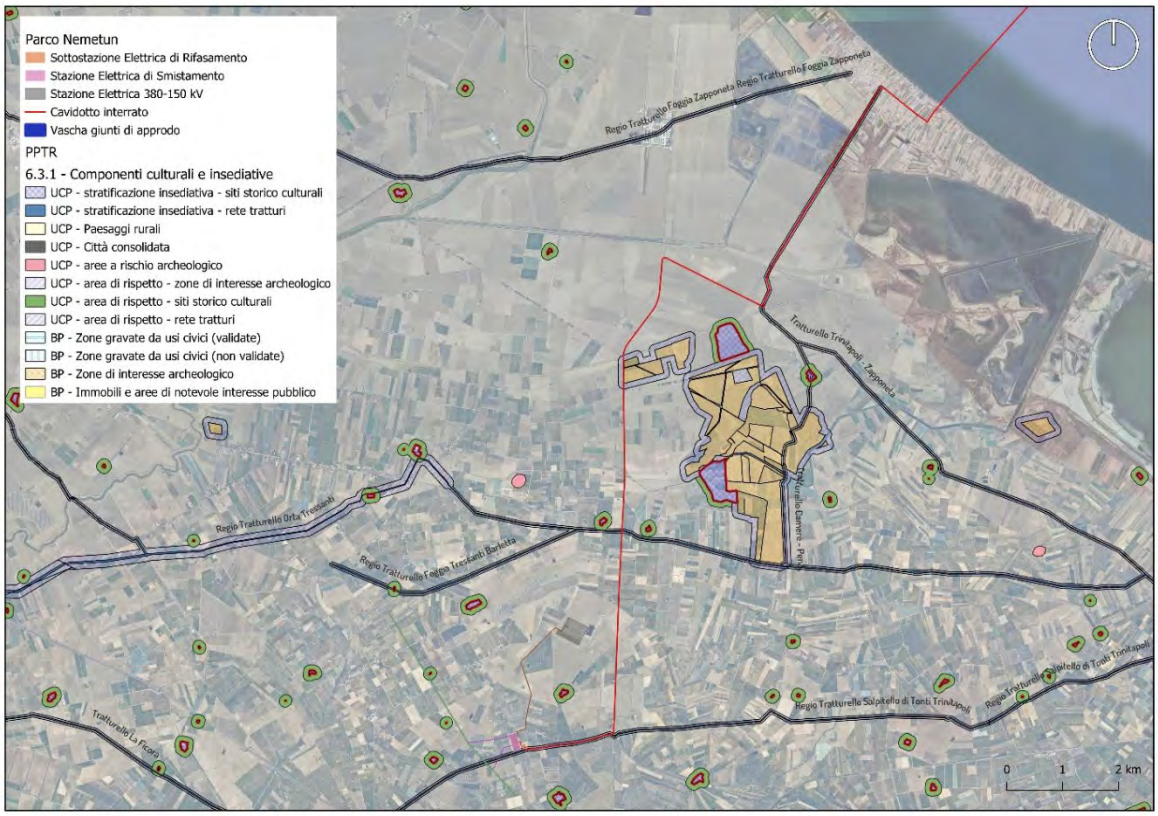
Onshore works on PPTR - Hydrogeomorphological structure - Hydrological components



Onshore works on PPTR - Ecosystem and environmental structure - Botanical-vegetational components



Onshore works on PPTR - Ecosystem and environmental structure - Components of protected areas and naturalistic sites



Onshore works on PPTR - Anthropic and historical cultural structure - Cultural and settlement components

Onshore works on PPTR - Anthropic and Historical Cultural Structure - Components of Perceptual Values

The definition of the interfering elements as reported in the NTAs of the PPTR is shown below:

- ***UCP Landscape Roads*** (Section 143(1)(e) of the Code) They consist of driveways, rolling stocks, cycle-pedestrian and natable paths from which it is possible to grasp the diversity, peculiarities and complexity of the landscapes that cross natural or anthropic landscapes of high landscape importance, that skirt or cross characteristic morphological elements (greenhouses, ribs, blades, canals, cliff or dune coasts, etc.) and from which it is possible to perceive close-up panoramas and glimpses of high landscape value, as identified in the tables in section 6.3.2. In the case at hand, the route of the onshore underground power line coincides with some of these roads (SP141 and SP66). However, the underground cable duct does not change the perceptual characteristics of the roads concerned. Construction site activities, which are short-lived, do not stand out significantly in terms of impact compared to normal road maintenance operations.
- ***BP Coastal Territories*** (Article 142, paragraph 1, letter a, of the Code) consist of the constant depth band of 300 m, starting from the coastline identified by the Regional Technical Map, as also delimited for the islands in the cartographic document 6.1.2. In the case at hand, theThe works on the coastal stretch consist of the landing carried out by means of marine HDD, the underground Joint Bay and a section of HV cable duct buried in a trench on agricultural land.
- ***BP Rivers, streams and streams registered in the lists of public waters*** (Article 142, paragraph 1, letter c, of the Code) consist of rivers and streams, as well as other watercourses registered in the lists of public waters approved pursuant to Royal Decree no. 1775 of 11 December 1933 and the relative banks or feet of the banks, where recognizable, for a strip of 150 meters on each side, as delimited in the tables of section 6.1.2. Where the banks or embankments are not recognisable, the 150-metre strip has been defined starting from the valley line identified in the hydrographic network of the regional Geomorphohydrological map, as delimited in the tables in section 6.1.2. In the case in question, the route of the underground power line intersects Marana di Castello, and therefore this portion of the power line will be carried out using the "Horizontal Directional Drilling" (HDD) technique.
- ***UCP Wetlands*** (section 143(1)(e) of the Code) consist of swamps, marshes, peat and natural or artificial basins, permanent or temporary, with stagnant or flowing, fresh, brackish, or salt water, characterized by hygrophilous flora and fauna, as delimited in the tables in section 6.2.1. In the case in question, the proximity to the UCP – wetlands in the municipality of Zapponeta is highlighted. However, the transit of the onshore cable duct and the installation of the intermediate Joint Bays will only affect the road layout of the SP 66, which is elevated compared to the surrounding areas. As a result, interference such as habitat loss is not expected.
- ***UCP Sites of naturalistic significance*** (section 143, paragraph 1, letter e, of the Code) consist of sites pursuant to Directive 79/409/EEC, Directive 92/43/EEC referred to in the list published by decree of the Ministry of the Environment of 30 March 2009 and sites of naturalistic value classified within the Bioitaly project as sites of national and regional interest due to the presence of flora and fauna of conservation value, as delimited in the tables of section 6.2.2 and the areas identified after the approval of the PPTR pursuant to the specific legislation in force. They include:

  a) Special Protection Areas (SPAs) - pursuant to art. 2 of the resolution of 2.12.1996 of the Ministry of the Environment - and "a territory suitable for the conservation of the species of birds referred to in Annex 1 of Directive 79/409/EEC, concerning the conservation of wild birds, taking into account the need for protection of the latter in the geographical maritime and terrestrial area to which the directive itself applies";

  b) Sites of Community Interest (SCI) and Special Areas of Conservation (SACs) are sites which, in the biogeographical region(s) to which they belong, contribute significantly to the maintenance or

restoration of a habitat type referred to in Annex A or of a species referred to in Annex B of Presidential Decree no. 357 of 8 September 1997, in a 52 favourable conservation status and which may, moreover, to contribute significantly to the coherence of the "Natura 2000" ecological network referred to in art. 3 of Presidential Decree no. 357 of 8 September 1997, in order to maintain biological diversity in the biogeographical region or regions in question. In the case in question, the presence of the SPA areas IT9110038 "Marshes at the Gulf of Manfredonia" and SAC/SCI IT9110005 "Wetlands of the Capitanata" is reported. Also in this case, it should be noted that the transit of the onshore cable duct and the installation of the intermediate Joint Bays will only affect the road layout of the SP 66, which rises above the surrounding areas. As a result, direct interference such as loss of significant habitats is not expected. For further details on the discretized impacts relating to the various phases of the life cycle of the work, please refer to the following paragraphs and to the Environmental Impact Assessment Study.

- ***UCP Settlement stratification - sheep track network*** (Article 142, paragraph 1, letter m of the Code) the areas belonging to the network of sheep tracks, their minor branches and any other appurtenance, referred to in the Ministerial Decree of 22 December 1983, constituting the "Park of the sheep tracks of Puglia" (Regional Law of 23 December 2003, art.1), as archaeological evidence of settlements of various periods, with relative protection strip of the depth of 100 meters from their external perimeter or as otherwise defined in the municipal plans of the sheep tracks legitimately in force. In the case in question, it is worth mentioning the route of the cable duct alongside the Trinitapoli – Zapponeta Tratturello, further on, the crossing of the Foggia Tressanti Barletta Tratturello and in the last section alongside the Regio Tratturello Salpitello di Tonti Trinitapoli. In the first scenario, the works (underground cable duct and intermediate Joint Bays) will involve the SP66 road, which is located in embankment on a slightly different route than the historic route of the tratturello. In the second case, the crossing will be performed using the HDD technique. In the third scenario, the route will be located alongside the sheep track. In addition, the NTG station and the mitigation works are adjacent to the sheep track and the buffer zone. The intersection of the 380 kV overhead junctions is only apparent, because the route of the power line will not cross the PPTR signal.
- **UCP Area of respect for cultural and settlement components - Areas of archaeological interest** (art 143, paragraph 1, lett. e, of the Code) consists of a safeguard strip from the external perimeter of the sites referred to in point 2), letters a) and b), and of the areas of archaeological interest referred to in art. 75, point 3, aimed at ensuring the protection and enhancement of of the landscape context in which those assets are located. In particular: for areas of archaeological interest, it takes on a depth of 100 m. These areas are identified in the tables in section 6.3.1. in the case at hand, please refer to the section dedicated to paragraph 4.1.7.1. It is important to underline that archaeological surveillance is required for the execution of the works in accordance with current legislation on the subject.

On the**Eligibility of interventions** with respect to the prescriptions, the safeguard and protection measures, and the directions concerning the assets and the additional landscape contexts considered above, it should be noted that the interfering works consist in the construction of Is of underground cable ducts with restoration of the state of the places, not subject to Landscape Authorization (Presidential Decree 13 February 2017, no. 31 Annex A point A.15) and also exempted from the Landscape Compatibility Assessment pursuant to art. 91 paragraph 12.

Moreover, it is specified that the compatibility of the works with the NTA of the Landscape Plan is in any case guaranteed considering:

- that the route of the power line connecting to the ground from the landing point to the electrical substation of the user is planned to be buried on existing roads, which will be adequately restored. In particular, all interferences with the hydrographic network, crossings of roads, railway networks and gas pipelines will be managed by laying the interfering sections by means of horizontal Directional Drilling (HDD), i.e. avoiding open-cast excavation.
- The works connecting to the NTG partially affect, with only the visual shielding works, the zone of respect for the cultural and settlement components. No excavations are planned for the construction of these works.

Having noted the above, the project interventions are subject to a **Assessment of landscape compatibility**, based on art. 89 paragraph 1 letter b) as works of significant transformation subject to the Environmental Impact Assessment procedure of state competence.

Areas of considerable public interest and landscape and territorial quality objectives

Project interventions **do not fall within areas of significant public interest**, but the plant is located over 30 nautical miles off the Gargano promontory, in front of territories characterized by the following landscape constraints:

- PAE0027 (Ministerial Decree 25.02.1974) Declaration of considerable public interest of an area in the Municipality of Mattinata Established pursuant to Law 1497 Official Gazette no. 121 of 10.05.1974

  The area is of considerable public interest because it has cliffs, which alternate with bays and inlets, and valley parts in which almost always up to the border of the beaches and pebble beaches, olive and woodland crops develop, the latter consisting of turkey oaks, pines and beeches generally always developed on the rocky ridges that end overlooking the sea, moreover, the area in question takes the entire town and the bay, offering the former a traditional aesthetic complex of uncommon beauty and of undoubted public interest that presents, in numerous and beautiful natural paintings, multiple points of view and viewpoints accessible to the public from which the spectacle of these beauties can be widely enjoyed, while in the flat part of the second there are olive crops arranged with order and rationality constituting an imposing green scrub.

- PAE0028 (Ministerial Decree 25.09.1970) Declaration of the considerable public interest of an area located in the municipality of Monte S. Angelo. Established pursuant to Law 1497 Official Gazette no. 05 of 08.01.1971

  Recognized that the aforesaid area is of considerable public interest because it constitutes a complex of immovable things with a characteristic appearance of traditional aesthetic value as well as a natural framework of exceptional beauty, visible from the hairpin bends of the national road delimiting upstream, which form natural belvedere terraces accessible to the public.

- PAE0038 (Ministerial Decree 16.11.1971) Declaration of considerable public interest of the entire territory of the Municipality of Vieste Established pursuant to Law 1497 Official Gazette no. 308 of 06.12.1971

  The area is of considerable public interest because, with the inhabited center that overlooks and juts out into the sea, it constitutes a landscape of great beauty, as an essential note of complexes of immovable things having a characteristic appearance of aesthetic and traditional value, in which

the spontaneous concordance and fusion between the expression of nature and that of human work is evident.

- PAE0100 (Ministerial Decree 01.08.1985) Integration of the declarations of considerable public interest of the stretch of coast and hinterland of the Gargano between Vieste and the municipal territory of Monte S. Angelo in the municipalities of Vieste, Mattinata and Monte S. Angelo Established pursuant to Law 1497 G. U. n. 30-06/02/1986

  The existence of the constraint pursuant to Law no. 1497 of 29 June 1939 has not guaranteed sufficient protection of environmental values as the lack of drafting of suitable landscape planning tools has led to the implementation of urban and building interventions, most of the time illegal, which, due to their randomness and diffusion, risk definitively compromising the morphology of the places with serious prejudice to the ecological-environmental balance.

  Specifically:

  1.La area located in the municipality of Monte Sant'Angelo is of considerable interest for the presence of a complex of immovable things with a characteristic appearance of traditional aesthetic value as well as a natural picture of exceptional beauty, visible from the hairpin bends of the national road of delimitation upstream, which form natural belvedere terraces accessible to the public;

  2. of complexes of immovable things having a characteristic appearance of aesthetic and traditional value, in which the spontaneous concordance and fusion between the expression of nature and that of human work is evident;

  3. An area of the municipality of Mattinata has cliffs, which alternate with bays and inlets, and valley parts in which almost always up to the border of the beaches and pebble beaches, olive and woodland crops develop, the latter consisting of turkey oaks, pines and beeches, generally developing on rocky ridges that end sheer to the sea, moreover, the area in question takes the entire town and the bay, offering the former a traditional aesthetic complex of uncommon beauty and of undoubted public interest that presents, in numerous and beautiful natural paintings, multiple points of view and viewpoints accessible to the public from which the spectacle of these beauties can be widely enjoyed, while in the flat part of the second there are olive crops set with order and rationality constituting an imposing green scrub.

- PAE0105 (Ministerial Decree 01.08.1985) Declaration of considerable public interest of the area called Monte Sacro located in the municipalities of Mattinata and Monte S. Angelo Established pursuant to Law 1497 G. U. n. 30-06/02/1986

  The area called "Monte Sacro" falling within the municipalities of Mattinata and Monte S. Angelo (Foggia) is of considerable interest because this hill, almost entirely covered with woods, covers, due to its location and view that offers in several points of view, exceptional landscape as well as naturalistic value. To this must be added the presence of the remains of the ancient abbey of the Holy Trinity which, in symbiosis with the wild nature of the places, constitutes a picture of exceptional aesthetic value.

- PAE0106 (Ministerial Decree 01.08.1985) Declaration of considerable public interest of an area called Vallone di Pulsano, located in the municipalities of Monte S. Angelo and Manfredonia Established pursuant to Law 1497 Official Gazette no. 30 of 06.02.1986

  Considering that the area of the Vallone di Pulsano falling within the municipalities of Monte S. Angelo and Manfredonia (Foggia) is of considerable interest because it is largely made up of deep and tortuous erosion valleys, of particular natural beauty.

In the identification and definition sheets of the specific regulations for the use of the aforementioned areas included in the PPTR documents of the Puglia Region, the elements of value, risk factors and the dynamics of transformation in progress or planned are reported for each area.

For each area, therefore, the discipline of use is identified in relation to hydrogeomorphological structure, ecosystem and environmental structure and anthropic and historical-cultural structure, in analogy with section C2 relating to the regulations of use (addresses and disciplines) of the reference areas.

Considering that the areas are adjacent and/or partly overlapping and affect the areas described in chapter 4, some general considerations regarding the consistency of the interventions with the guidelines and directives of the disciplines and regulations of use provided for by the PPTR:

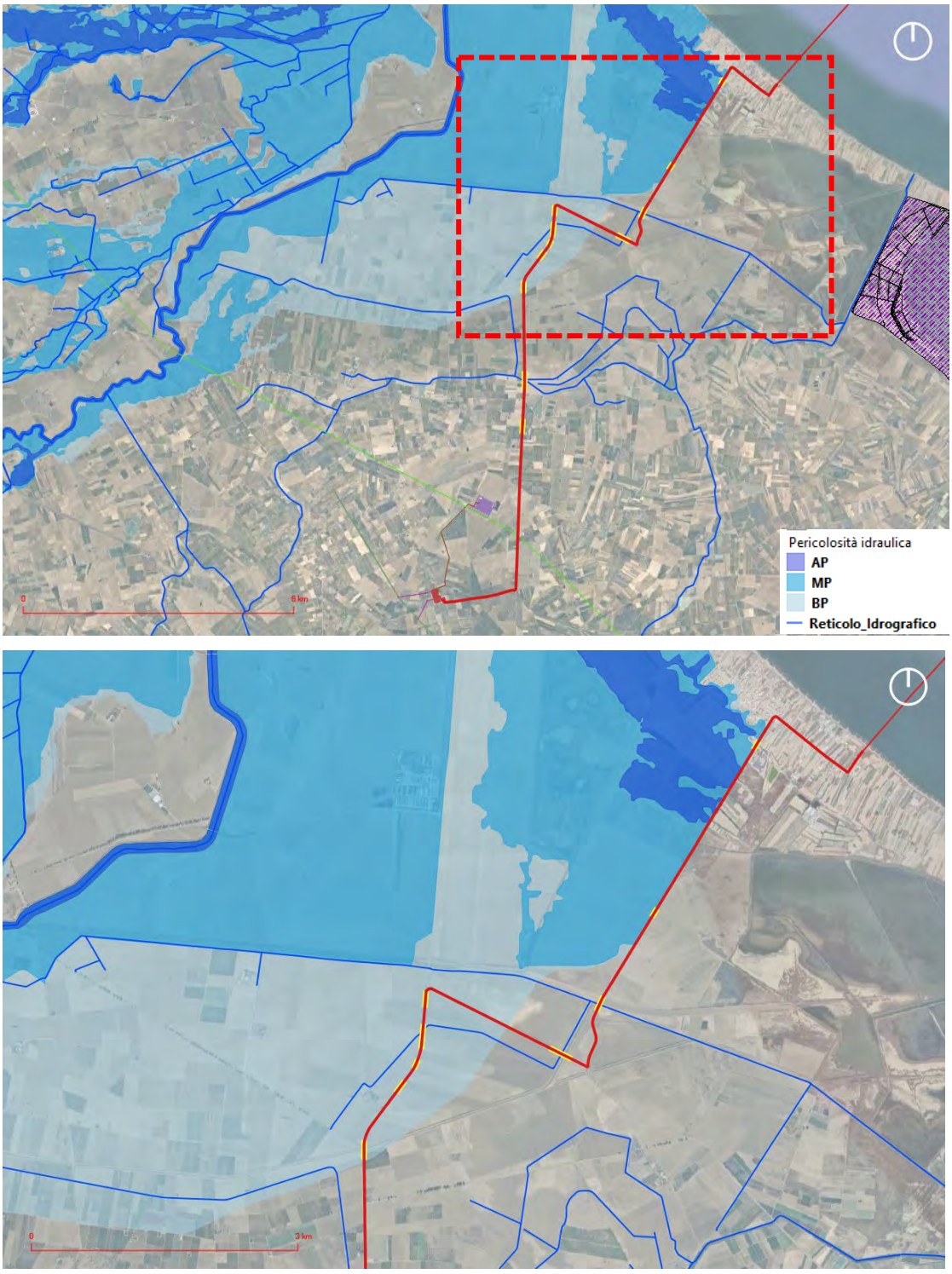
- hydrogeomorphological structure, the project works affect the Marana Castello watercourse and the coastal strip (300m). However, the planned transformations do not affect the riverbeds; they do not occupy areas in natural conditions; they do not modify the hydrographic network and the areas of water outflow (the crossings envisaged for the construction of the power lines are all made with the No Dig technique); they do not involve soil waterproofing; they do not cause erosion of coastal areas or occupy coastal state-owned areas for incongruous uses or illegal constructions; they do not result in water withdrawals; they do not affect artifacts related to the traditional management of water resources, they are not located on slopes and escarpments or at risk of landslides;
- ecosystem and environmental structure, The project works they do not interfere with the natural and semi-natural forms of the landscape such as woods, bushes, shrubs, dry stone walls, hedges and rows; Not Compromise the functionality of the ecological network; Not directly affect wetlands and sites of landscape importance (SPAs IT9110038); they do not have specific effects on the rural landscape; Not Change historic rural buildings and traditional structures for water supply;
- anthropic and historical-cultural structure, it is verified that the works do not directly affect restricted areas or buildings. In the following paragraphs and in the other documents, which make up the landscape report, all the aspects useful for assessing the visual impact of the wind farm and, in particular, the perception of the wind turbines from the coast, considering the reciprocal relationship between them and the coastal landscape, are explored. In summary, it is believed that the implementation of the proposed works gensures compliance with the rules of reproducibility of structural invariants without altering the constituent characteristics of the territorial figures, or defining new forms of landscape compatible with the protection and management of existing landscapes. In fact, as shown in the photosimulations produced, the construction of the wind farm does not significantly alter the panoramic views of identity or of significant landscape value, the views from the panoramic points and the related cones and visual areas, the view from the panoramic roads and the views from the axes and historical places.

2.4.2.2 Hydrogeological Asset Plan (PAI)

From the Consultation of the "Risk Map" of the Plan for the Defense from Hydrogeological Risk of the District Basin Authority of the Southern Apennines of Puglia, it emerged that in the area in question there are PAI perimeters with low, medium and high degree in relation to hydraulic hazard. The intervention area is not characterized by the presence of important PAI constraints, the crossings of the hydrographic network and network infrastructures (gas pipelines, electricity and water networks) will be managed using the technique called "Horizontal Directional Drilling" (HDD). HDD is a no dig technique (i.e. without excavation) for laying underground pipes and cables. With the help of a drilling machine controlled by a remote control

system, it allows the creation of holes in which the electrical cables or pipes to contain them can be "pulled back" directly.

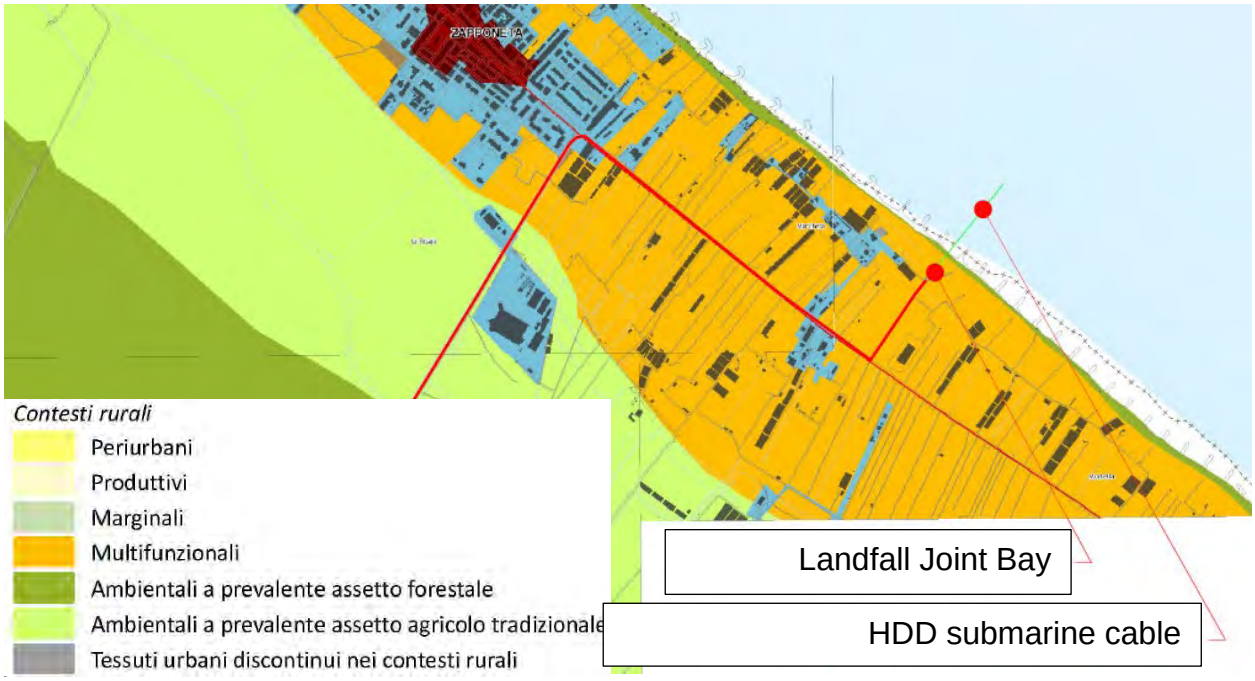
On the sites crossed by the onshore power line, there are no areas of geomorphological hazard of any kind. Please refer to the *R.1.3.1_01_ Onshore Geological Report* and *R.1.4_01_ Hydraulic Compatibility Assessment* for more informations.



Framing of onshore works on PAI cartography

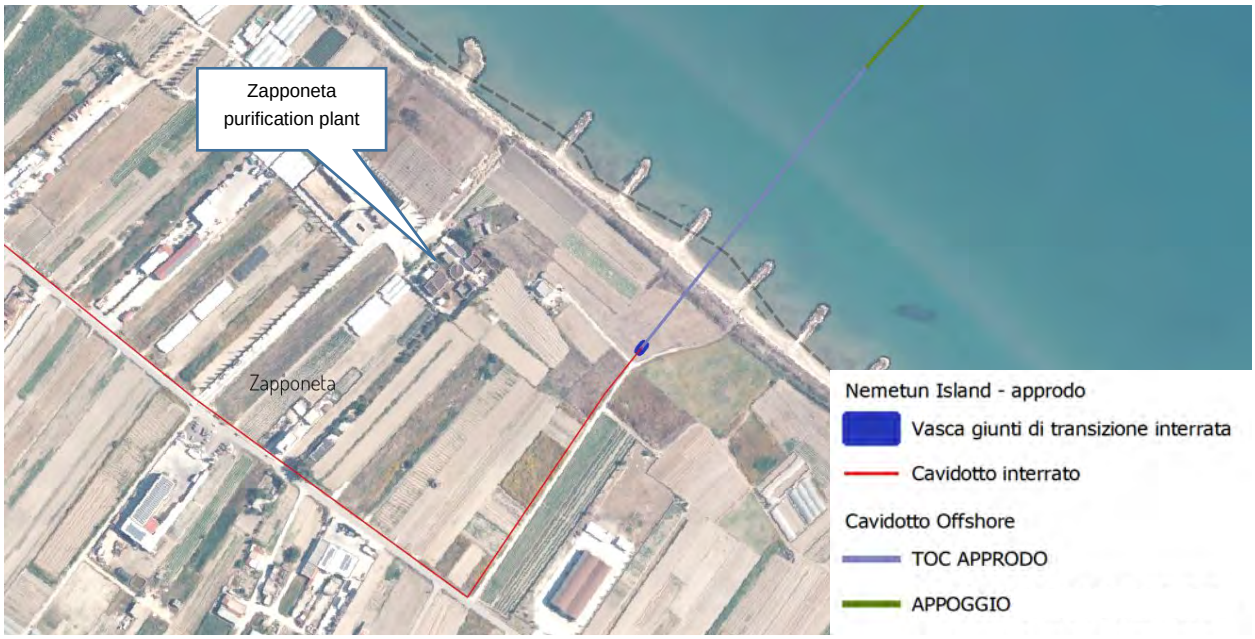
2.4.2.3 Municipal urban planning of the municipality of Zapponeta – landing area

The landing area in the municipality of Zapponeta was selected for its territorial characteristics, according to the PTCP the area falls within a rural context defined as multifunctional.

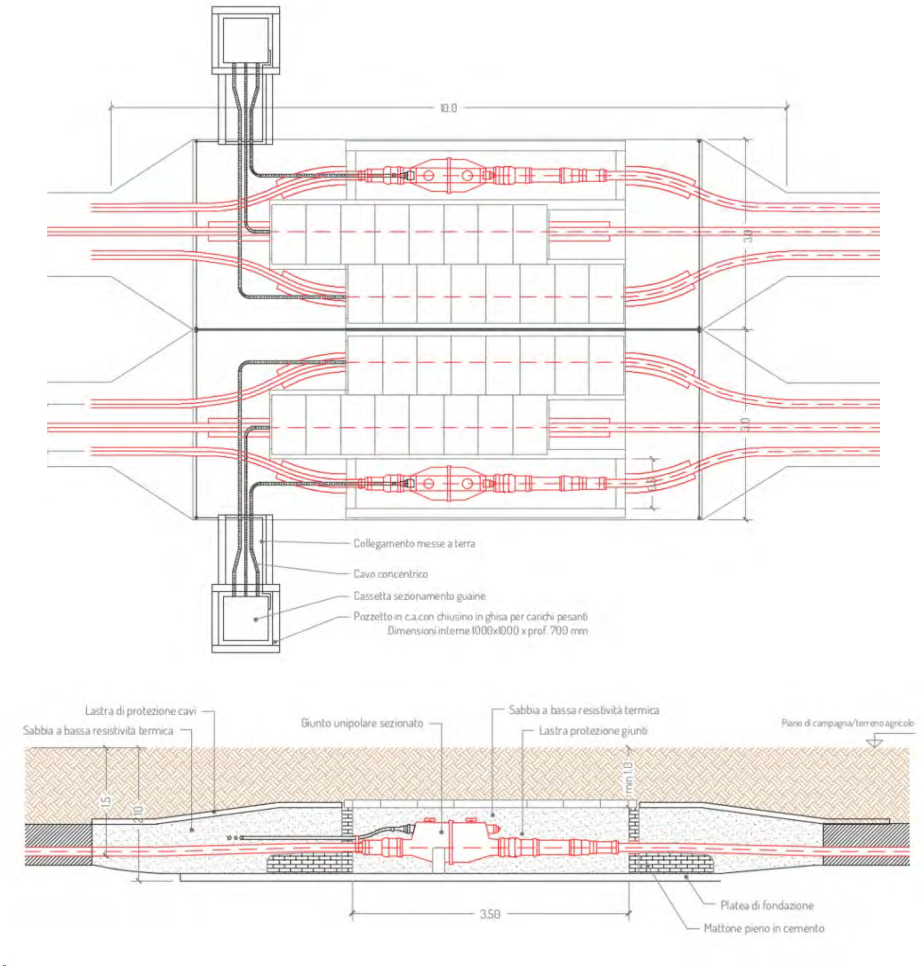


Framework on the Provincial Territorial Coordination Plan Table C – Territorial Planning of the Municipality of Zapponeta

The choice of this particular area was influenced by its proximity to the Zapponeta purification plant, in the multifunctional context. Therefore, an area was selected that already hosts this infrastructure and is therefore not particularly attractive from a tourist point of view.



Location of the landing point and the Joint Bay



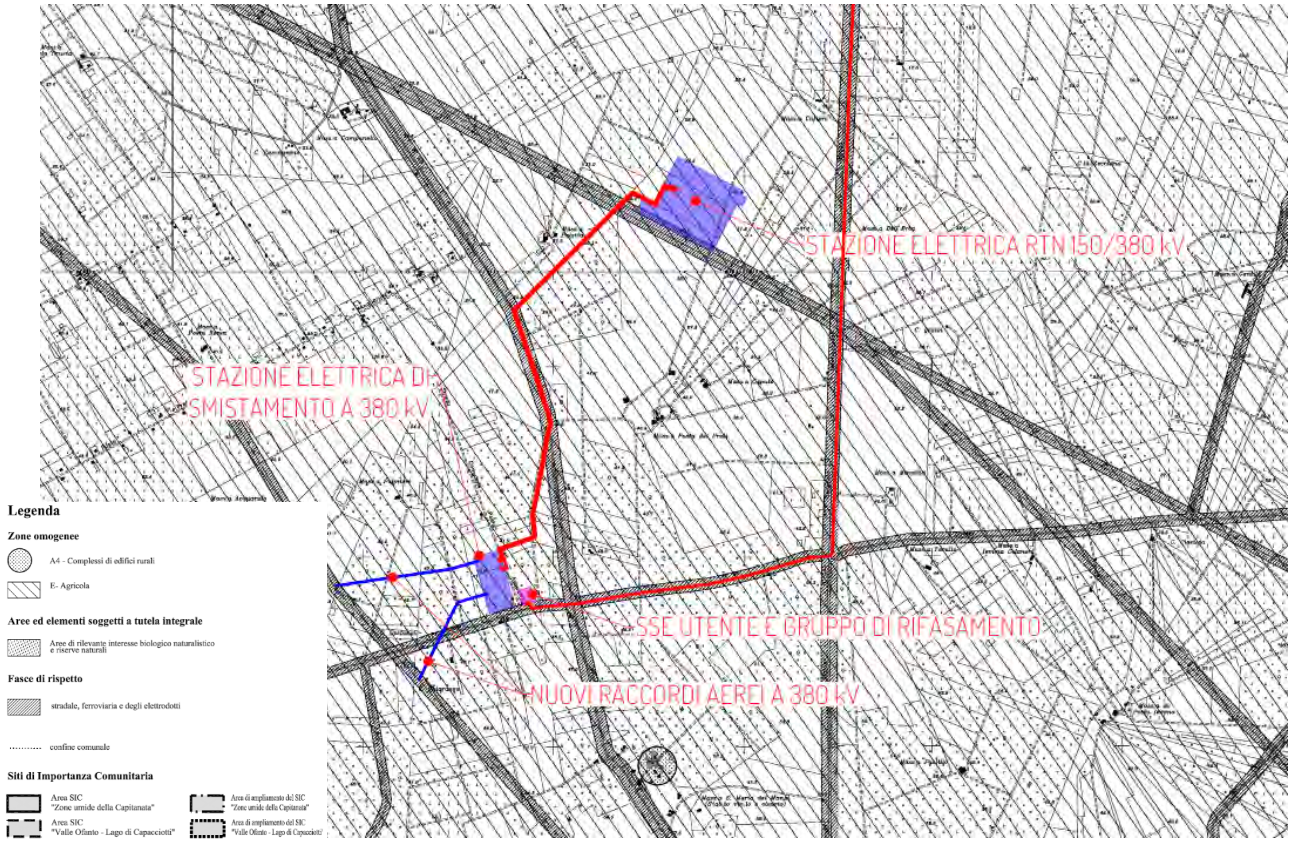
Typical of the soundhole in the project

However, it should be noted that the works planned for the landing of the offshore cable duct will be underground, both the Joint Bay and the arrival in HDD will not be visible on the ground level.

2.4.2.4 Municipal urban planning of the municipality of Cerignola – area of the underground cable duct and the electrical substation

The user substation and the network works are located in the municipality of Cerignola, within an area designated as agricultural by the municipal General Regulatory Plan (PRG). It is important to note that this area is close to the new electrical substation in Cerignola, currently under construction, and therefore already characterized by the presence of other infrastructures.

The project includes interventions aimed at the visual improvement and mitigation of existing and planned infrastructures, thus contributing to the recovery of the surrounding environment.



PRG of the municipality of Cerignola

2.4.3 SITES OF CONSERVATION INTEREST - NATURA 2000 NETWORK, EBSAS AND FRAS

The body of water Object of construction of the field Aeolic **does not contemplate any SACs/SCIs** and **Marine SPA** inside or in the immediate vicinity**, nor does it fall within protected natural areas** state or regional authorities.

It should be noted, however, that a portion of the wind farm falls within a peripheral area belonging to the **Ecologically or Biologically Significant Area (EBSA) No. 126** call **South Adriatic Ionian Straight**.

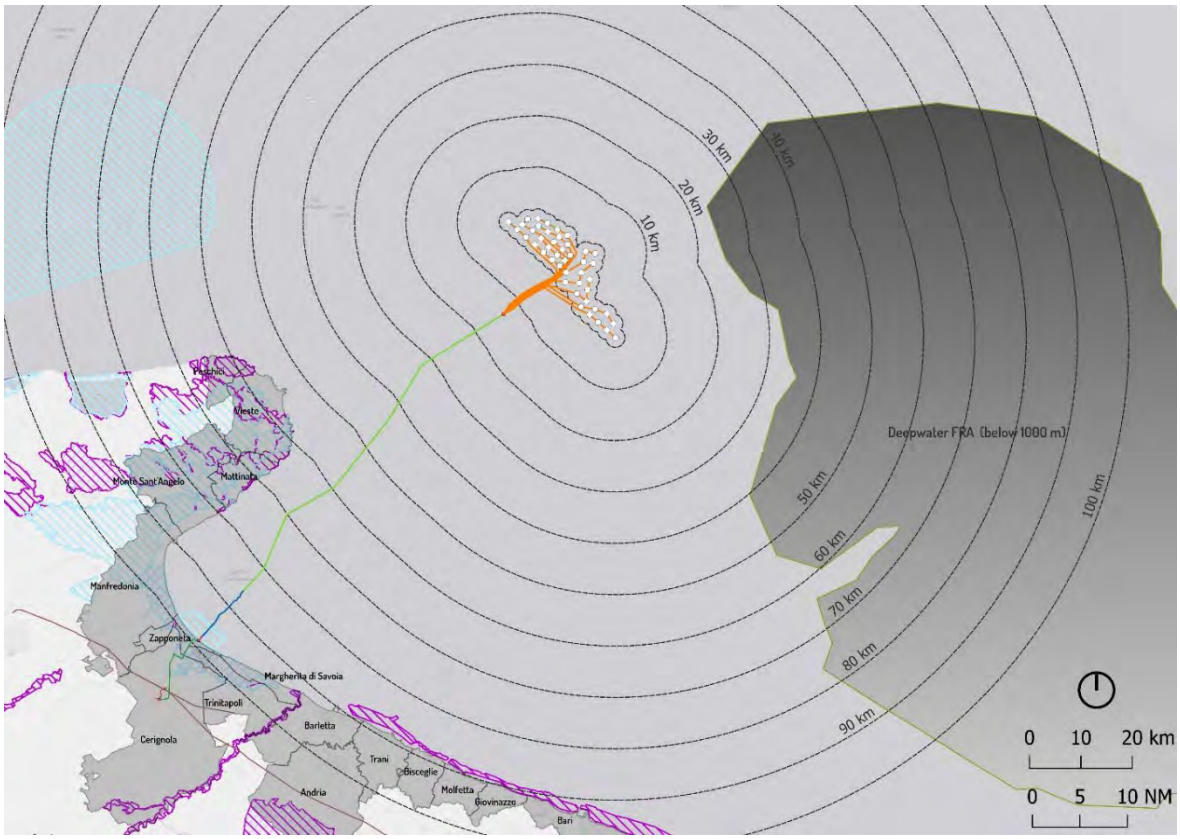
In addition, 11 nautical miles from the wind farm, the "Fishing Restricted Area (FRA)" begins in the area called "Deepwater FRA (below 1000 m)" which is included within the aforementioned EBSA 126.

Regarding **the terminal section of the HV cable duct** (about 4 km) **to be laid in the sea, it crosses the "Aloisa – Carapelle" marine SPA IT9110041**, which is located in the municipality of Zapponeta.

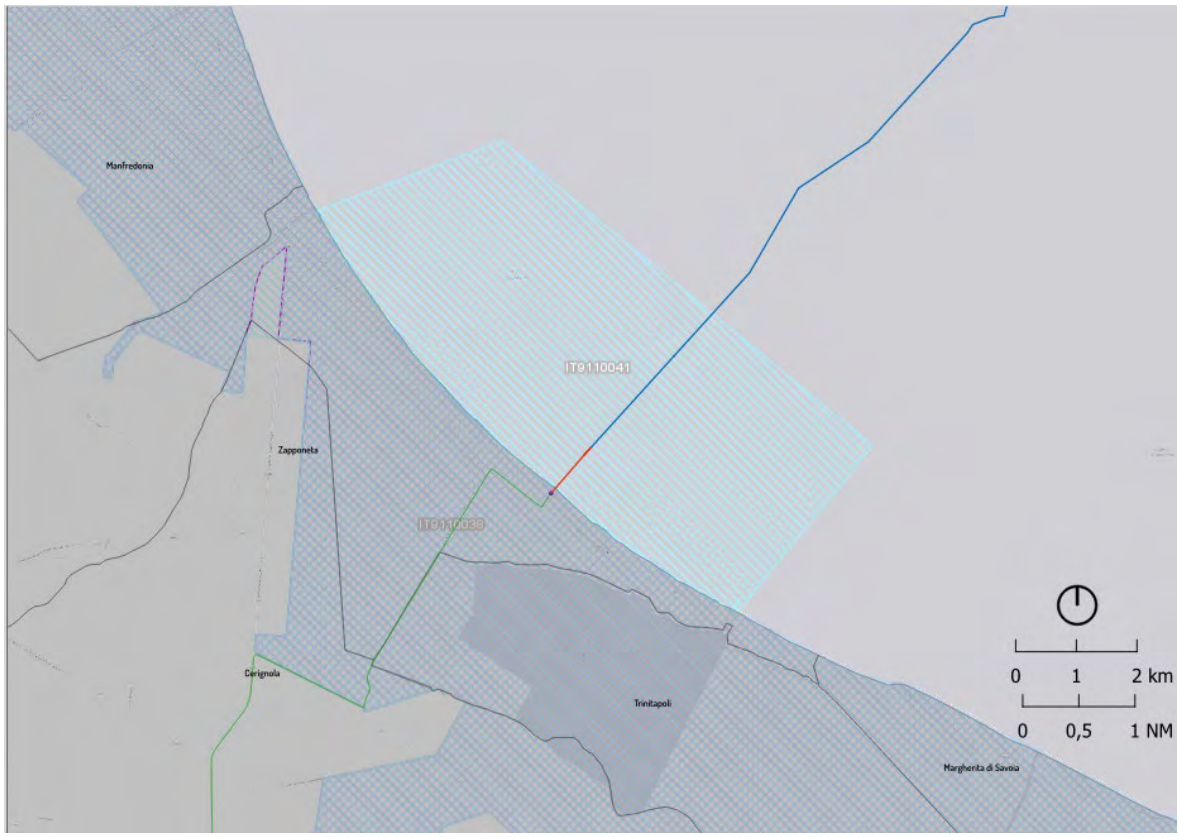
Also **8 km of underground cable duct section crosses the land SPA IT9110038 "Marshes near the Gulf of Manfredonia"** and **the SAC/SCI IT9110005 "Wetlands of the Capitanata"** which extend between the municipalities of Manfredonia, Zapponeta, Cerignola, Trinitapoli and Margherita di Savoia.

For the wind farm, the sections of cable duct and the related works (Joint Bays, cable duct and HDD sections) falling within the aforementioned Natura 2000 and EBSA network sites, appropriate measures will be taken, especially concerning the construction phase, in order to eliminate or minimize the possible impacts on these ecosystems.

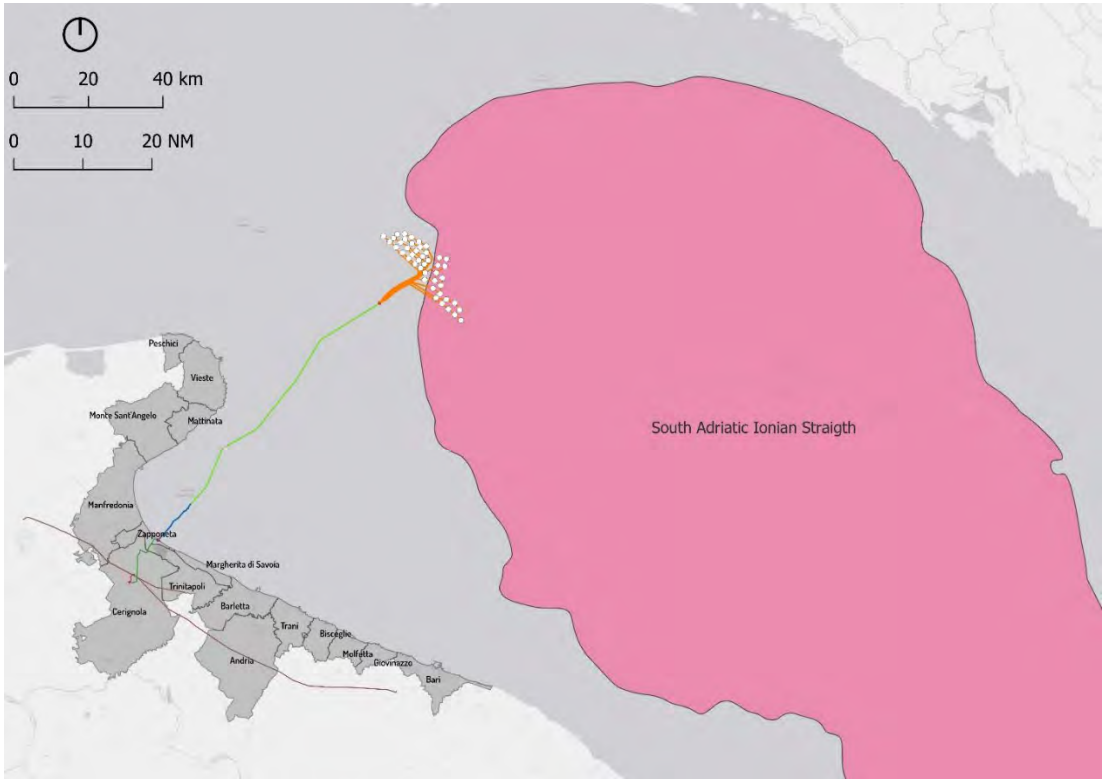
Below are some cartographic excerpts representative of what has been highlighted, referring to the specialist sections for the necessary further information.



Natura 2000 Network Areas and Fishing Restricted Areas – general framework

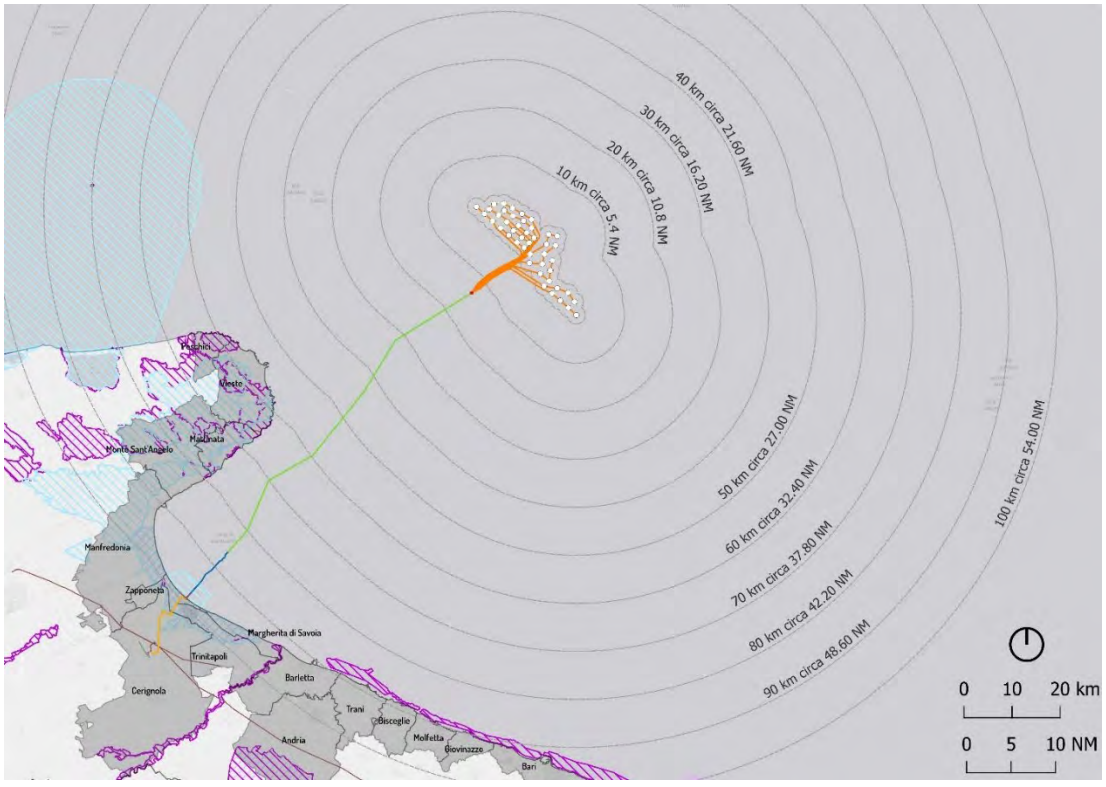


Natura 2000 Network Areas framework of the landing area and onshore works



Map of theat Ecologically or Biologically Significant Area (EBSA) n.126 - South Adriatic Ionian Straight, in which part of thethe Nemetun Island plant

Below is a brief description of Natura 2000 sites along the Adriatic coast from north to south and in the approximate area of 100 km from the project wind farm.



Natura 2000 Network Areas around 100 km from the intervention area

- **IT9110011 Tremiti Islands**:

established by Ministerial Decree 28/12/2018 - G.U. 19 of 23-01-2019 and falling within the "Mediterranean" biogeographical region, it has a total extension of 372.0 ha, of which 10% is marine area.

The following habitat types are present within the site area:

Habitat types - *IT9110011 Tremiti Islands*	**Surface** (ha)
1120*: Posidonia meadows (*Posidonion oceanicae*)	186,0
1210: Annual vegetation of marine deposit lines	7,44
1240: Cliffs with vegetation of the Mediterranean coasts with *Limonium spp*. Endemic	4,8
1430: Halonitrophilous grasslands and orchards (*Pegano-Salsoletea*)	
5320: Low euphorbia formations near cliffs	3,8
5330: Thermo-Mediterranean and pre-desert shrubs	18,6
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	18,6
8330: Submerged or semi-submerged sea caves	3,72
9540: Mediterranean pine forests of endemic mesogenic pines	18,6

The site is characterized by a geological substrate consisting of limestone formations of the Lower and Middle Eocene, Cretaceous, Middle and Upper Pleistocene formations. It is a small archipelago characterized by islands and islets of modest size and with highly diversified habitats. In them, the habitats of cliffs and cliffs predominate. The area around the islets is home to a grassland of *Posidonia Ocean*. On one of the islets there is an autochthonous pine forest with Aleppo pine. It is an important migratory route. There are numerous endemic or trans-Adriatic faunal elements, including *Camponotus nylanderi*: endemic to southern Italy; *Aphaenogaster pallida*, endemic to southern Italy, restricted to the Tremiti in Puglia; *Podarcis sicula sanctinicolai*: endemic subspecies of the Tremiti.

- **IT9110040 Tremiti Islands**:

established by DGR no. 1022 of 21.07.2005 and falling within the "Mediterranean" biogeographical region, it has a total extension of 313218.0 ha, of which 99.82% is marine area.

In the site sheet, updated in December 2023, the habitat types present are not listed but only the habitat classes which are N01 and N05. Below is the table with the list of habitat types present in the site sheet updated in December 2022:

Habitat types - *IT9110040 Tremiti Islands*	**Surface** (ha)
1120*: Posidonia meadows (*Posidonion oceanicae*)	6,87
1170: Cliffs	2,84
1240: Cliffs with vegetation of the Mediterranean coasts with *Limonium spp*. Endemic	14,27
1420: Mediterranean and thermo-Atlantic halophilous grasslands and orchards (*Sarcocornietea fruticosi*)	3,27
1430: Halonitrophilous grasslands and orchards (*Pegano-Salsoletea*)	3,83
5320: Low euphorbia formations near cliffs	5,95
5330: Thermo-Mediterranean and pre-desert shrubs	10,53
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	3,1

Habitat types - *IT9110040 Tremiti Islands*	**Surface** (ha)
8310: Caves not yet exploited for tourism	31 (n° caves)
8330: Submerged or semi-submerged sea caves	31 (n° caves)
9340: Forests of *Quercus ilex* and *Quercus rotundifolia*	1,69
9540: Mediterranean pine forests of endemic mesogenic pines	105,2

The site is a unique island environment characterized by three small islands: S. Domino, S. Nicola and Capraia and the Cretaccio rock. In S. Domino there is an interesting rocky vegetation with *Euphorbia dendroides*. The geological substrate consists of limestone formations from the Early and Middle Eocene, Cretaceous and Upper and Middle Pleistocene formations. On the islands there are highly diversified habitats with a predominance of cliffs and cliffs. It is the only breeding site of *Calonectris diomedea* and *Puffinus puffinus* for the entire Adriatic side of Italy. There is a nesting colony of *Falco eleonorae* currently extinct. The presence of the wild rabbit is reported *Oryctolagus cuniculus*, the genetic status of the present population must be verified. The area around the islets is home to a Posidonia meadow and on one of the islets there is an autochthonous pine forest of Aleppo pine. This archipelago is an important migration route. There are numerous endemic or trans-Adriatic faunal elements, including *Camponotus nylanderi*, endemic to southern Italy; *Aphaenogaster pallida*, endemic to southern Italy, restricted to the Tremiti in Puglia; *Podarcis sicula sanctinicolai*: endemic subspecies of the Tremiti. In the past, the monk seal was present *Monachus monachus* currently extinct.

- **IT9110037 Lakes of Lesina and Varano**:

established by Ministerial Decree 08/08/2014, updated on 09/2019 and falling within the "Mediterranean" biogeographical region, it has a total extension of 15,195.0 ha, of which 100% is land area.

In the site sheet, updated in December 2023, neither the habitat types present nor the habitat classes are listed. Below is the table with the list of habitat types present in the site sheet updated in December 2022:

Habitat types - *IT9110037 Lakes of Lesina and Varano*	**Surface** (ha)
1150*: Coastal lagoons	10637,2
1210: Annual vegetation of marine deposit lines	303,92
1310: Pioneer annual vegetation in *Salicornia* and other species of muddy and sandy areas	455,88
1410: Mediterranean flooded pastures (*Juncetalia maritimi*)	303,92
1420: Mediterranean and thermo-Atlantic halophilous grasslands and orchards (*Sarcocornietea fruticosi*)	911,76
2250*: Coastal dunes with *Juniperus spp*.	759,8
2260: Dunes with sclerophyll vegetation of the *Cistus-Lavanduletalia*	1519,6
2270*: Dunes with forests of *Pinus pinea* and/or *Pinus pinaster*	303,92

These are two coastal lagoons called "Lesina" and "Varano". The two lagoons, although very similar in geographical position, have several peculiarities that make them very distinct from each other in origin, shape, salinity of the waters, etc. Varano has the largest lake, with its 6000 hectares it is the seventh basin in Italy. Hvar, on the other hand, covers 5200 hectares. The Varano lagoon, vaguely trapezoidal in shape, was formed by the closure of a large rocky marine inlet, through the work of currents that deposited

sediments creating a narrow strip of land called the Island. This is documented by two geographers of antiquity, Strabo and Pomponio Mela (first century BC), who do not mention the lake, while Pliny refers to the presence in the area of a large breast called Seno Uriano. Ptolemy (second century A.D.) also refers to a marine gulf calling it Marano from which perhaps by later modification the current name derives. The banks of Varano are rocky and the waters fresh, since it is fed through numerous underground springs that bring the waters that have fallen into the upper part of the promontory. The lagoon of Lesina, narrow and elongated in shape, was formed in the Tavoliere thanks to the deposits transported by the Fortore river, which in the past flowed further east. These deposits have formed over time a sandy barrier that has closed a bay forming the lagoon. Both lagoons were once surrounded by vast swamps and marshes that were later reclaimed by man. Lesina is shallower and has waters with greater salinity. Both lagoons are separated from the sea by an uninterrupted strip of sand dunes, the Varano dune has a pine forest in a more backward position. *Pinus halepensis*, obtained with reforestation interventions, and a vegetation of sclerophylls and *Juniperus oxycedrus* subsp. macrocarpa in the summit portion. That of Lesina has one of the largest expanses of Mediterranean scrub in Italy in which the only Apulian station of *Cistus clusii*. In the area known as the "Black Stones" there is a dark rock of volcanic origin, the only outcrop of its kind in Puglia. The vegetation of the lagoon is part of the association *Chetomorpho-Ruppietum*.

The two lagoons represent one of the most important areas nationally and internationally for aquatic birdlife, both for the extension of the total areas over 11,000 hectares and for the quality of the environments. Among the nesting aquatic species, the most important are *Ardea purpurea, Sterna albifrons, Himantopus himantopus, Acrocephalus melanopogon*probably *Botaurus stellaris, Recurvirostra avosetta* and some species of Anatidae. The role of stopover and wintering for many species of water birds is very important. The two old mouths of S. Andrea and Cauto and the Muschiaturo marsh are, together with the vast extension of reeds in the eastern Sacca, among the most interesting environments for fauna. Only here do some rare species nest such as the Little Tern and the Black-winged Stilt. For many species, the site represents the second nesting area of Puglia. It is possible, along the beach of the extensive sand dune that separates the lagoon from the sea, the reproduction of the rare *Caretta caretta*, a pelagic marine species that reaches the quieter coasts to reproduce. In the lagoon and in the characteristic Fantine there is an important population of *Emys orbicularis*. In this, as well as in the Varano lagoon, the presence of several species of fish is reported, including two species of community interest, *Padogobius panizzai* and *Aphanius fasciatus*, in addition to the interesting *Gasterosteus aculeatus*. The two sand spits separating the lagoons from the sea represent, in particular for Lesina, some of the largest areas of Mediterranean scrub in Italy, very important wintering areas for many passerines, with a large nesting population of *Caprimulgus europaeus* and *Burhinus oedicnemus*. The basement of the large abandoned military complex, of San Nicola, on the Varano lagoon has become one of the most important refuge habitats for large populations of various species of bats.

- **IT9110016 Pineta Marzini**:

established by Ministerial Decree 28/12/2018 - G.U. 19 of 23-01-2019 and falling within the "Mediterranean" biogeographical region, it has a total area of 787.0 ha, of which 100% is terrestrial area.

The following habitat types are present within the site area:

Habitat types - *IT9110016 Pineta Marzini*	**Surface** (ha)
1210: Annual vegetation of marine deposit lines	15,74
1240: Cliffs with vegetation of the Mediterranean coasts with *Limonium spp*. Endemic	1,1
5320: Low euphorbia formations near cliffs	0,1
5330: Thermo-Mediterranean and pre-desert shrubs	39,35

Habitat types - *IT9110016 Pineta Marzini*	**Surface** (ha)
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	78,7
8210: Limestone rock faces with chasmophytic vegetation	78,7
9540: Mediterranean pine forests of endemic mesogenic pines	472,2

The site has a geological substrate of Eocene nummulite limestones and Cretaceous "flakes" or "majolica" type limestones with Mediterranean Brown Lands of the xerophilous forest. The site is characterized by the presence of spontaneous pine forests *Pinus halepensis* which is found in rocky habitat. A percentage of the site is made up of substeppe grasslands.

- **IT9110025 Manacore of the Gargano**:

established by Ministerial Decree 28/12/2018 (G.U. 19 of 23-01-2019) and falling within the "Mediterranean" biogeographical region, it has a total extension of 2063.0 ha, of which 100% is land area.

The following habitat types are present within the site area:

Habitat types - *IT9110025 Manacore del Gargano*	**Surface** (ha)
1210: Annual vegetation of marine deposit lines	1,7
1240: Cliffs with vegetation of the Mediterranean coasts with *Limonium spp*. Endemic	3,4
1310: Pioneer annual vegetation in *Salicornia* and other species of muddy and sandy areas	0,5
1410: Mediterranean flooded pastures (*Juncetalia maritimi*)	103,15
1420: Mediterranean and thermo-Atlantic halophilous grasslands and orchards (*Sarcocornietea fruticosi*)	103,15
2110: Mobile embryonic dunes	0,2
2120: Da mobile of the coastal cordon with the presence of *Ammophila sandstone* (white dunes)	0,1
2250*: Coastal dunes with *Juniperus spp*.	1,3
3140: Calcareous oligomesotrophic waters with benthic vegetation of *Chara spp.*	
3260: Lowland and mountain rivers with vegetation of the *Ranunculion fluitantis* and *Callitricho- Batrachion*	
5330: Thermo-Mediterranean and pre-desert shrubs	103,15
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	103,15
7210*: Limestone marshes with *Cladium mariscus* and species of the *Caricion davallianae*	1,7
92D0: Tunnels and fortified southern shelters (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)	1,1
9540: Mediterranean pine forests of endemic mesogenic pines	1237,8

The site has a coastal area of great landscape value with a geological substrate of Cretaceous limestone with a distinctly Mediterranean climate. There is a spontaneous pine forest in *Pinus halepensis* in good vegetation conditions, strips of sclerophyllous scrub vegetation with therophyte meadows in the clearings and the halo-hygrophilous vegetation of Sfinale.

- **IT9110004 Umbra Forest**:

established by Ministerial Decree 28/12/2018 - G.U. 19 of 23-01-2019 and falling within the "Mediterranean" biogeographical region, it has a total extension of 20656.0 ha, of which 100% is land area.

The following habitat types are present within the site area:

Habitat types - *IT9110004 Umbra Forest*	**Surface** (ha)
6210*: Semi-natural dry grassland formations and facies covered by bushes on calcareous substrate (*Fescue-Brometalia*) (*beautiful orchid bloom)	3098,4
9180*: Forests of slopes, screes and valleys of the *Tilio-Acerion*	3,6
91M0: Pannonian-Balkan Turkey oak and oak forests	2065,6
9210 *: Beech forests of the Apennines with *Taxus* and *Ilex*	5164,0

The site has a geological substrate of limestone and dolomite from the Upper Jurassic and Lower Cretaceous and a pedological substrate of Terre Brune. There is an extraordinary example of a beech forest present at very low altitudes and a very important vegetation with heliophilous broad-leaved trees and grazing areas with substeppe grasslands of the *Fescue - Brometalia*. It is one of the largest deciduous forests in the E.U., with a numerous and interesting forest biocoenosis, with a high concentration of *Picidae* (6 species). There is an isolated autochthonous nucleus of *Capreolus capreolus*, of high biogenetic interest and the presence of *Viper aspis hugyi* as it is an endemic subspecies of southern Italy and Sicily.

- **IT9110012 Head of Gargano**:

established by Ministerial Decree 28/12/2018 (G.U. 19 of 23-01-2019) and falling within the "Mediterranean" biogeographical region, it has a total extension of 5658.0 ha, of which 1% is marine area.

The following habitat types are present within the site area:

Habitat types - *IT9110012 Head of the Gargano*	**Surface** (ha)
1240: Cliffs with vegetation of the Mediterranean coasts with *Limonium spp*. Endemic	5,5
5330: Thermo-Mediterranean and pre-desert shrubs	282,9
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	565,8
8210: Limestone rock faces with chasmophytic vegetation	848,7
8330: Submerged or semi-submerged sea caves	56,58
9540: Mediterranean pine forests of endemic mesogenic pines	2829,0

The site has a substrate consisting of Cretaceous limestone type "flakes" and type "majolica". The site includes spontaneous pine forests with *Pinus halepensis* in good vegetation conditions, rocky environments of high phytogeographical value, and large expanses of Mediterranean scrub with therophyte meadows vegetating in the clearings. The site contains *Viper* at*Spis Huggyi* endemic in southern Italy and Sicily, *Strongylognathus cecconii* endemic to the Gargano and Tremiti.

- **IT9110009 Valloni di Mattinata - Monte Sacro**:

established by Ministerial Decree 28/12/2018 (G.U. 19 of 23-01-2019) and falling within the "Mediterranean" biogeographical region, it has a total area of 6510.0 ha, of which 100% is land area.

The following habitat types are present within the site area:

Habitat types - *IT9110009 Valloni di Mattinata - Monte Sacro*	**Surface** (ha)
5210: Arborescent Matorral of *Juniperus spp*	651,0
5330: Thermo-Mediterranean and pre-desert shrubs	325,5
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	651,0
8210: Limestone rock faces with chasmophytic vegetation	2604,0

The site has a substrate of Cretaceous limestone and Pleistocene limestone and a distinctly Mediterranean climate. It is also characterized by the presence of limestone valleys of erosive origin, with interesting rocky vegetation. In the area there are particularly interesting substeppe herbaceous formations both because they are registered as a priority habitat and for the high presence on Mount Sacro of spontaneous orchids with various species protected by the CITES convention. Presence of *Viper* at*Spis Huggyi* endemic to southern Italy. Important site for rock birdlife. In addition, there is the presence of gariche of *Euphorbia spinosa* with coverage percentage 5 and with the respective ratings: A, A, C, A.

- **IT9110039 Gargano Promontory**:

established by DGR no. 346 of 10/2/2010 and falling within the "Mediterranean" biogeographical region, it has a total extension of 70012.0 ha, of which 100% is land area.

In the site sheet, updated in December 2023, neither the habitat types present nor the habitat classes are listed. Below is the table with the list of habitat types present in the site sheet updated in December 2022:

Habitat types - *IT9110039 Gargano Promontory*	**Surface** (ha)
5210: Arborescent Matorral of *Juniperus spp*	2100,36
5330: Thermo-Mediterranean and pre-desert shrubs	7001,2
6210*: Semi-natural dry grassland formations and facies covered by bushes on calcareous substrate (*Fescue-Brometalia*) (*beautiful orchid bloom)	17503,0
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	5600,96
8210: Limestone rock faces with chasmophytic vegetation	10501,8
9180*: Forests of slopes, scree and valleys of the Tilio-Acerion	1400,24
91M0: Pannonian-Balkan Turkey oak and oak forests	1400,24
9210*: Apennine beech forests with *Taxus* and *Ilex*	10501,8
9540: Mediterranean pine forests of endemic mesogenic pines	3500,6

Karst plateau that rises from the sea up to 1100 m a.s.l. by M. Calvo, characterized by high environmental heterogeneity and representative of many of the characteristic environments of the Mediterranean biome: forests, steppes, rocky environments, Mediterranean scrub, marine cliffs, etc. Among the forest formations, Umbra is the largest and most intact, as well as the best known, woodland formation in Puglia, characterized by the presence of an interesting nucleus of beech forest vegetation (*Aquifolio-Fagetum*) considered a priority habitat, one of the southernmost sites in Europe located at modest altitudes, which reach a minimum of about 300 m above sea level. Within the site there are formations of herbaceous pasture vegetation attributable to the Festuco-Brometea class. The site is also characterized by the presence of woods of *Quercus cerris* and *Q. frainetto*. The geological substrate is represented by limestone and dolomite from the Upper Jurassic and Lower Cretaceous. The soil substrate from Terre Brune is one of the rainiest areas of Puglia with over 1200 mm per year. The forest represents one of the southernmost areas of presence of forest species with six species of nesting picids. Along the coastal stretch there are native natural woodland formations of *Pinus halepensis* that can be framed within the association *Pistachio-Pinetum halepensis*,

areas of Mediterranean scrub of the Rosmarinetea class and open areas of substeppe type. The geological substrate consists of Cretaceous limestone type "flakes" and type "majolica". It is one of the most intact coastal stretches of great landscape value in the whole of Italy. Important nesting site for several rock species. The system of valleys and pedagargan steppes is very interesting, rich in rocky environments and pastures. The site is characterized by the presence of a series of erosive furrows of limited extension but often impervious and inaccessible, which play an important role as a refuge environment for the rocky flora rich in endemisms and trans-Adriatic relict entities. These grooves are dug into a substrate consisting of Cretaceous limestone and Pleistocene limestone. The steppes as well as in the upper part of the plateau are found in the areas that slope down towards the Foggia plateau from the first Gargano reliefs. It consists of vast expanses with herbaceous vegetation used for pasture, interspersed with large arable land. These are mainly pseudosteppes with *Cymbopogom hirtus* and asphodelic moors, with nuclei of garrigue shrubby vegetation. The geological substrate is made up of Cretaceous and Upper Jurassic limestones. The area falls within the largest area of minimum rainfall in peninsular Italy. Overall, the site represents one of the most important nesting areas for birdlife in Italy, with the presence of species characteristic above all of steppe environments.

An extraordinary site characteristic of the Mediterranean biome and essential for the conservation of species characteristic of steppe environments, including some priority ones: in particular, there is the only peninsular station of *Tetrax tertax* and a breeding population of *Falco biarmicus* formed by 5-8 pairs. In the area there are particularly interesting substeppe herbaceous formations both because they are registered as a priority habitat and for the high presence on Mount Sacro of spontaneous orchids with various species protected by the CITES convention. The site includes the largest substeppe areas of peninsular Italy with very high biodiversity. The Umbra forest is one of the largest deciduous forests in the E.U., with a numerous and interesting forest biocoenosis, with a high concentration of *Picidae* (6 nesting species), presence of an isolated native nucleus of *Capreolus capreolus*, of high phytogeographical and biogenetic interest. Isolated populations of *Petronia petronia*. Presence of *Viper* at*Spis Huggyi* endemic to southern Italy.

- **IT9110014 Monte Saraceno**

Established by Ministerial Decree 28/12/2018 (G.U. 19 of 23-01-2019) and falling within the "Mediterranean" biogeographical region, it has a total area of 197.0 ha, of which 1% is marine area.

The following habitat types are present within the site area:

Habitat types - *IT9110014 Monte Saraceno*	**Surface** (ha)
5330: Thermo-Mediterranean and pre-desert shrubs	9,85
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	19,7
8210: Limestone rock faces with chasmophytic vegetation	29,55
8330: Submerged or semi-submerged sea caves	1,97
9540: Mediterranean pine forests of endemic mesogenic pines	98,5

The site has geological substrate of Cretaceous limestone. The site is of particular importance for the presence of natural Aleppo pine forests of great forest value. Rock habitats with characteristic flora, strips of scrub and small expanses of substeppe grasslands are frequent in the area. It is one of the few intact coastal stretches of great landscape value. Important nesting site for several rock species.

- **IT9110008 Foothills and Steppes**:

established by Ministerial Decree 28/12/2018 (G.U. 19 of 23-01-2019) and falling within the "Mediterranean" biogeographical region, it has a total extension of 29817.0 ha, of which 100% is land area.

The following habitat types are present within the site area:

Habitat types - *IT9110008 Walloons and Steppes Pedegarganiche*	**Surface** (ha)
62A0: Dry grasslands of the eastern sub-Mediterranean region (*Scorzoneretalia villosae*)	11696,0
8210: Limestone rock faces with chasmophytic vegetation	3,0
8310: Caves not yet exploited for tourism	161 (number of caves)
9320: Forests of *Olea* and *Ceratonia*	25,9
9340: Forests of *Quercus ilex* and *Quercus rotundifolia*	361,0

The site has a geological substrate consisting of Cretaceous and Upper Jurassic limestones. The area falls within the largest area of minimum rainfall in peninsular Italy. The site includes the largest sub-steppe areas of Puglia with very high biodiversity and a series of canyons of erosive origin that host a rocky environment of high naturalistic interest with rare endemic plant species and of high phytogeographical interest. The only peninsular resort of *Tetrax tertax*. Isolated populations of *Petronia petronia*. Presence of *Viper* at*Spis Huggyi* endemic to southern Italy. In addition, there is the presence of garrigues of *Euphorbia spinosa* with coverage percentage 5 and evaluations respectively: A, A, C, A.

- **IT9110038 Marshes near the Gulf of Manfredonia**:

established by DGR no. 347 of 10/2/2010 and falling within the "Mediterranean" biogeographical region, it has a total extension of 14437.0 ha, of which 100% is land area.

In the site sheet, updated in December 2023, neither the habitat types present nor the habitat classes are listed. Below is the table with the list of habitat types present in the site sheet updated in December 2022:

Habitat types - *IT9110038 Marshes near the Gulf of Manfredonia*	**Surface** (ha)
1150*: Coastal lagoons	2830,4
1310: Pioneer annual vegetation in *Salicornia* and other species of muddy and sandy areas	721,85
1410: Mediterranean flooded pastures (*Juncetalia maritimi*)	1443,7
1420: Mediterranean and thermo-Atlantic halophilous grasslands and orchards (*Sarcocornietea fruticosi*)	3320,51

It is a complex system of coastal wetlands functionally communicating with each other, representing what today remains of the ancient reclamation interventions that have affected the entire coastal system of the Gulf of Manfredonia. The environment consists of almost all types of wetlands, with freshwater basins, brackish lagoons, temporarily flooded areas covered with salicornieti. The salt pans of Margherita di Savoia represent one of the largest areas of salt pans in Europe, about 4200 ha. The site is characterized by vast expanses of salicornieto with a prevalence of *Arthrocnemum glaucum* and by numerous evaporation tanks at different depths and salinity. After the establishment of a protected area over the entire area of the salt pan, the most important contingent of water birds in central and southern Italy winters. The Frattarolo marsh is a vast flooded coastal plain, an ancient expansion basin of the Candelaro stream, with vast extensions of *Arthrocnemum glaucum*, areas of rushes, reeds and scattered nuclei of vegetation with *African Tamarix*. In Lake Salso (formerly Daunia Risi) there is a vast artificial basin of fresh water with vast expanses of reeds and flooded marshes.

The set of wetlands present represents one of the most important areas nationally and internationally for aquatic birdlife. The salt pans of Margherita di Savoia, after the reclamations have almost completely

destroyed the natural brackish wetlands, have replaced their important ecological function. The succession of tanks with salinity and diversified water levels determines a great variety of habitats. In the mid-90s, a very important colony of flamingos settled in the salt pans (*Phoenicopterus ruber*) nesting, many other are the very rare species that have in the salt pans some of the most important reproductive colonies in the whole Mediterranean, we mention: avocet (*Avosetta recurvirostra*), rosy gull (*Larus genei*), coral gull (*Larus melanocephalus*), tern (*Gelochelidon nilotica*). Exceptional is the recent observation in the Frattarolo area of a group made up of about 15-17 *Numenius tenuirostris* (Serra et al. 1995), this observation represents the largest group recently reported in the entire Palearctic.

- **IT9110005 Wetlands of the Capitanata**:

established by Ministerial Decree 28/12/2018 (G.U. 19 of 23-01-2019) and falling within the "Mediterranean" biogeographical region, it has a total extension of 14110.0 ha, of which 100% is land area.

The following habitat types are present within the site area:

Habitat types - *IT9110005 Wetlands of the Capitanata*	**Surface** (ha)
1150*: Coastal lagoons	2830,4
1210: Annual vegetation of marine deposit lines	282,18
1310: Pioneer annual vegetation in *Salicornia* and other species of muddy and sandy areas	2821,8
1410: Mediterranean flooded pastures (*Juncetalia maritimi*)	846,54
1420: Mediterranean and thermo-Atlantic halophilous grasslands and orchards (*Sarcocornietea fruticosi*)	5220,33
92D0: Tunnels and fortified southern shelters (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)	60,4

The site has a geological substrate consisting of silts and clays from the Quaternary. Wetlands of very high vegetation interest due to the presence of hygro-halophilic associations considered priority habitats and for the high presence of aquatic birdlife.

- **IT9110041 Aloisa - Carapelle**:

established by DGR no. 1874 of 14.12.2023 and falling within the "Mediterranean" biogeographical region, it has a total area of 3269.0 ha, of which 100% is marine area.

The site sheet does not list the types of habitats present but only the habitat class which is N01. Below is the description of the site. The SPA as identified affects the coastal stretch between Foce Aloisa and Foce Torrente Carapelle and the adjacent marine area is part of the SPA already existing IT9110038 "Marshes near the Gulf of Manfredonia". It represents an area of importance for the wintering of the *Mergus serrator*. The SPA at sea has a local but also national significance due to the presence of additional wintering marine species of Annex I DU. Data on wintering aquatic bird species on the stretch of coast in question are based on IWC's annual monitoring.

Please refer to the *S.3_02* for more information.

- **IT9120011 Ofanto Valley – Lake Capaciotti**:

established by Ministerial Decree 21/03/2018 (G.U.82 of 09/04/2018) and falling within the "Mediterranean" biogeographical region, it has a total extension of 7572.0 ha, of which 100% is terrestrial area.

The following habitat types are present within the site area:

Habitat types - *IT9120011 Ofanto Valley – Lake Capaciotti*	**Surface** (ha)
6220*: Substeppe paths of grasses and annual plants of *Thero-Brachypodietea*	378,6
92A0: Gallery forests *Salix alba* and *Populus alba*	4543,2

Site of high landscape and archaeological value. It is the most important river environment in Puglia. At times the riparian vegetation *Populus alba* it has specimens of considerable size that are among the most majestic in southern Italy.

- **IT9120009 Posidonieto San Vito - Barletta:**

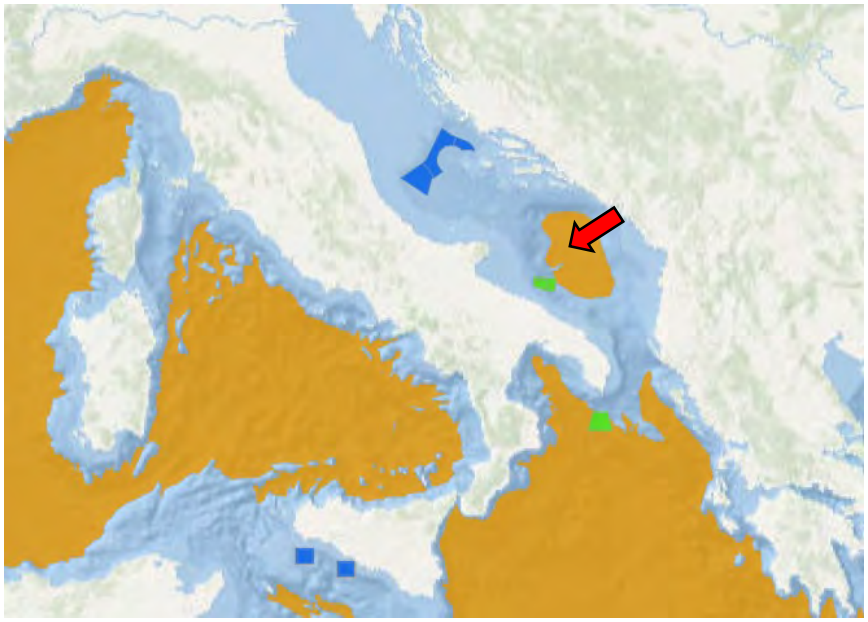
established by Ministerial Decree 21/03/2018 (G.U.82 of 09/04/2018) and falling within the "Mediterranean" biogeographical region, it has a total extension of 12459.0 ha, of which 100% is marine area.

The following habitat types are present within the site area:

Habitat types - *IT9120009140003 Posidonieto San Vito - Barletta*	**Surface** (ha)
1120*: Posidonia meadows (*Posidonion oceanicae*)	11213,1

The not very luxuriant nature of the prairie leaves enough space for the establishment of various biocoenoses typical of the infralittoral plane. Particularly widespread in the field of photophilic algae biocoenosis are the species *Cystoseira sp* and *Dictyota sp*, present both on rocky substrates and on large stretches of dead matte seabed. Near the lower limit (15-16 m) of the prairie there is the coralligenous biocoenosis that develops, in extension and height, as the depth increases. It highlights the ability to colonize surface bathymetric levels also due to a certain turbidity that characterizes the waters of this stretch of sea. The biocoenosis, however, shows its maximum development in the bathymetric belt between 18 and 27 m, with organogenic constructions, made by a myriad of organisms (encrusting algae, porifera, cnidarians, bryozoans, annelids, ascidiaceans, etc.). These bioconstructions are often impressive as shown by some sonograms recorded during navigation in this stretch of sea. The coralligenous biocoenosis is gradually replaced, as the depth increases (30-40 m), by the organogenic debris bottoms.

Of particular importance due to the proximity to the site of the offshore wind farm is the presence of an area within the **Fisheries Restricted Areas (FRAs) Deepwater FRAs (below 1000 m)** (Recommendation GFCM/29/2005/1) since it has a seabed of more than 1000 m and therefore falls within those areas scattered throughout the Mediterranean Sea where there are recommendations on governance frameworks and management of deep-sea fisheries with the aim of ensuring the long-term conservation and sustainable use of marine biological resources in the deep sea and preventing significant negative impacts on vulnerable marine ecosystems.



Map of Fisheries Restricted Areas established until 2022, in orange the Deepwater FRA (below 1000 m) with the one closest to the Nemetun Island plant indicated (FAO, 2022)

Of particular relevance for thepartial overlap of the wind farm with the**Ecologically or Biologically Significant Area, EBSA No. 126** call **South Adriatic Ionian Straight**. The area is located in the middle of the southern part of the southern Adriatic basin and the northern Ionian Sea. It is characterized by steep slopes, high salinity and a maximum depth of between 200 m and 1500 m. The exchange of waters with the Mediterranean Sea takes place through the Strait of Otranto (Artegiani et al., 1996). This area is home to important habitats for the Cuvier's beaked whale (*Ziphius cavirostris*), a species listed in Annex II to the SPA/BD Protocol in the Mediterranean under the Barcelona Convention, and other megafauna such as the Mediterranean manta ray.*Mobula mobular*), the striped dolphin (*Coeruleoalba dolphin*), the Mediterranean monk seal (*Monachus monachus*) and the sea turtle *Caretta caretta*, all listed in Annex II to the SPA/BD Protocol. The benthos includes species of cold deep-sea coral communities with aggregations of deep-sea sponges that represent important reservoirs of biodiversity and contribute to the trophic recycling of organic matter (Fortuna et al., 2014; UNEP-MAP-RAC/SPA, 2014a). In these communities we find the scleractinias (*Prudent madrepora*, *Lophelia pertusa*, which are the skeleton of these cold-water coral communities), stony corals such as *Desmophyllum dianthus* and *Stenocyathus vermiformis* and yellow coral (*Dendrophyllia cornigera*), the antipatari (*Leiopathes glaberrima*) and gorgonians (*Verticillate callogorgia*) as major taxa that form habitats together, often in association with sponges such as *Pachastrella monilifera* and *Compressed poecillastra* and serpulids (Freiwald et al., 2009; Taviani et al., 2011; Angeletti et al., 2014; Oceana, 2014). The best known examples refer to the south-western margin of the basin where scleractinie-sponge communities (i.e. *Prudent madrepora*, *Lophelia pertusa*, *Dendrophyllia cornigera*, *Desmophyllum dianthus*, *Compressed poecillastra*, *Pachastrella monilifera*) in the Bari Canyon, Gondola Slide and Dauno Seamount (Angeletti et al., 2014 and references contained therein).

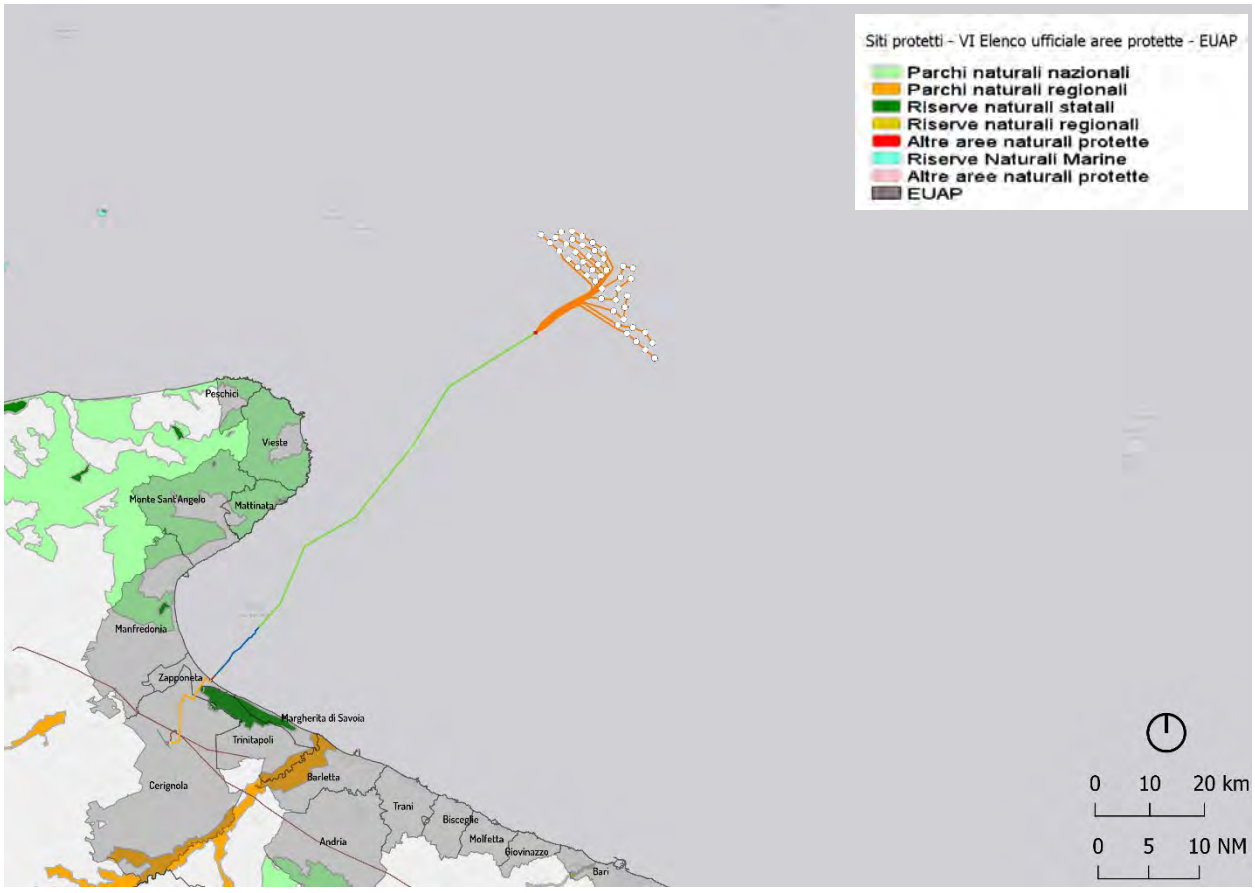
In the area you can also find tuna (*Thunnus thynnus*), swordfish (*Xiphias gladius*) and sharks (UNEP-MAP-RAC/SPA, 2014b). In addition, this area includes the Bari Canyon, which plays an important role in the dynamics of the Adriatic Sea as it is the main strait facilitating sediment transport between the western Adriatic shelf and the southern basin (Oceana, 2014). The Southern Adriatic Trench is also characterized by offshore zooplankton, particularly euphasiace, also known as krill. Mesopelagic and deep zooplankton are also present in the area (Viličić, 2008). Due to the strong oceanographic conditions, this area constitutes an important migratory corridor for megafauna such as the short-billed common dolphin (*Delphinus delphis*)

and sea turtles (Oceana, 2014). The area is one of the most important fishing grounds for pelagic species and deep-sea trawling. Slow-growing deep-sea corals are sensitive to bottom trawling, and pelagic species are affected by high fishing pressure and bycatch (Rogers, 2004).

2.4.4 CONSERVATION SITES - PROTECTED NATURAL AREAS

Offshore and onshore works do not affect protected natural areas. An insignificant portion of the underground cable duct, extending for about 500 meters, runs along the SP 66 near the **State Nature Reserve "Masseria Combattenti"** in continuity with the **Salt pans of Margherita di Savoia**. It is important to highlight that the underground cable duct is located on a pre-existing road infrastructure, placed in embankment with respect to the nature reserve, therefore there are no particular negative impacts due to the presence of the work, such as the subtraction of habitats.

Below are some cartographic excerpts representative of what has been highlighted, referring to the specialized documents for the necessary in-depth analysis.



State and regional protected natural areas – Classification of a large area

Below is a brief description of the protected natural areas along the Adriatic coast from north to south and inland.

- **Marine Protected Area "Tremiti Islands"**

Established by Ministerial Decree 14/7/1989 of the Ministry of the Environment, it has been under the management of the Gargano National Park Authority since 1995, in accordance with the provisions of the framework law on protected areas. It extends to the sea for 1466 hectares and the Tremiti Islands Archipelago is located about 12 miles north of the Gargano promontory. It consists of three major islands: S. Domino, S. Nicola and Caprara, an islet located between the three islands called Cretaccio and finally a

minor island, located at a distance of about 12 miles in a NE direction from the first three and over 30 miles from the Gargano coast, called Pianosa. In less than 3 km^2 of surface area and 20 km of coastal perimeter, the Tremitese archipelago is an example of rare beauty both for the unspoiled nature of its seabed and for the landscape and historical-architectural aspects present especially on the two largest islands: S. Domino and S. Nicola. The Tremiti Islands are the only Italian islands in the Adriatic, so much so that they are also known as the "Pearls of the Adriatic". The area is divided into 3 zones (called zone A, B and C respectively) with different intended uses and different protection regimes: 1) zone A of integral reserve, which includes only the stretch of sea surrounding the island of Pianosa up to the bathymetry of 70 m; 2) zone B of general reserve, which includes almost the entire sea area surrounding the island of Caprara, and in particular the one between Grotta delle Vedove on the west side and the Scoglietti on the east side of the island, within an ideal boundary line that follows the isobath of 70 meters. In addition, the stretch of sea between P.ta Secca and P.ta della Provvidenza di S. Domino, located on the south-west side, which includes the Grotta del Bue Marino, up to the bathymetry of 70 m, is also included in zone B; 3) zone C of partial reserve which includes the remaining stretch of sea surrounding the island of S. Domino, the stretch of the island of Caprara not included in zone B as well as the one surrounding the entire island of S. Nicola. Also in this case the boundary line offshore corresponds approximately to the isobath of 70 m. The archipelago is a true natural paradise, both for the unspoiled nature of its seabed and for the landscape and historical-architectural aspects of its islands. The terrestrial part is colonized by a thick pine forest of Aleppo pine (*Pinus halepensis*), with specimens sometimes prostrate and typically shaped "flag-shaped" evident especially along the north-western side of the island most beaten by sea winds, is one of the most evocative vegetation features of the Island of S. Domino. In some areas, the aforementioned pine forest evolves into a mixed forest with holm oak (*Quercus ilex*), butcher's broom, wild madder, buckthorn, myrtle, mastic and honeysuckle. The presence of the Mediterranean scrub is evocative, characterized by thick bushes of wild olive trees, mastic trees, phillyrea, tree spurge and daphne olivella. Among the rocky outcrops sloping down towards the sea, a sparse and discontinuous rocky vegetation takes root, characterized by low shrubs shaped as a buffer by the sea winds loaded with salt, such as the helichrysum italico and the oven sweep, as well as by two characteristic and endemic species of the Tremiti islands: the lavender (*Limonium diomedeum*) and the Tremiti cornflower (*Centaurea diomedea*). As far as fauna is concerned, the island is characterized by the presence of numerous species of seabirds, including the characteristic Cory's shearwater, known in Tremiti as diomedea, which reaches the Tremiti Islands in spring to nest along the cliffs. Other seabirds present on the island are the herring gull and the peregrine falcon. The Tremiti Islands are located along a migratory route of European birdlife and represent an important stopping point for it; some species stop for a short time on them to rest, while others stay longer, even to reproduce. Among the small passerines, the most common species are the common sparrow and the warbler while the presence of the solitary sparrow and the pale swift is rarer. As for the other vertebrates, reptiles are represented by three species, the field lizard, the warty gecko and, as the only snake, the whip snake. Mammals are represented only by the house mouse and the black rat. An element of extreme naturalistic importance, whose presence in the past is certain and documented on the Island of S. Domino, is the monk seal (*Monachus monachus*) called by local fishermen "sea ox", hence the name of the cave of the same name along the western side of the island where this species used to take refuge. Among the invertebrates it is worth mentioning the malmignatta, a large spider known as the black widow, some species of small scorpions and the Mediterranean scolopendra. The numerous pools originating from the waves that break on the exposed coasts of the island are characterized by the presence of shrimps belonging to the genus *Palaemon*, the runner crab, the chiton, and near mean sea level by sea anemones and various species of algae. On the rocks continuously wet by the spray of the waves, the presence of the gastropod is also detected *Littorina neritoides* and barnacle crustaceans that along the north slope form almost continuous bands until they completely cover the underlying rock. Large stretches of the northern coast, at mean sea

level, are characterized by the horizontal development of calcareous structures, produced by the growth of coral algae of the genus *Lithophyllum*, called trottoir. On all sides it is easy to find, near the surface, agglomerations of mussels. The seabed of Pianosa appeared to be characterized by populations of variable macrobenthic species, as different edaphic conditions are detected. The seabed is particularly characterized by the presence of algae belonging to the genus *Cystoseira*. The intense grazing operated by the urchins determines the complete denudation of large areas of rocky bottom. Dives carried out on the west side of the island have made it possible to detect, at depths between 40 and 60 m, the presence of an interesting almost continuous association of the cnidarium *Paramuricea clavata* and bryozoan *Pentapora fascialis* with the presence of false black coral (*Gerardia savaglia*).

- **"Isola Varano" Protection Nature Reserve**

Established by Ministerial Decree of 13 July 1977, it covers an area of about 154 hectares and access is free along the firebreak avenues, also for reaching the beach and the sea. Along one of the avenues (no. 10) a walkway for the disabled has been set up for this purpose and is appropriately signposted. Inside the Reserve, on the other hand, access can only be obtained with written permission from the Carabinieri Biodiversity Umbra Forest Department and for study, research or educational and dissemination purposes. The area was acquired by the State Property Office between 1957 and 1961 and consists of two bodies with an average width of 220 m, between the provincial road no. 41 and the Adriatic Sea and is located at an altitude of 0-4 m above sea level. After numerous and violent fires that, in the past, destroyed the original vegetation, an intensive reforestation plan was applied to the Reserve with psammophilous species such as acacia, to strengthen the dune, and pines and eucalyptus to protect the cultivated land behind it from salt. Currently in the area, which is suitable for tourism, there is a fair number of accommodation facilities (campsites, holiday homes, hotels, restaurants). The protected area has several habitats protected by the EU, such as lagoons and coastal juniper dunes (*Juniperus oxycedrus*) and pine forests with stone and maritime pine (*Pinus pinea* and *P. pinaster*). The most widespread natural vegetation consists of Aleppo pine, holm oak, mastic, myrtle, phillyrea, rosemary, smilace, asparagus, junipers and cistus. The non-indigenous vegetation consists of eucalyptus, stone pine, maritime pine and acacia saligna. The sedentary wildlife consists of hare, fox and hedgehog. There are numerous species of migratory birds: turtledove, cuckoo, hoopoe, oriole, woodcock; a few species of Falconidae and Turgidae. Numerous water birds and birds fly over the reserve in their frequent movements between the lake and the sea.

- **Biogenetic Nature Reserve "Bosco Ischitella e Carpino"**

Established by Ministerial Decree of 13 July 1977, it covers an area of about 299 hectares and access is allowed for reasons of study, research and environmental education, exclusively along the existing forest roads and paths and only on foot or by bicycle, with the permission of the Carabinieri Biodiversity Department of the Umbra Forest. The area was acquired by the State Property in 1957, is located at an altitude of 253-600 m above sea level and has an orography characterized by a complex system of valleys. Their orientation to the west, towards the underlying Lake Varano, means that the slopes facing north and north-east, are cooler and with a fertile and evolved soil covered by a particular vegetation that has been defined as "One of the most evocative and important botanical monuments of the South". In the locality of "Coppa delle Rose", at an unusually low altitude (about 300 m), there is a beech forest typically of the same age with plants over 30 m high and 60-70 cm in diameter. In 2008, silvicultural works were started to reduce even-aged structure and increase the biodiversity of the ecosystem. The forest is characterized by the presence of the English oak and that of the beech at a completely unusual altitude. Hornbeam and lime are also present in sporadic form. Shrubby and herbaceous vegetation is scarce where beech predominates and is represented by: hazelnut, dogwood, lantana, laurel, strawberry tree, cistus, broom, buckthorn, butcher's broom, holly and ferns. The presence of roe deer is reported, as well as dormouse, fox, stone

marten, badger, hare and wild boar. Among the birds we find: green woodpecker, long-eared owl, tawny owl, wood pigeon, woodcock and various species of turgids, finches and parids.

- **"Falascone" Oriented Nature Reserve**

Established by Ministerial Decree of 13 July 1977, it covers an area of about 48 hectares and access is allowed, subject to written permission from the Carabinieri Biodiversity Umbra Forest Department, only for the purposes of study, research and environmental dissemination and education. The two reserves of Falascone and Umbra constitute a single body and represent the nucleus of the ancient "*Nemus garganicum*" mentioned by Ovid, Strabo and Virgil, which cloaked the entire Gargano Promontory. The history of the Umbra Forest is a confused succession of conquests, usurpations, cessions by Kings, local princes, Swabians, Lombards, Byzantines, etc. The first certain news is around the second half of the 1500s when the nobleman Girolamo Grimaldi bought all the vast territory surrounding Monte Sant'Angelo, including the Forest. The Grimaldi family passed on this property to themselves for about two centuries. In the Napoleonic era, the Forest was expropriated and the Estate became the property first of the State Property of the Kingdom of the Two Sicilies and later of the Kingdom of Italy. With Law 3713 of 1866, the forest was declared inalienable and finally handed over to the State Forestry Administration. The Reserve, together with the contiguous Umbrian Reserve, is located in the summit portion of the largest state-owned forest owned by the region, located between 730 and 760 meters above sea level. The Reserve is a fine example of a "beech forest of the Apennines with *Taxus* and *Ilex*" (badger and holly), a priority habitat protected by the EU Habitats Directive. The predominant vegetation consists of a beech forest with a multi-layered structure that allows excellent shrubby and herbaceous development. In the arboreal level we find: hornbeam, hornbeam, maples, limes, ashes, elm, manna ash and yew; In the shrub plane we find: butcher's broom, holly and daphne. Among the endemic herbaceous species we find: *Gargano bellflower, Cardamine bulbifera* subsp. *garganica, Ranunculus garganicus, Lamium garganicum* and *Gargano tapsia*. Particular attention and protection is given to the Italian roe deer; we also find the wild boar, the badger, the fox, the wild cat, the stone marten and the dormouse and, recently, the reappearance of the wolf. Among the birds we find: the long-eared owl, the wood pigeon, the tawny owl, the great spotted woodpecker, the lesser spotted woodpecker, the nuthatch, the green woodpecker, the blackbird, the woodcock and various species of turgids, finches and woodhs.

The entire protected area, together with a large part of the Umbrian Reserve, on July 7, 2017, was recognized as an ancient beech forest "Natural World Heritage Site" by UNESCO.

- **"Umbra" Integral Biogenetic Nature Reserve**

Established by Ministerial Decree of 13 July 1977, it covers an area of about 399 hectares and access is allowed only along the forest roads and paths that cross the protected area and exclusively on foot or by bicycle; it is also conditional on respect for places and the environment. Within the same, along the aforementioned rolling stock, there are equipped parking areas. In the protected area there is a "Visitor Center" where it is possible to admire a rich xylotheque, lithic finds, a taxidermy collection of fauna, images of the flora and a valuable 1:25,000 scale model of the Gargano Promontory. There is also a recreational-educational area dedicated to children, called "Giocabosco", designed and set up to allow young visitors to play in the woods and with the woods with greater safety margins than elsewhere. The two reserves of Umbra and Falascone constitute a single body and represent the nucleus of the ancient "*Nemus garganicum*" mentioned by Ovid, Strabo and Virgil, which cloaked the entire promontory. The history of the Umbra Forest is a confused succession of conquests, usurpations, cessions by Kings, local princes, Swabians, Lombards, Byzantines, etc. The first certain news is around the second half of the 1500s when the nobleman Girolamo Grimaldi bought all the vast territory surrounding Monte Sant'Angelo, including the

Forest. The Grimaldi family passed on this property for about two centuries. In the Napoleonic era, the Forest was expropriated and the Estate became the property first of the State Property of the Kingdom of the Two Sicilies and later of the Kingdom of Italy. With Law 3713 of 1866, the forest was declared inalienable and finally handed over to the State Forestry Administration. The reserve, together with the contiguous one of Falascone, is located in the summit portion of the largest state-owned forest of the same name, located between 670 and 800 meters above sea level. The reserve is a fine example of "Beech forest of the Apennines with *Taxus* and *Ilex*" (badger and holly), a priority habitat protected by the EU Habitats Directive. The predominant vegetation consists of beech forests with a multi-layered structure that allows excellent shrubby and herbaceous development. In the arboreal level we find: hornbeam, hornbeam, maples, limes, ashes, elm, manna ash and yew; In the shrub plane we find: butcher's broom, holly and daphne. Among the endemic herbaceous species we find: *Gargano bellflower, Cardamine bulbifera* subsp. *garganica, Ranunculus garganicus, Lamium garganicum* and *Gargano tapsia*. Particular attention and protection is given to the Italian roe deer; we also find the wild boar, the badger, the fox, the wild cat, the stone marten and the dormouse. Recently, the reappearance of the wolf is certain. Among the birds we find: the long-eared owl, the wood pigeon, the tawny owl, the great spotted woodpecker, the lesser spotted woodpecker, the nuthatch, the green woodpecker, the blackbird, the woodcock and various species of turgids, finches and woodhs.

- **Gargano National Park**

Established by Presidential Decree of 5 June 1995, it is under the management of a Park Authority and subject to the supervision of the Ministry of the Environment. The Authority carries out its tasks through two fundamental tools: the regulation and the Park plan. The park, which extends for 118144 hectares, protects an exceptional concentration of different habitats, ranging from the high and rocky coasts, to the warm valleys of the southern side, rich in rare and endemic species of plants and animals, to the central beech forests located at an altitude (300 m above sea level) much lower than normal (about 1000 m above sea level) and rich in centuries-old specimens, to the Mediterranean pine forests of Aleppo pine, also present with specimens over 500 years old. From the point of view of fauna, the exceptional nature of the promontory is given by the presence, for example, of the roe deer (one of the very few native nuclei present in the country) or the species of woodpeckers (greater red, medium, minor, Lilford's, the last two very rare and localized, present in Italy only within protected areas) which underline the naturalistic value of the forests. The undergrowth of the Gargano forests, as well as the steppe meadows, are very rich in flowers. In the case of wild orchids, of which the Gargano is the richest locality in Europe and the Mediterranean basin, there are 56 species and 5 subspecies. Finally, it should be remembered the role that the promontory has had in the past as a link with the fauna and flora of the Balkan peninsula, proven by the numerous list of so-called "transadriatic" species. A remnant of the primeval and millenary forest of the Gargano promontory, the Umbra Forest is the most representative environment of the inland areas of the Gargano. In spite of the devastation and senseless deforestation of the last three centuries that have made the hilly and mountain slopes of the Gargano bare of the forest mantle, the Forest has preserved almost intact its majestic and imposing vegetative luxuriance with a rich variety of species and tree and shrub forms. The attributions of the name to the Forest are lost in the mists of time and all, although acceptable, are insufficiently verifiable and do not provide a clear reading of the denomination. For some, the name Umbra derives from ancient populations of Umbri (a prehistoric tribe of the Celtic branch), inhabitants of the forest who used to raid and rob in the lowest and most fertile places of the promontory to the detriment of nomadic shepherds; for others more simply a shady place. One of the reasons that led to the establishment of the Park was undoubtedly the presence of important wetlands included in the biotopes of community importance such as the lagoons of Lesina and Varano, the marshes of Frattarolo and ex Daunia Risi and others such as the mouths of the Fortore, the area of the ancient Lake of Sant'Egidio and the Marsh of

Sfinale. In addition, very interesting especially for the survival of amphibians, some reptiles and for the occasional stopover of birdlife, is the existence in the North-Gargano and in the coastal area between Vieste and Peschici of springs as well as, in the inland areas, temporary stagnation of water called "cutini" or traditional "pools". The wetlands of the Gargano and Capitanata have always aroused considerable interest in scholars and enthusiasts, placing themselves among the most important in Italy not only for the variety of environments but also for their strategic position on the migratory routes of water birds between Africa and central-eastern Europe. Inside the Park we find a series of unique habitats. It goes from the dense and extensive forests, for which it is famous, to the Mediterranean scrub, from the large karst plateaus, rich in sinkholes and sinkholes, to the steep cliffs overlooking the sea, dotted with fantastic caves, from the steep and wooded valleys that descend towards the sea, to the coastal lagoons of Lesina and Varano, from the hills and steppe plains to the Marshes of Frederick II. The four Tremiti Islands are part of this jewel surrounded by a crystal clear sea and rich in caves. It is unlikely to find along the shores of the Mediterranean another place like the Gargano National Park capable of enclosing so much biodiversity in such a small extension, we are faced with a small microcosm, a true biological island.

- **"Sfilzi" Integral State Nature Reserve**

Established by Ministerial Decree of 26 July 1971, the area covers 56 hectares and since it is an integral reserve, access is allowed only with written permission from the Carabinieri Biodiversity Department of the Umbra Forest and exclusively for the purposes of study, research or environmental education. The area came to the State Property in 1919 by purchase from the noble Forquet family, of French origin, owner of a larger hunting estate. The reserve extends along the slopes of the Carpinosa Valley upstream of the only perennial spring in the mountain area of the Gargano called "Fontana di Sfilzi" which was built by hermits and dates back to the seventeenth century. The Reserve develops at an altitude of 389-600 m. a.s.l. It is a well-preserved forest with vegetation conditioned by interesting thermal inversion phenomena. In the area, the University of Tuscia is carrying out surveys aimed at measuring tree growth. The vegetation, although not precisely framed in one of the habitats protected at EU level, is particularly interesting as it can be framed in the beech-turkey oak tension area and characterized, due to the particular orographic conformation, by an extraordinary interpenetration of vegetation facies. The plant species are those typical of beech and turkey oak forests. Thanks to the different exposures that influence the microclimate, there are: opal maple, field maple, hornbeam, hornbeam, turkey oak, oak, holm oak, linden, elm, rowan, molastro, laurel, strawberry tree, terebinth. Many shrubs and a rich variety of herbaceous species and mosses make the vegetation very varied and interesting. Particular attention and protection is given to roe deer; we also find the wild boar, the badger, the fox, the wild cat, the stone marten and the dormouse. Recently, the reappearance of the wolf has been reported. Birds include the long-eared owl, wood pigeon, tawny owl and numerous species of woodpeckers and woodpeckers. The presence of some pairs of the rare middle spotted woodpecker has also been ascertained. In the waters of the Fountain lives the Italian newt, a small caudate amphibian endemic to our country, protected by the EU Habitats Directive.

- **"Monte Barone" Biogenetic State Nature Reserve**

Established by Ministerial Decree of 13 July 1977, it covers an area of about 124 hectares and access is allowed only along the paths in the protected area and exclusively on foot or by bicycle. The area was acquired by the State Property Office in 1913; it is located at an altitude of 0-296 m a.s.l. and is exposed to the south/south-east, where it borders for the most part with the Adriatic Sea on which it overlooks with overhangs tens of meters high, a circumstance that makes it difficult to use by any visitors / hikers. The vegetation is characterized by the Aleppo pine, certainly native to the Gargano Promontory, which often roots on the bare rock. In 2002 it was affected by a violent fire, but thanks to targeted silvicultural interventions, the damage caused is slowly healing. The maintenance of forests (accidental cutting) and

infrastructures. Surveys have recently been started, in collaboration with the University of Tuscia, aimed at studying and evaluating the growth and ecophysiology of the Aleppo pine. Although not among the habitats considered of EU interest, the Reserve represents one of the largest and best preserved strips of Aleppo pine forest in the country. The natural vegetation consists of a pine forest of Aleppo pine. In the undergrowth we find the holm oak and numerous tree and shrub species of the Mediterranean scrub, including mastic, phillyrea, oil, rosemary and cistus. The sedentary wildlife consists of hare, fox, hedgehog, badger; Among the birds we find wood pigeons, turtledoves, blackbirds and various species of parids and finches.

- **State Nature Reserve of Animal Population "Frattarolo Marsh"**

Established by Ministerial Decree of 5 May 1980, the reserve covers 257 hectares and access is allowed only with written permission from the Carabinieri Biodiversity Umbra Forest Department and for reasons of study, research and environmental education. The area represents the natural expansion basin of the Candelaro stream. It is located at an altitude of 1-2 m above sea level. The rich marsh vegetation and the proximity of the sea make it a particularly interesting biotope. Walking along the borders from the outside, it is possible to observe the particularity of the environment and the birdlife. In the Reserve, buffalo breeding is allowed in the wild. In the area, monitoring and census of the birdlife present is periodically carried out. The area represents the natural expansion basin of the Candelaro stream. It is located at an altitude of 1-2 m above sea level. The rich marsh vegetation and the proximity of the sea make it a particularly interesting biotope. Walking along the borders from the outside, it is possible to observe the particularity of the environment and the birdlife. In the Reserve, buffalo breeding is allowed in the wild. The protected area is representative of the particular environment of the "Coastal Lagoons", protected by the EU Habitats Directive. On small areas there is also habitat 1310 "Pioneer annual vegetation in Salicornia", which is also protected at European level. The vegetation is typically marshy with tamarisks, willows, syrups, greater herringbone and, where the soil is more consolidated, glasswort. In addition, it represents the best preserved area characterized by halophilic meadows that in the winter season are submerged by the floods of the stream. Among the characteristic species of the area, you can find grey heron, snipe, pintail, godwit, curlew, black-winged stilt, fighter, lapwing, curlew barley, egret, spoonbill, squacco heron, moorhen, coot, tern, teal, black squid, shoveler, garganey, shelduck, bittern and marsh harrier, marsh owl, as well as the very rare curlew. There are also frequent passages of geese, cranes, bustards, white storks, black storks, cattle egrets. The wildlife situation is affected by the evolution of the water regime of the district. During the spring and autumn seasons, it plays an important complementary role to the basins of the former Daunia Risi, as a place of foraging for the various species of ducks and waders.

- **Regional Natural Park "Bosco Incoronata"**

Established by Regional Law no. 10 of 15/05/2006, the Park is located about 12 kilometers from the city of Foggia, in the heart of the Tavoliere delle Puglie. It is bordered to the north by the Cervaro stream, to the south by its ancient bed, to the east by the bridge of the state road 16 and to the west by the borders of the municipality of Foggia near the Mass. Ponte Rotto. The protected area, of about 1000 hectares, preserves a small strip of natural vegetation within a deeply cultivated territory. Currently, the surface of the lowland forest lapped by the Cervaro stream occupies an area of about 320 hectares, of which 162 hectares of tall forest and 115 hectares of prairie. It is therefore a diversified territory representative of the environments that in the past covered a large part of the Tavoliere. The Regional Natural Park includes, in addition to the Bosco dell'Incoronata, also part of the proposed Site of Community Importance (pSCI) called "Valle del Cervaro - Bosco dell'Incoronata" falling within the perimeter of the Municipality of Foggia. Inside the park we find a particularly interesting and rare habitat: the Downy Oak forest. The presence of oaks, in many cases of centuries-old age, represents a unique genetic heritage testifying to the original lowland woods

that were distributed along the Tavoliere before the great reclamations. The large oaks are an ideal habitat for many species of animals that hide or take refuge in their branches, roots and crevices. The Cervaro Torrent flows inland, which originates from the Dauni Mountains and has a course of about 80 km with an average annual flow rate of a few cubic meters per second. It flows near the Gulf of Manfredonia, feeding the marsh of the Lago Salso Oasis with its waters. Ideally tracing a transect that extends from the bank of the Cervaro stream towards the heart of the Natural Park, one first encounters a strip that emerges only for a short period of the year and is characterized by the presence of annual plants with a very rapid biological cycle (mainly polygons and grasses). The wildlife present within the Incoronata Regional Natural Park is very diversified thanks to the richness of habitats present in the protected area (watercourse, pastures, woods, agroecosystems, etc.). In this oasis, the environment is made up of extensive reeds that alternate with large areas of open water, which allow the observation of many species of flora and fauna typical of marshy environments. Among the first are the*Utricularia vulgaris*, a small carnivorous aquatic plant with beautiful yellow flowers, the *Ranunculus trichophyllus*, which creates extensive carpets of white flowers in spring, and the very popular swamp reed *Phragmites communis*. Among the fauna, in addition to the numerous species of invertebrates and the abundant presence of amphibians, reptiles and fish, the most striking and easily visible animals are birds. The open waters are frequented in winter by thousands of wintering ducks, including pochards *Feral Aythya*, morette *Aythya fuligula*, shovelers *Anas clipeata*Codons *Acute Anas* and wigeons *Anas penelope*, while in summer purple herons reproduce in the reeds *Ardea purpurea*little bittern *Ixobrychus minutus*, cannareccioni *Acrocephalus arundinaceus*, sideburns *Panurus biarmicus* and marsh harriers *Circus aeruginosus*. In the area there is also one of the most important heronries in central-southern Italy where dozens of pairs of egrets *Egretta garzetta*, night heron *Nycticorax nycticorax*, squacco gauze *Ardeola ralloides* and in some years of glossy *Plegadis falcinellus* They build their nest on eucalyptus trees.

- **State Nature Reserve for Animal Population "Masseria Combattenti"**

Established by Ministerial Decree 09.05.1980, the Reserve covers 82 hectares and entry is allowed to those entitled and aimed at extensive agricultural crops, i.e. only for study reasons, including bird censuses. The Reserve is located in the Gulf of Manfredonia at an altitude of 1-5 m above sea level, in an area reclaimed in the last century and which was previously completely marshy. It is contiguous to the salt pan of Margherita di Savoia, of which it represents a complementary environment as a place of refuge for birdlife that finds shelter among the vegetation. The environment of the Reserve is characterized by land on which extensive agriculture with low environmental impact is allowed. On some small areas, abandoned to natural evolution and not subject to cultivation, a "pioneer annual vegetation in Salicornia" is established, a habitat protected by the Habitats Directive of the European Union. The natural vegetation, where present, is typical of salty soils: clover, limonium, glasswort. Among the nesting species that also find refuge in the area are: black-winged stilt, little tern, egret avocet, shelduck, sandpiper, shrimp, redshank, plover, herring gull, rosy gull, common gull, terns, coot, moorhen, little grebe and grebe.

- **State Nature Reserve of Animal Population "Il Monte"**

Established by Ministerial Decree 15.07.1982, the Reserve covers 130 hectares and access to the area is allowed for the exercise of agricultural practices and for grazing as well as, with the permission of the Carabinieri Biodiversity Umbra Forest Department, for reasons of study, research (including the census of birdlife) and environmental education. The Reserve is adjacent to the salt pan and annexed to it as a complementary environment for the refuge of birdlife that finds shelter among the vegetation and *Salicornia*. The environment of the Reserve is to be considered a transitional one between the wetland of the salt pans and that of the crops used in productive horticulture. On part of the surface there is the presence of "Pioneer annual vegetation in Salicornia", a habitat protected by the EU Habitats Directive. The natural vegetation is

typical of a marsh consisting of arboreal elements such as willows and tamarisks as well as the marsh reed. Where the soil is more consolidated and has a certain salinity, glasswort grows. The reserve is a resting, wintering and nesting place for numerous migratory birds and in particular for anseriformes and ciconiformes. The presence of egrets, purple heron, glossy ibis, marsh harrier, harrier, black-winged stilt, tern, whitefisher, kingfisher, all species protected by the E.U.

- **State Nature Reserve of Animal Population "Salina di Margherita di Savoia"**

Established by Ministerial Decree 10.10.1977, the Reserve covers 3871 hectares and access to the area is allowed only for study or research reasons (e.g. monitoring and periodic census of birdlife) or environmental education, subject to written permission from the Carabinieri Biodiversity Umbra Forest Department. The protected area is located in the Gulf of Manfredonia at an altitude of 1-5 m above sea level, in an area that has seen intense reclamation works in the last century and which was previously completely marshy. Already used in Roman times, it is the largest Italian salt pan and among the largest in Europe. The "Il Monte" and "Masseria Combattenti" Reserves are adjacent to the Salina and annexed to the protected area as important places of refuge for birdlife, which finds shelter among the salicornia vegetation. The Reserve has been declared a "wetland of international importance (Ramsar Convention of 2 February 1971)" as a privileged resting and nesting place for numerous species of water birds, including numerous waders. The very particular and rare environment is framed among the coastal lagoons and protected by the EU Habitats Directive; in fact, there is habitat 1310 "Pioneer annual vegetation in Salicornia". The salicornieto is a type of prairie characterized by the presence of Chenopodiaceae, among which salicornia stands out which, with its fleshy branches, is widely used and appreciated locally also as a food. On salty soils, clover, *Limonium* and glasswort. Among the nesting species we find the black-winged stilt, little tern, avocet and pink flamingo, which in recent years has formed a colony of about 4000 individuals. In addition, there are significant presences of egrets, shelducks, sandpipers, shrimp, redshanks, plover, herring gull, rosy gull, common gull, terns, coots, moorhens, little grebes and grebes. You can also find beetles, including rare *Othiorrhynchus transadriaticus*, *Bothynoderes andreae* and *Conorhynchus luigionii* and the fish osteichthys, like the ninth *Aphanius fasciatus* and stickleback *Gasterosteus aculeatus*.

- **Regional Natural Park "Ofanto River"**

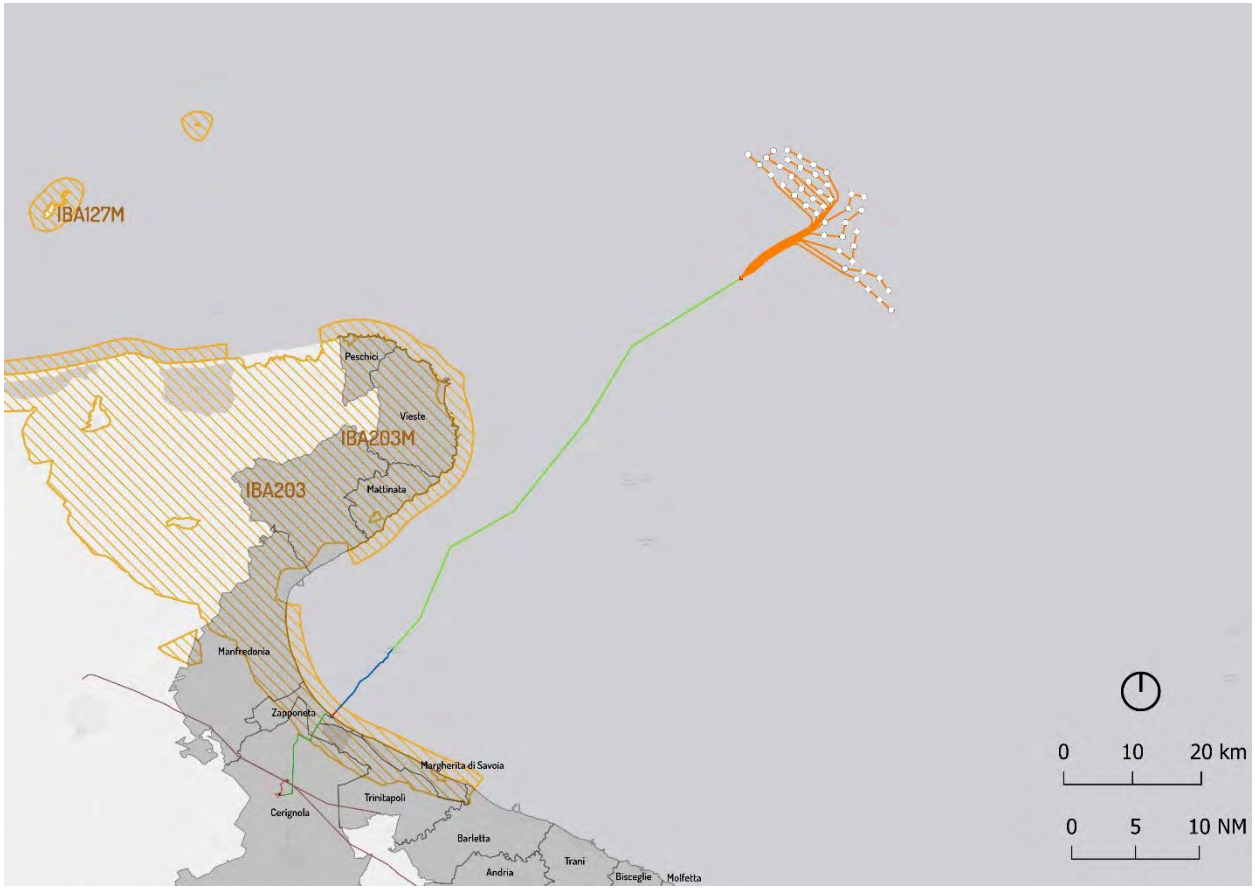
The Park was established by Regional Law 14 December 2007, n. 37, the Park covers an area of 24883 hectares. The landscape of the Ofanto Valley is the result of a significant canalization activity which, by crystallizing the river in its bed, has allowed the development of a pervasive monofunctional agriculture that is highly fragmented, within which residual strips of naturalness creep in. The settlement system consists of the main centers that develop in dominant orographic positions along the valley and its tributaries (Canosa, Minervino, Spinazzola) and the rural villages of Loconia (Canosa di Puglia), Moschella (Cerignola), Gaudiano (Lavello), Santa Chiara (Trinitapoli) which develop in the alluvial plain along the linear road network and represent a system of secondary polarity. The landscape changes progressively from the mouth to the slopes of the sub-Apennines: the dense, narrow and elongated weave of the coastal gardens is transformed into a carpet of vineyards that forces the river into a thin serpentine of riparian vegetation, which further upstream widens into large floodplain strips. The area expresses a fair amount of environmental heterogeneity: from the wetlands along the river proper, to the forest stands, from environments with herbaceous or shrubby vegetation, to agricultural areas such as the beaches along the coast. Along the Ofanto and Loconte rivers there are the main remnants of naturalness associated with riparian vegetation, including willows, dense reeds and settlements of marsh plants such as cattail, water mint, horsetail exedra, dog tongue, canine tooth, bramble rush and dog laughter. Within the territory of the

Ofanto Regional Park there are 410.51 hectares of temperate climate shrubs, mostly located in the southern part of the Park, on small fragmented areas. In the preserved areas upstream, there are some specimens of White Poplar (*Populus alba*), which are among the most majestic in southern Italy. There is no shortage of ashes, alders and various species of oaks, such as downy oak, turkey oak and holm oak. The hygrophilous woods represent the largest wooded area of the Park, 808.36 ha, forming a long strip that follows the entire course of the Ofanto river, with some discontinuity. North of Spinazzola and belonging to the Locone basin, the formation of aquatetta, i.e. a strip of the forests that must have covered the bradanic trench before being cultivated, is very interesting. Mediterranean pines occupy 220.25 hectares and are concentrated along the shores of Lake Locone and Lake Capacciotti. In marshy and brackish areas, the rake (*Cakile maritima*) and kali grass (*Salsola kali*), while in the dune areas the presence of grasses is significant. The territory near the Ofanto river is made up of a rather articulated environmental system, which manifests a high vocation for numerous fauna species, of which there are 60 species, including mammals, birds, fish, amphibians and reptiles. The area is home to one of the most nationally threatened mammals: the otter (*Lutra lutra*), the wild boar (Sus scrofa), the stone marten (*Martes marten*), the rate (*Meles meles*), the weasel (*Mustela nivalis*), the octopus (*Muscardinus avellinarius*), the quercino (*Elyomis quercinus*). Noteworthy is the stable presence of the wild cat (*Felis silvestris*), In addition to the wolf (*Canis lupus*) present in Basilicata and 12 bats. Other significant species are among the birds: lanner (*Falco biarmicus*), hobbyist (*Falvo subbuteo*), small courier (*Charadrius dubius*), black kite (*Milvus migrans*), quail (*Coturnix dubius*), the coot (*Fulica atra*), the moorhen (*Gallinula chloropus*), the water rail (*Rallus aquaticus*), the red kite (*Milvus milvus*), the short-toed eagle (*Circaetus gallicus*), buzzard (*Buteo buteo*), the sparrowhawk (*Accipiter nisus*), the kingfisher (*Alcedo atthis*), the reed warbler (*Acrocephalus scirpaceus*), the reed warbler (*Acrocephalus arundinaceus*), the oriole (*Oriolus oriolus*), the pendulum (*Remiz pendelinus*), the white stork (*Ciconia ciconia*), the bee-eater (*Merops apiaster*), the black-winged stilt (*Himantopus himantopus*), night heron (*Nycticorax nycticorax*), the bittern (*Ixobrychus minutus*), the big eyelet (*Burhinus oedicnemus*) and different species of woodpeckers. The fish fauna is relatively abundant and characterized by several species: the eel (*Eel eel*), chub (*Leuciscus cephalus*), the barbel (*Barbus spp.*), the rovella (*Rutilus rubilio*), roach (*Rutilus Classroom*), the crucian carp (*Carassius carassius*), the rookie (*Chondrostoma genei*), the bleak, (*Alburnus albidus*), carp (*Cyprinus carpio*), tench (*Tench tench*), catfish (*Ictalurus melas*), perch (*Perca fluviatilis*), bluegill (*Lepomis gibbosus*). For the brown trout (*Salmo trutta fario*), typical of some stretches until the early 90s, is perhaps still present with small populations. The river crab (*Potamon fluviatile*) is well distributed throughout the basin, while the crayfish (*Austrapotamobius pallipes italicus*). Overall, 7 species of amphibians survive in the area, equal to 70% of those reported in Puglia and 17.5% of those present in Italy. Among the 7 we can mention the Italian newt (*Triturus italicus*), the common toad (*Bufo bufo*), the tree frog (*Hyla Intermediate*) and the Apennine toad (*Bombina pachypus*). The area is also important for the presence of some interesting invertebrate species such as *Melanargia arge*, *Cordulogaster trinacrie*, *Callimorpha quadripunctata*.

2.4.5 IMPORTANT BIRD AREAS (IBA)

The intervention area has the landing point and 8 km of onshore cable duct located within an area important for birds: **The IBA** (Important Bird Areas) **No. 203** - **Gargano promontory and Capitanata wetlands**.

Below are some cartographic excerpts representative of what has been highlighted, referring to the specialized documents for the necessary in-depth analysis.



IBA Important Bird Areas – Classification of a large area and onshore works

Below is a brief description of the IBAs in the Apulian territory, present around the project area.

- **Middle Adriatic**

IBA Code: 222

Earth's surface: 321 ha

Sea surface: 648.043 ha

the IBA is characterized by the Tremiti Islands and two distinct portions of the sea: a southern portion that extends from northern Puglia to the southern coasts of Abruzzo and a northern portion that includes a large stretch of sea in front of the central-southern coast of the Marche. The IBA includes the colonies of Cory's Shearwater and Tremiti Cory's Shearwater. The area of greatest use by the Cory's shearwaters of the Tremiti colony totally overlapped with the pre-existing IBA 127 'Tremiti Islands'. Consequently, it was decided to include the pre-existing IBA in the new IBA 222 'Middle Adriatic'. The IBA 127 'Tremiti Islands' is therefore replaced by the new IBA 222 'Middle Adriatic'. IBA 127 had a land area of 321 ha and a marine area of 5,122 ha and included all the following islands: Capraia Island, San Nicola di Tremiti Island, Cretaccio Island, San Domino Island, Pianosa Island and the islets of the archipelago, as well as a 2 km marine strip around the coasts. The islands and islets are rich in cliffs and Mediterranean scrub, with the presence of an autochthonous pine forest of Aleppo pine.

- **Daunia Mountains**

IBA code: 126

Earth's surface: 75,027 ha

The IBA is characterized by a vast pre-Apennine mountainous area. The area includes the highest peaks of Puglia (Monti Cornacchia and Saraceno), the middle course of the Fortore river and Lake Occhito

affected by the stopover of water birds. The area is identified to the east by Casalnuovo Monterotaro, Coppa Rinnegata, Monte Marcentina, Piano Capraia, the Torrente Radiosa and Fara di Volturino, Toppo della Ciammaruca, Il Coppone, Piano Marrone, Coppa Pipillo and the Bosco dei Santi. To the south from Monte Taverna, Colle Servigliuccio, Monte San Vito, Toppo di Cristo, Toppa Vaccara, Monte Leardo. To the west by Toppo San Biagio, Fiume Fortore, Poggio del Fico, Monte Taglianaso, Toppo Cola Mauditta, Poggio Marano, Toppo dei Morti, Monterovero, Sant'Elia a Pianisi. To the north from Colletoro and Monte Calvo.

- **Promontory of the Gwinch and wetlands of the Capitanata**

IBA Code: 203

Earth's surface: 207,378 ha

Sea surface: 35.503 ha

IBA 203 includes 3 neighboring IBAs (Lakes of Lesina and Varano IBA 128, Gargano Promontory IBA 129, Wetlands of the Gulf of Manfredonia or Capitanata IBA 130) that fall partially or entirely within the territory of the Gargano National Park. Also from an ornithological point of view, it is justified to treat the whole of the wetlands of the capitanata (both north and south of the Gargano) as a single system that should be managed in a coordinated manner. The area includes:

- the Gargano promontory and the adjacent foothill steppe areas,
- the coastal lakes of Lesina and Varano located north of the promontory,
- the complex of freshwater and brackish water wetlands along the Adriatic coast south of the promontory (Frattarolo, Daunia Risi, Carapelle, San Floriano, Saline di Margherita di Savoia, Foce Ofanto), including the neighboring agricultural areas most important for the feeding and resting of birdlife (aquatics, birds of prey, etc.),
- the disjointed area of the Amendola military air base, which represents the last well-preserved strip of foothill steppe, is also part of the IBA.

Inland, the main area is bordered by the mouth of the Fortore River, a stretch of the A14 motorway and the road leading to Cagnano. At the height of the Masseria S. Nazzario, the border bends southwards along the road that leads to Apricena (excluding the town) to the Candelaro station and from here to Trinitapoli (excluding the town). To the south, the area is bordered by the mouth of the Ofanto river. The following inhabited centers are excluded from the IBA: Lesina, Sannicandro, Rodi Garganico (and their bathing establishments), Peschici, Vieste and the coast (and related campsites, villages, bathing establishments) up to Pugnochiuso, Mattinata, San Giovanni Rotondo, Manfredonia and the coast from Lido di Siponto to the former Barracks of Finance.

- **Murge**

IBA Code: 135

Earth's surface: 144.498 ha

This IBA includes the vast limestone plateau of the Apulian hinterland. To the west, the area is bordered by the road that from Cassano delle Murge passes from Santéramo in Colle to Masseria Viglione. To the south-east it is bordered by the Via Appia Antica (or the Tarantina) and then by the State Road n° 97 up to Minervino Murge. To the east, the perimeter includes Le Murge di Minervino, the Bosco di Spirito and Femmina Morta. To the north, the area is bordered by the road that leads from Torre del Vento to Quasano (excluding the town) to Cassano delle Murge. The villages of Minervino Murge, Cassano della Murge,

Santéramo in Colle, Altamura and Gravina in Puglia are deliberately included in the IBA as they are important areas for the nesting of the lesser kestrel. The perimeter of the IBA largely coincides with that of the IT9120007-Murgia Alta SPA except in a stretch of the north-eastern portion.

3 DESIGN FRAMEWORK

Referring to the specialist reports attached to the project for the analysis of any detail, the salient features of the project works are illustrated below.

The project reference framework has been drawn up in accordance with current legislation and describes the project and the solutions adopted as a result of the studies carried out.

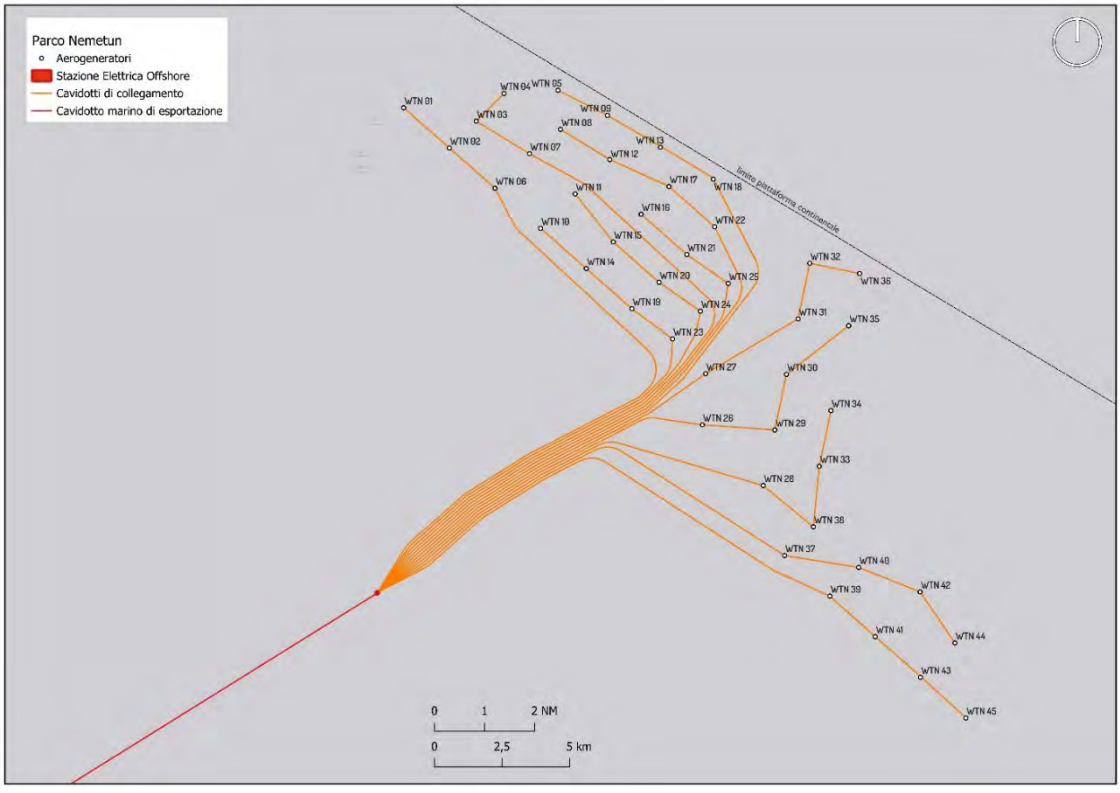
The elements of the project and the reasons given by the proponent in the choice of the components are described, the technical reasons behind the design choices, the measures, measures and interventions, even if not strictly related to the project, that the proponent considers appropriate to adopt for the purpose of better integrating the work into the environment.

The characteristics of the work are specified with particular reference to:

- nature of the goods and/or services offered;
- articulation of the activities necessary for the construction of the work during the construction phase, operation and decommissioning;
- forecast of the short and long-term territorial transformations resulting from the project location, the service infrastructures and any related industries.

3.1 MAIN FEATURES OF THE PROJECT

The project involves the construction of a "Wind Farm" consisting of n. **45 wind turbines,** installed on as many tubular steel towers and moved by three-blade rotors. The generators that are planned to be used will have a nominal power of **20 MW**; there will therefore be a maximum total production capacity of 900 MW, to be fed into the National Transmission Grid.



Summary representation of the works at sea

The main components of the offshore part of the system are:

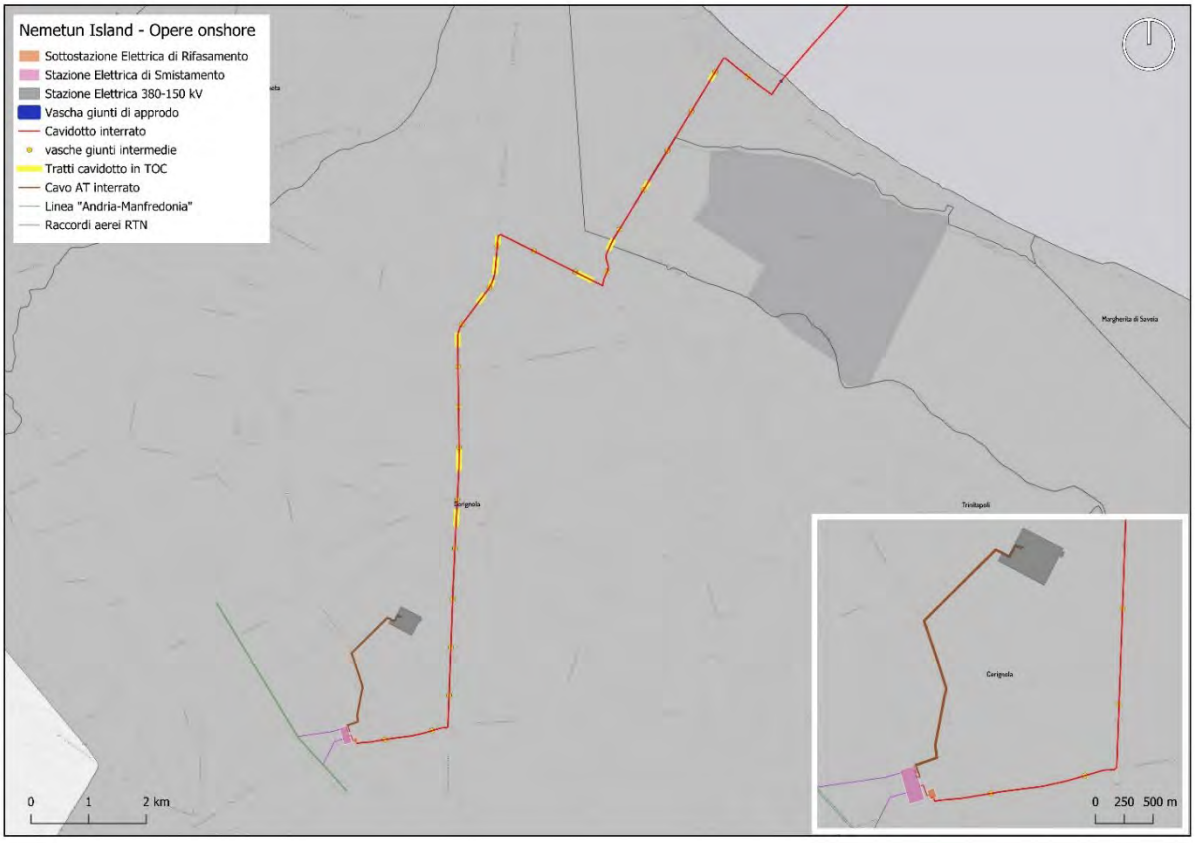
- **45 wind generators** installed on tubular steel towers and their floating foundations divided into 12 subfields;
- **12 submarine cable power lines** connection between the wind turbines and the off-shore electrical collection and transformation station, with all the necessary voltage transformation and disconnection devices;
- **An off-shore electrical substation (66/380 kV) (SE)**, i.e. all the electrical equipment (switches, disconnectors, CTs, TVs, etc.) necessary to collect the energy produced in the wind subfields, raising the voltage from 66 kV to 380 kV. The marine electrical substation will be approximately 45 km from the Gargano coast and 12 km from the wind farm in a stretch of sea characterized by bathymetric altitudes between 160 and 170 m deep;
- **An Export Cable Duct in HVAC** about 89 Km equal to about 48 nautical miles, characterized by a first section of 380 kV marine cable, will be used to connect the wind farm to the National Transmission Grid (NTG) on land.

As regards the connection to the NTG, the exchange will be connected to the 380 kV antenna on the future expansion of a 380/150 kV Electrical Transformer Substation (SE), the latter under construction in the countryside of Cerignola through the construction of specific connection works that are divided into User Works and Network Works.
Near the planned landing point in the municipality of Zapponeta, an underground joint hole will be built to transition from marine cable to land cable and from there on the cable will continue with underground laying following the existing public road network. The energy produced will then be conveyed to the user's Electrical Substation where the power factor correction system is housed and connected, again by means of an underground power line, to the National Transmission Grid (NTG).
In In these hypotheses, the user works for the connection consist of:

- **An Underground Transition Joint Bay**, located near the landing point in the municipality of Zapponeta, which will allow the transition from the submarine cable to the cable intended for underground laying in the onshore section;
- **An underground power line consisting of two three 380 kV cables**, extended for about 18 km, mainly located along the public road network in the territories of the municipalities of Zapponeta, Trinitapoli and Cerignola, with short transits on agricultural land. The cable laying will be carried out mainly through open-cut trenching; however, in order to manage interferences along the route, **11 sections will be installed using the trenchless technique known as Horizontal Directional Drilling (HDD)**. The 11 sections will have variable lengths, as represented in the project documents;
- **A series of 22 intermediate Joint Bays,** located along the route of the underground cable duct with a variable distance between 700 and 950 meters. The intermediate joints will be made as part of the excavation with a fixed section planned for the laying of the power line;
- **An electrical utility substation, isolated in GIS, for sharing the stall and equipped with a power factor correction unit, dedicated to the Nemetun Island plant**, with a maximum capacity of 600 MVAr, consisting of two Shunt type reactors. The GIS Substation will be located in an industrial building located in the municipality of Cerignola, near the connection point to the NTG indicated by TERNA and represented by a new Switching Station to be built as an extension to the Cerignola Electrical Substation;
- **An underground power line consisting of a trio of 380 kV cables,** about 200 m long, for the connection of the electrical substation to the nearby new Switching Station to be built in extension to the Cerignola Electrical Substation.

In order to allow the connection of the offshore wind farm, some interventions are necessary to expand the NTG identified by TERNA in the connection estimate and which consist of:

- **A 380 kV Switching Station** - in extension to the Cerignola Electrical Substation of the TERNA unified type with air insulation and having the following configuration:
  - N. 1 double busbar system
  - N. 2 cable line stalls for SE RTN 380 kV "Cerignola 380" connection
  - N. 2 parallel busbar stalls
  - No. 1 TIP stall
  - N. 2 stalls fully equipped for the entrance – exits on the existing 380 kV power line "Manfredonia 380 – Andria"
  - N. 6 line stalls available for future network needs
- **Two 380 kV Overhead connections**, for the incoming connection – exits in a simple circuit of the new Switching Station to the existing line of the 380 kV "Manfredonia-Andria" NTG. The connections will be supported by 4 new pylons after the decommissioning of 2 existing pylons;
- **Two underground AT connections, consisting of a total of 4 triads of 380 kV cables**, approximately 2.70 km long, for the connection of the new Switching Station to the SE RTN 380 kV "Cerignola 380" under construction connected in and out to the 380 kV RTN "Foggia-Palo del Colle" line.



Summary representation of the onshore works

3.2 DESCRIPTION OF THE PHYSICAL CHARACTERISTICS OF THE PROJECT

Below is a summary of the main characteristics of the works described in detail in the documents of the various sections of the final project.

3.2.1 WIND TURBINES

P_{Nom}:	20,000 kW
Rotor diameter	260 m
Tower:	Tubular – with 6 logs – height 151 m

3.2.2 FLOATING FOUNDATIONS

DESCRIZIONE	UNITA'	VALORE
Potenza wtg	MW	20
Numero di colonne	---	3
Diametro colonne	m	16
Distanza tra qli assi delle colonne	m	85
Altezza colonne	m	30
Peso	T	3400

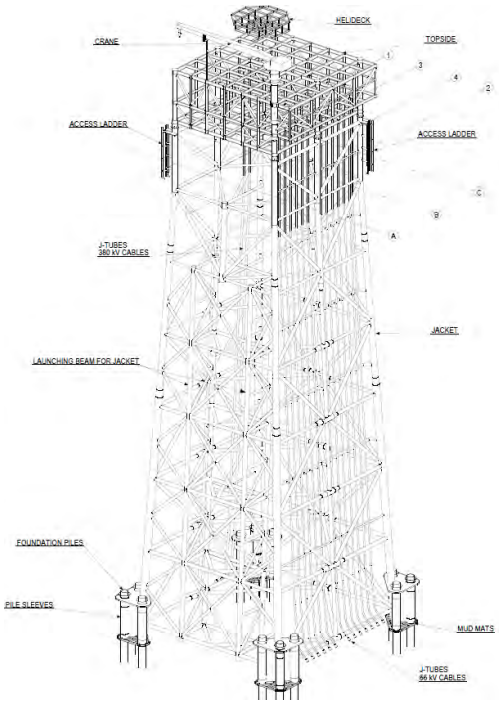
Floating foundations

3.2.3 OFFSHORE SUBSTATION

The Nemetun Island wind farm includes an offshore substation. The electrical substation will be approximately 45 km from the Gargano coast and 12 km from the wind farm in a stretch of sea characterized by bathymetric altitudes between 160 and 170 m deep.

The structure of the offshore substation is of the fixed type and consists of the following components:

- substructure (Jacket);
- foundation piles;
- superstructure (Topsides).



SStructure of the electrical substation on fixed type platform

The Jacket corresponds to the submerged part of the offshore substation structure and consists of a 4-legged truncated pyramidal shaped welded truncated steel truss steel structure, which extends from the seabed, -170 m, to an elevation of +13.3 m above sea level. The tubular and diagonal bracing elements are arranged in four main rows, with an inclination of 1/20, and 5/6 horizontal planes, with a maximum inter-storey distance of 26 m.

J-tubes are steel tubes that provide guidance and mechanical protection for submarine cables rising from the seabed, which are contained within them. The cables enter through the bell prepared on the bottom (bellmouth) and are guided until they reach the cable deck (+16.0m), the floor where the suspension systems (hang-off) are located. Inside the structure of the Jacket there are n°12 16" import J-tubes and 2 24" export J-tubes, suitably bound to the structure of the Jacket by means of a guide system that limits the length of the free spans and the risk of vortice-induced vibrations (VIV) in conditions of current, waves, current and wind.

The platform is equipped with two berths arranged on the two legs of the Jacket on the east side to allow access from the sea via Crew Transfer Vessel (CTV). The docks are attached to the main structure and therefore will be installed together with the Jacket.

The structure of the Jacket is anchored to the seabed by means of 'skirt piles' type foundation piles, positioned at the four corners. The poles are driven into the ground by means of a beating (with an underwater hydraulic pile driver) through appropriate guides (fleece sleeves) firmly connected to the base of the jacket. Once the design driving has been reached, the piles will be connected to the Jacket by pumping cement mortar into the cavity between the pile and the guide with a special injection system.

The Topsides structure rests on the Jacket in correspondence with the six main columns, arranged in two rows with a main mesh of 42m x 45m.

The main expected levels are (elevations above sea level):

- Level 1 – el +16.0m - Cable deck and Main deck: floor to which the top of the J-tubes reaches, dedicated to providing adequate capacity and space for pulling systems and cable routing to the 66kV and 380kV GIS; and to which Main Transformers and Shunt Reactors are located;
- Level 2 - el. +23.0m – Utility deck: semi-floor to which the 66kV, 380kV GIS and control rooms are housed;
- Level 3 - el. +28.6m – Accommodation: semi-intermediate floor for accommodation;

- Level 4 - el. +34.0m - Weather deck: cover with a load-bearing capacity suitable for the loading and handling of equipment, housing the coolers of the main transformers/shunt reactors and the diesel generators;
- Level 5 - el. +37.0m - Helideck: landing plan for helicopters.

3.2.4 INTERNAL POWER LINES

Number of cables for 66 kV marine power lines:	12 Three-core cables
Cable length for marine power lines 66 kV:	319,5 Kilometer
Number of cables for 380 kV marine power lines:	2 three-core cables
Cable length for marine power lines 380 kV:	89,40 Kilometer
Maximum number of 380 kV terrestrial cables:	6 single-core cables
Length of underground power line 380 kV:	18,30 kilometer

3.3 WIND TURBINES

The choice of the type of wind turbine to be used in the project is a technological choice that depends on the characteristics of the standard machines available on the market at the time of supply. The turbines referred to in the project are of particularly advanced technology.

The project currently involves the use of 45 latest generation wind turbines CRRC20000D260-20.0 MW or equivalent turbines from other manufacturers.

CRRC20000D260-20.0MW

The wind turbines have the following characteristics:

P_{Nom}: 20,000 kW

Rotor diameter 260 m

Tower: Tubular – with 6 logs – height 151 m

It is one of the most advanced offshore wind turbine models in the world. The planned turbine has 130 m blades and a rotor of a total of 260 m which corresponds to a swept area of 53092.92 m^2. With these characteristics, it is estimated that the Annual Energy Produced (AEP) will increase by 25% compared to previous models of wind turbines, thus compensating for the higher costs due to the use of floating foundations and at the same time reducing the overall number of turbines and the surface area occupied by the wind farm.

The turbines in the project will be mounted on tubular towers with a height (base-hub) of 151 m, with 3-blade rotors and a maximum diameter of 260 m. The coloring of the tubular tower and rotor blades will be white and non-reflective. The blades of the wind turbines will also be colored in white and red horizontal bands, in order to facilitate daytime viewing and all wind turbines will be equipped with fixed red light of medium intensity for night signaling, ICAO approved, and in any case with the characteristics that will be indicated by the National Civil Aviation Authority (ENAC).

In the same way, light or electromagnetic signals will be applied to the wind turbines, the foundations will be painted yellow, up to 15 meters above the level of the highest astronomical tides and finally each wind turbine will also be equipped with an AIS (Automatic Identification System) tag so that ships with AIS receivers can see and locate them precisely. All this must be prepared according to a maritime signalling plan consistent with the recommendations of the International Association of Lighthouse Authorities (IALA) to be submitted to the opinion of the MARIFARI Command competent for the area.

Please refer to the annexes of the section *2-Wind turbines* of the final project for the necessary in-depth analysis.

3.4 WIND TURBINE FOUNDATION STRUCTURES

3.4.1 THE WINDFLOAT

Image of a demonstration plant of the WindFloat

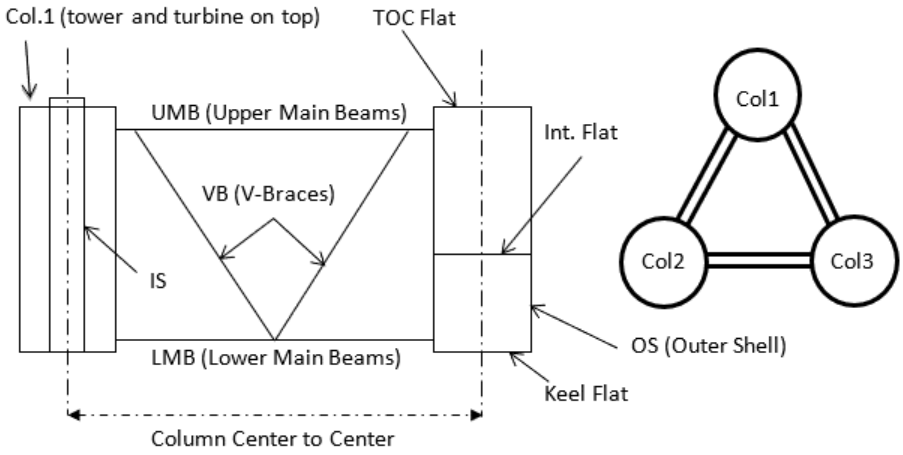
The WindFloat is a three-column semi-submersible floating platform for wind turbines equipped with an intelligent hull trim management system that adapts to different marine weather conditions by moving the water ballast contained within it between the columns to keep the wind turbine tower vertical, maximizing production and minimizing loads.

This type of semi-submersible foundation achieves buoyancy stability through the combination of three dimensional factors: the overall overall surface area on the water surface (footprint), the draft and the diameter of the three columns. The three-column design can therefore be scaled to accommodate the largest offshore wind turbines, efficiently handling loads with minimal increase in structural mass.

The WindFloat has a shallow draft construction that allows the turbine to be installed in most ports eliminating the need for heavy lifting offshore and is inherently stable during handling. Permanent water ballast is used to lower the platform to its operating draft while the intelligent hull trim system moves water from one column to another to compensate for average turbine thrust loads during operation, increasing performance and energy yield.

The three columns therefore give buoyancy and stability to the structure. The columns are appropriately spaced and arranged in a triangular arrangement to counteract the large moment of wind-induced capsizing. The typical global configuration of the Wind Float is shown below.

The main components are described below:



Main components of the WindFloat

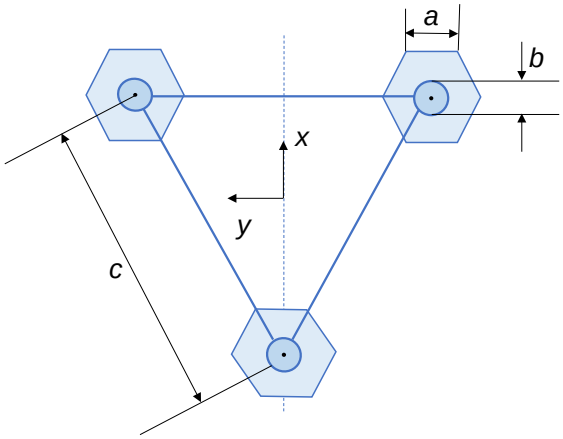
Column 1 differs from the other two in that it is the column that houses the WTG. This element contains a cylindrical technical compartment on top of which the support tower of the wind turbine is bolted by means of a coupling flange. The internal diameter of the shaft conforms to the diameter of the tower. This component provides structural continuity to the tower and serves as the main load-bearing structure. Inside the internal compartment are the engine room rooms.

To complete the semi-submersible platform, the columns are interconnected with a truss structure composed of main beams and braces. Each WindFloat requires three tubular frame truss subassemblies consisting of a Lower Main Beams (LMB), an Upper Main Beams (UMB), and the interconnecting braces (V-Braces).

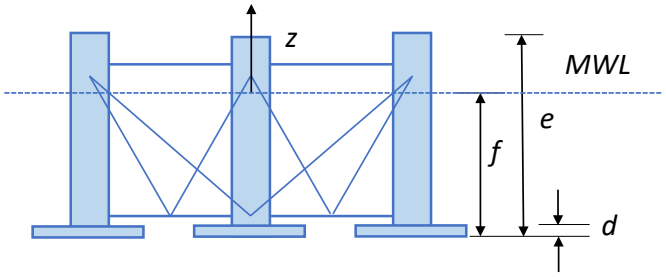
At the bottom of the columns are Water Entrapment Plates (WEPs) that provide additional hydrodynamic inertia to the platform by increasing the volume displaced and adding viscous damping to the system in roll, pitch and lift movements. This moves the natural frequencies of the platforms away from the peaks of the wave spectrum, avoiding resonance.

3.4.2 TYPICAL WINDFLOAT DIMENSIONS

Below are the main parameters and typical dimensions of a WindFloat, for further details please refer to the documents in the section *3 "Foundation structures of wind turbines"*.



Plan view



Elevation view

Main dimensional parameters of a WindFloat

Parameters	Unit	Value
at. *Side length "Water entrapment plate"*	*m*	*17.0*
b. *column diameter*	*m*	*16.0*
c. *Distance from center to center of the column*	*m*	*85.0*
d. *height of the "water entrapment plate"*	*m*	*1.4*
and. *Total height of the column*	*m*	*30.0*
f. *Draft*	*m*	*20.0*
Displacement (volumetric)	m^3	*~15 200*
Mass of steel (including tower and RNA)	*t*	*~3,400*
Static tilt angle at rated wind speed	*Degrees*	*4.5*

Typical WindFloat Dimensions

Please refer to paragraph 6.2.1 of the report *"R.3_02_Relazione on floating foundation structures and anchors"* for the necessary insights into the characteristics of the floating platform and the considerations made during the reanalysis of the structures.

3.4.3 MOORING AND ANCHORING SYSTEMS

The University of Strathclyde, together with the selection and design of the floating foundation structures, also provided the choice and sizing of the mooring and anchoring systems, see the report "*R.3_02_Relazione on floating foundation structures and anchors"* for sizing data.

3.4.3.1 Mooring systems

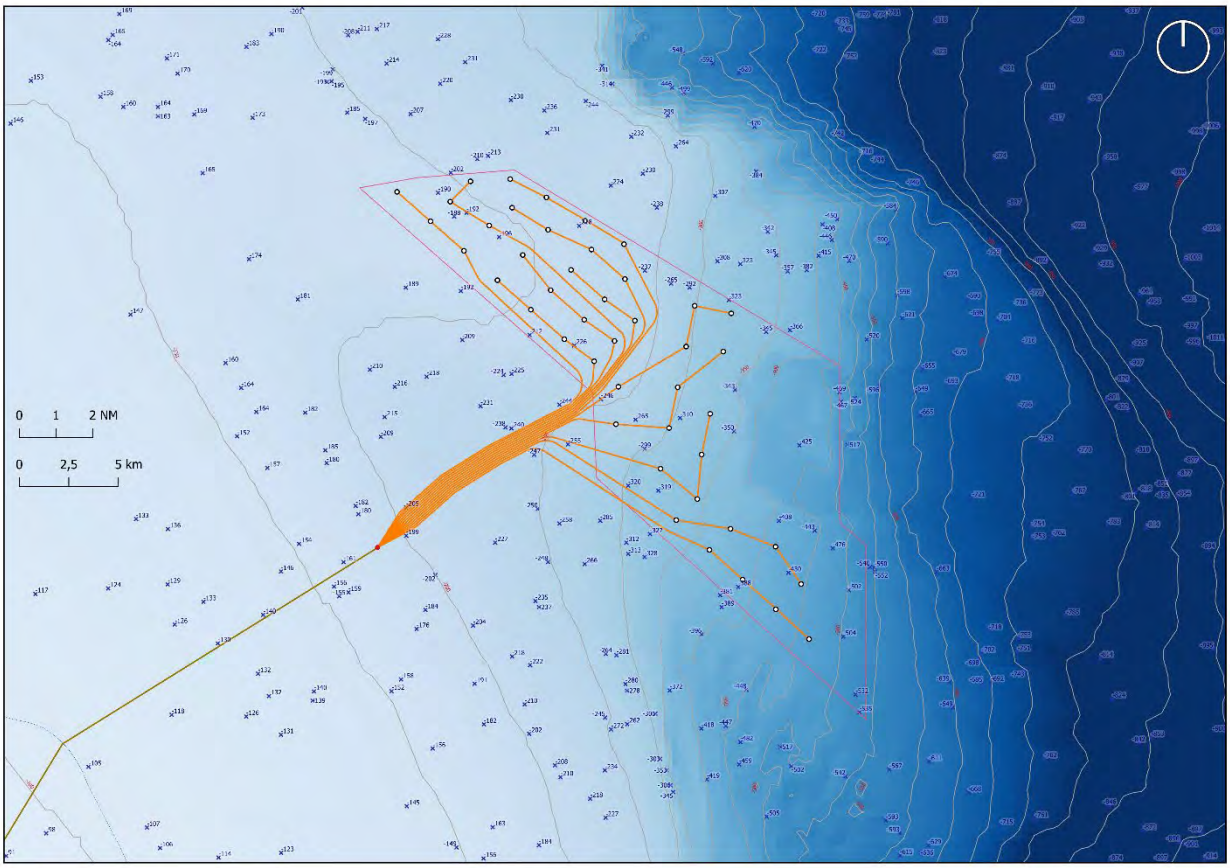
The water depth of the project site varies from a minimum of 180 m to a maximum of 509 m. Because of this wide range, it was agreed to divide the area of the offshore wind farm into two representative areas, with two different water depth bands:

- Area A: Area of the offshore wind farm with water depth less than 250 m.
- Area B: Area of the offshore wind farm with water depth greater than 250 m.

Based on bathymetry, the average water depth in each area was calculated, considering the water depth at the coordinates of each wind turbine in each area:

- Average water depth in area A: ~210 m
- Average water depth in area B: ~375 m

In the later phases of the project, these average water depths will be considered as the reference water depth for the two areas.



Bathymetry of the area

This is the end result of a series of evaluated mooring configurations, trying to minimize the distance between the center of the platform and the anchor points, as well as the amount of chain length, while maintaining the maximum horizontal displacement at less than 10% of the water depth. The final mooring configuration for the two areas is shown in the table and in the figures below.

Wind turbine coordinates, water depth and area

Projection	**EPSG 32633**		**Depth**	**Area**
WTG number	**North**	**East**	**of water**	
WTN 01	4670730	641635	-177	Area A
WTN 02	4669244	643324	-165	Area A
WTN 03	4670234	644317	-185	Area A
WTN 04	4671260	645347	-215	Area A
WTN 05	4671378	647346	-220	Area A

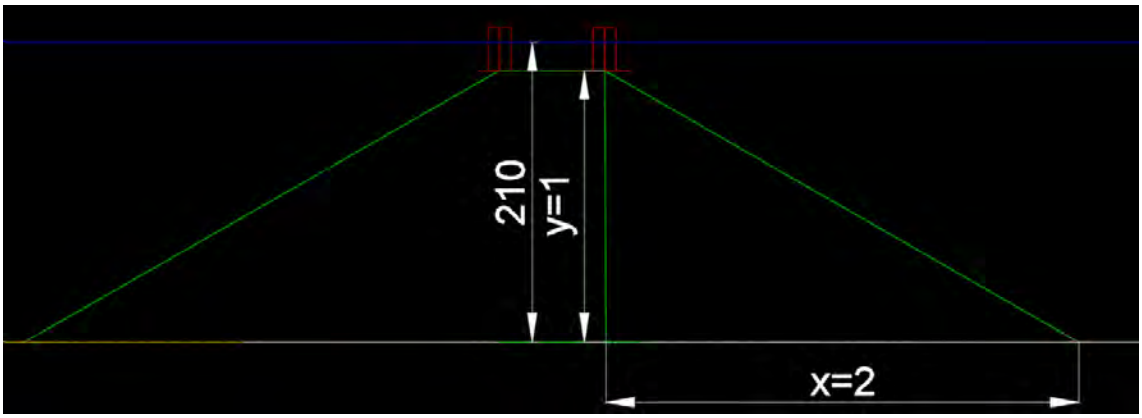
WTN 06	4667757	645013	-172	Area A
WTN 07	4669030	646290	-196	Area A
WTN 08	4669931	647440	-208	Area A
WTN 09	4670448	649174	-219	Area A
WTN 10	4666271	646702	-192	Area A
WTN 11	4667542	647981	-196	Area A
WTN 12	4668814	649261	-208	Area A
WTN 13	4669269	651133	-220	Area A
WTN 14	4664784	648391	-210	Area A
WTN 15	4665768	649392	-207	Area A
WTN 16	4666794	650421	-209	Area A
WTN 17	4667820	651450	-218	Area A
WTN 18	4668089	653092	-228	Area A
WTN 19	4663298	650080	-225	Area A
WTN 20	4664278	651084	-220	Area A
WTN 21	4665304	652114	-220	Area A
WTN 22	4666330	653143	-228	Area A
WTN 23	4662180	651586	-234	Area A
WTN 24	4663206	652615	-231	Area A
WTN 25	4664232	653644	-234	Area A
WTN 26	4659005	652687	-262	Area B
WTN 27	4660894	652810	-245	Area A
WTN 28	4656759	654939	-320	Area B
WTN 29	4658814	655370	-303	Area B
WTN 30	4660869	655801	-294	Area B
WTN 31	4662925	656231	-293	Area B
WTN 32	4664980	656662	-302	Area B
WTN 33	4657474	657016	-338	Area B
WTN 34	4659529	657447	-329	Area B
WTN 35	4662670	658105	-329	Area B
WTN 36	4664597	658508	-327	Area B
WTN 37	4654169	655732	-337	Area B
WTN 38	4655230	656796	-346	Area B
WTN 39	4652668	657408	-361	Area B
WTN 40	4653729	658472	-371	Area B
WTN 41	4651167	659084	-390	Area B
WTN 42	4652825	660748	-411	Area B

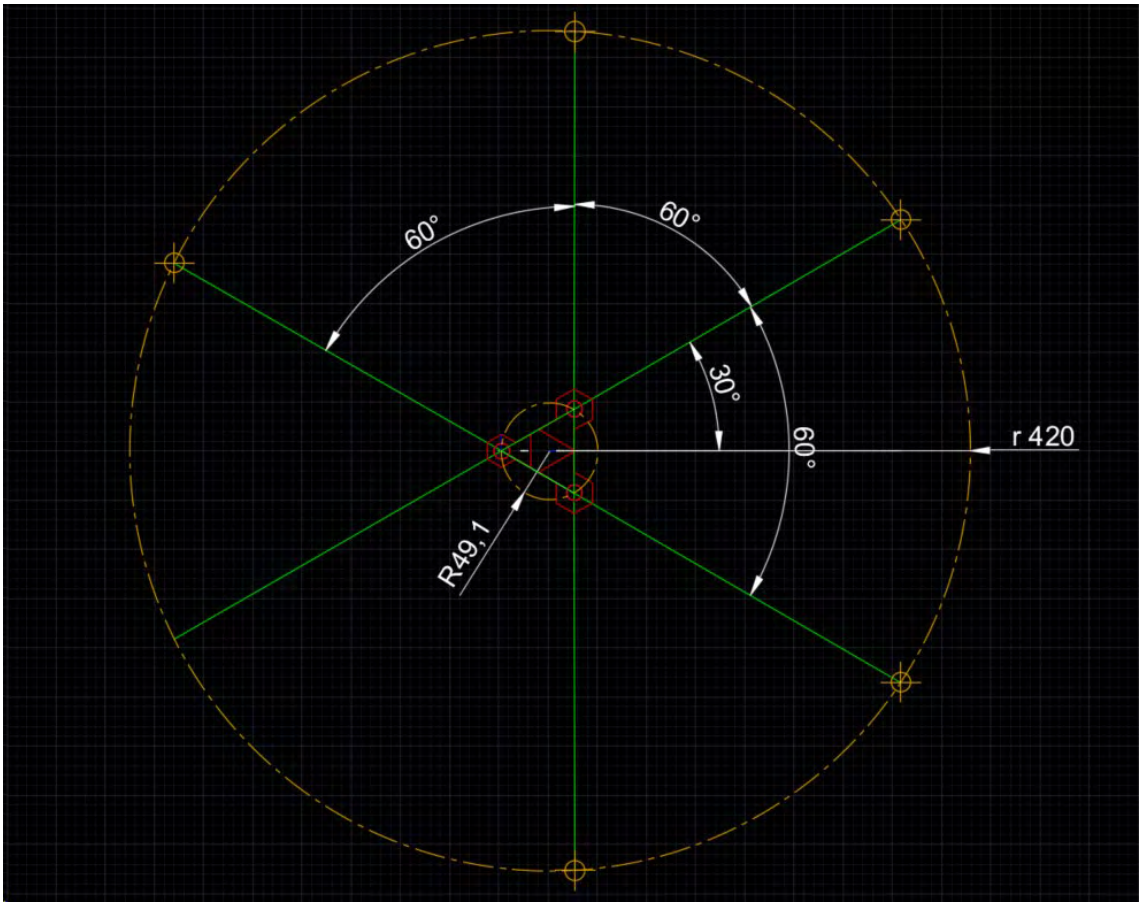
WTN 43	4649666	660761	-423	Area B
WTN 44	4650937	662035	-444	Area B
WTN 45	4648162	662439	-458	Area B

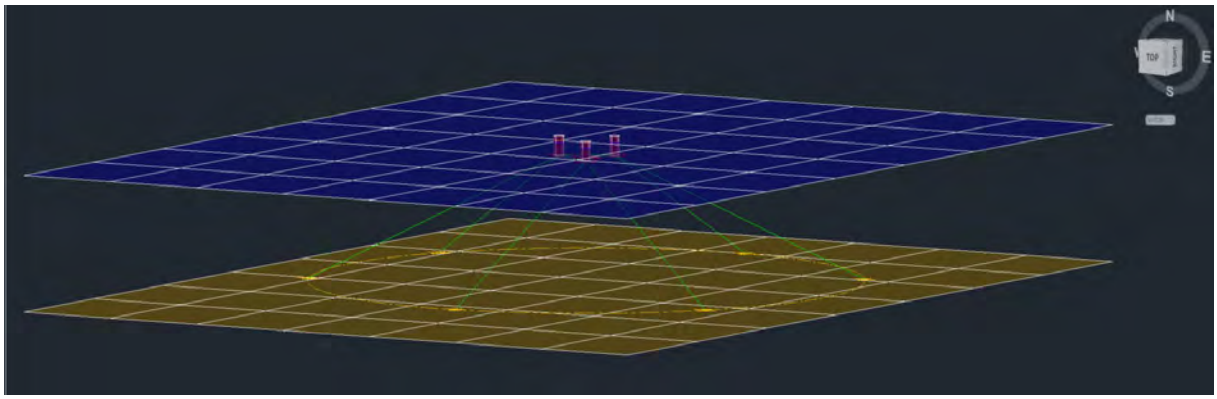
- **Area A (average depth 210 m):**

Parameter	*Unit*	*Value*
Type of mooring system	*-*	*Taut*
Anchor Depth	*m*	*210*
Grommet depth	*m*	*20*
Number of lines	*-*	*6*
Segments per line	*-*	*3 (chain – polyester – chain)*
Segment Type 1 (and 3)	*-*	*R4 Studless Chain*
Nominal chain segment diameter	*m*	*0.120*
Linear Chain Segment Density (Dry)	*kg/m*	*291*
Resistance to breakage of the chain segment	*Kn*	*13.573*
Axial stiffness of the chain segment	*Kn*	*1.23E+06*
Segment Type 2	*-*	*Polyester fiber rope*
Nominal diameter of polyester segment	*m*	*0.261*
Linear density polyester segment (dry)	*kg/m*	*29.90*
Breaking load of polyester segment	*Kn*	*13.514*
Axial stiffness polyester segment	*Kn*	*3.14 E+05*
Line length (not stretched) (grommet to anchor)	*m*	*50 m (chain), 110 m (polyester), 50 m (chain)*

AREA A (average depth 210 m) Mooring line configuration





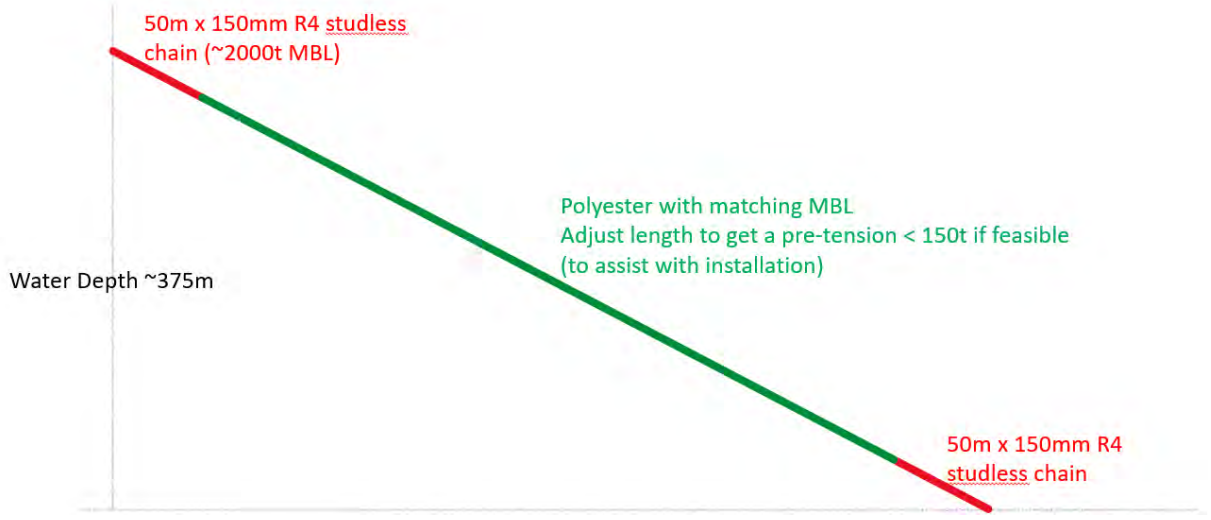


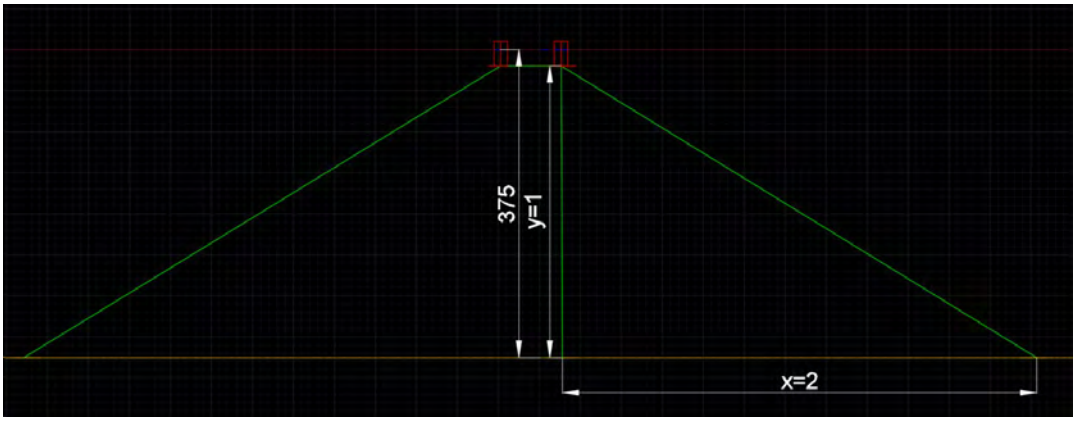
Schematic Configuration of Stretched Mooring - Area A

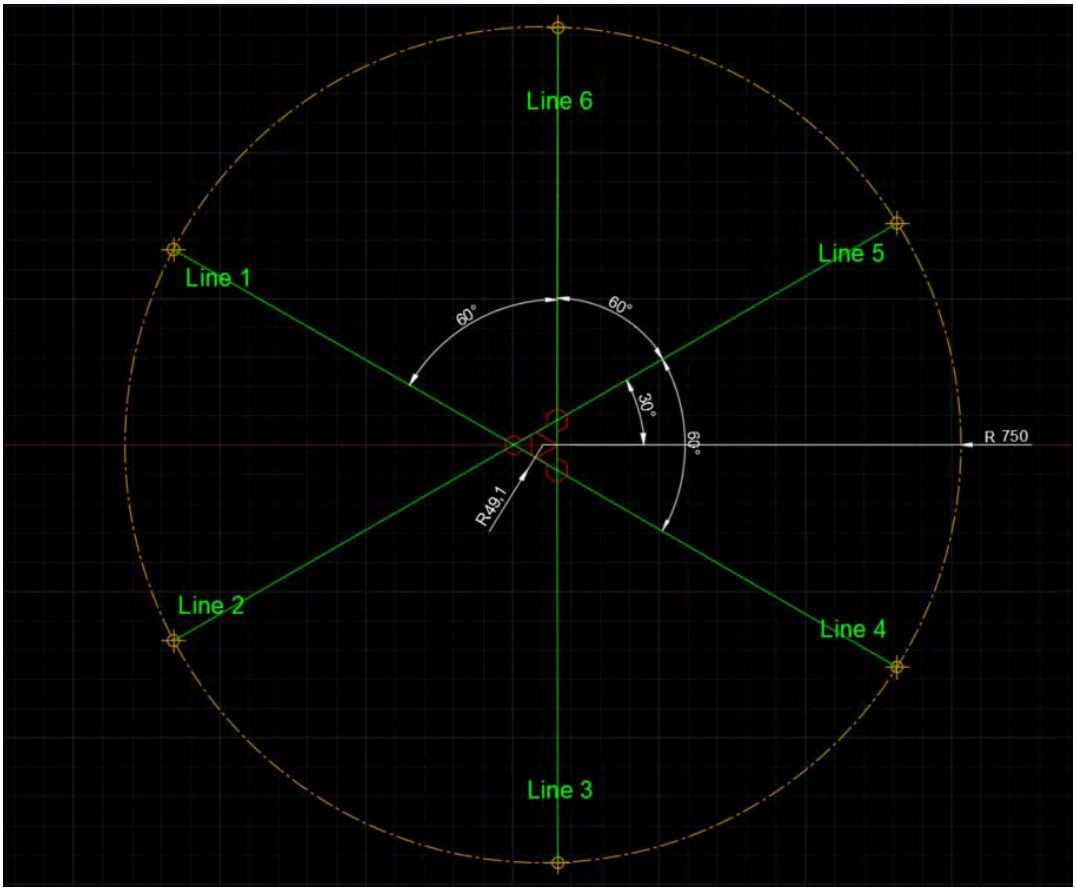
- **Area B (average depth 375 m):**

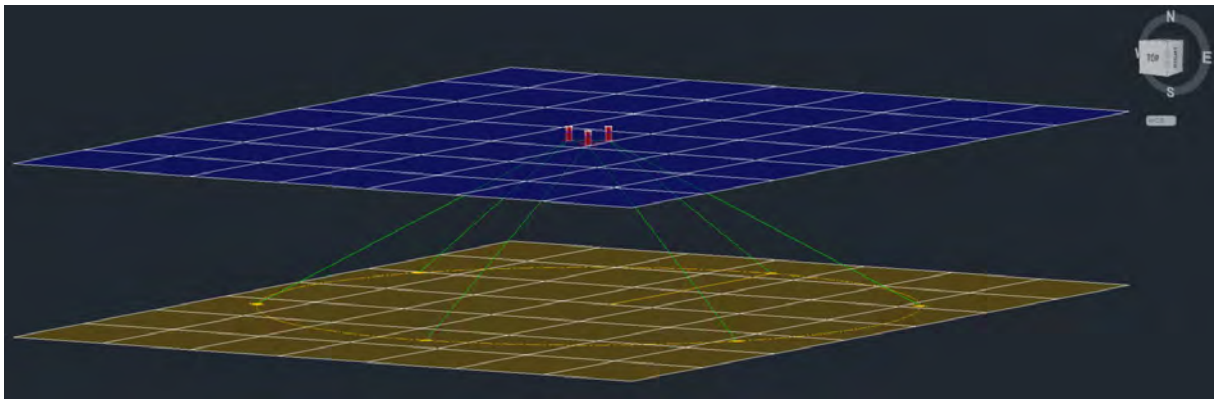
Parameter	*Unit*	*Value*
Type of mooring system	*-*	*Taut*
Anchor Depth	*m*	*375*
Grommet depth	*m*	*20*
Number of lines	*-*	*6*
Segments per line	*-*	*3 (chain – polyester – chain)*
Segment Type 1 (and 3)	*-*	*R4 Studless Chain*
Nominal chain segment diameter	*m*	*0.120*
Linear Chain Segment Density (Dry)	*kg/m*	*291*
Resistance to breakage of the chain segment	*Kn*	*13.573*
Axial stiffness of the chain segment	*Kn*	*1.23E+06*
Segment Type 2	*-*	*Polyester fiber rope*
Nominal diameter of polyester segment	*m*	*0.258*
Linear density polyester segment (dry)	*kg/m*	*29.90*
Breaking load of polyester segment	*Kn*	*13.514*
Axial stiffness polyester segment	*Kn*	*3.14 E+05*
Line length (not stretched) (grommet to anchor)	*m*	*50 m (chain), 275 m (polyester), 50 m (chain)*

AREA B (average depth 375 m) Mooring line configuration

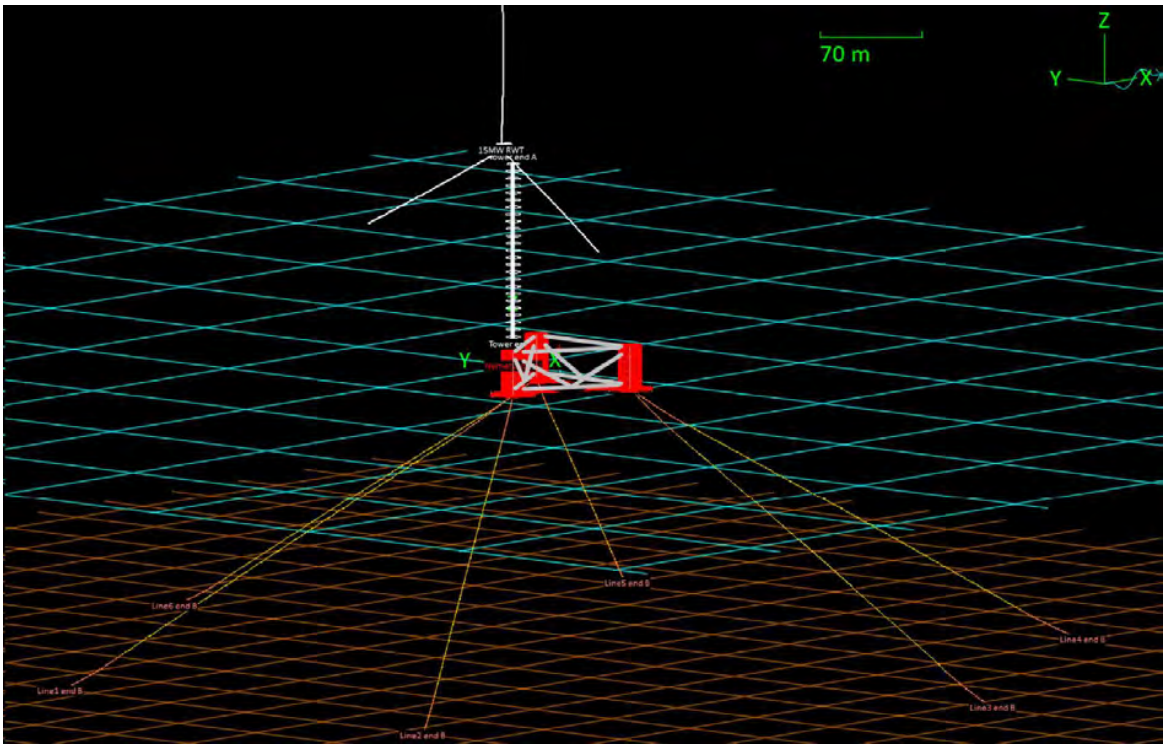








Schematic configuration of the stretched berth – Area B

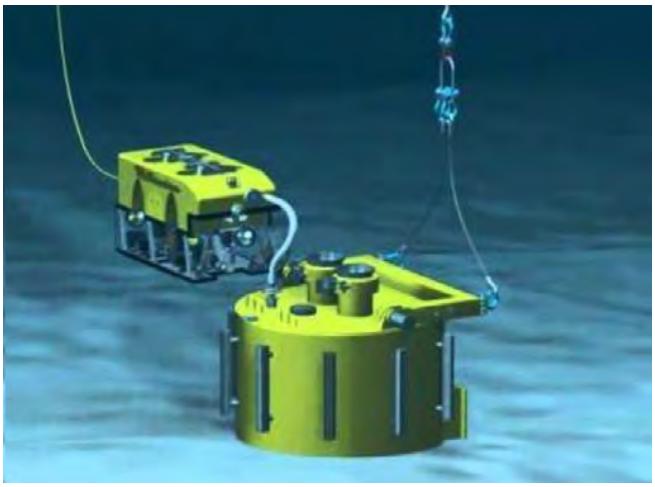


Graphic diagram of the mooring system with taut lines – 3D graphic

3.4.3.2 Anchoring systems

Based on geophysical prospections and bathymetric characteristics of the seabed (section *ES.6 Investigations and characterization of the seabed*) two main categories of anchors were selected:

- **Suction anchors:**
  Suction buckets are installed on the seabed until they reach the desired depth by sucking water and creating a depression inside the container, which thus sinks. The mechanical characteristics of the soil represent the main constraint for this solution, which can be successfully used in soft or medium clays and in thickened sands, but is not suitable for hard and fractured clays or compact rocks.



Suction Boxes

- **Anchors made of bored or beaten piles:**
  The pole is a hollow steel pipe, prefabricated in a single piece, which is driven into the seabed by means of an underwater hydraulic pile driver (hydraulic hammer) or vibrator (vibro-hammer). The holding capacity of the pile is generated by the combination of the friction of the soil along the pile shaft and the lateral passive resistance of the soil itself. The pole is able to withstand both horizontal and vertical loads. Thanks to its ability to carry even very high loads, this solution is often used in the oil and gas industry. When driving by hammering or vibration is not possible, drilling can be used for the installation of the pile.
  The bored piles are installed in three phases: drilling with soil removal, laying the pile and injecting the cement mortar.

Bored or driven piles

The sizing of the piles was carried out in accordance with the internationally recommended design procedure and detailed in the report *"R.3_02_Relazione on floating foundation structures and anchors"*.

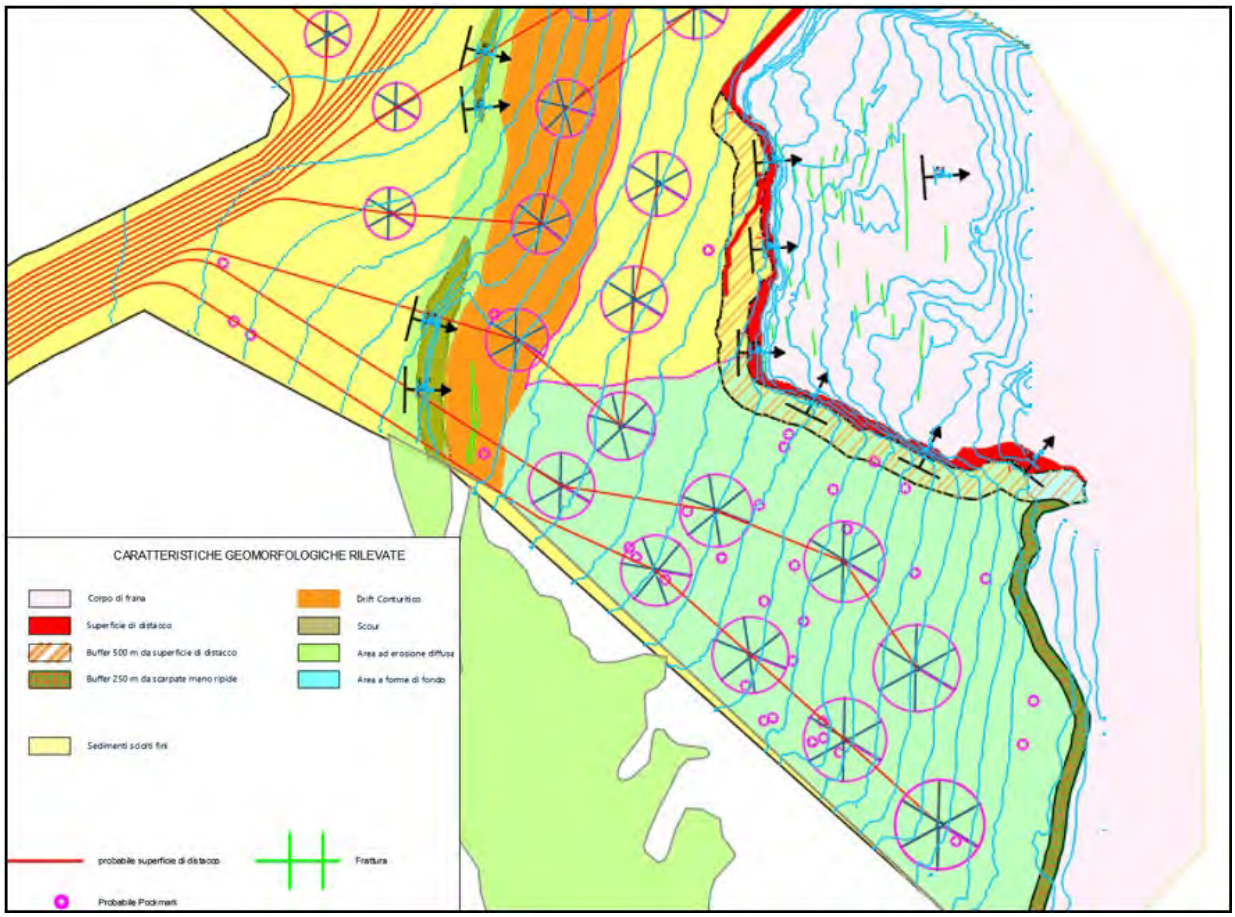
3.4.3.3 Anchors and moorings, rough positioning

The geophysical investigations carried out (see report in the annex *ES.6.1_01*), have made it possible to acquire detailed information on the seabed of the installation area of the Nemetun Island wind farm, characterized by the well-known geomorphological forms that affect the areas under consideration and which are substantially associated with deep erosive phenomena and tectonic deformations that have given rise to the current conformation of the seabed areas. The investigations carried out have shown an unchanged condition compared to the numerous studies conducted in these areas, such as those (widely reported in the Offshore Geological Report) prepared for the MAGIC project and for the Geological Map of the Italian Seas.

In addition, in compliance with what was recorded during the joint minutes between the Proponent and the Commissioners of the PNRR-PNIEC Technical Commission (24-25 February 2025), **the Proponent has entrusted Dr. Geol. Fabio Trincardi, former Director of the Department of Earth System Sciences of the CNR, with the task of carrying out a specialized geological and geomorphological study aimed at analyzing the areas affected by the intervention.**

The in-depth study concerned in particular the detailed characterization of the geomorphological phenomenologies present, the evaluation of their state of activity and the analysis of genetic causes.

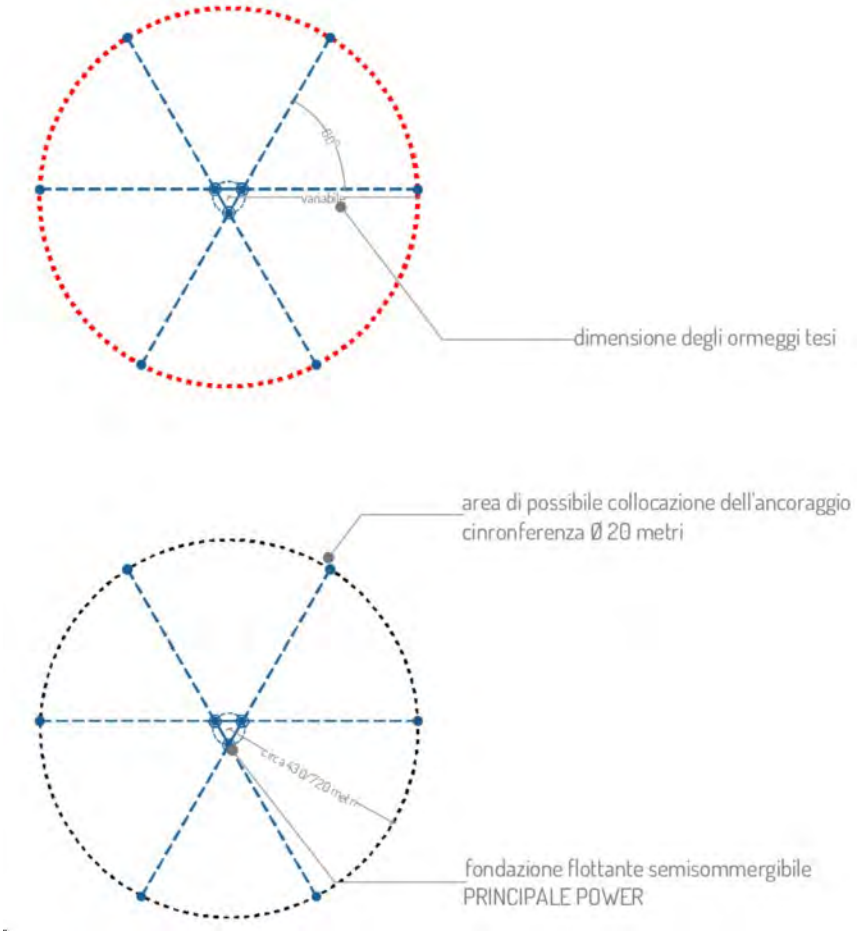
Below is an excerpt relating to the southern area of the wind farm, in which there are large-scale erosive structures (conturist drift, scour, areas of widespread erosion and bottom forms), while in the outermost margin there is the Vieste landslide. The sedimentary cover consists of very fine loose material (presumably silt and/or clays) and, in the escarpment area, of chaotic sediments.



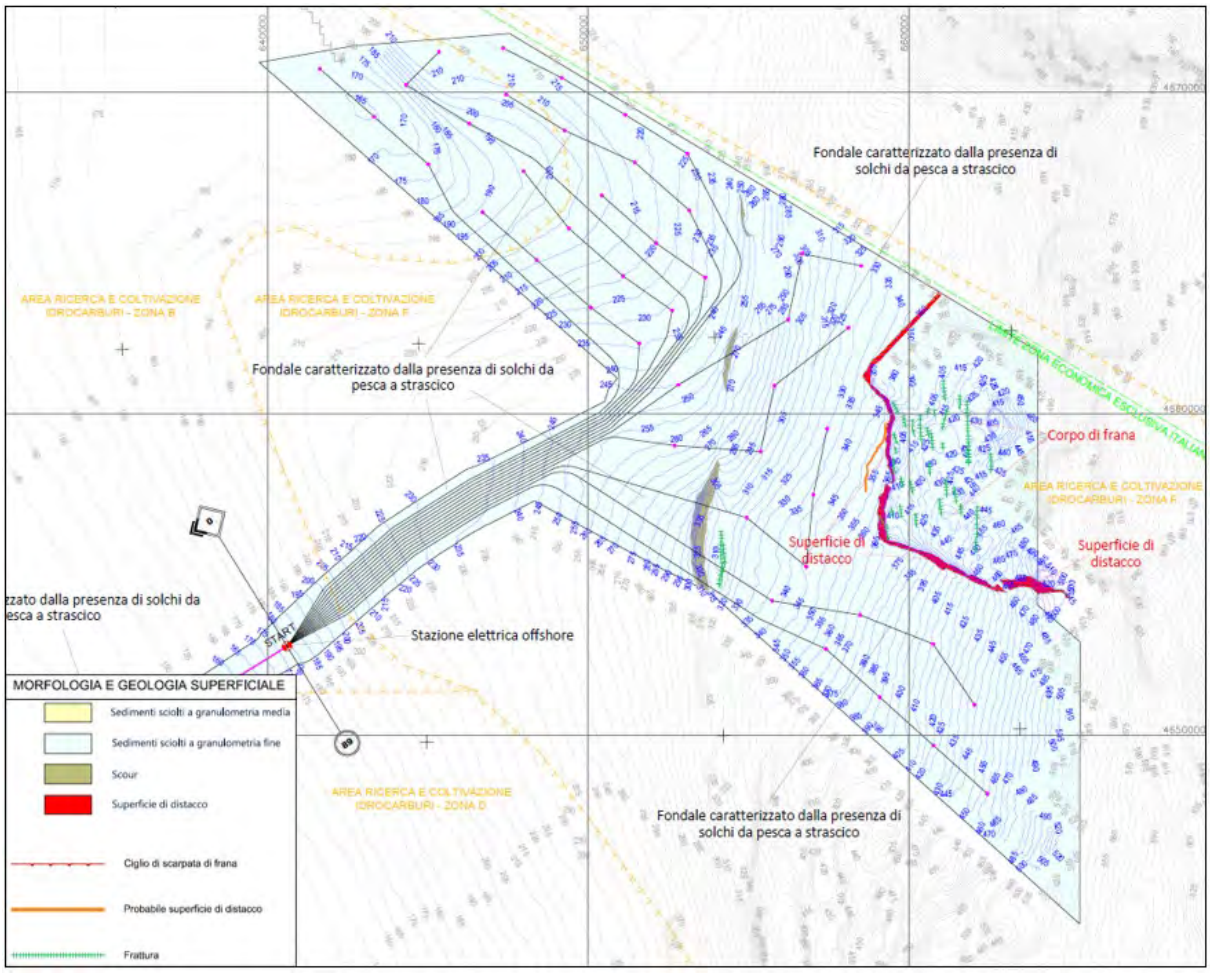
Map of the wind farm with the presence of a loose sediment seabed and escarpments in the southern area

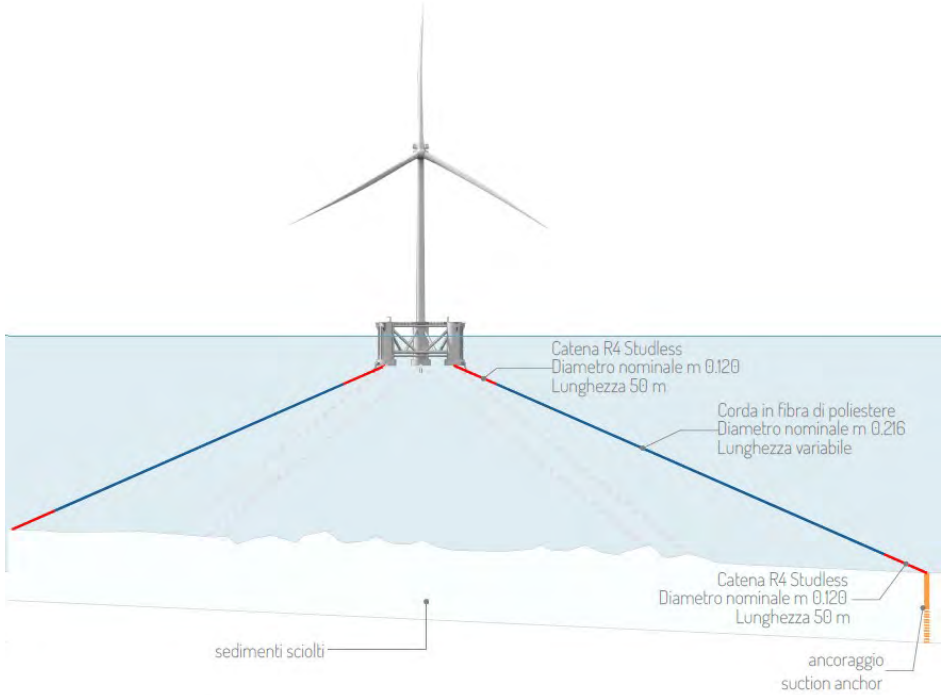
The results obtained from the in-depth study also made it possible to define a new installation layout of the wind turbines and the related inter-array connection cables.

The presence of areas characterized by soft bottoms makes these areas compatible with the presence of suction anchors of floating foundations and taut moorings. However, especially in southern areas, the detailed positioning of the anchors will have to be carried out through the execution of specific direct investigations. Considering the range of distance allowed by the type of mooring and while waiting for the executive positioning of the anchors, at this stage the circumferences in which these anchors should fall have been identified.
In referring to the *"T.3.2_02_Anchors and moorings – positioning scheme"* For further information, some exemplary excerpts are reported below.



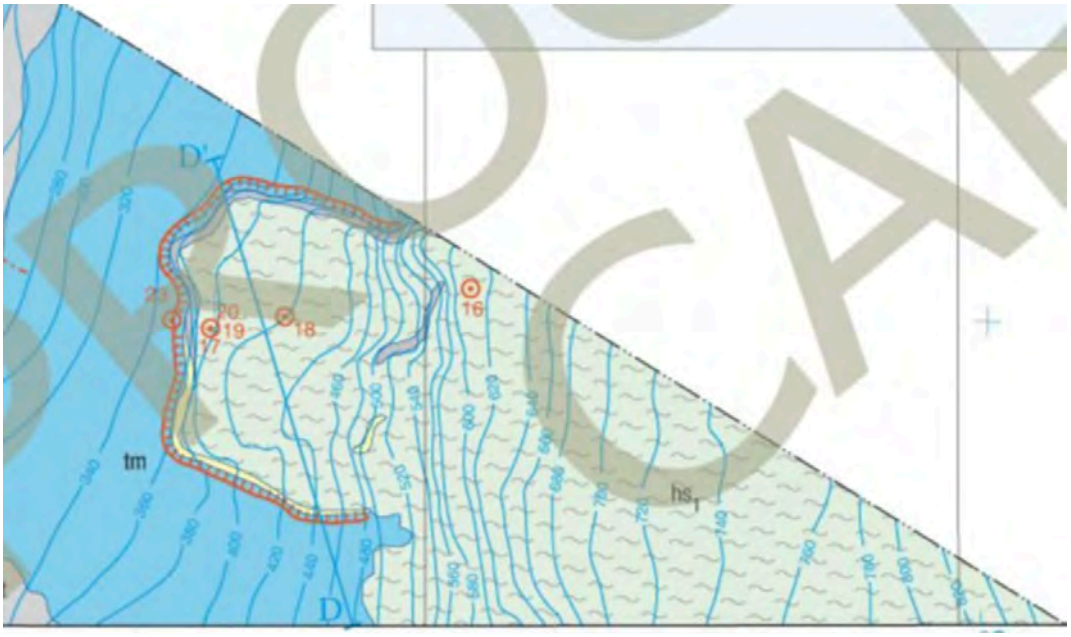
Anchor placement range

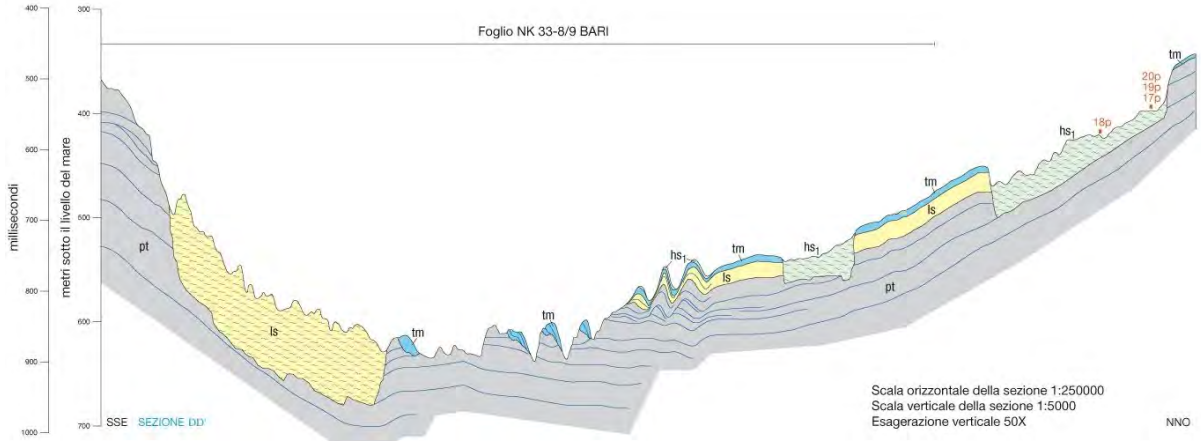




Positioning of mooring lines and table anchors T.3.2_02

Specifically, below is the detail of the geological section which concerns, specifically, the landslide area located on the edge of the eastern area of the project area.



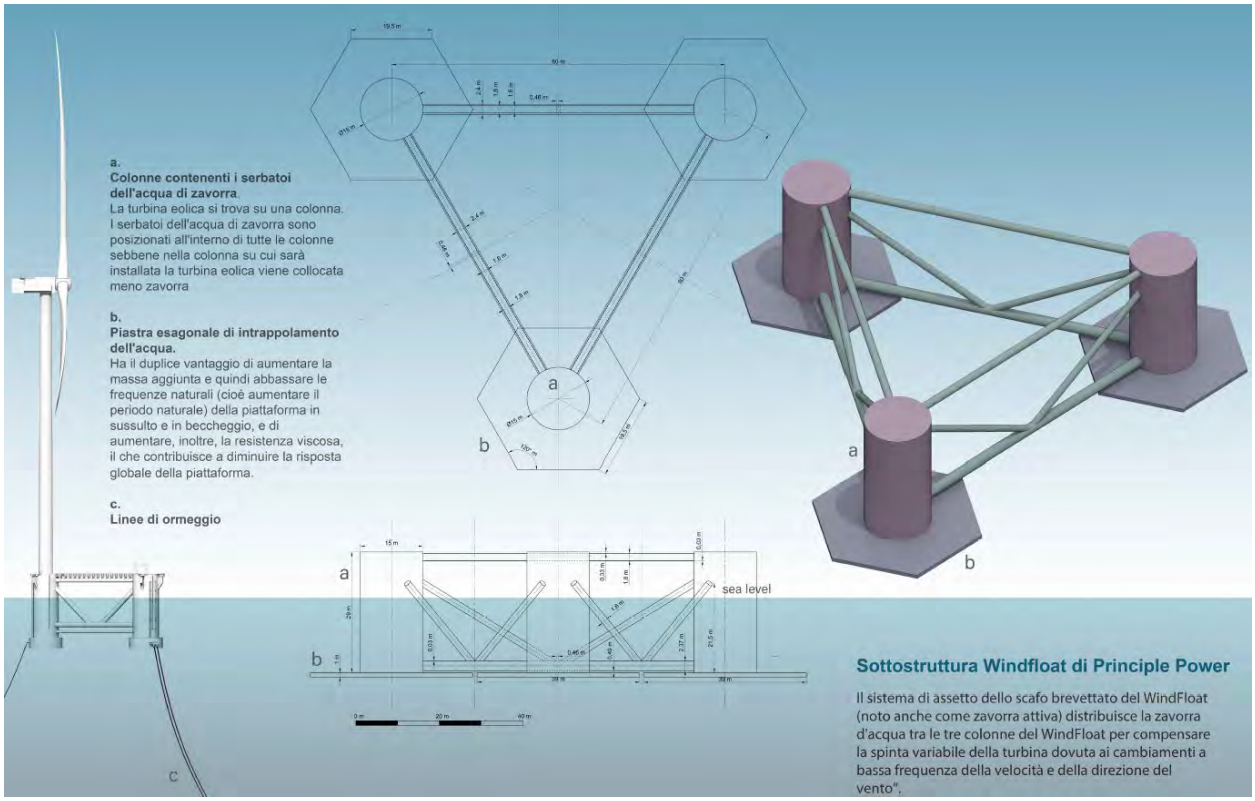


LEGENDA DELLE SEZIONI

- hs_1 — Sistemi di stazionamento alto (HST) Depositi di prodelta e piattaforma interna (hs_1)
- ls — Sistemi di stazionamento basso e di caduta (LST-FST) Depositi regressivi costituiti da depositi deltizi sabbiosi, peliti di prodelta e di scarpata (ls)
- tm, tp_1, tp_2 — Sistemi trasgressivi (TST) Complesso trasgressivo marino costituito da peliti di prodelta e scarpata (tm); sabbie fini in unita' clinostratificate (tp_1); sabbie di spiaggia sommerse (tp_2)
- pt — Depositi sedimentari pre-tirreniani (PT) Unità regressive pelitico-sabbiose pleistoceniche delimitate da superfici erosive che registrano le principali terminazioni isotopiche (risalite eustatiche)

- 25 — carotaggi superficiali (p se proiettati sulla traccia di sezione)
- superficie di massima ingressione marina (mfs)
- superficie di rimaneggiamento marino trasgressivo (rs)
- superficie di trasgressione (ts)
- superficie rs coincidente con ts (rs+ts)
- limite di sequenza (sb)
- superficie rs coincidente con ts e limite di sequenza (rs+sb)
- orizzonti guida (es: riflettori sismici principali)
- depositi gravitativi di varia età

3.4.4 FOUNDATION STRUCTURES - PROJECT DIAGRAMS AND GRAPHS



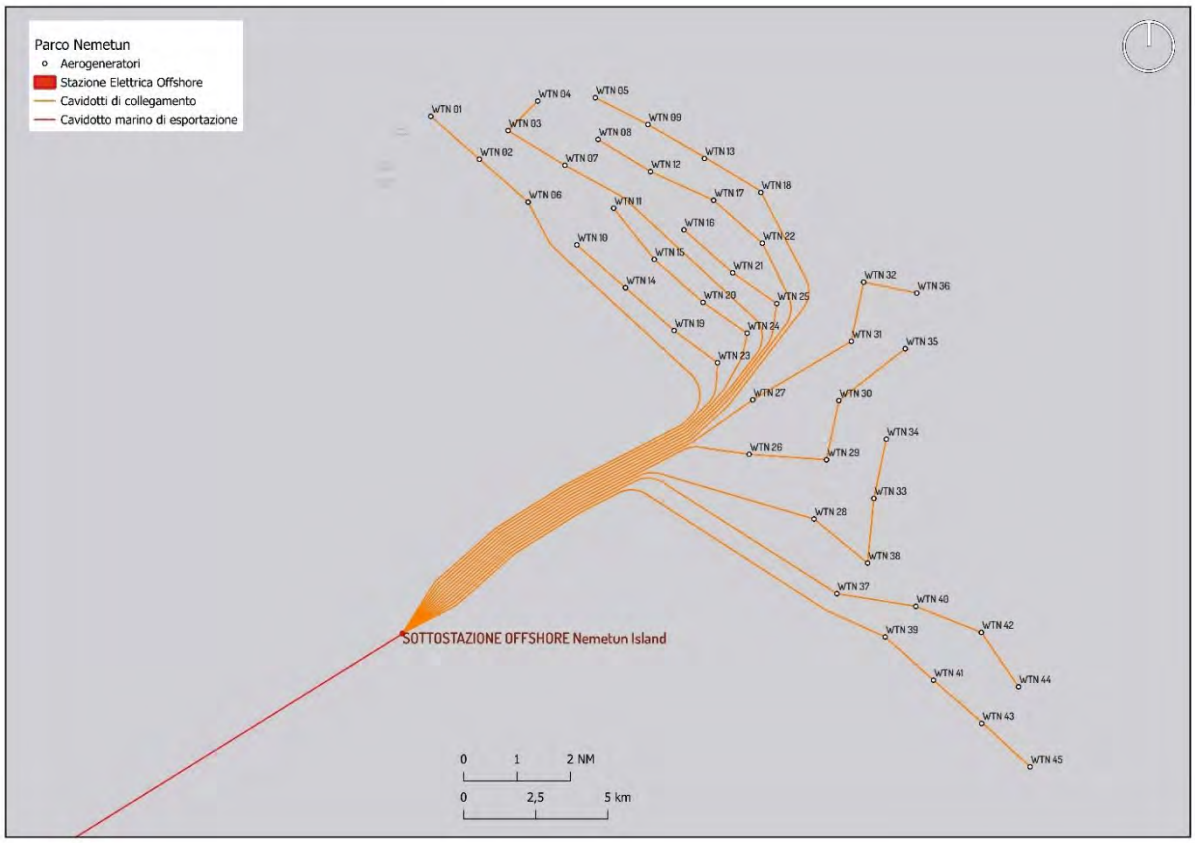
WindFloat substructure elaborated T.3.1

3.5 OFFSHORE TRANSFORMER POWER STATION

Below is a brief description of the works, referring any detailed technical information to the documents contained in the project section called *Offshore Transformation 4_Stazione* by ESE and TECON srl.

3.5.1 PLACEMENT AND DESCRIPTION OF THE STRUCTURE

The Nemetun Island wind farm includes an offshore transformer station, located approximately 6 nautical miles away from the installation area of the plant. The decision to locate the substation in a separate area, albeit close, to the offshore installation is based on feasibility considerations and the use of technologies already available on the market, such as the installation of a fixed substation by means of a metal jacket on the seabed. According to the analysis of alternatives conducted in the Environmental Impact Study, although the option of a floating offshore power station was considered valid, its technology is not sufficiently developed to be considered applicable at the moment.



The location point of the offshore substation

In addition, the bathymetric height of 160 meters for the installation of the jacket is a significant challenge, but manageable with the standard launch operations commonly adopted in the oil and gas industry.

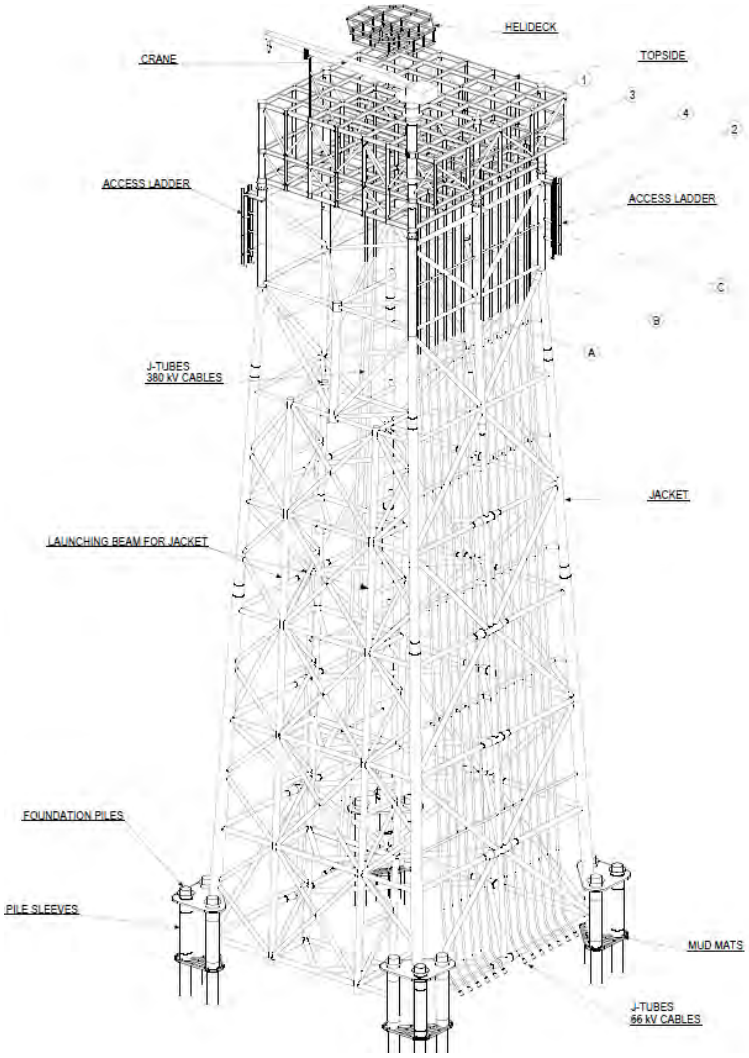
The structure of the offshore substation consists of the following components:

- substructure (Jacket);
- foundation piles;
- Topsides

The Jacket It corresponds to the submerged part of the offshore substation structure and consists of a 4-legged truncated pyramid-shaped welded truncated steel truss structure, which extends from the seabed, -170 m, to +13.3 m above sea level. The tubular and diagonal bracing elements are arranged in four main rows, with an inclination of 1/20, and 5/6 horizontal planes, with a maximum inter-storey distance of 26 m.

I J-tubes They are steel pipes that provide guidance and mechanical protection for submarine cables rising from the seabed, which are contained within them. The cables enter through the bell prepared on the bottom (bellmouth) and are guided until they reach the cable deck (+16.0m), the floor where the suspension systems (hang-off) are located.

Inside the structure of the Jacket there are 11 16" import J-tubes and 2 24" export J-tubes, suitably bound to the structure of the Jacket by means of a guide system that limits the length of the free spans and the risk of vortice-induced vibrations (VIV) in conditions of current, waves, current and wind.



Structure of the electrical substation on a fixed type platform

The platform is equipped with two berths arranged on the two legs of the Jacket on the east side to allow access from the sea via Crew Transfer Vessel (CTV). The docks are attached to the main structure and therefore will be installed together with the Jacket.

The structure of the Jacket is anchored to the seabed by means of 'skirt piles' type foundation piles, positioned at the four corners. The poles are driven into the ground by means of a beating (with an underwater hydraulic pile driver) through appropriate guides (fleece sleeves) firmly connected to the base of the jacket. Once the design driving has been reached, the piles will be connected to the Jacket by pumping cement mortar into the cavity between the pile and the guide with a special injection system.

The Topsides is a 4-level lattice structure, inside which all the electrical equipment, systems and the housing module are located.

The Topsides structure rests on the Jacket in correspondence with the six main columns, arranged in two rows with a main mesh of 42m x 45m.

The main expected levels are (elevations above sea level):

- Level 1 – el +16.0m - Cable deck and Main deck: floor to which the top of the J-tubes reaches, dedicated to providing adequate capacity and space for pulling systems and cable routing to the 66kV and 380kV GIS; and to which Main Transformers and Shunt Reactors are located;
- Level 2 - el. +23.0m – Utility deck: semi-floor to which the 66kV, 380kV GIS and control rooms are housed;
- Level 3 - el. +28.6m – Accommodation: semi-intermediate floor for accommodation;
- Level 4 - el. +34.0m - Weather deck: cover with a load-bearing capacity suitable for the loading and handling of equipment, housing the coolers of the main transformers/shunt reactors and the diesel generators;
- Level 5 - el. +37.0m - Helideck: landing plan for helicopters.

3.5.2 DIMENSIONS AND WEIGHTS

Size and Weight	Substation
Jackets	
Height	183.3m (-170m to +13.3m from sea level)
Overall footprint at the base	74 m x 72 m
Leg spacing at the head of the Jacket	42m x 45m
Distance between legs on the bottom	61 m x 58 m
No. of horizontal planes	7
Elevation of horizontal planes	El. -9.0m, -35.0m, -61.0m, -87.0m, -113.0m, -139.0m, -165.0m
Estimated weight	9500t
Foundation piles	
No. of posts per leg	3
Total number of poles	12
diameter	2000 mm - 2500 mm
length	120 m fixtures per 100 m
total weight	5400 t (12poles)
Topsides	
Maximum footprint:	L=58.0 m, B=58.0 m, H=24.0m
Main column spacing:	42.0m x 45.0m
No. of Service Plans:	n.4 + n.1 heliport
Elevation of service floors from sea level:	+16m, +23m, +28.6m, +34m, +37m
Expected weight at lifting:	5000 t

3.5.3 PLANT CONFIGURATION AND MAIN COMPONENTS

The offshore electricity substation in question conveys the power produced by the wind farm to the shore.

The electrical components collect the power from the 63 turbines, grouped into 11 strings connected by 66kV submarine dynamic cables to the 66kV GIS stalls present in the offshore electrical substation. The substation raises the voltage level from 66kV to 380kV through 2 transformers with a nominal power of 580MVA.

The 66kV-2 GIS consists of:

- n°6 stalls (bays) at the entrance to the wind farm;

- n°2 stalls connected to the 580MVA Step-up Transformers to raise the voltage level to 380kV;
- The system is divided into two busbars connected by a normally open junction. Each busbar is equipped with a voltage transformer and high-speed earthing disconnector.

The 380kV GIS includes 2 bays necessary for:

- connection through 2 submarine cables to the onshore substation for the export of the energy produced by the wind farm;
- connection to n°2 66/380kV Elevator Transformers;
- connection of the n°4 Shunt Reactors of 250MVA each, provided for the compensation of the capacitive energy due to the cable connection.

For each substation, from the stalls of the 66kV GIS lowering transformers, the energy is distributed to the substation auxiliaries through 2 HV/LV transformers. Each transformer is connected to the main Low Voltage switchboard which in turn supplies the system auxiliaries.

The LV system is characterized by:

- n°1 Low Voltage panel at 400V for the power supply of the auxiliary subpanels. The switchboard is divided into 3 busbars with two busbar coupling switches (ATS). The switchboard is normally powered by two auxiliary transformers and in case of emergency by 2 diesel generators;
- Direct current system (DC UPS);
- Alternating current uninterruptible power supply (AC UPS).

In addition to the above, all the auxiliary system systems necessary for the correct functioning of the substation are provided, such as:

- Control and protection system;
- HVAC system;
- Fire extinguishing system;
- Lighting and socket system;
- Navigation aid system;
- Video surveillance system;
- Water treatment system.

3.6 MARINE CABLE DUCTS

3.6.1 TECHNICAL AND ELECTRICAL CHARACTERISTICS OF MARINE CABLE DUCTS

The power connection and transport cables envisaged by the project can be divided by type as follows:

- 380 kV AC marine cable connecting the offshore electrical substation and the landing/onshore junction point (export cable);
- 66 kV AC dynamic marine cables connecting the turbines and the offshore electrical substation (inter-array cables);
- 66 kV AC static marine cables interconnecting the turbines and the offshore Electrical Substation (inter-array cables – IAC).

3.6.1.1 66 kV AC marine cables – inter-array cables

The following cross-sections of the 66 kV cables have been designed for the interconnecting cables under the two proposed operating conditions:

- IAC 1 (dynamic and static), 3x300 mm^2 Cu, suitable for transporting the power generated by up to two wind turbines (45 MW).

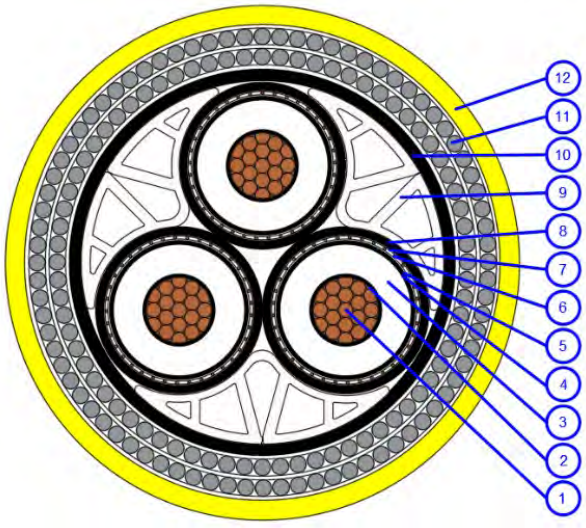
- IAC 2 (dynamic and static), 3x800 mm^2 Cu, suitable for transporting the power generated by up to four wind turbines (90 MW).

The preliminary sizing of the cables is shown below inter-array.

Cable cross section	Installation scenario	Conductor operating temperature at I_N (°C)	Rated current at 90°C, I_{MAX} (A)	Cable capacity utilization rate I_N/The$_{MAX}$ (%)
IAC 1 Dynamic	Inside I-tube	76.1	472	74
	Buried	48.1	571	62
IAC 1 Static	Inside J-tube	74.1	488	72
	Buried	46.4	586	60
IAC 2 Dynamic	Inside I-tube	87.2	815	87
	Buried	68.3	931	76
IAC 2 Static	Inside J-tube	89.3	795	88
	Buried	72.9	896	79

Cross-section of the connection cable

3.6.1.1.1 IAC 1 – 3x300 mm^2 Cu 66kV 45MW dynamic



Item	Layer
1	Conductor
2	Conductor screen
3	Insulation
4	Insulation screen
5	Water swellable tape
6	Metallic screen
7	Water swellable tape
8	Core sheath
9	Fillers
10	Inner sheath
11	Armour
12	Outer sheath

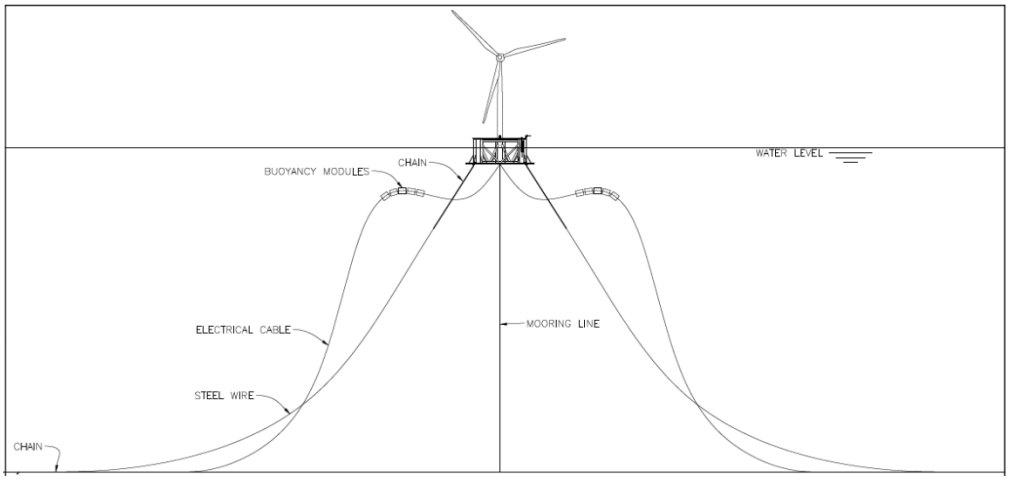
Item	Layer	Nominal thickness (mm)	Nominal outer diameter (mm)
1	Conductor	21	21
3	Insulation	11	43
6	Metallic screen	48 wires x ф 0.8	46
8	Core sheath	2	52
10	Inner sheath	4	122
11	Armour	76/84 wires x ф 5	150
12	Outer sheath	5	160

Inside the cable meeting, protected by a suitable separator septum, there will be a 24-fiber fiber optic cable useful for the supervision and control system.

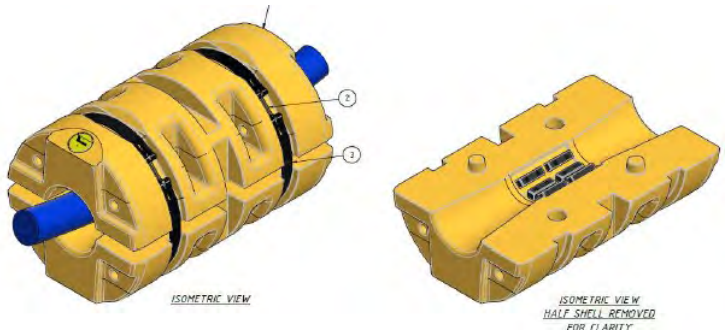
3.6.1.1.2 IAC 2 – 3x800 mm² Cu 66kV 90MW dynamic

Item	Layer	Nominal thickness (mm)	Nominal outer diameter (mm)
1	Conductor	41.5	41.5
3	Insulation	12	65.5
6	Metallic screen	37 wires x ϕ 1.1	68.7
8	Core sheath	3	77
10	Inner sheath	5	177.6
11	Armour	91/993 wires x ϕ 6	211.6
12	Outer sheath	5	221.6

For the dynamic cable path in the sections between the platform and the point of arrival on the seabed (touchdown point), the "lazy wave" configuration will be adopted by installing floating modules along specific sections of the cable: it has been shown that the performance of the "lazy wave" is superior to that of the more classic catenary shape in compensating for the movement of the floating foundation and reducing, therefore, the maximum damage cycles due to tension and fatigue.
The cable runs between two successive touchdown points can simply be placed on the seabed or laid in the trench. In the first case, if necessary to ensure the level of stabilization or mechanical protection required at the touchdown point or along the section, the cables may be covered with cementitious aggregates (e.g. concrete mattresses) or boulders (rockdumping).

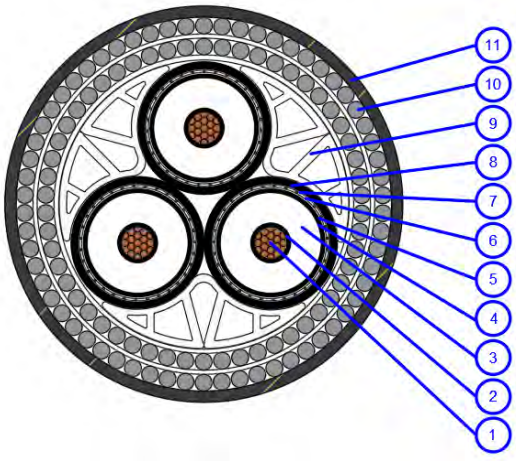


Laying of dynamic "lazy wave" cables by means of floats



Typical of the float

3.6.1.1.3 *IAC 1 – 3x300 mm² Cu 66kV 45MW Static*



Item	Layer
1	Conductor
2	Conductor screen
3	Insulation
4	Insulation screen
5	Water swellable tape
6	Metallic screen
7	Water swellable tape
8	Core sheath
9	Fillers
10	Armour
11	Outer serving

Item	Layer	Nominal thickness (mm)	Nominal outer diameter (mm)
1	Conductor	21	21
3	Insulation	12	45
6	Metallic screen	48 wires x ф 0.8	48
8	Core sheath	2	54
10	Armour	74/82 wires x ф 5	147
11	Outer serving	6	159

3.6.1.1.4 *IAC 2 – 3x800 mm² Cu 66kV 90MW Static*

Item	Layer	Nominal thickness (mm)	Nominal outer diameter (mm)
1	Conductor	41.5	41.5
3	Insulation	12	65.5
6	Metallic screen	37 wires x ф 1.1	69
8	Core sheath	3	77
10	Armour	86/945 wires x ф 6	202
11	Outer serving	6	214

Inside the cable meeting, protected by a suitable separator septum, there will be a 24-fiber fiber optic cable useful for the supervision and control system.

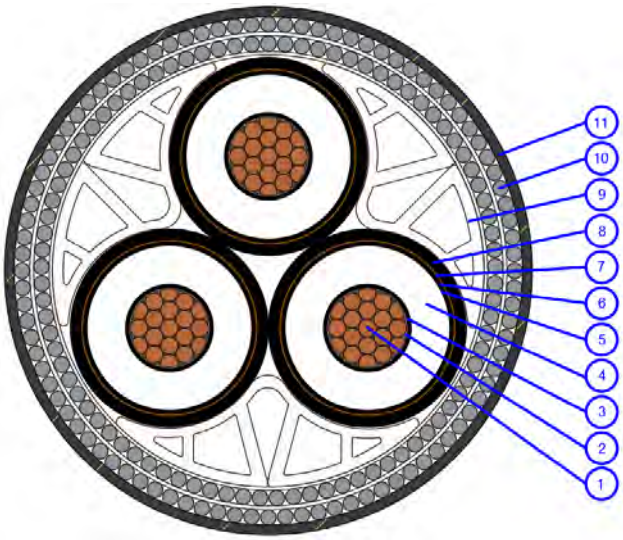
3.6.1.2 380 kV AC marine cable – export cable

As far as export cables are concerned, the 380 kV section designed is as follows:

Export (static), 2x3x1400 mm^2 Cu, two three-core cables suitable for carrying the power of 450 MW.

Cable cross section	Installation scenario	Conductor operating temperature at I_N (°C)	Rated current at 90°C, I_{MAX} (A)	Cable capacity utilization rate I_N/The_{MAX} (%)
Export 1 1400mm² Static	Inside J-tube	79.1	1059	97
	At landfall	87.9	900	99

Cable cross-section Export



Item	Layer
1	Conductor
2	Conductor screen
3	Insulation
4	Insulation screen
5	Water swellable tape
6	Metallic screen
7	Water swellable tape
8	Core sheath
9	Fillers
10	Armour
11	Outer serving

Inside the cable meeting, protected by a suitable separator septum, there will be a 24-fiber fiber optic cable useful for the supervision and control system of wind turbines.

Section of a three-core marine cable with XLPE insulation and steel armour

3.6.2 THE CONNECTION CABLES BETWEEN THE WIND TURBINES AND THE OFFSHORE ELECTRICAL SUBSTATION

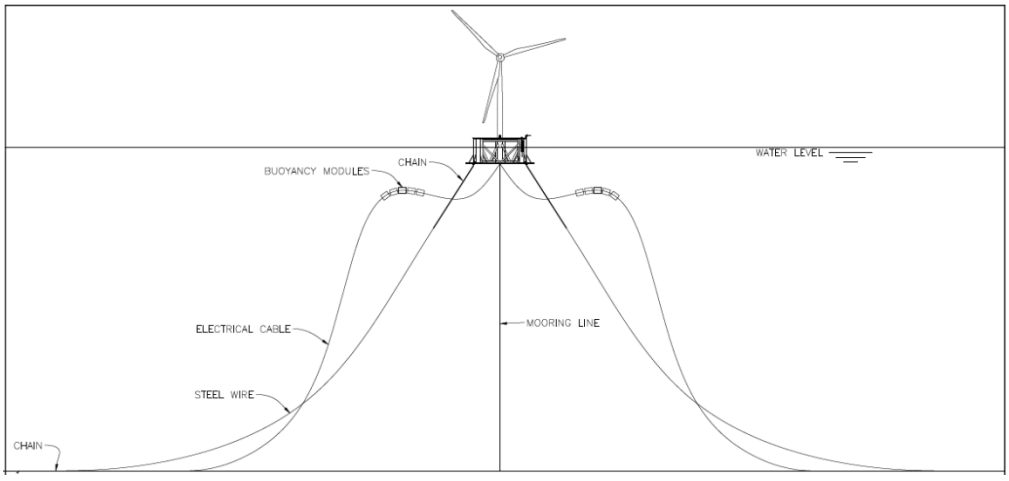
From an electrical point of view, the wind turbines will be connected to each other and to the offshore substation by 66 kV submarine lines in in-and-out configuration. The substation will collect power from the 45 wind turbines, divided into 12 Subfields:

The assembly collection ducts will have an operating voltage of 66 kV and the following lengths:

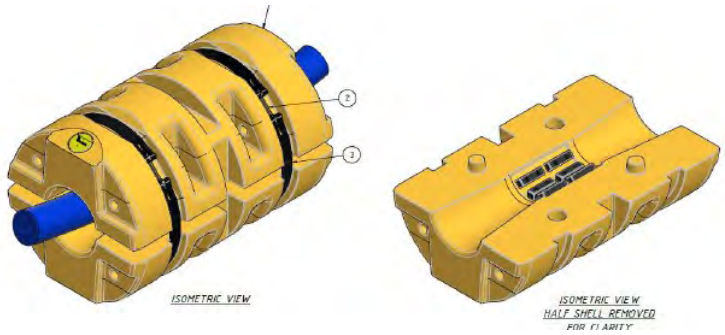
GROUP	Interconnected WTGs	NR. WTG	Maximum WTG Distance - Offshore Substation (km)
IA01	WTN 01, WTN 02, WTN 06	3	27,13
S.A02	WTN 10, WTN 14, WTN 19, WTN 23	4	21,29
IA03	WTN 11, WTN 15, WTN 20, WTN 24	4	22,67
IA04	WTN 04, WTN 03, WTN 07	3	29,44
S.A05	WTN 25, WTN 21, WTN 16	3	21,91
S.A06	WTN 22, WTN 17, WTN 12, WTN 08	4	27,15
IA07	WTN 18, WTN 13, WTN 09, WTN 05	4	29,20
S.A08	WTN 36, WTN 32, WTN 31, WTN 27	4	22,59
Ia09	WTN 26, WTN 29, WTN 30, WTN 35	4	21,69
IA10	WTN 34, WTN 33, WTN 38, WTN 28	4	22,94
Aw11	WTN 44, WTN 42, WTN 40, WTN 37	4	25,33
S.A. 12	WTN 45, WTN 43, WTN 41, WTN 39	4	26,39

For the path of the dynamic cable in the sections between the platform and the point of arrival on the seabed (touchdown point), the "lazy wave" configuration will be adopted by installing floating modules along specific sections of the cable: it has been shown that the performance of the "lazy wave" is superior to that of the more classic catenary shape in compensating for the movement of the floating foundation and reducing, therefore, the maximum damage cycles due to tension and fatigue.

The cable runs between two touchdown points can simply be placed on the seabed or laid in the trench. In the first case, if necessary to ensure the level of stabilization or mechanical protection required at the touchdown point or along the section, the cables may be covered with cementitious aggregates (e.g. concrete mattresses) or boulders (rockdumping).



Laying of dynamic "lazy wave" cables by means of floats



Typical of the float

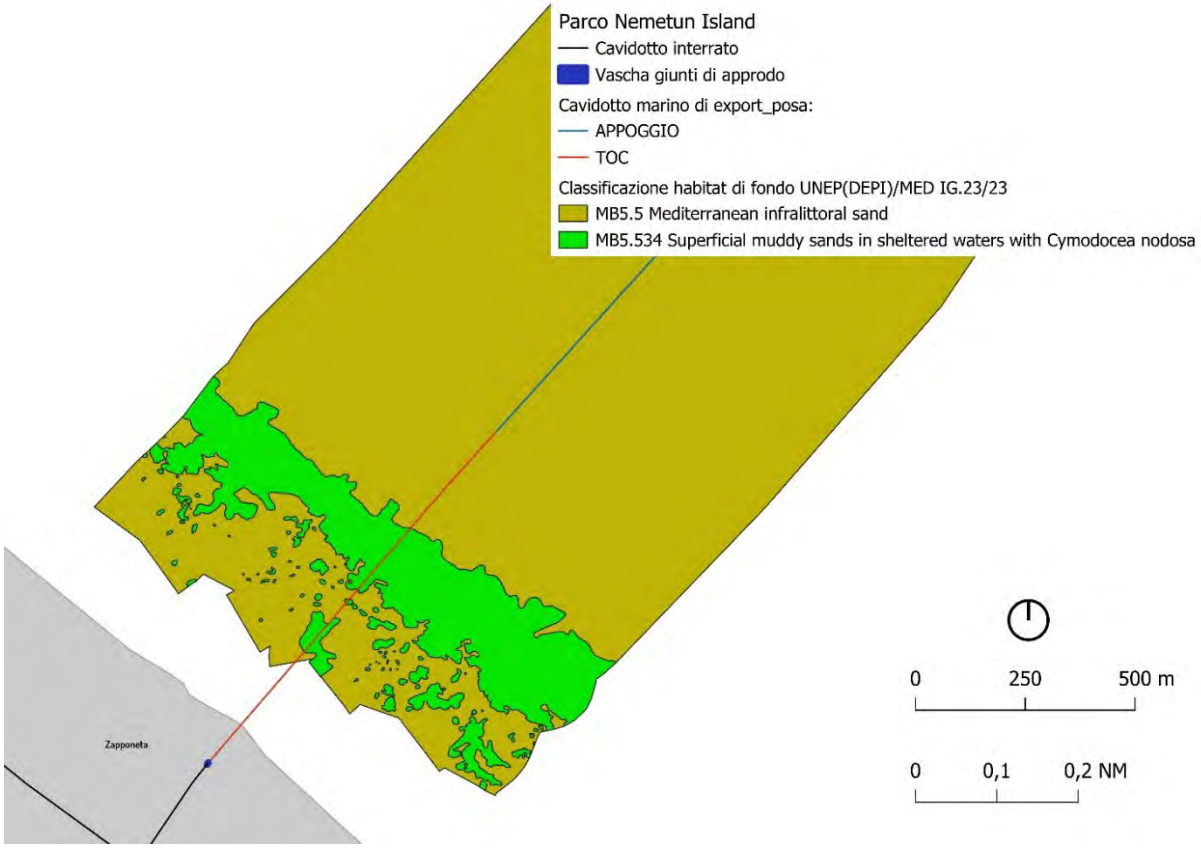
3.6.3 THE OFFSHORE EXPORT CABLE DUCT

The construction of a cable duct connecting the offshore substation and the onshore landing point is envisaged, consisting of laying two three-core cables arranged along parallel routes.

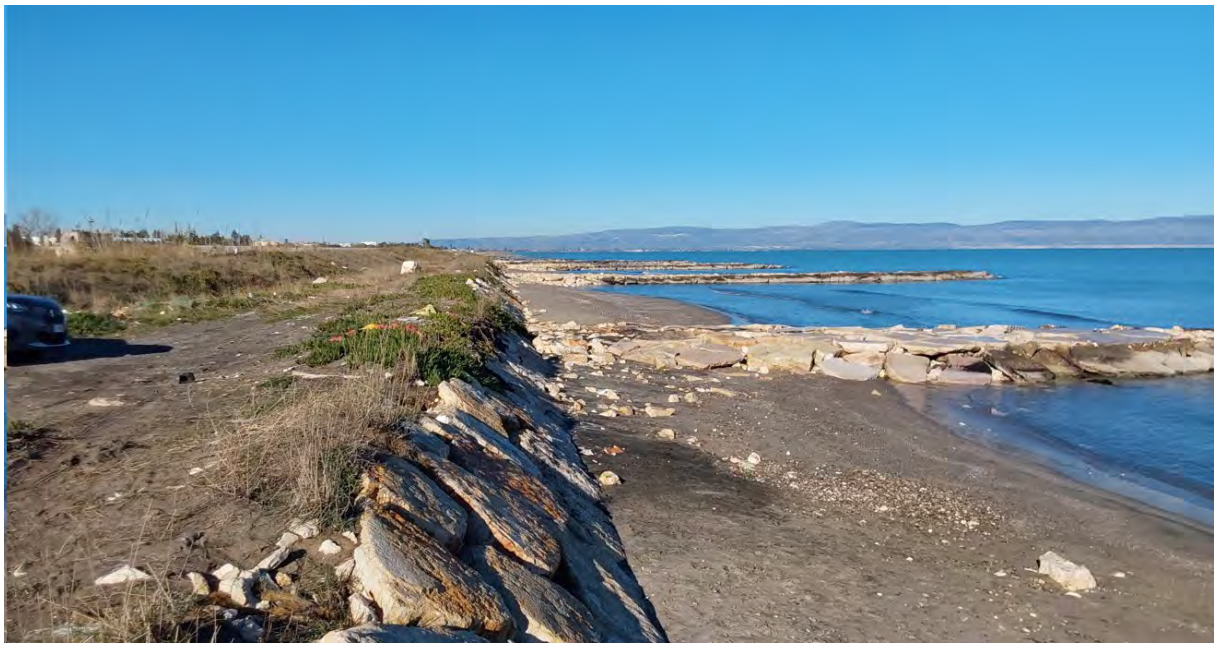
In order to best preserve the environmental conditions along the planned route, it was necessary to develop cable laying methods that minimized environmental impacts and simultaneously ensured adequate protection of the cable from potential risks deriving from interference with fishing activities, other uses of the sea - such as anchoring boats or the loss of transported loads - and adverse weather and sea conditions.

Based on the specificities of the seabed, the following types of installation have been identified:

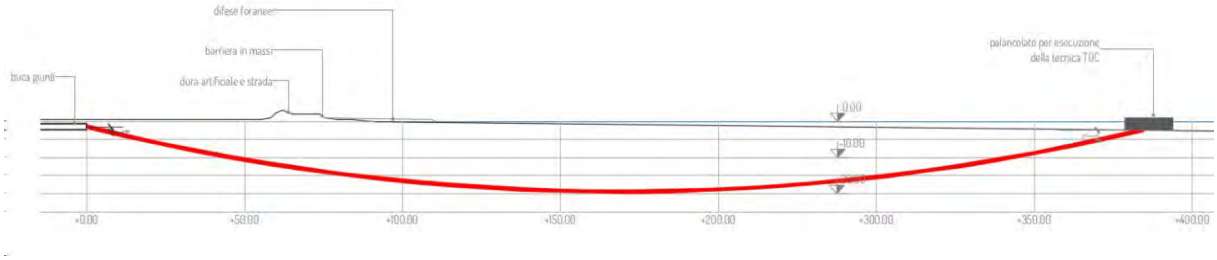
1- **Near the landing point** The cable will be laid in the seabed **for about 880 m** (for a total of 1000 m, including the land side) and up to a minimum bathymetry of 8 m by technique **Horizontal Directional Drilling** (HDD). This technique will allow to cross the habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa,* surveyed during geophysical surveys, and the defense works present on the coast, thus reaching the transition joints without excavating on the coastline and preserving the habitat of conservation interest.



Crossing of the marine cable duct at the landing place of the C. nodosa meadow (habitat MB5.534 - Superficial muddy sands in sheltered waters with Cymodocea nodosa



The existing breakwater defences



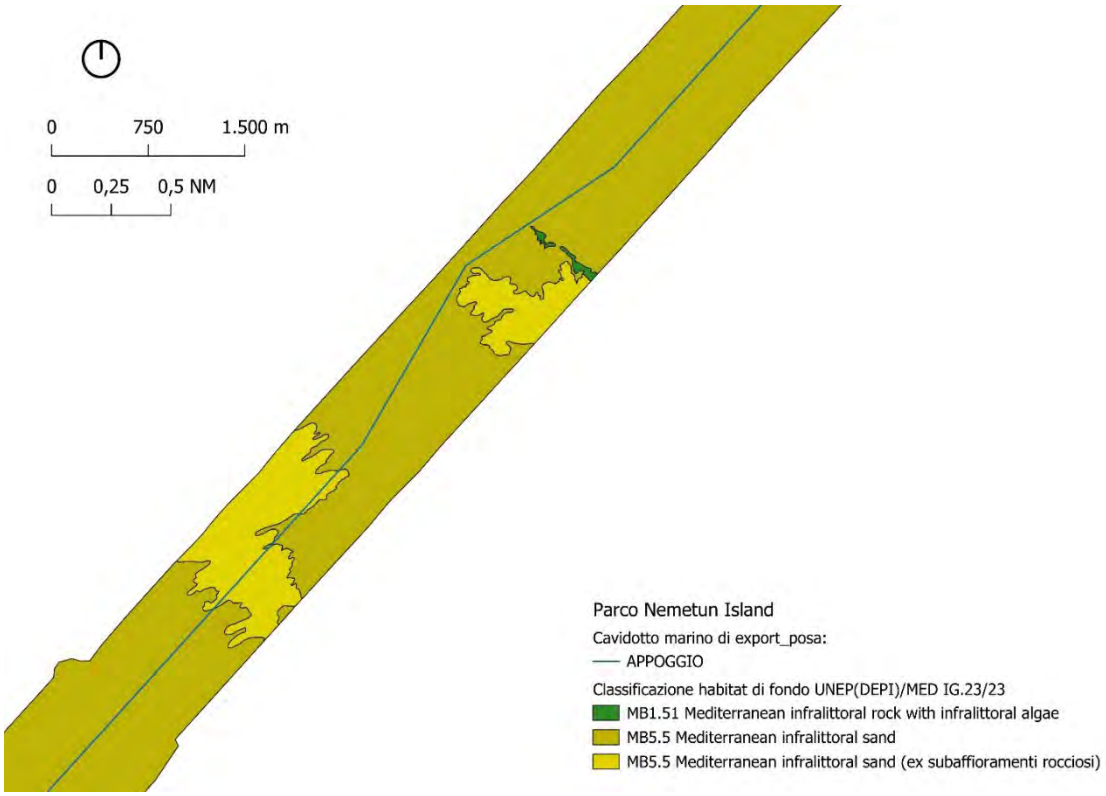
Horizontal Directional Drilling schematic profile

Horizontal Directional Drilling, the basic onshore construction site

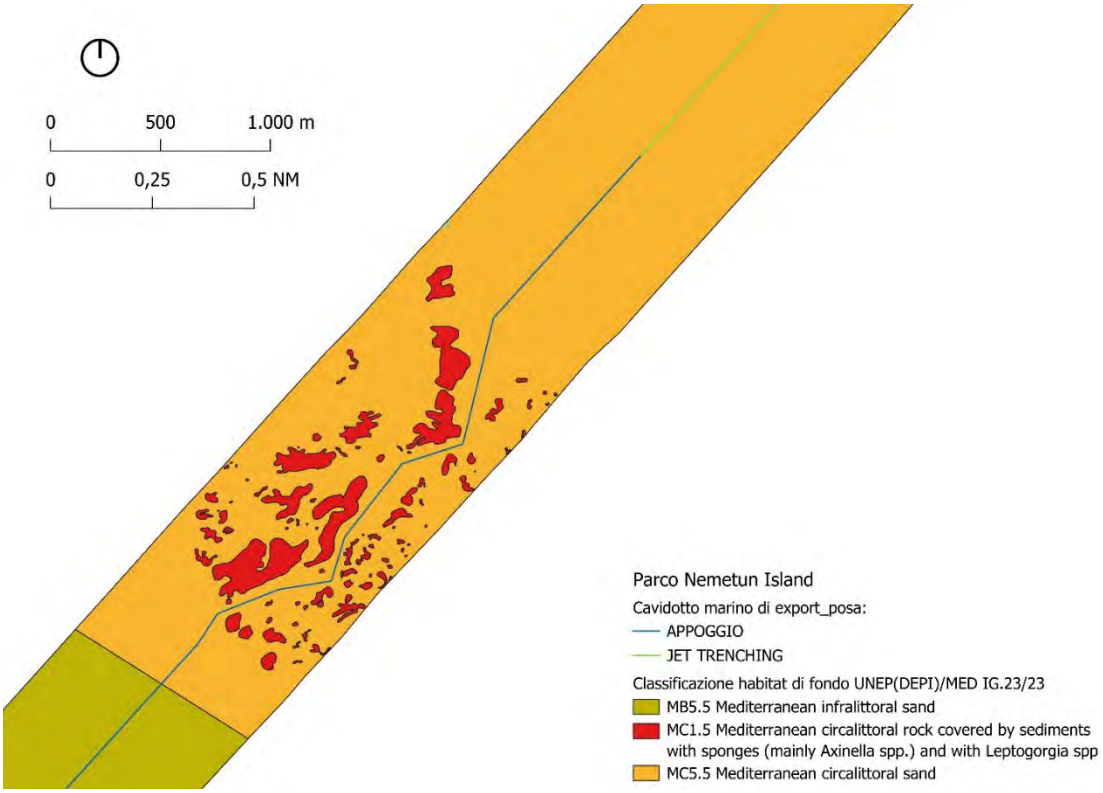
2- **The second interfering section of the cable duct of about 12.5 km in length** (**6.7 NM**), where geophysical investigations have identified the presence of:

- rocky sub-outcrops covered by a significant layer of sandy-muddy sediment (habitat MB5.5 – Mediterranean infralittoral sand),
- habitat MB1.51 - Mediterranean infralittoral rock with infralittoral algae
- coralligenous bioconstructions (habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*)

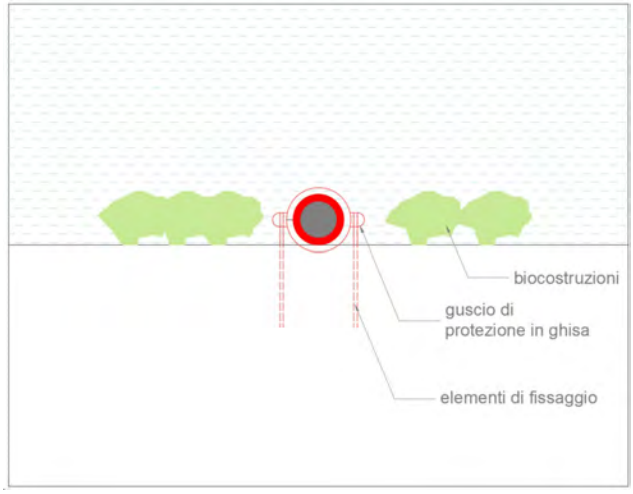
will be laid by means of a simple **Mechanical support and protection with cast iron shells**. This laying method offers a certain flexibility to the cable even after the protection has been applied and prevents contact with the habitats present, ensuring the best possible protection. In addition, the metal material provides an optimal substrate for the growth and proliferation of hard-bottom biocoenoses. The 12.5 km of laying also includes a buffer of about 1 km of cable duct that continues beyond the habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*, where jet trenching will then begin.

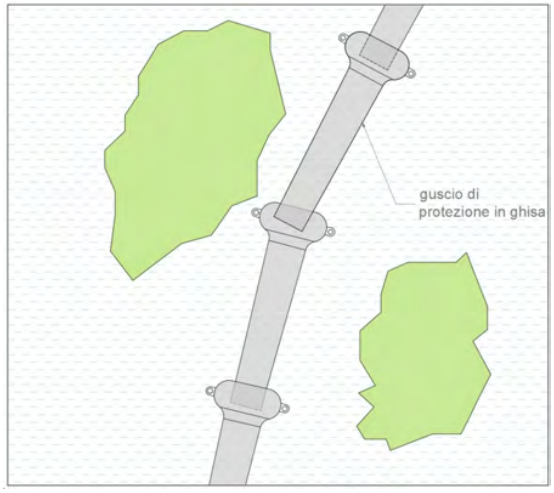


Crossing of the marine cable duct in correspondence with the habitats MB5.5-Mediterranean infralittoral sand (former rocky suboutcrops) and MB1.51 - Mediterranean infralittoral rock with infralittoral algae



Crossing of the marine cable duct in correspondence with the habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly Axinella spp.) and with Leptogorgia spp

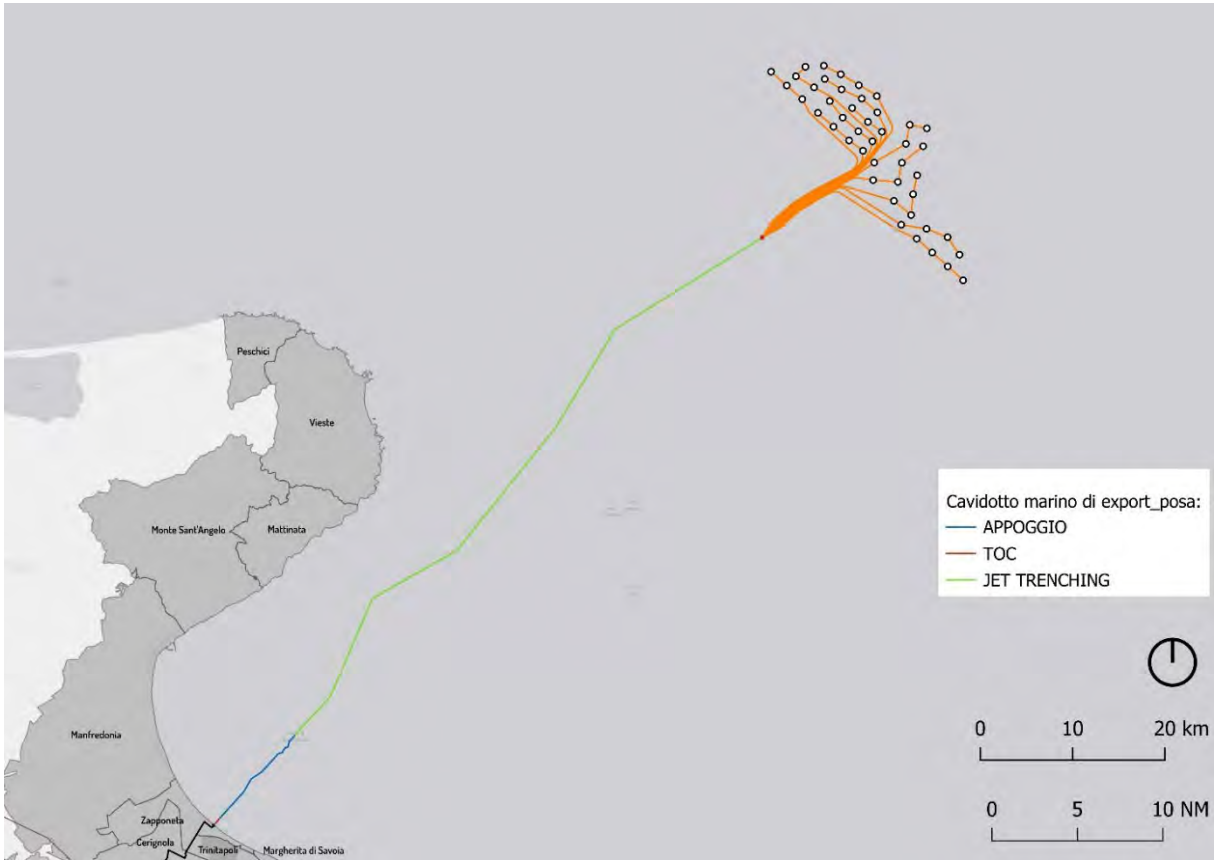




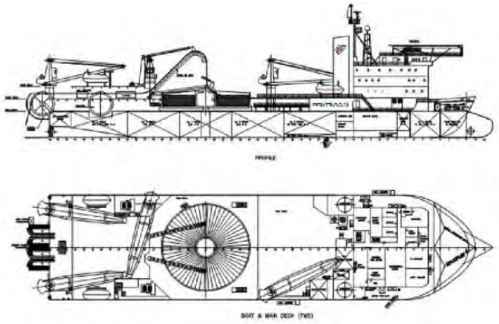
Precision installation by simple support

3- **For the stretch from bathymetric height (-17 meters) to the offshore electrical substation,** along a path of 76 kilometers (equivalent to approximately 41 NM), the characterization of the seabed reveals the following habitats: MC5.5 - Mediterranean circalittoral sand, MC6.51 - Coastal terrigenous muds, MD6.5 - Mediterranean offshore circalittoral mud, therefore, the cable duct will be installed in the trench using the technique known as **Jet Trenching**. These drag-driven trenching systems **Takes** A plough specially designed to adapt to different types of soil and laying depths. The excavation takes place thanks to the pulling action exerted on the plough by a tow boat, which provides the necessary pulling force. The plough is equipped with water jets that liquefy the seabed, creating the trench, laying the cable duct and at the same time closing the trench.
The processing does not require any movement of the cable on the bottom. The operation can be interrupted at any point and possibly resumed at a later point. A processing time of about 78 hours is expected for the entire development of the Jet Trenching installation, to be carried out with minimal interruptions and organized over a period of ten days. All operations will be carried out in close cooperation with the port authorities in order to coordinate the work in the areas subject to the circulation of vessels.
In general, the "jet trenching" waterjet technique allows:

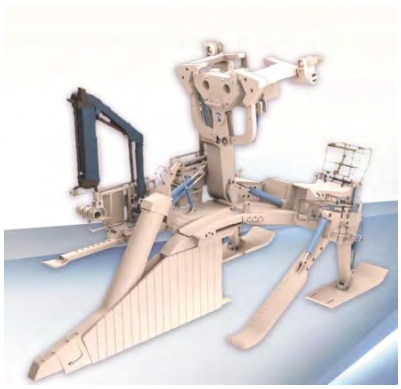
- a modest impact on the environment and living organisms, limited only to the period of the works;
- the natural recolonization of the installation area after the works;
- No impact after laying.



Export cable duct laying systems – general framework



Cable-laying vessel

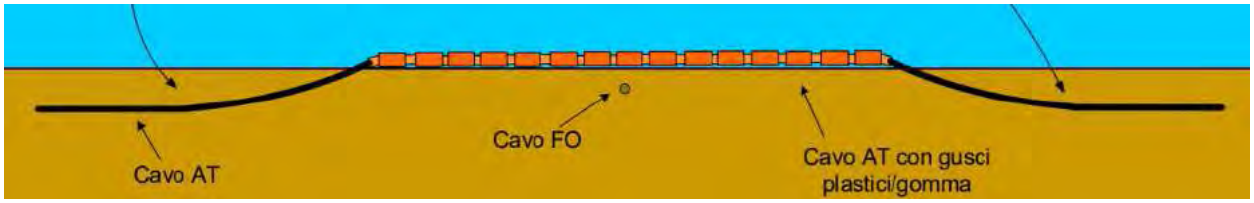


Sea plough and three-dimensional diagram of the excavation trench

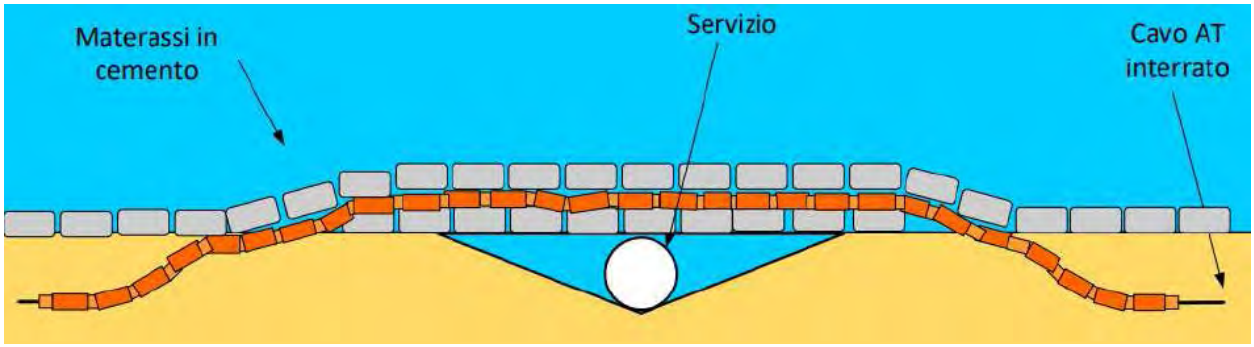
3.6.4 INTERFERENCE WITH UNDERGROUND UTILITIES AT SEA

The research conducted did not detect interference with other submarine services. However, in the event that it is necessary to cross other cables or gas pipelines, it will be possible to overlap the cable to be installed with the existing service, carefully separating the two and adopting solutions of covering the cable with plastic shells, followed by the protection of the crossing by means of concrete mattresses or sand-filled bags, as illustrated in the following figures.

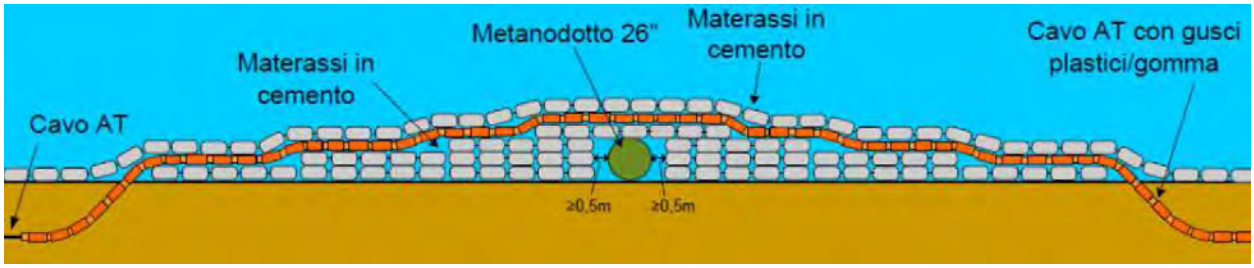
The same technique may also be necessary if the cable or pipe crossed is artificially or naturally buried.



Typical of cable crossing



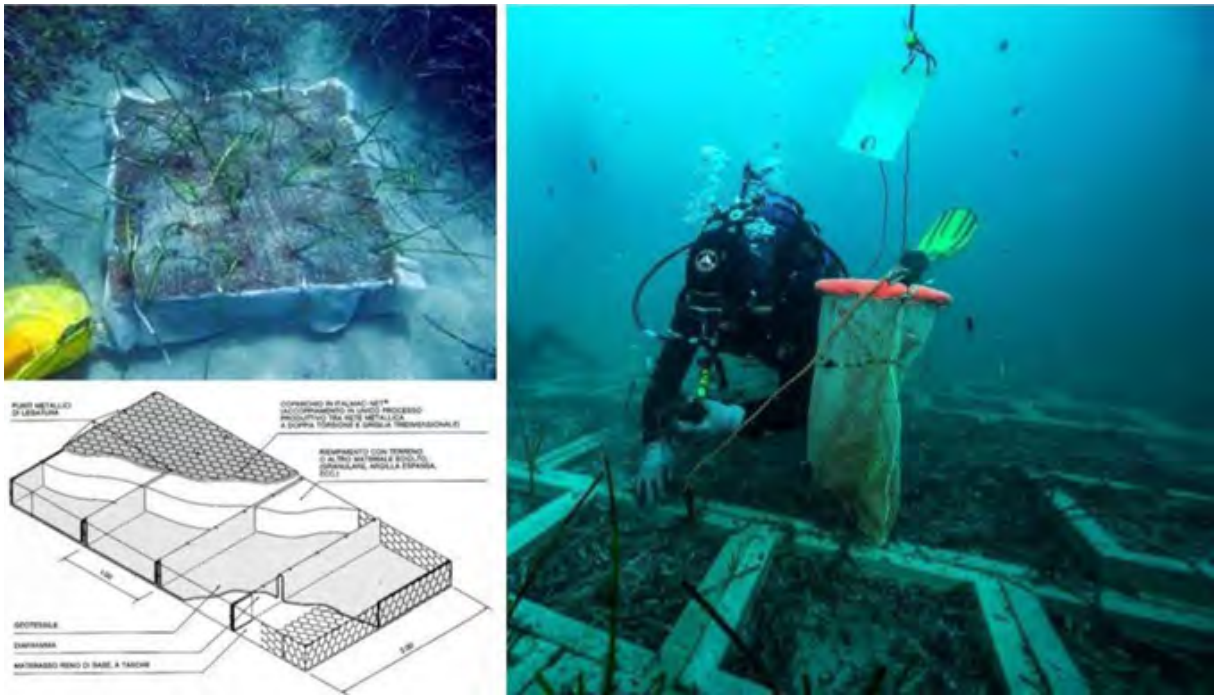
Typical of outcropping metal pipe crossing



Typical of outcropping pipeline crossing

The protection technique can be integrated with specific reactive elements to carry out remediation interventions in locally contaminated areas, also offering the possibility of creating a suitable substrate for the implantation of biocoenoses of ecological value.

Protection systems with plastic shells



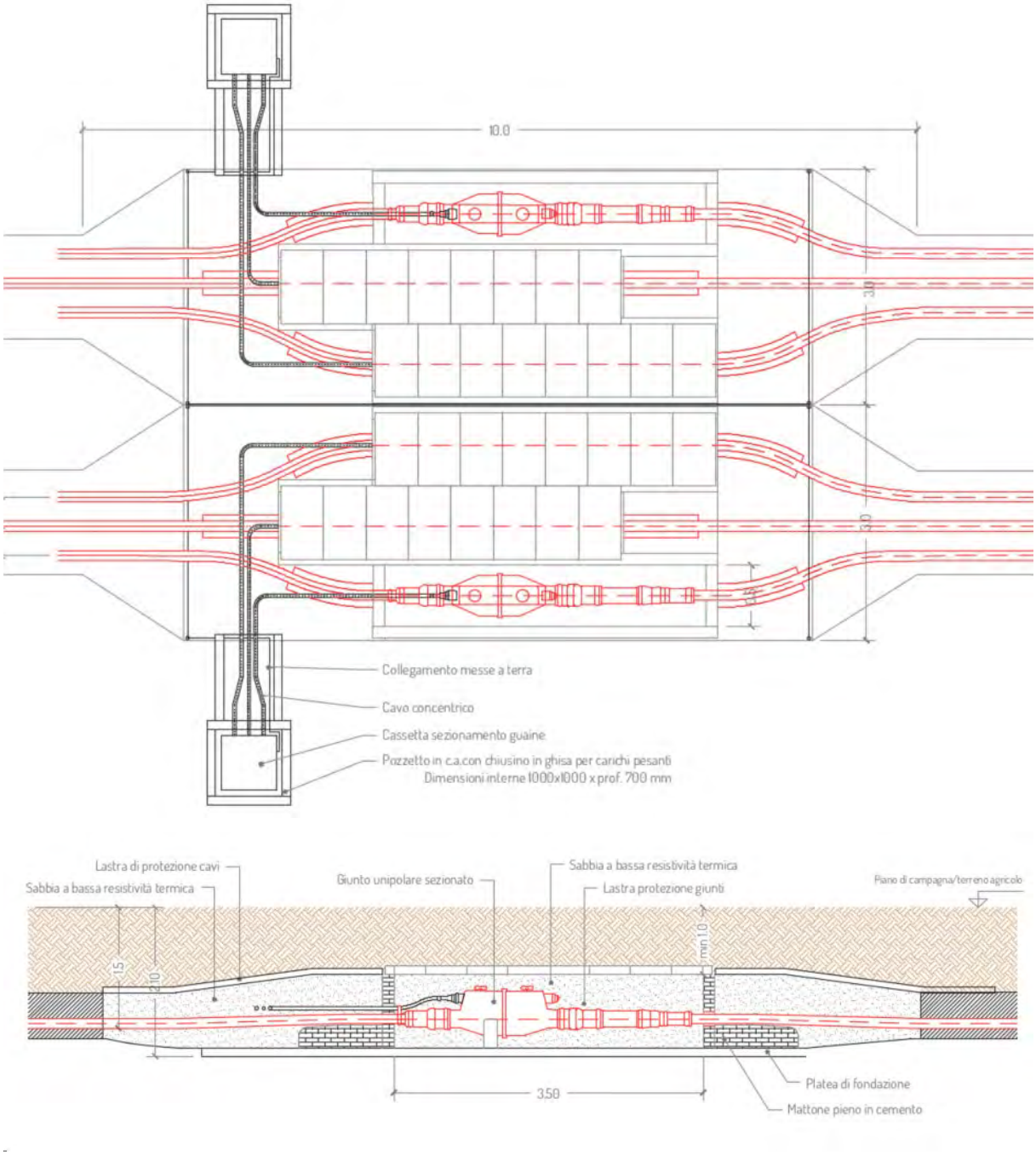
Ballasted mattresses for the creation of biocenotic substrates

3.6.5 TECHNICAL CHARACTERISTICS OF THE DISEMBARKATION POINT

Near the landing site, about 120 m from the coast line, the marine cable will be spliced with the land cable. The land-sea joint will be made of a special concrete structure, to be buried at the landing in a joint hole. The "joint hole" or "Joint Bay" will have dimensions indicative of 10 m (length) x 6 m (width) x 2.1 m (depth). The joints will have the following characteristics:

- They will be built inside niches filled with sand and covered with reinforced concrete slabs, with a mechanical protection function;
- At the bottom of the joint hole, a concrete slab will be built, in order to create a stable surface on which to rest the joint supports. In addition, a local earth mesh consisting of 4 or more pegs, connected to each other and to the sectioning box, by means of a copper rope, will be created.

- A manhole will be installed next to the junction box for housing the cable sheath disconnection box. By acting on the internal connections of the box, it is possible to connect or disconnect the cable sheaths from the earthing system.



Typical of tub joints

3.7 LAND CABLE DUCTS

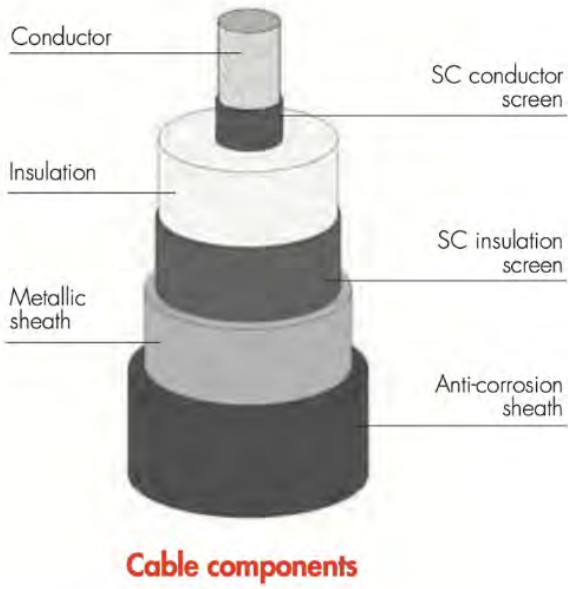
3.7.1 TECHNICAL AND ELECTRICAL CHARACTERISTICS OF THE LAND CABLE DUCT

The onshore power line consists of a first section connecting the landing point and the onshore substation and a second section interconnecting the substation to the NTG station

The rated operating voltage of the connection cable will be 380 kV in alternating current. In the first section, considering both the maximum active production power and the reactive power, a total nominal production current of about 2100 A is considered to be distributed over the two cable triplets. In the section between the onshore electrical substation and the RTN electrical substation in Cerignola, it is assumed that a single trio of cables with the maximum possible section will be installed, thus considering the possibility that the stall in the RTN station will be shared with other producers through the onshore substation.

The cables chosen for underground laying on land will be of the single-core type with XLPE insulation and steel armour, with the following characteristics:

Rated Voltage:	380 Kv
Nominal frequency:	50 Hz
Formation:	2x3x1x2000 - 3x1x2500
Conductor Type:	Copper
Isolation:	XLPE
Maximum Permanent Operating Voltage:	420 kV
Single cable maximum outer diameter:	132.8 mm - 140.8 mm



Onshore cable duct

3.7.2 ROUTE AND CHARACTERISTICS OF THE ONSHORE CABLE DUCT

The onshore cable conduit consists of:

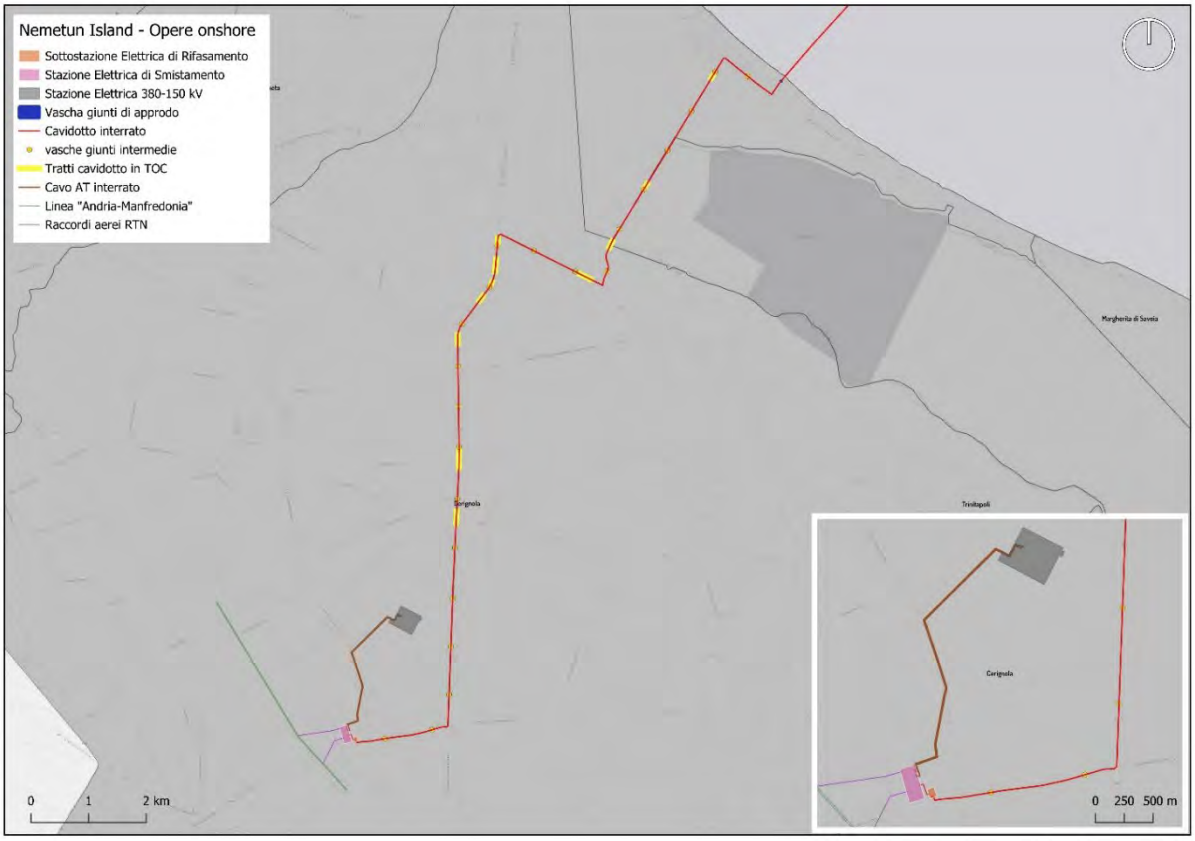
- a first section in marine cable in the section built in HDD between the landing point along the coast line and the land-sea joint hole set back by about 110 m;

- an underground power line consisting of a double circuit of land cables approximately 18,3 km from the hole to the onshore electrical substation of the user
- an underground power line consisting of a trio of 380 kV cables, about 200 m long, for the connection of the Electrical Substation to the nearby new Switching Station to be built as an extension to the Cerignola Electrical Substation.

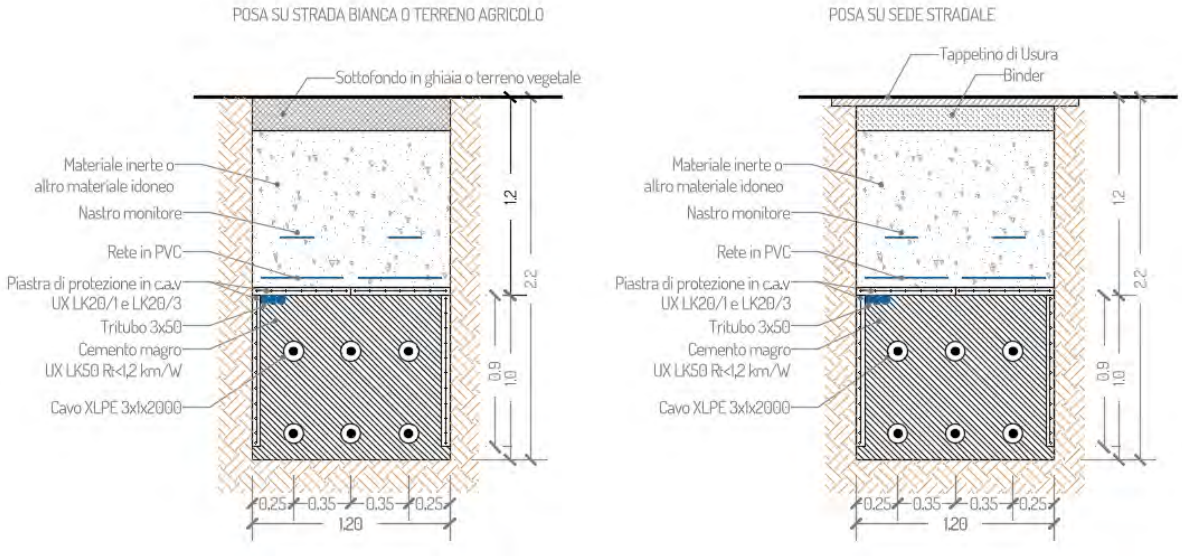
The route of the underground power line will be largely located on existing asphalt roads and partly on agricultural land alongside the transit routes. The cables will be placed flat inside trenches with a narrow section, characterized by a Average width of 1.35 metres and a maximum depth of 2.2 meters.
The standard provision provides:

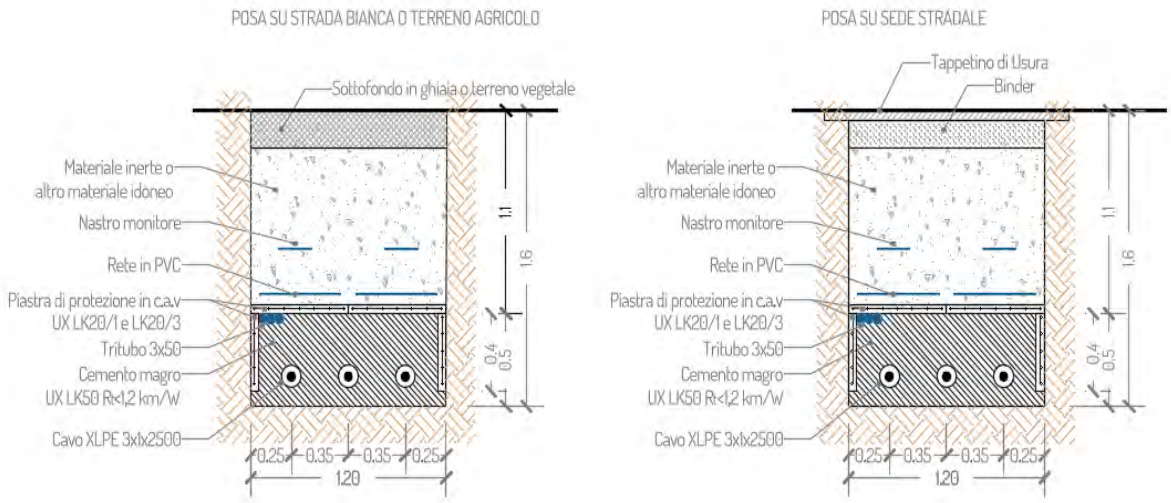
- in the double circuit section, the cables must be laid on two separate levels located at a depth of -2.1 m and -1.6 m with respect to the ground level. The first trio of cables will be laid on a bed of sand or lean concrete with a thickness of about 10 centimeters. The cables will then be covered with the same material, sand or cement, for a layer of about 40 centimeters above which the second trio of cables will be laid, covered, like the previous one, for a further 40 cm. A reinforced concrete protection slab will be laid on the sand or lean concrete roofing layer. Additional slabs will be placed on the sides of the trench to provide additional mechanical protection.
- The single circuit section will follow similar requirements for laying with excavation at 1.6 m, laying of the cable circuit at -1.5 m on one layer a bed of sand or lean concrete with a thickness of about 10 centimeters, covering the cables with the same material for a layer of about 40 cm on which to lay a reinforced concrete protection slab. Additional slabs will be placed on the sides of the trench to provide additional mechanical protection.

The remaining part of the trench will be filled with waste and/or fill material, of suitable characteristics. In the case of passage on the road, the restoration of the same (substrate, binder, mat, etc.) will be carried out in accordance with the provisions of the managing bodies of the road layouts (Municipality, Province, ANAS, etc.).
The cables will be marked by a red P.V.C. mesh, to be placed above the protective plates. Further signaling will be carried out by laying monitoring tape to be positioned about halfway up the trench.
Inside the trench, the installation of a Ø 50 mm Tripipe is planned within which Fiber Optic cables and telephone and signaling cables can be laid.

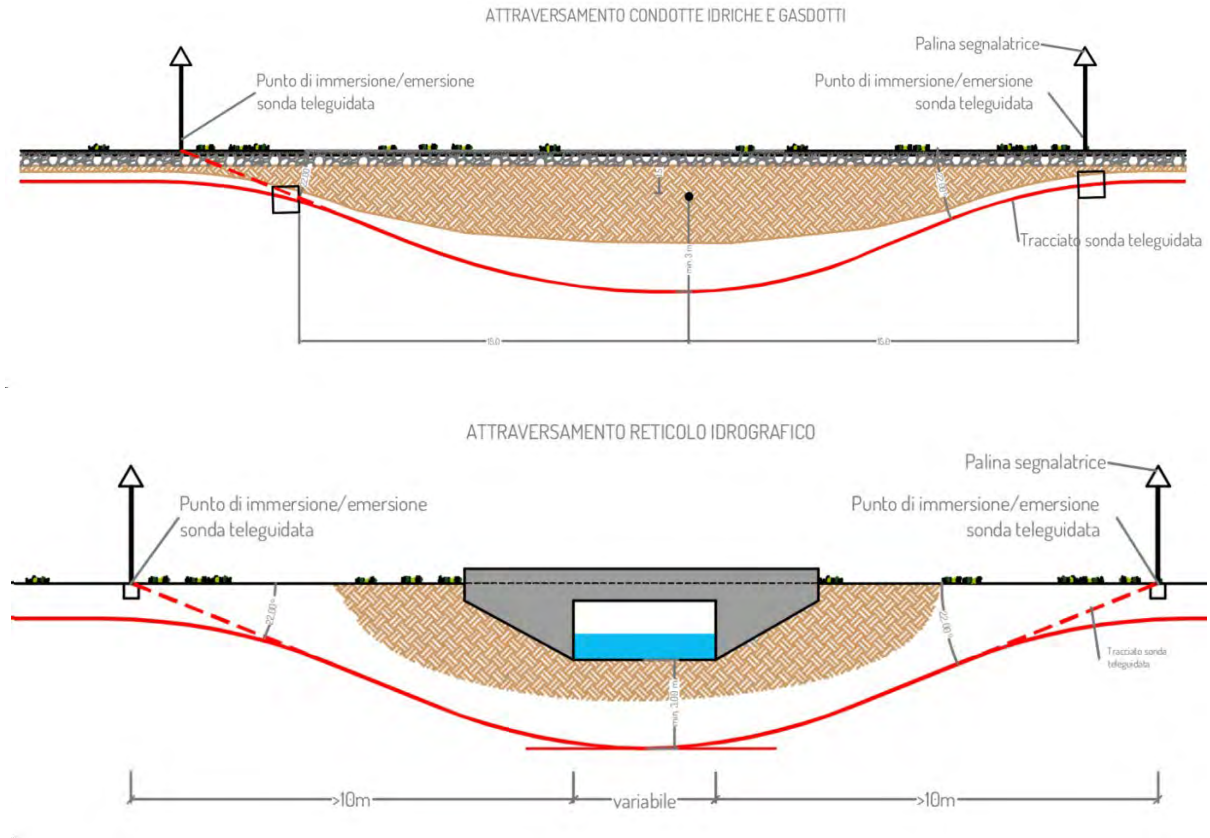


The onshore cable duct in the project general framework





Typical sections of the underground cable duct

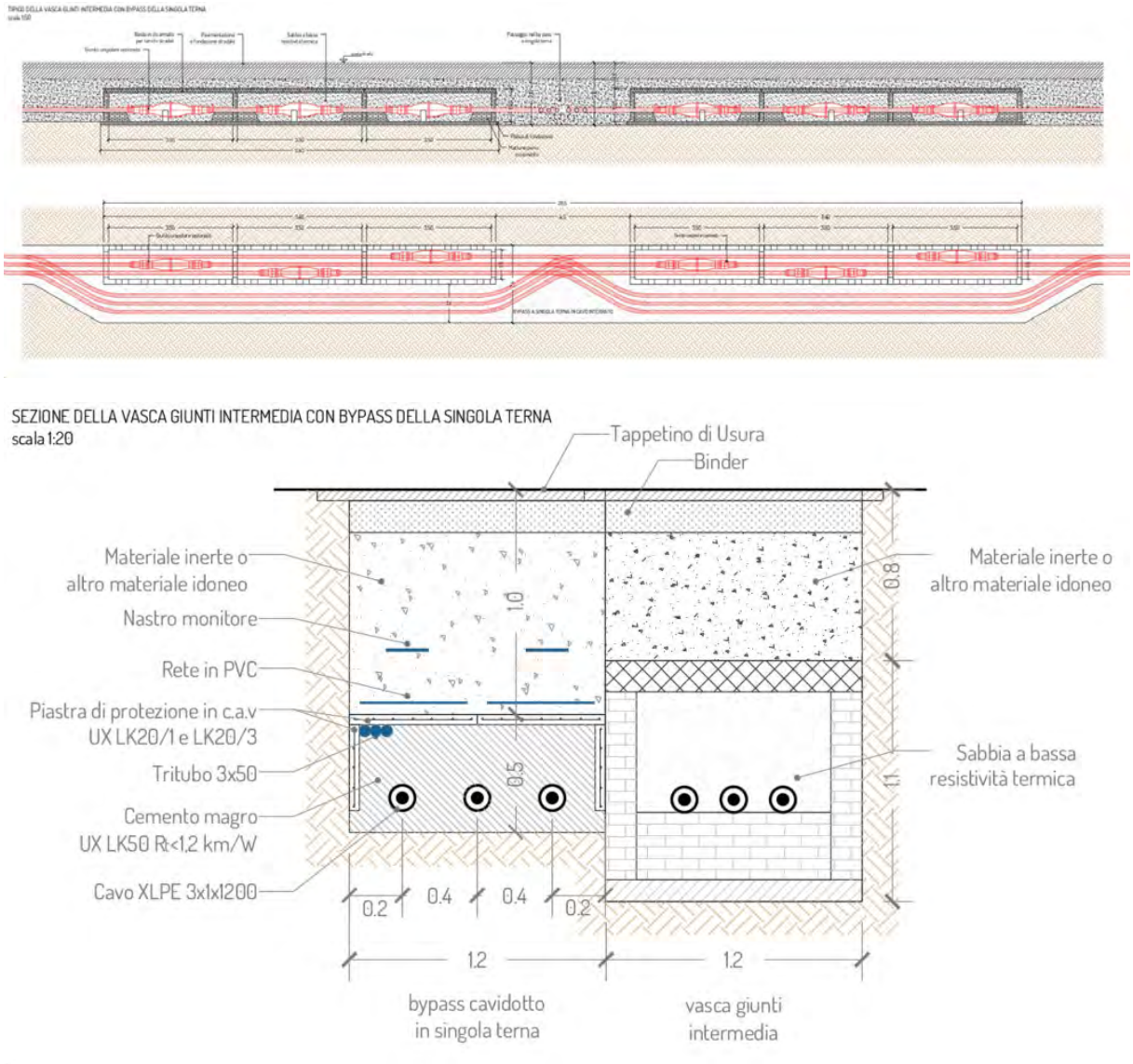


Typical crossings in HDD

11 main crossings of hydrographic networks or other infrastructures are planned, and it will also be possible to interfere with existing underground networks such as AQP water networks, Enel electricity networks, electricity networks of producers of energy from renewable sources (photovoltaic and wind power plants), gas networks and telephone networks. These interferences will be punctually verified during the executive design phase with the bodies/companies owning the networks and the technical methods for laying the HV cables at the intersections will be defined in concert. In the aforementioned 11 sections and in the other

crossings, where necessary, the Horizontal Directional Drilling technique will be used. All the details on the installation methods and the management of interferences are detailed in the document *Underground onshore T.5.4.5_ Transmission Line - schematic profiles of the HDD sections*.

Along the land route, it will be essential to create intermediate joint holes along the land route to connect the cable segments and for any maintenance operations. It is planned to build 22 holes intermediate joints to divide the course into segments from 700 to 950 meters long each. These holes will be made as part of the excavations for the cable duct. Since the cable conduit is composed of a double circuit of HV cables, it will be necessary to prepare holes joined with a bypass system, allowing the triad to be connected separately before combining both cable ducts in a single trench. The joint holes will have a total length of about 28 meters, with a total width of 2.4 meters, of which 1.2 meters will be used for the bypass system.



Typical of the intermediate Joint Bay

3.8 CONNECTION TO THE NATIONAL ELECTRICITY GRID

3.8.1 GENERAL MINIMUM TECHNICAL SOLUTION AND METHODS OF CONNECTION TO THE NTG

The technical connection solution released by TERNA, with connection quote **Code 202201688**, provides that the Nemetun Island plant will be connected by 380 kV antenna on a future expansion of the 380/150 kV Electrical Substation (SE) of Transmutation of the NTG to be inserted in the in-exit to the 380 kV "Foggia-Palo del Colle" RTN line, after the construction of:

- 380 kV connections for the extension of the above-mentioned SE NTG to the 380 kV "Manfredonia-Andria" power line;

Implementation of the following interventions referred to in the Development Plan:

- 380 kV Foggia – Larino – Gissi power line (code 402-P);
- 380 kV Brindisi Sud – Andria power line (code 512-S);
- 380 kV Aliano – Montecorvino power line (code 546-P);
- 380 kV Montecorvino – Benevento power line (code 506-P);
- 380 kV power line in the North Benevento area (553-N).

The works envisaged by the TERNA Development Plan have an independent authorisation process managed by the aforementioned NTG Management Company and are motivated by grid needs that go beyond the construction of the Nemetun Island wind farm. Most of the above-mentioned interventions envisaged by Terna's Development Plan are already authorised and have expected construction times compatible with those of the construction of the planned plant.

The project process for the offshore wind farm will include the grid works and the user works for the connection indicated by TERNA according to the definitions in Annex A to Resolution Arg/elt/99/08 as amended.

In the connection point assignment document (STMG), the NTG management company specifies that, in order to optimize the use of grid facilities, it will be necessary to share the space dedicated to the Nemetun Island plant with other possible production plants. In other words, to connect the energy produced by the Nemetun Island power plant to the grid, the**The user system must be equipped with a condominium electrical substation (SSE), which allows the same connection stall to be shared with other manufacturers.**

Near the planned landing point in the municipality of Zapponeta, an underground joint hole will be built to transition from marine cable to land cable and from there on the cable will continue with underground laying following the existing public road network. The energy produced will then be conveyed to the condominium electrical substation equipped with a power factor correction unit, planned inside an industrial building near the TERNA electrical substation in Cerignola and its future expansion.

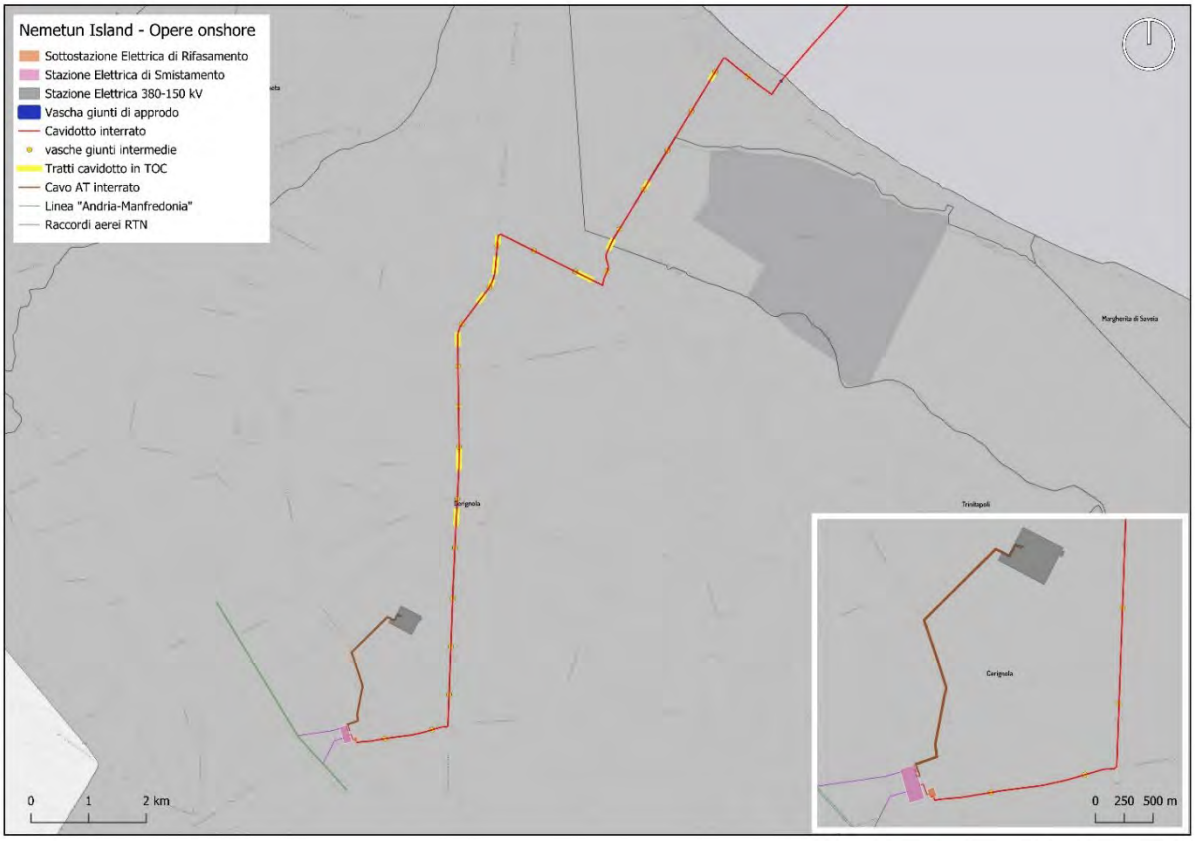
In In these hypotheses, the user works for the connection consist of:

- **An Underground Transition Joint Bay**, located near the landing point in the municipality of Zapponeta, which will allow the transition from the submarine cable to the cable intended for underground laying in the onshore section;
- **An underground power line consisting of two three 380 kV cables**, extended for about 18 km, mainly located along the public road network in the territories of the municipalities of Zapponeta, Trinitapoli and Cerignola, with short transits on agricultural land. The installation will take place mainly through excavations with a fixed section, but to manage interference along the way, **11 sections laid using the excavation-free technique called "Horizontal Directional Drilling" (HDD).** The 11 sections will have variable lengths, as represented in the project documents;

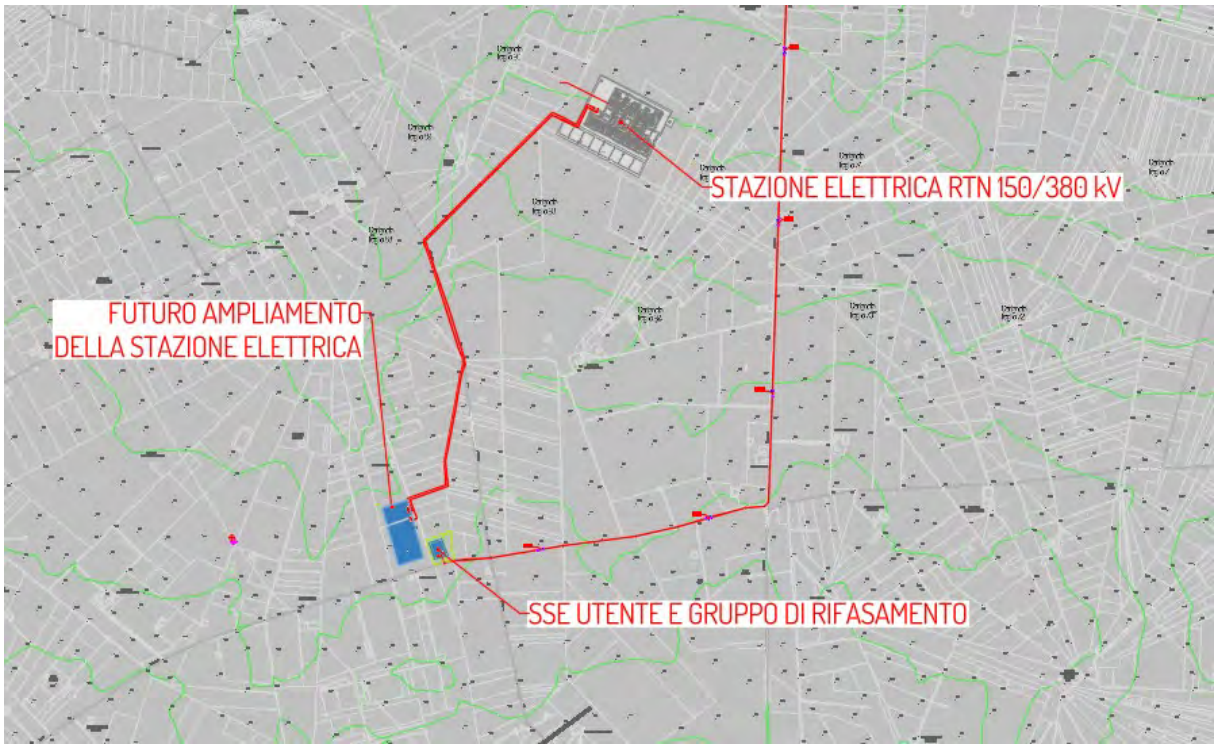
- **A series of 22 intermediate Joint Bays,** located along the route of the underground cable duct with a variable distance between 700 and 950 meters. The intermediate joints will be made as part of the excavation with a fixed section planned for the laying of the power line;
- **An electrical utility substation, isolated in GIS, for sharing the stall and equipped with a power factor correction unit, dedicated to the Nemetun Island plant**, with a maximum capacity of 600 MVAr, consisting of two Shunt type reactors. The GIS Substation will be located in an industrial building located in the municipality of Cerignola, near the connection point to the NTG indicated by TERNA and represented by a new Switching Station to be built as an extension to the Cerignola Electrical Substation;
- **An underground power line consisting of a trio of 380 kV cables,** about 200 m long, for the connection of the electrical substation to the nearby new Switching Station to be built in extension to the Cerignola Electrical Substation.

To allow the connection of the offshore wind farm, some interventions are necessary to expand the NTG (grid works) identified by TERNA in the connection estimate and which consist of:

- **A 380 kV Switching Station** - in extension to the Cerignola Electrical Substation of the TERNA unified type with air insulation and having the following configuration:
  - N. 1 double busbar system
  - N. 2 cable line stalls for SE RTN 380 kV "Cerignola 380" connection
  - N. 2 parallel busbar stalls
  - No. 1 TIP stall
  - N. 2 stalls fully equipped for the entrance – exits on the existing 380 kV power line "Manfredonia 380 – Andria"
  - N. 6 line stalls available for future network needs
- **Two 380 kV Overhead connections**, for the incoming connection – exits in a simple circuit of the new Switching Station to the existing line of the 380 kV "Manfredonia-Andria" NTG. The connections will be supported by 4 new pylons after the decommissioning of 2 existing pylons;
- **Two underground AT connections, consisting of a total of 4 triads of 380 kV cables**, approximately 2.70 km long, for the connection of the new Switching Station to the SE RTN 380 kV "Cerignola 380" under construction connected in and out to the 380 kV RTN "Foggia-Palo del Colle" line.



Summary representation of the onshore works



User works and network works at the connection point

3.8.2 CONNECTION WORKS – THE ELECTRICAL SUBSTATION AND THE POWER FACTOR CORRECTION UNIT

Before being fed into the grid, the energy produced will be conveyed into a user electrical substation equipped with a power factor correction unit. Tele opere is necessary for two reasons:

1. realize the compensation of the reactive power produced by the marine and underground cable network according to the network specifications. The power factor correction system for the HV cables will be built pro rata both on the offshore transformer substation and on the onshore user substation located in the immediate vicinity of the future Terna 380 kV substation.
2. share the grid operator's assigned stall in the NTG Electrical Substation with other production plants in order to rationalise the use of grid facilities by creating a condominium with other possible producers, all as indicated by TERNA in the connection estimate.

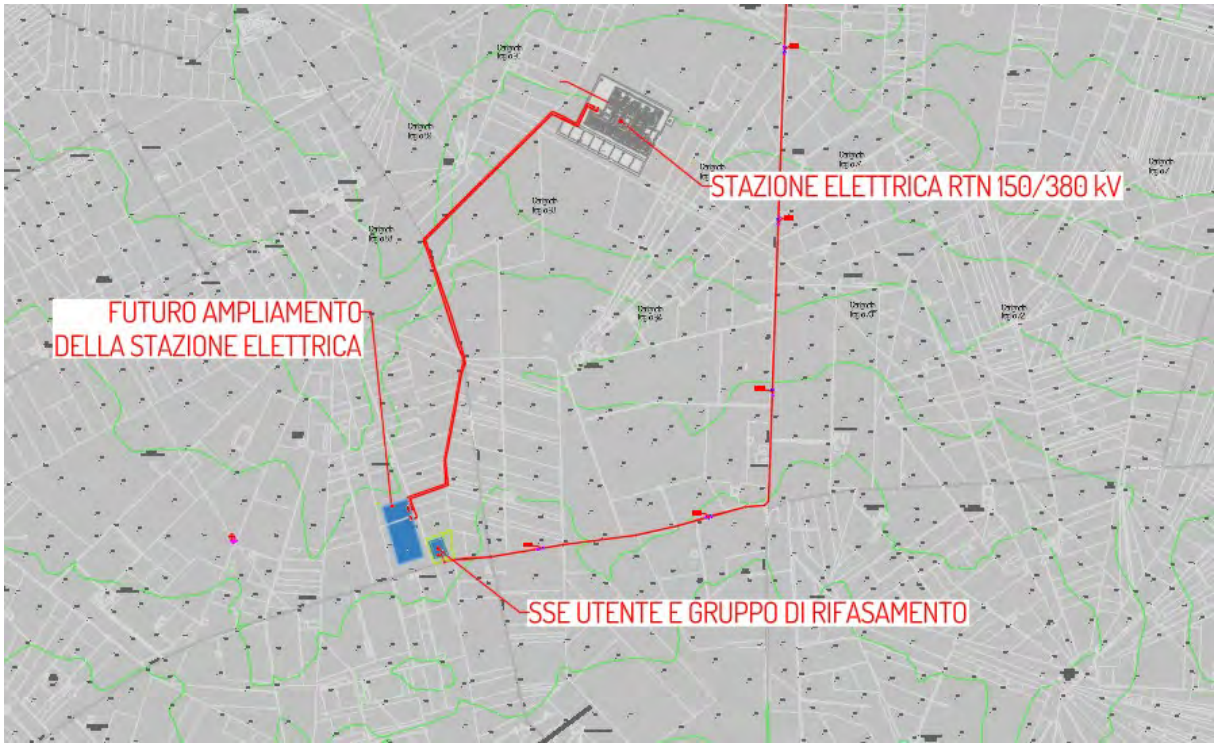
3.8.3 LOCATION OF THE WORK

The location of the Electrical Substation takes into account a system of social, environmental and territorial indicators, which have made it possible to assess the effects of electricity planning in the territorial area considered, in full compliance with the objectives of safeguarding, protecting and improving the quality of the environment, the protection of human health and the prudent and rational use of natural resources.
Among the possible solutions, it was decided to locate the onshore substation in the immediate vicinity of the new Electrical Sorting Substation, expansion of the Electrical Substation 380 kV RTN of Cerignola, indicated by TERNA as the connection point to the National Transmission Grid. This location is the most functional in consideration of all the needs and possible repercussions on the environment, with reference to the national and regional legislation in force on the subject.
The position of the onshore user substation, as shown by the cartographic frameworks of the project, was studied by comparing the needs of the public utility of the works with the public and private interests involved, trying in particular to:

- minimize interference with areas of environmental, naturalistic, landscape and archaeological value;
- avoid, as far as possible, the involvement of urbanized areas or urban development;
- avoid areas of agricultural value;
- make as little sacrifice as possible to the properties concerned, taking care to examine the existing situations on the land to be enslaved with respect to the conditions of the neighboring land;
- allow the regular operation and maintenance of the system;
- to limit the length of access roads;
- Minimise the lengths of future lines connecting to the SE
- contain the distance from MV power lines for the supply of auxiliary services;

To reduce the environmental impact, it was also decided to build the substation using gas-insulated systems instead of the classic air-insulated systems. These systems consist of insulating the active parts by confining them inside a metal shell filled with SF6 gas at a certain pressure and are commonly called GIS (Gas Insulated Switchgear) systems in armored execution with sulfur hexafluoride (SF_6). Il gas SF_6 It has high dielectric strength that increases with pressure and is used as a dielectric in electrical substations and substations. By using this gas as an insulator instead of air, it is possible to reduce the distances between active parts and therefore build the Medium and High Voltage electrical works in smaller spaces, allowing the electrical work to be installed completely inside a building. This solution also brings further technical advantages by reducing the maintenance of equipment subjected to climatic agents and ensuring a very high level of safety by virtue of the technology used. The construction of a GIS substation not only reduces

the overall dimensions of the work, but also allows the visual impact to be contained, given that all the electromechanical equipment is completely shielded inside the industrial building.
The user substation thus designed will occupy an area of 5265 m^2 located in an agricultural area (zone E) in the peri-urban fabric of the municipality of Cerignola. The work is easily accessible from the Provincial Road 69, this choice also makes it possible to minimise any impact due to the construction of the access roads.



Substation location user Onshore

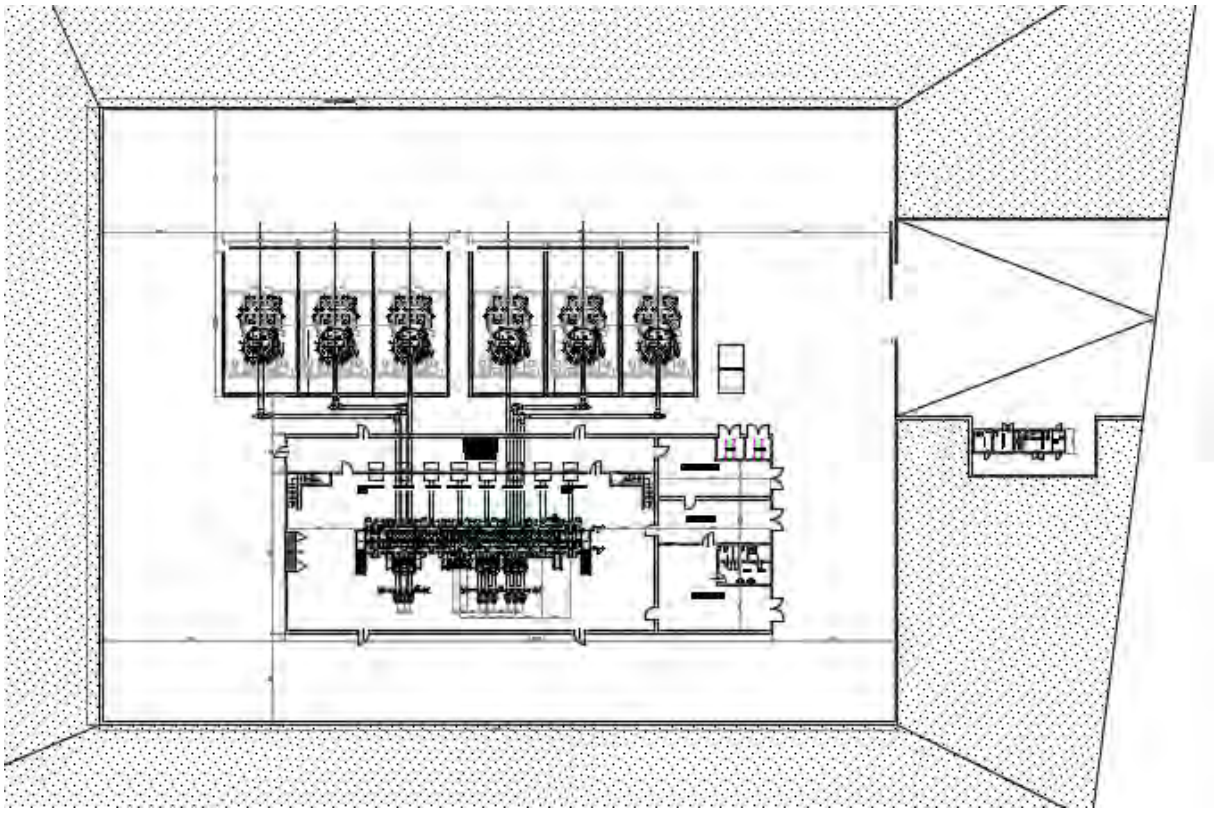
3.8.4 ELECTROMECHANICAL ARRANGEMENT

The substation, seen as a whole, will consist of a power building capable of containing all the components listed below.

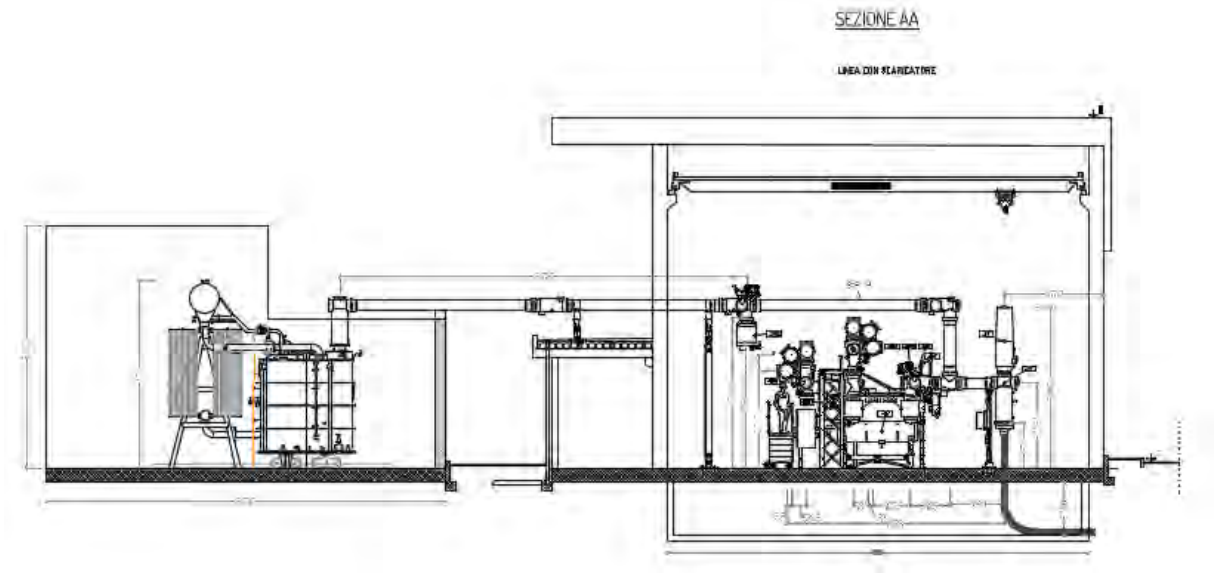
The fully SF6 insulated substation will consist of:

- Nr. 2 line stalls for cable arrival 400 kV and compensation reactor on the sea side;
- Nr.1 line stall for exit by cable to the RTN station;
- Nr.1 junction stall;
- Nr.2 segregated and insulated busbar systems;
- Nr.2 stalls available;
- Nr.2 Section Generals, Bar TV and Bar Ground.

There will also be space to add additional line stalls from other manufacturers for the possible sharing of the 380 kV stall in the TERNA station.



Electromechanical plan of the work



The new electrical utility substation, electromechanical plant

3.8.5 NTG CONNECTION WORKS

With regard to the connection works, both grid and user, it is important to point out that, following discussions with the lead operator at Terna, changes have been made to the configuration and location of the infrastructure necessary to connect the Nemetun Island plant to the NTG grid. These changes - introduced at a date subsequent to the inspection with the PNRR PNIEC technical commission carried out in February 2025 - led the proposing company to reposition and reconfigure the layout of the onshore connection works. In addition, the new configuration has made it necessary to include in the Nemetun Island project also the works under the responsibility of the NTG and the related environmental assessments, which had initially been excluded.

In particular, the expansion of the Terna station in Cerignola will no longer be carried out alongside the existing station, but through the construction of a **new Switching Station in expansion at the SE of Cerignola**, located in another site (satellite configuration).

This new station will be **Connected**:

- to **380 kV RTN overhead line "Manfredonia–Andria"** through **Overhead connections**;
- to the 380 kV RTN overhead line "Foggia – Palo del Colle" by means of an underground line connected to the existing station **of Cerignola.**

In line with this new configuration, the location of the power factor correction user station has also been modified, which is now planned adjacent to the new Terna Sorting Station.

The location of the connection works in the June 2025 Nemetun Island project update

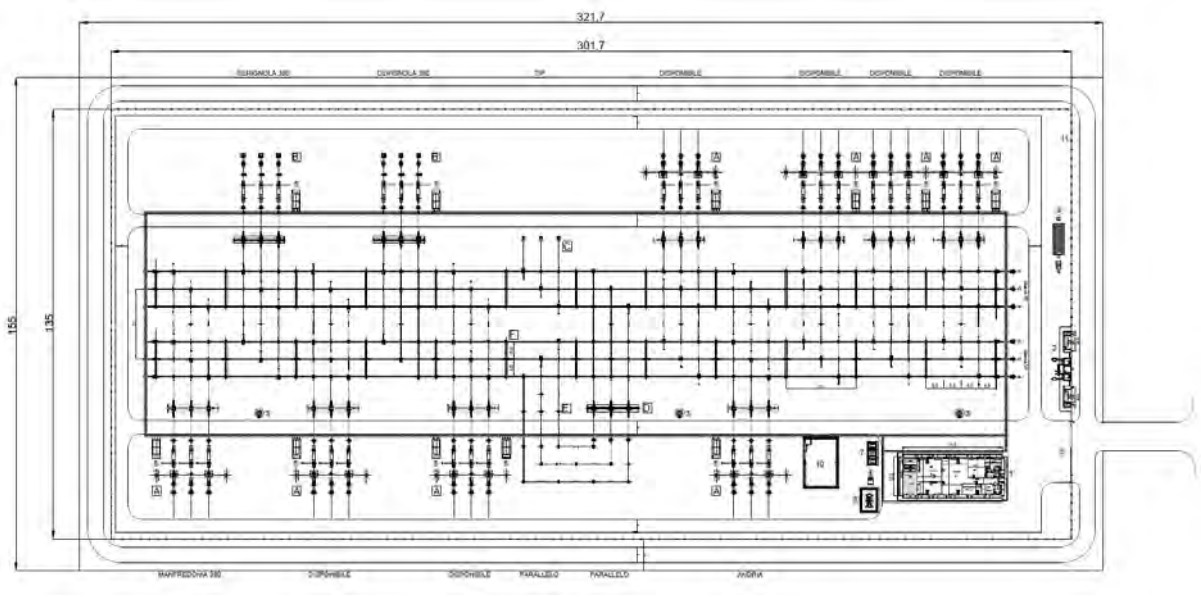
The update of the layout of the connection works is an integral part of the newly issued design package drawn up in June 2025, the new connection system and the environmental and visual mitigation systems of the project are modified and integrated accordingly.

3.8.5.1 380 kV Switching Station

The new RTN 380kV electrical sorting substation will, as anticipated, be connected to the existing 380 kV "Manfredonia 380 – Andria" line by means of simple circuit connections and connected by underground cable to the SE RTN 380kV "Cerignola 380" under construction.
The new station will therefore be composed, for both solutions, of a single 380 kV section, of the TERNA unified type with air insulation and with the following configuration:

- N. 1 double busbar system;
- N. 2 cable line stalls for SE RTN 380 kV "Cerignola 380" connection;
- N. 2 stalls parallel to the barriers;
- N. 1 TIP stall;
- N.2 fully equipped stalls for the entrance – exits on the existing 380 kV power line "Manfredonia 380 – Andria";
- N. 6 line stalls for RES initiatives.

Each line upright (or "line stall") will be equipped with vertical busbar disconnectors, line inlet arresters, barrier coils, SF6 switch, horizontal line disconnector with earth, TV and CT blades for protections and measurements.
The parallel busbar upright will be equipped with vertical busbar disconnectors, SF6 and CT switch for protection and measurements.
The new overhead connections will be located on portals with a useful height of the conductors equal to 21 m, the maximum height of the other parts of the system (380 kV busbars) will be 11.80 m. while the new underground cable connections will be located on the cable terminals with a useful height of 7.30 m.



Electromechanical SE sorting plan 380 kV

3.8.5.2 Auxiliary Services

The Auxiliary Services of the electrical substation will be designed and built with reference to the current standards of the TERNA HV electrical substations. They will be powered by two 400 Vac low voltage lines derived from MV/LV transformers, connected to the local MV network and/or by inductive power transformers (TIP) derived from the 380 kV section busbars. The MV power supply from the local network will be taken from a special room where the delivery of the Distributor will take place. This room, to facilitate access to the Distributor, will be placed in a position that facilitates entry from outside the station. In the

event of a simultaneous power failure on both MV lines, an emergency generator will be activated to support the station HS to ensure continuity of service. The fundamental utilities such as protections, switch and disconnector controls, signals, etc., will be powered by direct current at 110 Vdc through batteries held in buffer by rectifiers.

3.8.5.3 Ground network

The station's ground network will affect the fenced area of the plant. The plant earth rod and its connections to the equipment will be made according to the TERNA standardization for 380 kV stations and therefore thermally sized for a fault current of 63 kA for 0.5 sec. The earth rod will consist of a mesh made of 63 mm copper rope^2 buried at a depth of about 0.7 m composed of regular meshes of suitable sides. The side of the mesh will be chosen in such a way as to limit the step and contact voltages to non-hazardous values, in accordance with the provisions of the CEI EN 50522 and CEI EN 61936-1 standards.
In the points subjected to a greater potential gradient, the mesh sizes will be suitably thickened, as well as the meshes in the equipment area will be thickened to limit electromagnetic compatibility problems. All equipment will be connected to the earth rod by means of two or four copper cords with a section of 125 mm^2.
In order to contain the gradients near the edges of the earthing system, the peripheral meshes will have suitably reduced dimensions and rounded edges. The reinforcing rods of the reinforced concrete of the foundations, as well as the metal structural elements will be connected to the ground mesh of the station.

3.8.5.4 Substation buildings

The construction of the following buildings is planned in the Electrical Substation:

3.8.5.4.1 Integrated Building Commands and Auxiliary Services

The integrated Commands and Auxiliary Services building will consist of a rectangular building, with plan dimensions of about 31.50 x 12.20 m and height above ground of about 4.65 m. The area occupied will be about 385 m^2 with a volume of about 1,787 m^3.
The building contains the station's command and control panels, teleoperation equipment and carriers, offices and toilets for maintenance personnel, as well as a storage room.
In addition, it will house the batteries, the MV and LV panels in DC and AC for powering the auxiliary services and the emergency generator.
The construction will be of the prefabricated type (load-bearing structure consisting of prefabricated reinforced concrete pillars, prefabricated reinforced concrete infill panels, external finishing with quartz plasters) or, where this is not possible, of the traditional type with a reinforced concrete structure and brick masonry infills covered with civil plaster. The flat roof roof will be suitably insulated and waterproofed. The fixtures will be made of natural anodized aluminum. Particular care will be taken for the purposes of thermal insulation by using insulating materials suitable for the climatic zone and the minimum and maximum values of the global volume coefficients of heat loss, in compliance with the rules set out in Law No. 90 of 2013 and subsequent updates and implementing regulations.

3.8.5.4.2 Warehouse Building

The Warehouse building will consist of a rectangular building, with plan dimensions of about 16 x 11 m and height above ground of about 6.50 m. The area occupied will be about 176 m^2 with a volume of about 1150 m^3. In the warehouse, spare equipment and equipment, even of considerable size, will be kept in good condition. The construction will be of the same type as the integrated command and S.A. building.

3.8.5.4.3 MV Delivery Point Building

The MV delivery point will be intended to house the switchboards containing the General Devices and the line arrival switchboards and where the two medium-voltage power supply lines of the station's auxiliary services and the deliveries of the telecommunications systems will be located. It is planned to build a building consisting of three prefabricated buildings with the plan dimensions of:

- MT1 delivery cabin with dimensions 6.7 x 2.5 m with a height of 2.7 m (for a total volume of about 45 m3) consisting of n. 2 compartments. The first serves the Distributor for the delivery of the first MV power supply and the second as a meter compartment;
- TERNA delivery point cabin with dimensions 7.58 x 2.5 m with a height of 3.2 m (for a total volume of about 60 m3) consisting of 3 rooms. Two of them will contain the MV cells of the General Devices for MV power supplies, in the other compartment the delivery point of the telecommunications services (TLC) necessary for the remote management of the Station will be set up;
- MT2 delivery cabin approximately 6.7 x 2.5 m with a height of 2.7 m similarly to the MT1 delivery cabin for the delivery of any second MV power supply.

The rooms of the delivery points will be equipped with shatterproof fiberglass doors opening outwards with respect to the electrical substation as regards access to electricity and TLC service providers.

3.8.5.5 380 kV overhead connections to the "Andria - Manfredonia" line

As regards the NTG line connections, the consistency of the new overhead lines to be built and the sections of existing overhead line to be demolished is shown below:

- RTN connection "Manfredonia – Andria" line towards Manfredonia: 762 m overhead line to be built;
- RTN link "Manfredonia – Andria" line towards Andria: 616 m overhead line to be built;
- demolition of the "Manfredonia – Andria" overhead line along a stretch of 657 m.

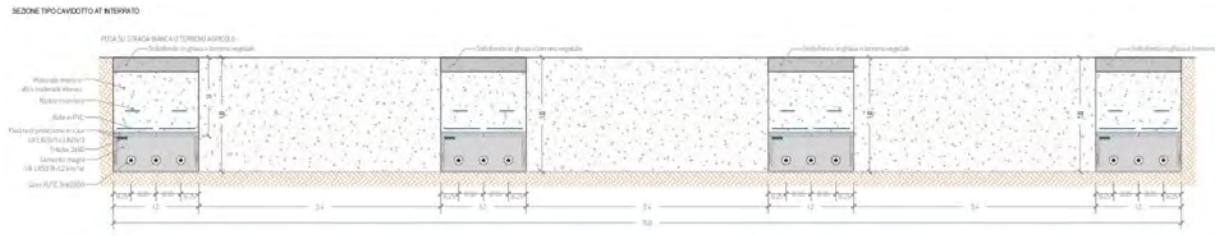
The construction of 1,500 m and the demolition of 390 m of overhead power lines are therefore planned.
The project essentially involves the insertion of 2 new pylons and a further 2 new pylons, all of the 380 kV series, in the area overlooking the existing power line. By opening the section on the 380 kV power line under consideration, we will allow the new inlet-exit connections of the 380 kV series to be supplied in a simple circuit, which will be located at the portals of the new 380 marshalling station. The pylons used (380 kV series with single triad) for the construction of the modest variant to the existing power line are completely similar to the truncated pyramidal truss type pylons currently installed, with useful heights in line with the orographic and altimetric trend of the land.

Overhead connections to the 380 kV RTN line "Andria – Manfredonia"

3.8.5.6 The RTN connection works - underground connection to the SE 380/150 kV "Cerignola"

For the AAT cable connection between the 380 kV SE and the "Cerignola 380" Electrical Transformer Substation, it is planned to lay four sets of 380 kV AAT single-core cables arranged in trefoils flat in excavations of adequate section that will run along the existing inter-farm road network for a length of about 2.7 kilometers.

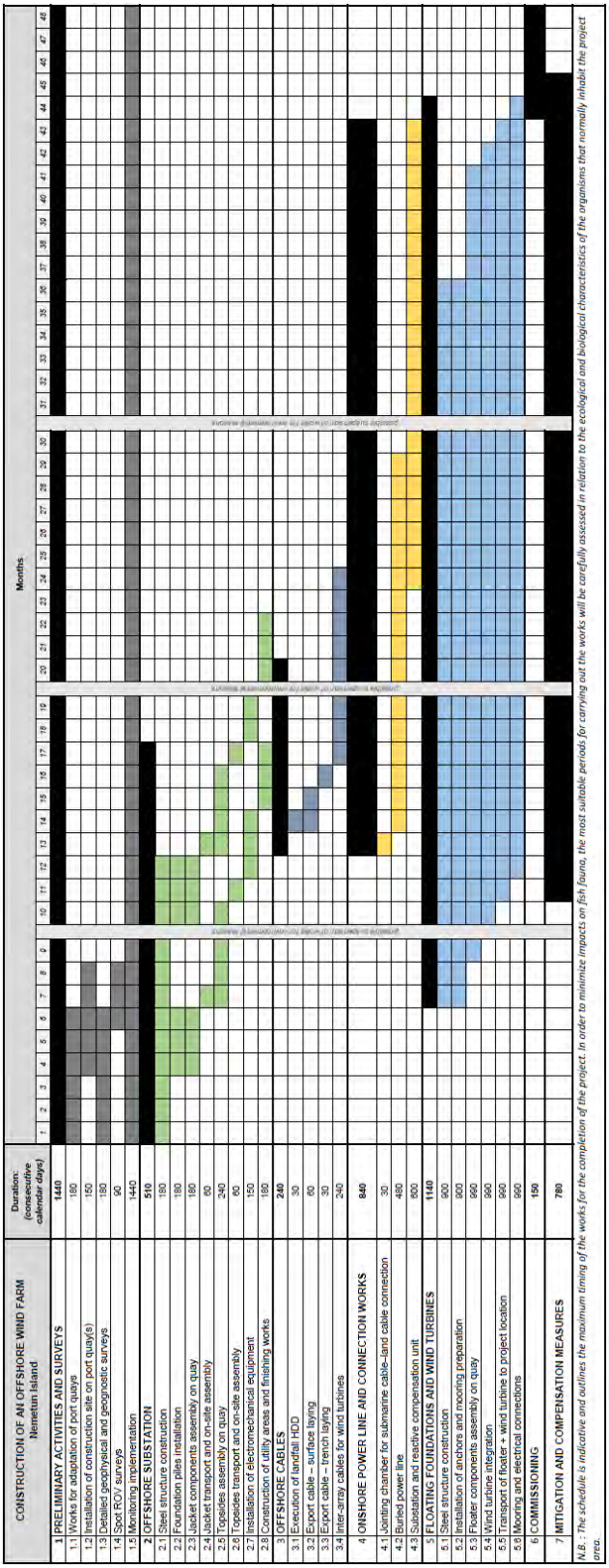
The cable connection between the new SE RTN 380 kV for sorting with the SE RTN "Cerignola 380" will take place through four triads of 380 kV single-core copper AAT cables buried and laid flat in special excavations of adequate section. The cables will start from two cable exit line stalls in the 380 kV Switching Station planned and will be located on the two new cable exit line stalls mentioned above, within the transformation SE of the "Cerignola 380" NTG.



The underground connection to the SE Cerignola plan and section

3.9 DESCRIPTION OF THE CONSTRUCTION PHASES

The construction of the Nemetun Island plant is expected to take a total of 48 months. With reference to the timetable of the works (see *R.8.1_01*), macro-operations and timing can be schematized as shown in the following graph:



Timeline of macro site operations

Preliminary activities and investigations, partially already carried out in the final project, will have timing at the same time as the entire execution of the construction site and will make it possible to monitor "during construction" various environmental and physical aspects of the site, in order to draw up and possibly perfect the executive project even during the performance of the actual construction site activities.

The second planned activity consists in the construction of the "hardware" part of the marine substation. This will allow the activity of *Pre-commissioning* and to prepare the area to accommodate the floating structures and wind turbines.

The third macro-activity consists of laying offshore cables, this activity is also preliminary and prodromal to the installation of production equipment.

The fourth phase reported is the onshore construction connection works, scheduled with a timing at the same time as the laying of the marine cables.

The fifth phase sees the assembly and launch of the production facilities, partially simultaneous with the other phases mentioned, this activity will be carried out far from the installation site in specially chosen and used port facilities, as better specified in the following chapter.

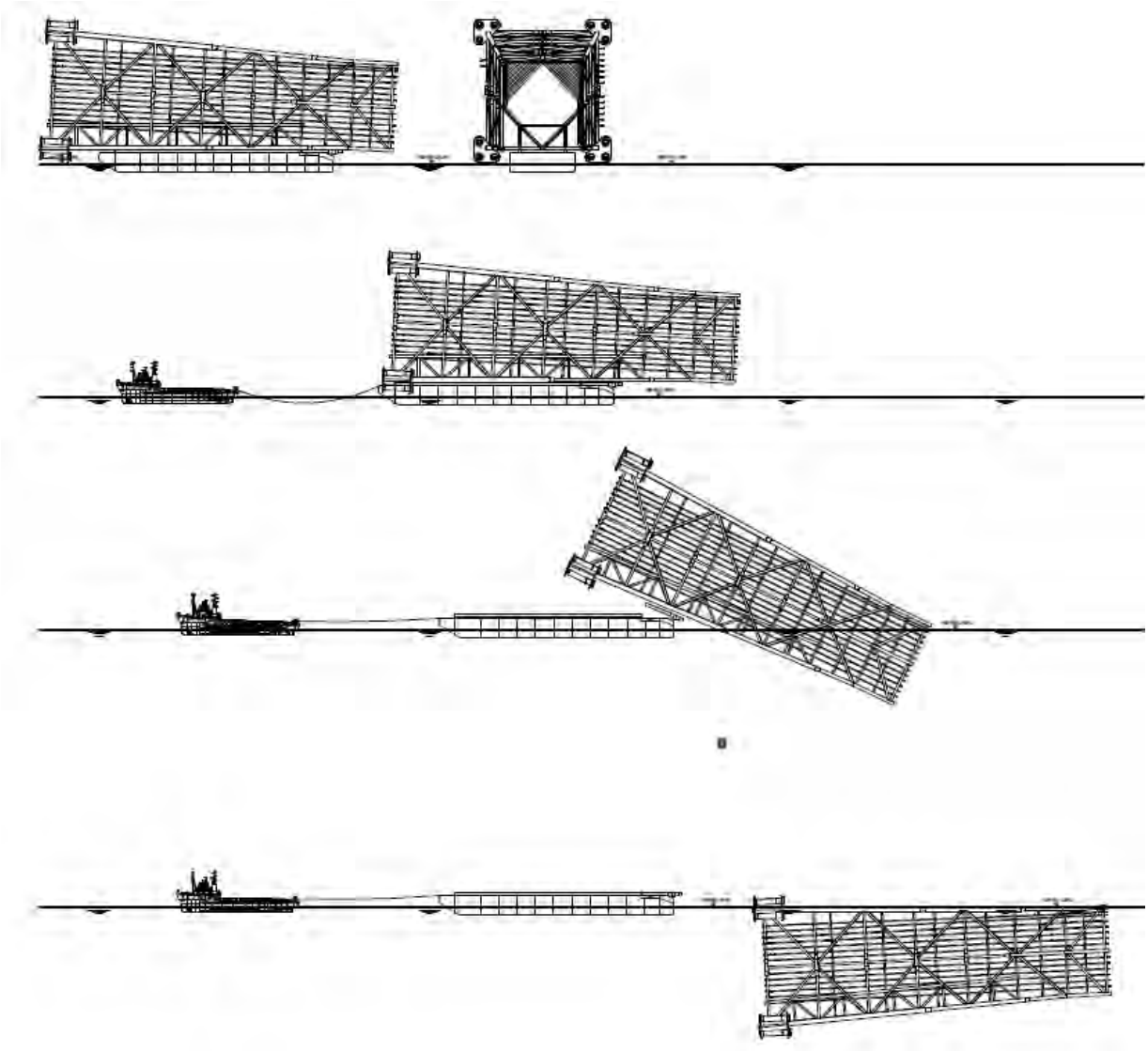
In terms of resources used, the assembly phase is the most demanding construction site activity among those envisaged.

The sixth and final phase consists of commissioning, i.e. synthetically in the connection and "*the ignition"* of the "software" equipment of the Nemetun Island wind farm and in the *starting* clean energy production activity.

All implementation phases are briefly described below; for further details, reference should be made to Section 7_Construction, Maintenance and Decommissioning of the final project design.

3.10 CONSTRUCTION OF THE OFFSHORE SUBSTATION

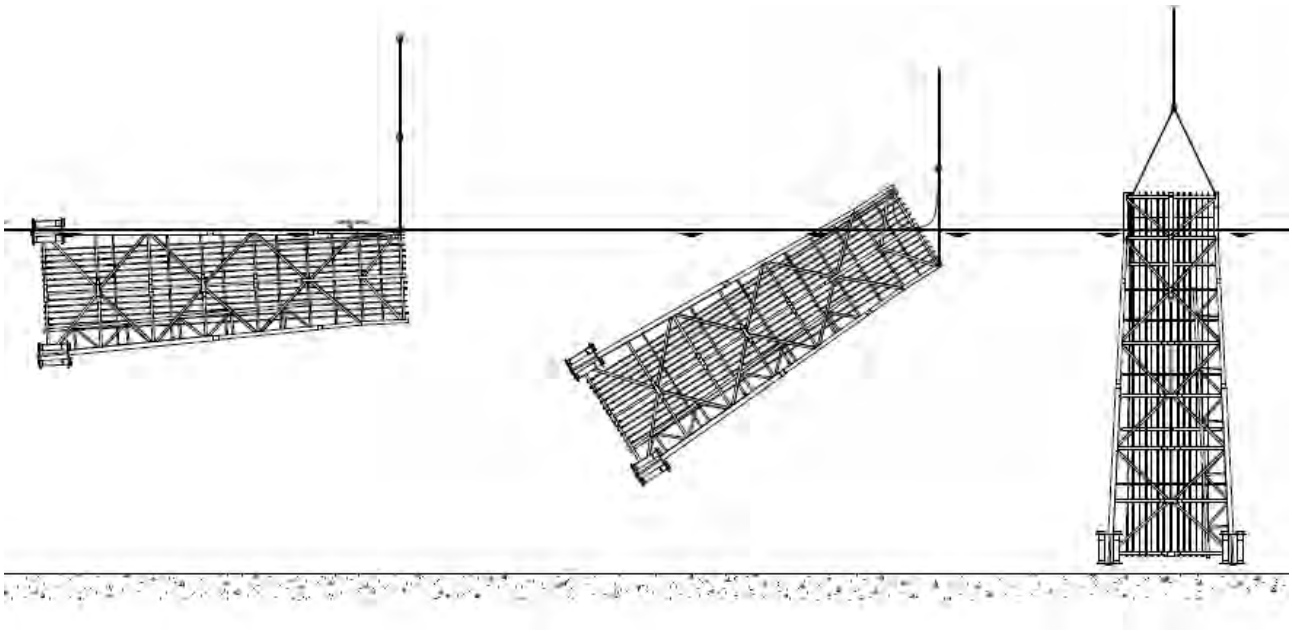
Before starting the installation of the Jacket, a thorough inspection of the bottom will be carried out in the installation area in order to identify any obstacles to be removed and check that the bottom is even. Given the depth, the inspection can be carried out by ROV (Remote Operated Vehicle).
Transport from the construction site to the installation site will take place by loading the Jackets onto transport barges of adequate capacity, equipped with runways and launching barges. The Jackets will be built and transported horizontally.
The buoyancy of the Jacket from the transport position on the barge is carried out by launching the Jacket from the barge itself: near the installation site, the barge is ballasted in order to lower the stern, then the Jacket begins to move towards the stern using the barge pull or thrust system until the critical value of the longitudinal heel angle is reached, after which the Jacket begins to slide without the need for external pulling or pushing systems until the center of gravity exceeds the hinge of the sling bar and the sling bar rotates together with the Jacket which submerges in the water and separates from the barge remaining balanced in the free floating position.



Jacket launch sequence

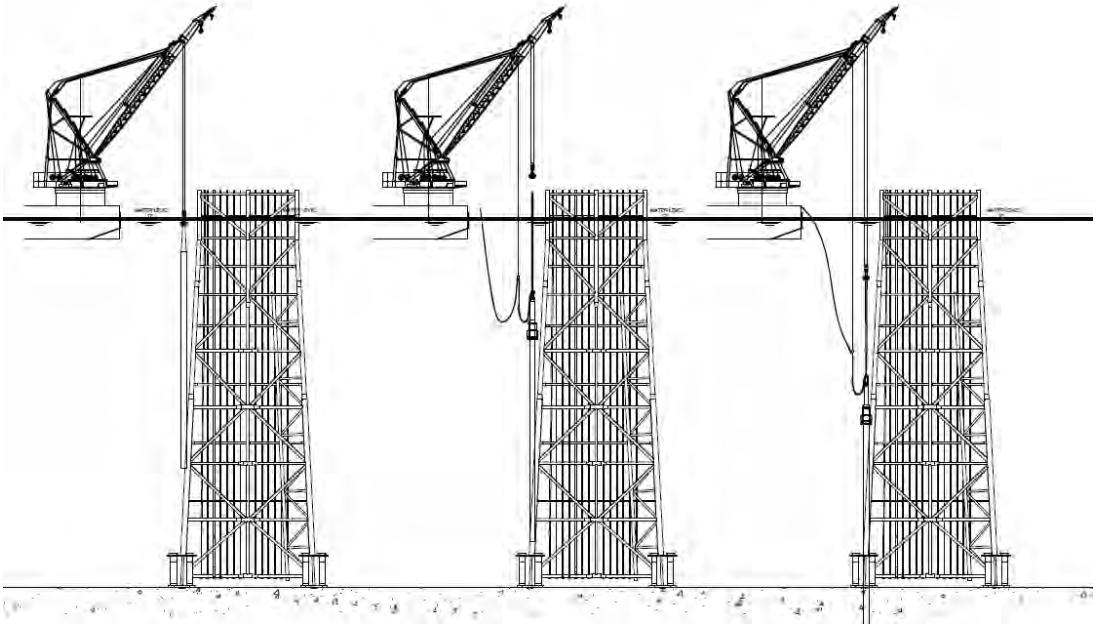
The verticalization of the Jacket in the water is obtained by operating with a crane and at the same time flooding some compartments in the lower part of the Jacket. At the end of this operation, the weight of the

jackets is completely unloaded on the bottom and remains in balance supported by the temporary foundation plates (mud-mats).



Sequence of Upending and Installation on the Seabed

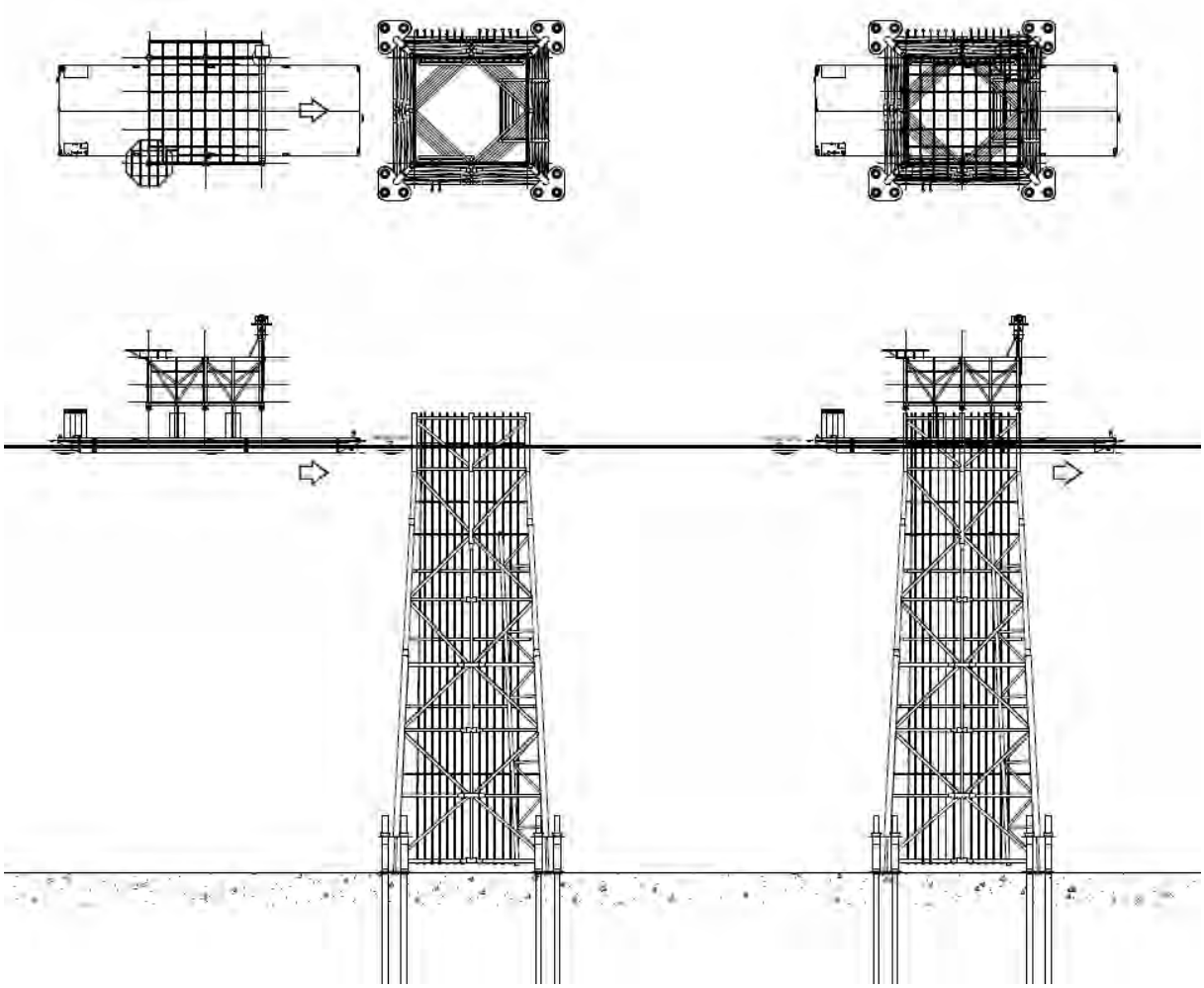
The platform foundations consist of eight or twelve piles ranging from 2 m to 2.5 m in diameter.
The eight piles will be driven into the ground up to the project penetration, equal to about 100 m.
The poles will be prefabricated in one piece and transported to the installation site on a special barge, or on the same barge on which the jacket will be transported. The installation of the pile can be carried out by pile driver or drilling of the housing hole, depending on the results of direct investigations.



Pile installation sequence

Topsides are installed by floatover the substructure. Floatover consists of transporting the pre-assembled topsides to the installation site on a standard cargo barge and placing the Topsides directly on top of the Jacket by fitting the cargo barge inside. To allow this operation, the upper part of the North and South rows of the Jacket structure is open (Jacket slot). Once in position, the boat is kept stationary and, acting on its

ballasting system, the superstructure is gradually lowered by progressively transferring the load from the boat to the substructure and implementing the coupling between the legs of the relative structures (mating). A steel lattice structure called a Deck Support Frame (DSF) is used to support the Topsides during floatover installation.

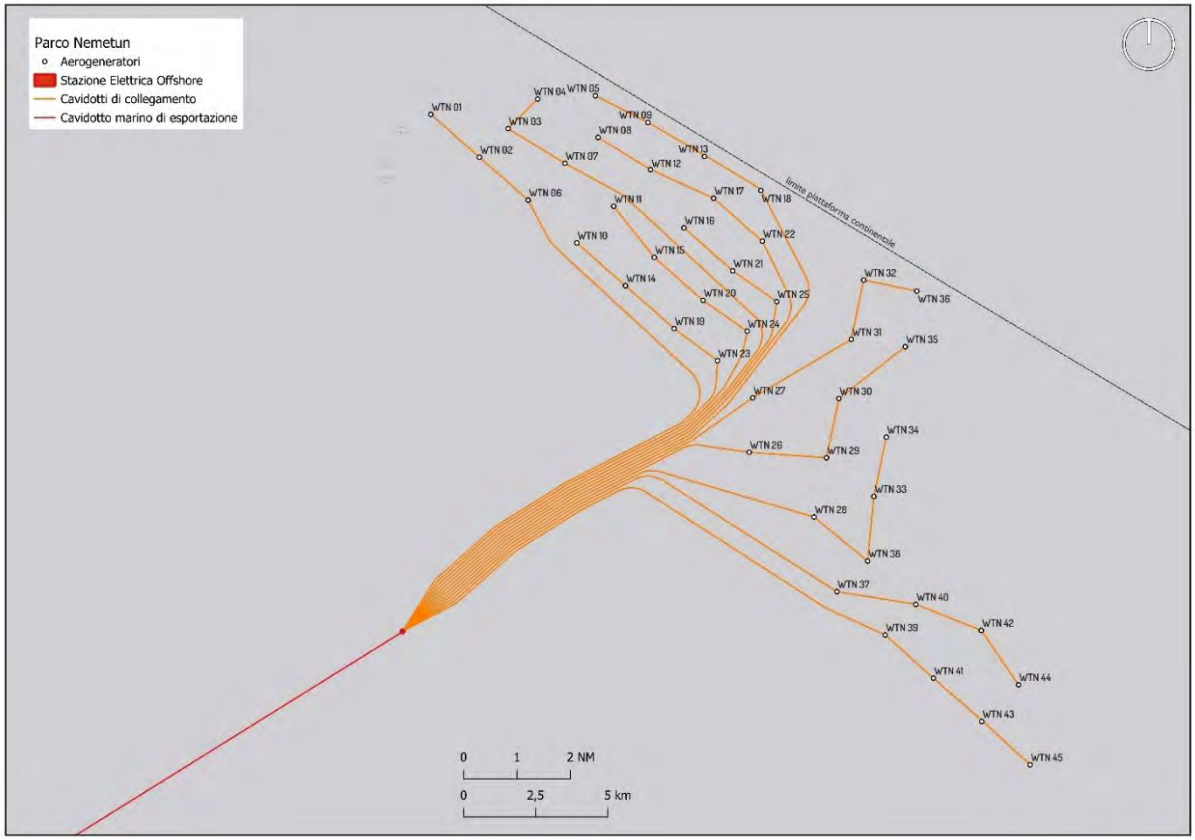


Topsides Installation Sequence – Cargo Barge Entry into the Jacket

3.11 CONSTRUCTION OF OFFSHORE CABLE DUCTS

Offshore cable ducts consist of the connection cables (66 kV) between the wind turbines and the offshore substation and from the marine cable duct for the transport of the energy produced and the connection (via ground section) to the NTG network.

The route of the interconnection cables between the production facilities and the offshore collection substations can be schematized as shown in the figure:



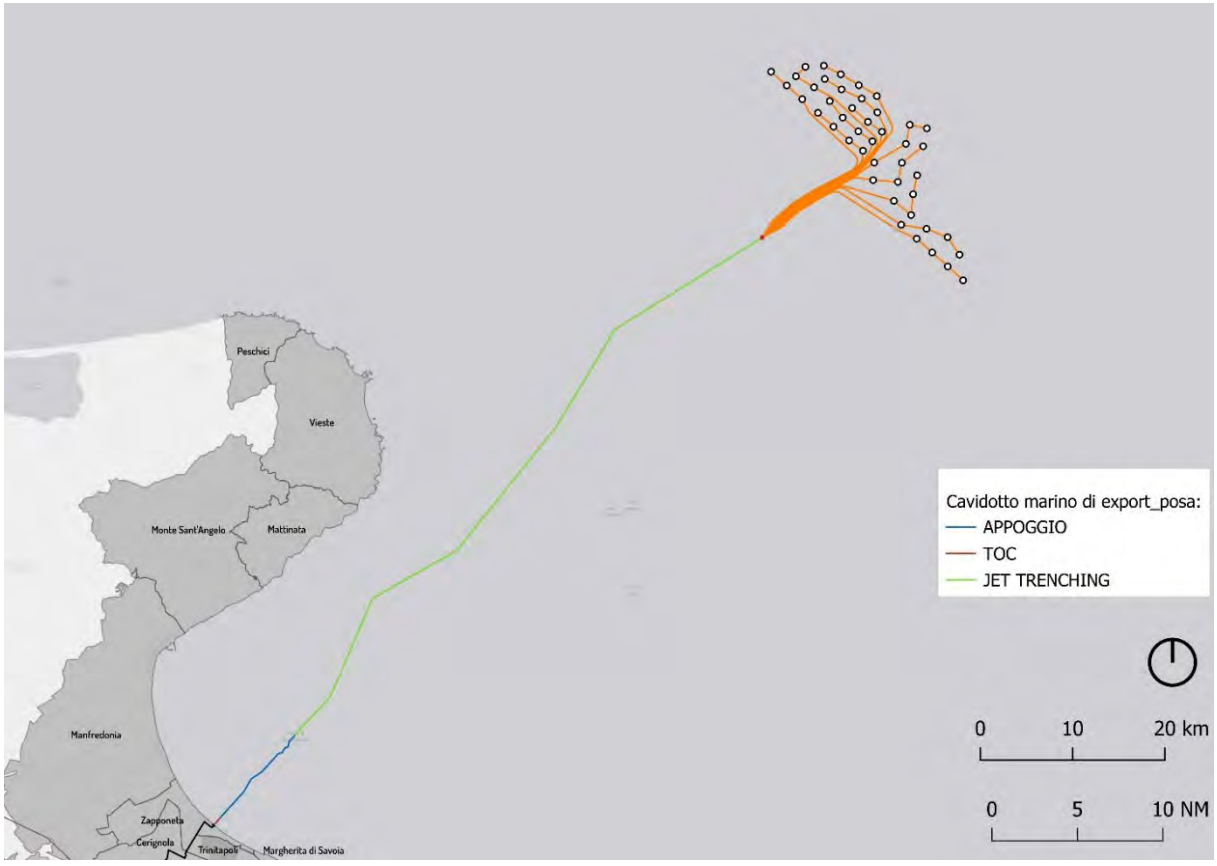
Route of the connecting cable ducts

With reference to the paragraph on biocoenosis and the environmental studies conducted, based on the specificities of the seabed, the route of the connecting marine cable duct can be divided into three parts:

- Near the landing point, the cable will be laid in the seabed for about 880 m (for a total of 1000 m, including the land side) and up to a minimum bathymetry of 8 m by means of the Horizontal Directional Drilling (HDD) technique. This technique will allow to cross the habitat MB5.534 - Superficial muddy sands in sheltered waters with Cymodocea nodosa, detected during the geophysical surveys, and the defense works present on the coast, thus reaching the transition joints without excavating the coastline and preserving the habitat of conservation interest;
- The second interfering section of the cable duct of about 12.5 km in length (6.7 NM), where geophysical investigations have identified the presence of rocky sub-outcrops covered by a significant layer of sandy-muddy sediment (habitat MB5.5 – Mediterranean infralittoral sand); habitat MB1.51 - Mediterranean infralittoral rock with infralittoral algae; coralligenous bioconstructions (habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*), the cable duct will be laid by means of a simple **Mechanical support and protection with cast iron shells**. This laying method offers a certain flexibility to the cable even after the protection has been applied and prevents contact with

the habitats present, ensuring the best possible protection. In addition, the metal material provides an optimal substrate for the growth and proliferation of hard-bottom biocoenoses. The 12.5 km of laying also includes a buffer of about 1 km of cable duct that continues beyond the habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*, where jet trenching will then begin

- For the stretch that goes from bathymetric height (-17 meters) to the offshore electrical substation, along a path of 76 kilometers (equivalent to approximately 41 NM), the characterization of the seabed reveals the following habitats: MC5.5 - Mediterranean circalittoral sand, MC6.51 - Coastal terrigenous muds, MD6.5 - Mediterranean offshore circalittoral mud, therefore, the cable duct will be installed in the trench using the technique known as Jet Trenching. These drag-driven trenching systems employ a plough specially designed to adapt to different types of soil and laying depths. The excavation takes place thanks to the pulling action exerted on the plough by a tow boat, which provides the necessary pulling force. The plough is equipped with water jets that liquefy the seabed, creating the trench, laying the cable duct and at the same time closing the trench.



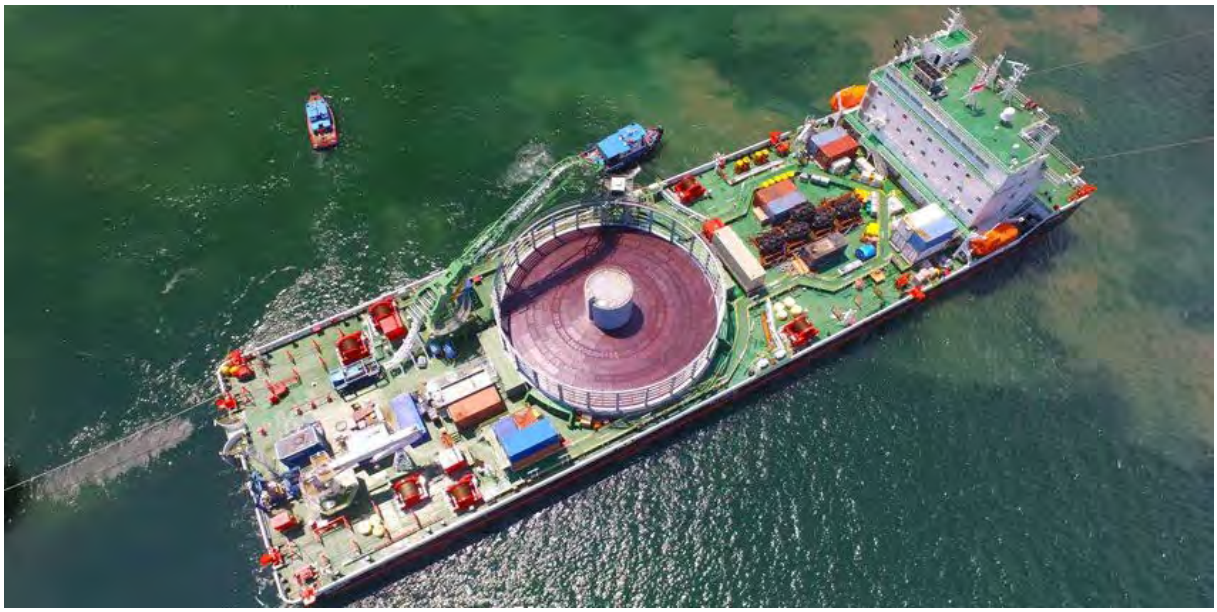
Export cable duct laying systems – general framework

The installation of the submarine electrical cables will take place with dedicated ships for the laying of marine cables that unwind the cable on the seabed with the assistance of other vessels. Preliminary biocenotic and geophysical reconnaissance activities were carried out and, based on the results of these investigations, the methods of laying and protecting the electrical cables were defined.

The ship will be equipped with all the equipment necessary for handling and controlling the cables both during the cable boarding phases and during the laying. All operations will be carried out in close collaboration with the port authorities in order to coordinate the works in the areas subject to the circulation of vessels.

The installation of the cable protection will take place with appropriate means depending on the type of protection chosen and can be carried out simultaneously with the laying of the cable or at a later time.

In the onshore section, the cables will be laid in trenches dug on public roads and to a lesser extent on agricultural land. Some sections will be built by Horizontal Directional Drilling (HDD) to manage interference with constraints, underground utilities or other pre-existing linear works.



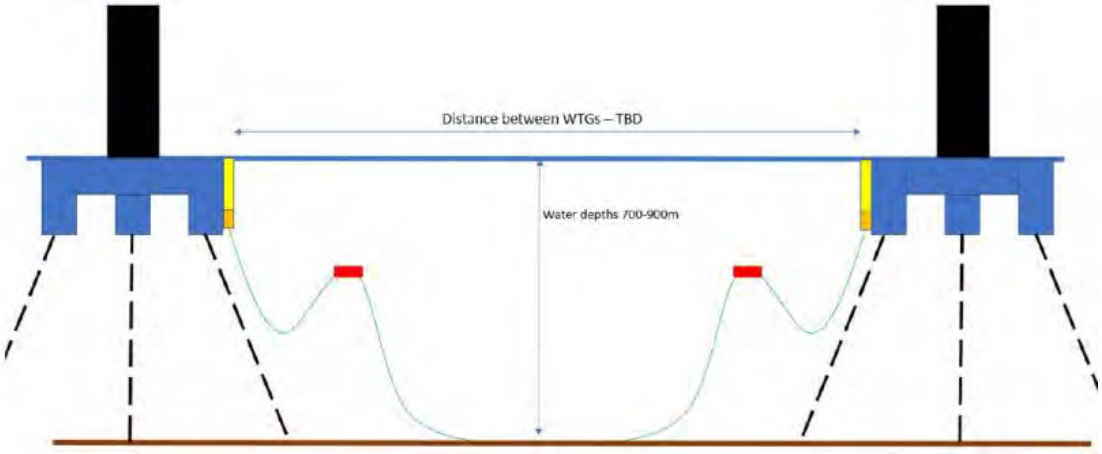
Cable-Laying Vessel

3.11.1 THE CONNECTIONS BETWEEN THE WIND TURBINES AND THE OFFSHORE ELECTRIC STATION

For the path of the dynamic cable in the sections between the platform and the point of arrival on the seabed (touchdown point), the lazy wave configuration will be adopted by installing floating modules along specific sections of the cable: it has been shown that the performance of the "lazy wave" is superior to that of the more classic catenary shape in compensating for the movement of the floating foundation and reducing, therefore, the maximum damage cycles due to tension and fatigue.

The cable runs between two touchdown points can simply be placed on the seabed or laid in the trench. In the first case, if necessary to ensure the level of stabilization or mechanical protection required at the touchdown point or along the section, the cables may be covered with cementitious aggregates (e.g. concrete mattresses) or boulders (rockdumping), following the procedures defined for the marine conveyance cable duct discussed in the following paragraphs.

Launching a lazy wave cable section



P"Lazy Wave" dynamic cables made by means of floats

The transition between the dynamic and static sections of the export cable can also be managed by means of a flexible coupling, pre-assembled at the factory. In addition, a technical solution based on a rigid joint will be provided to address any repair needs during the construction and operation phases of the project.

Example of a pre-assembled flexible joint

3.11.2 LAYING OF THE MARINE CABLE DUCT IN THE TRENCH SECTION

In the deepest stretch of sea and without significant habitats, the marine cable will be protected by silting up at an approximate depth of 2 m using a water jet machine, this type of laying called *"trenching"* or *"jet trenching"*.

The use of a special bottom machine is envisaged, The sea plough, towed by a ship equipped with all the necessary equipment for handling and controlling the cables both during the cable boarding phases and during installation. The processing will take place as schematically represented in the following image:

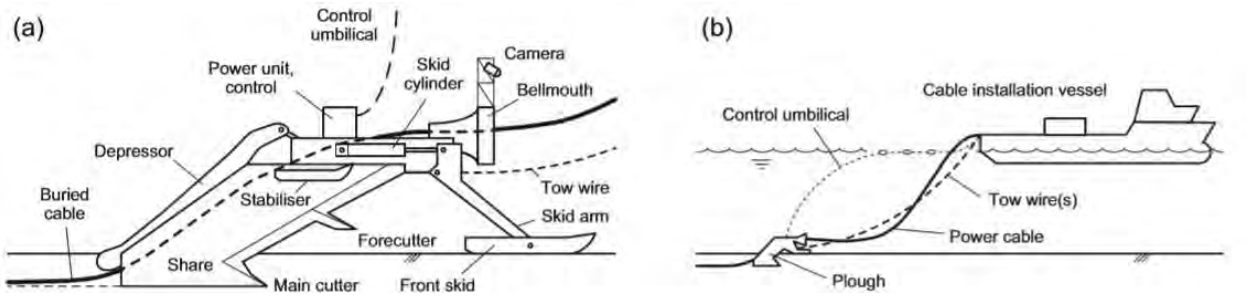
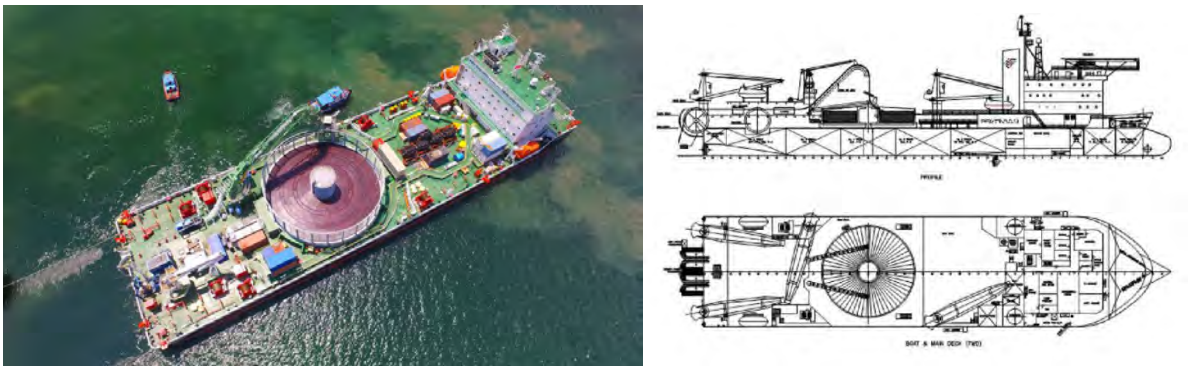


Diagram of cable laying with technology Jet TRenching Non-displacement

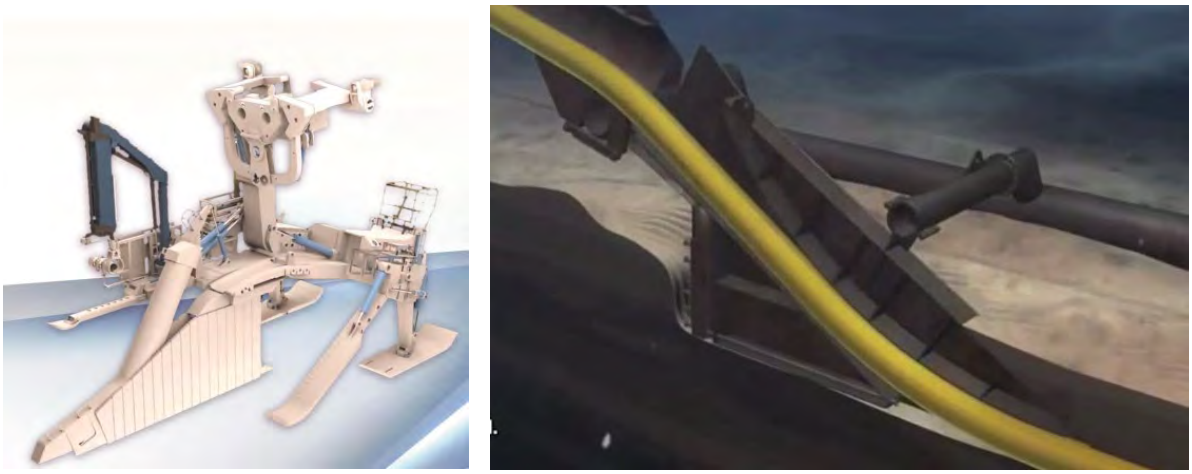
The water jet machine fluidizes the material of the seabed through the use of pressurized water, which is also used for its propulsion.

The machine is placed astride the cable to be buried and fluidizes the material of the bottom creating a trench within which the cable is laid, the plough itself closes the excavation, covering the cable with the same material moved, then the sea currents contribute in a natural way to reconstruct the morphology of the bottom. Due to the simultaneity between the laying and burying of the cable, this technique is called "non-displacement" Jet Trenching: it is a technique suitable for seabeds characterized by fine sediments. For environmental purposes, it should be noted that no fluids other than water are used in the processing.

The processing does not require any movement of the cable on the bottom. The operation can be interrupted at any point along the route and possibly resumed at a later point. It is envisaged, for the entire route of the installation in *jet trenching* a processing time of about 78 hours, to be carried out with minimal interruptions and organized temporally over a period of one week. All operations will be carried out in close collaboration with the port authorities in order to coordinate the works in the areas subject to the circulation of vessels.



Cable-laying vessel



Sea plough and diagram of the excavation trench

The width of the trench in which the cable is laid and protected is slightly greater than the diameter of the cable itself, minimizing the impact of operations on the seabed and the dispersion of sediment into the surrounding environment.

The waterjet machine *"jet trenching"* allows:

- a modest impact on the environment and living organisms, limited only to the period of the works;
- the natural recolonization of the installation area after the works;
- No impact after laying.

3.11.3 LAYING OF THE MARINE CABLE CONDUIT

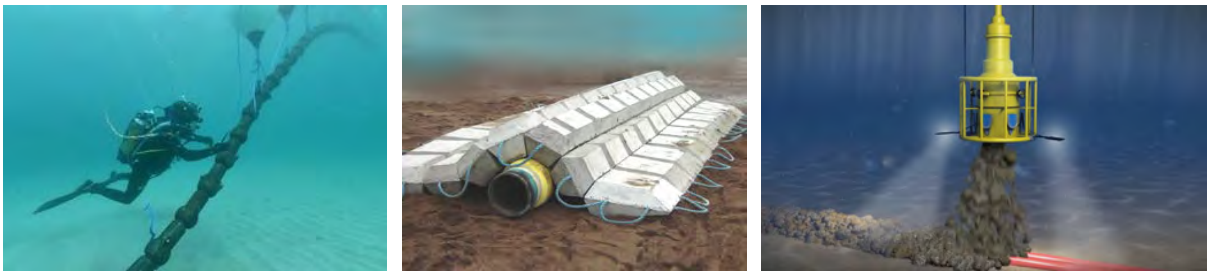
It was decided to build the section of offshore cable duct from a depth of 7 m up to about 17 m, for a distance of 12,5 km (6,7 NM) with resting (without excavation) on the seabed. This laying method appeared to be the most suitable for crossing an area characterised by the presence of valuable sites and habitats (SPA "Aloisa-Carapelle" and habitats MB1.51 - Mediterranean infralittoral rock with infralittoral algae, MB5.5 - Mediterranean infralittoral sand covering some rocky sub-outcrops detected during geophysical surveys

and MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*) and because it is considered the least invasive.

However, the laying of cables resting on the seabed requires the adoption of external mechanical protection systems of the cable from damage caused by human activity (fishing equipment and anchors) and the action of the sea. The presence of a mechanical protection of the cable appears particularly relevant also in consideration of the bathymetry of the area.

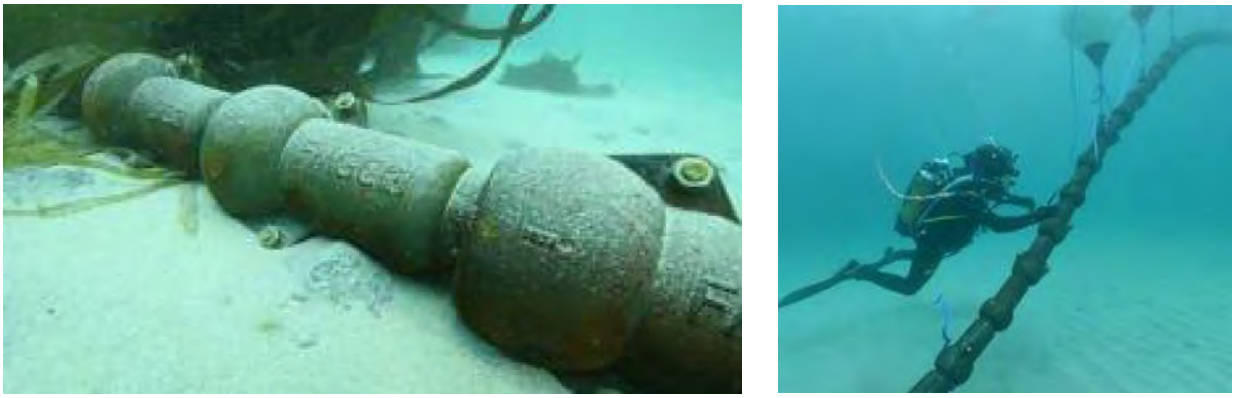
Different cable protection systems are available that also guarantee the necessary ballast to the cable:

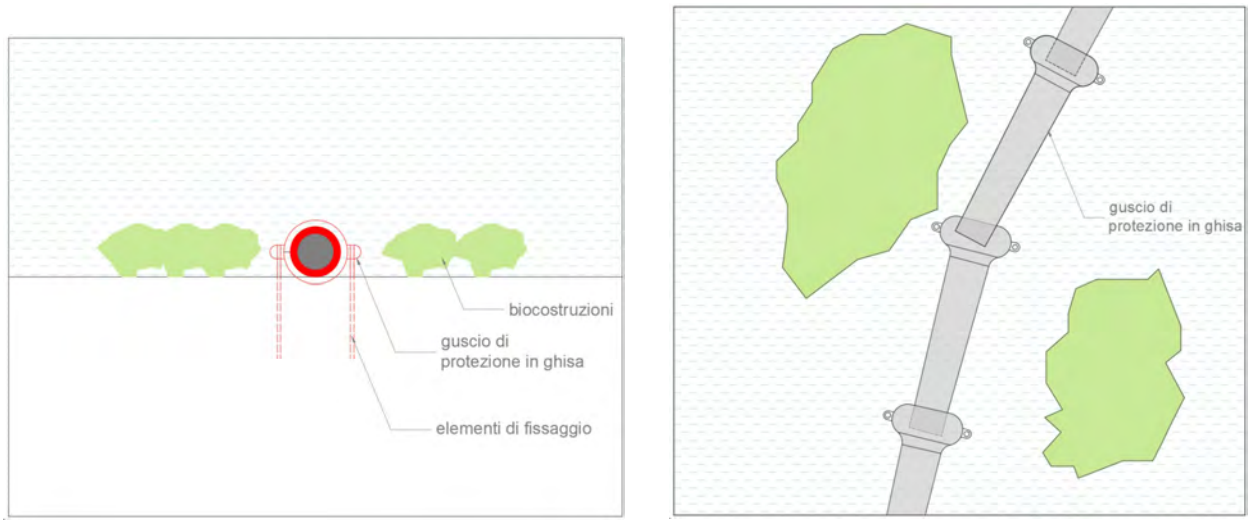
- cast iron shells: it consists of applying cast iron shells directly on the cable on board the ship before laying it;
- mattresses: it consists of covering the cable once laid with mattresses of specific material;
- rocks (rock dumping): consists of covering the cable once laid with natural boulders.



Systems for protecting cables resting on the seabed by means of cast iron shells, mattresses or rocks

Of the three possibilities illustrated **it was decided to use shells made of metal material, normally cast iron**: this solution, particularly suitable for protecting the cable laid on seabeds that have irregular or sharp conformations, has less impact on the ecosystem given the reduced dimensions. This method of laying offers a certain flexibility to the cable even after the protection has been applied and prevents contact with the bio-constructions present, ensuring the best protection. In addition, the metal material provides an optimal substrate for the growth and proliferation of hard-bottom biocoenoses.





Precision installation by simple support

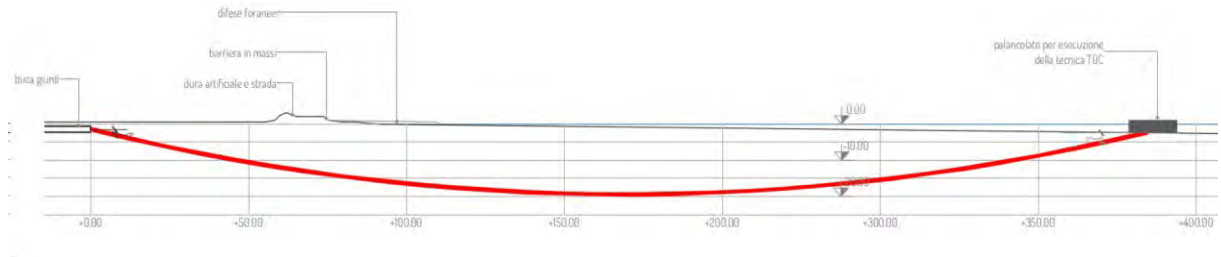
3.11.4 LANDFALL CONSTRUCTION BY HORIZONTAL DIRECTIONAL DRILLING (HDD)

The landfall of the submarine cable will be carried out using the Horizontal Directional Drilling (HDD) technique, with a length of 120 metres onshore and 880 metres offshore beneath the seabed. Geophysical investigations have, in fact, revealed the presence of a prairie of *Cymodocea* MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*) which extends to a depth of 7 meters. This technique was chosen to preserve this valuable biocoenosis.

During the drilling operations, a plastic pipe containing a pull cable will be installed, used to advance the head of the marine cable inside the pipe to the anchor point on land.

The drilling will take place from the position of the land end (joint hole), proceeding with the advance towards the sea. Once they reach the opposite end, the HDPE pipes will be towed in the opposite direction using a dedicated head for anchoring to the machine.

This landing solution through HDD will allow to overcome the coastal defense works and reach the transition joints without the need to carry out excavations along the coastline. In addition, it will protect the marine cable by using a HDPE pipe, positioned at a depth of a few meters below ground level, significantly reducing the risk of interference with the population.

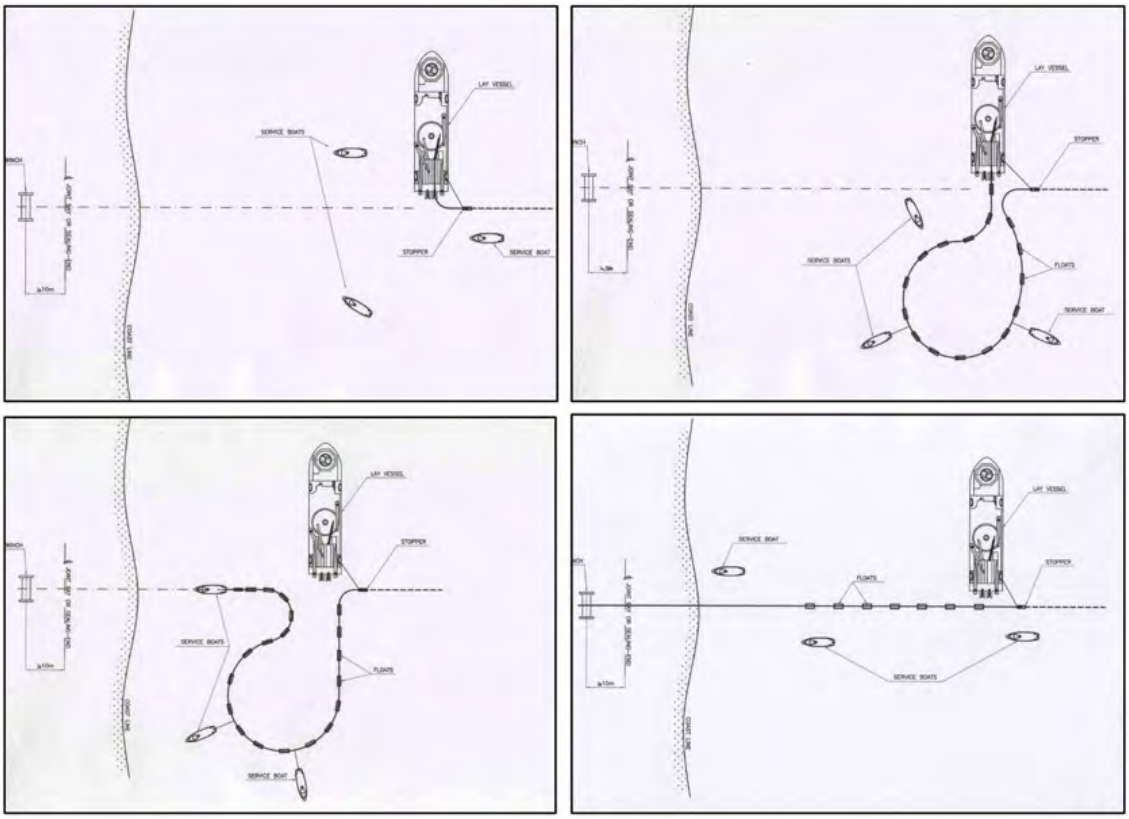


Horizontal Directional Drilling schematic profile

The sea-side end of the section to be carried out with remote-controlled drilling will be temporarily protected with a special sheet metal box, inside which an excavation will be carried out to let the aforementioned ends out while avoiding contact with water, in order to facilitate the laying of the pipes inside the holes and the subsequent laying of the cables. The caisson will be uncovered on the upper side and will have a height of about 1 m above the maximum water level. It will have a width of about 20 m by 15 m deep.

Horizontal Directional Drilling, the basic onshore construction site

For the installation at the arrival landing, it will be possible to proceed by following the technique shown in the following figure, which involves the use of support boats for the main ship to pull the end of the cables ashore, held on the surface by means of floats during the operations.



Cable installation at the landfall point

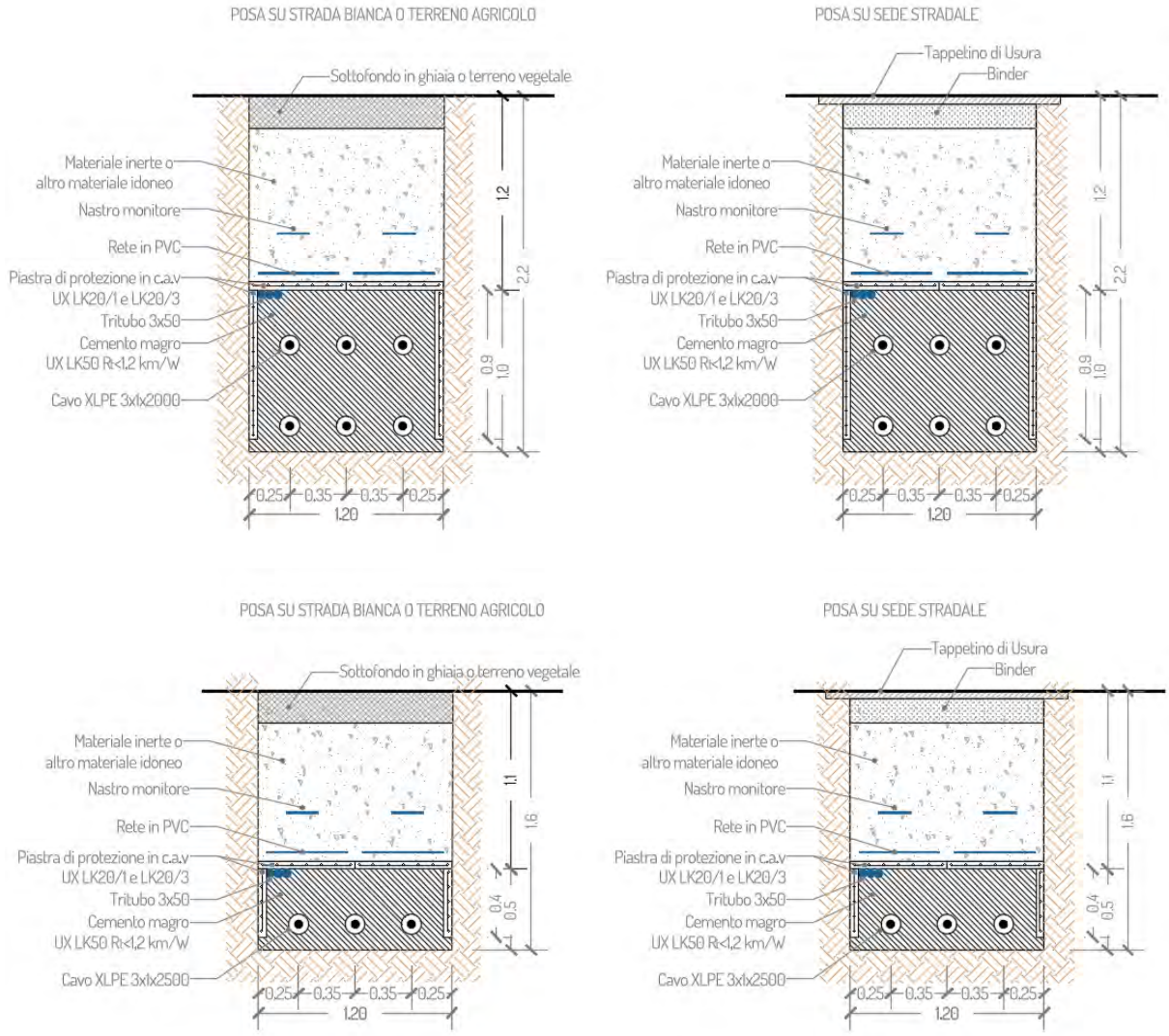
Execution of a marine HDD installation

3.12 CONSTRUCTION OF ONSHORE CABLE DUCTS

The onshore cable conduit consists of:

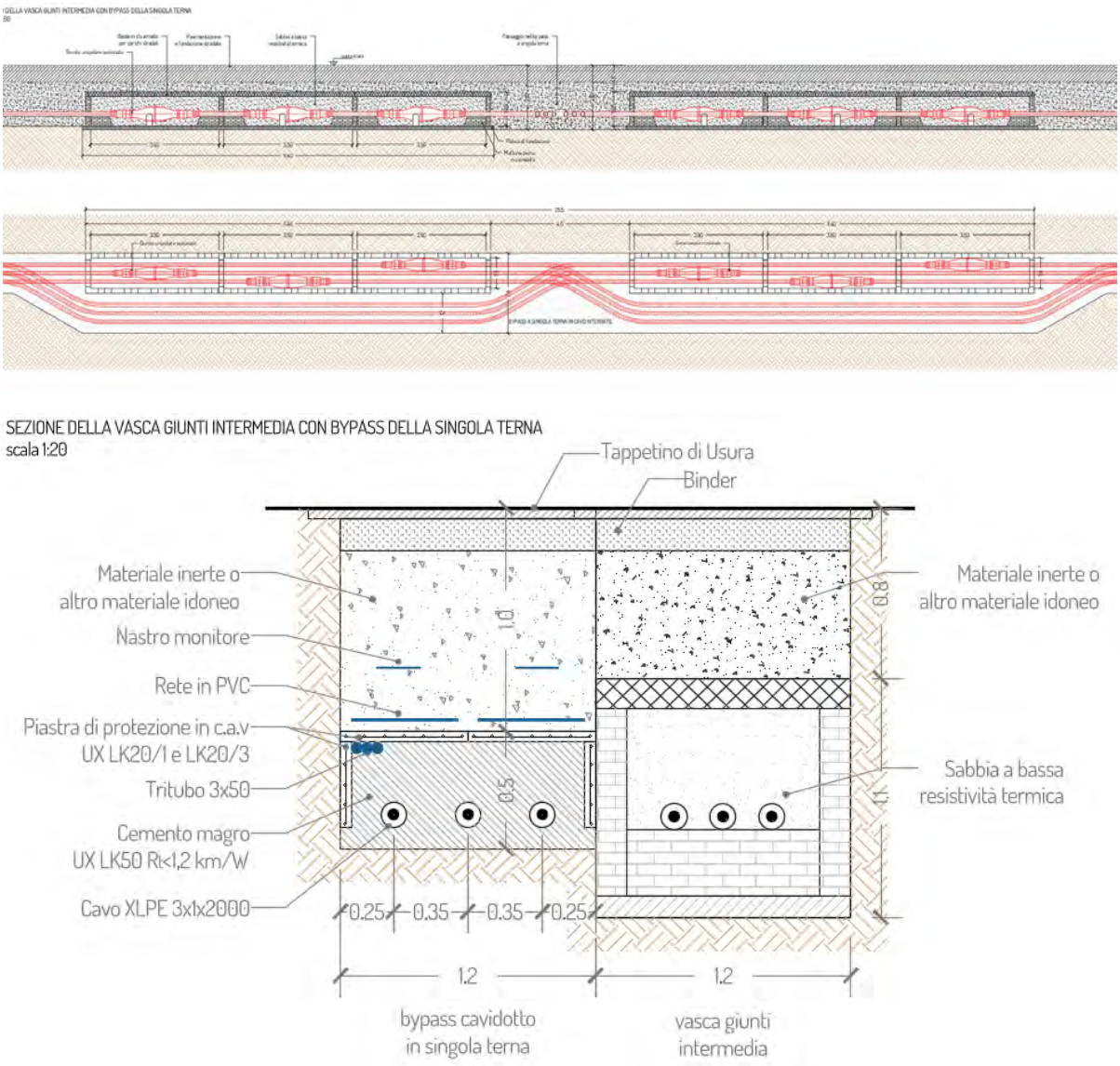
- a first section of marine cable in the section built in HDD between the landing point along the coast line and the land-sea joint hole set back by about 120 m;
- an underground power line consisting of a double circuit of land cables approximately 18 km from the hole to the onshore electrical substation of the user
- an underground transmission line consisting of a 380 kV three-core cable set, about 200 m long, for the connection of the electrical substation to the nearby new Switching Station to be built as an extension to the Cerignola Electrical Substation.

The route of the cable duct will be largely located on existing asphalt roads and partly on agricultural land alongside the transit routes. The cables will be placed flat inside trenches with a narrow section, characterized by a wide Average of 1.35 meters and a maximum depth of 2.2 meters.



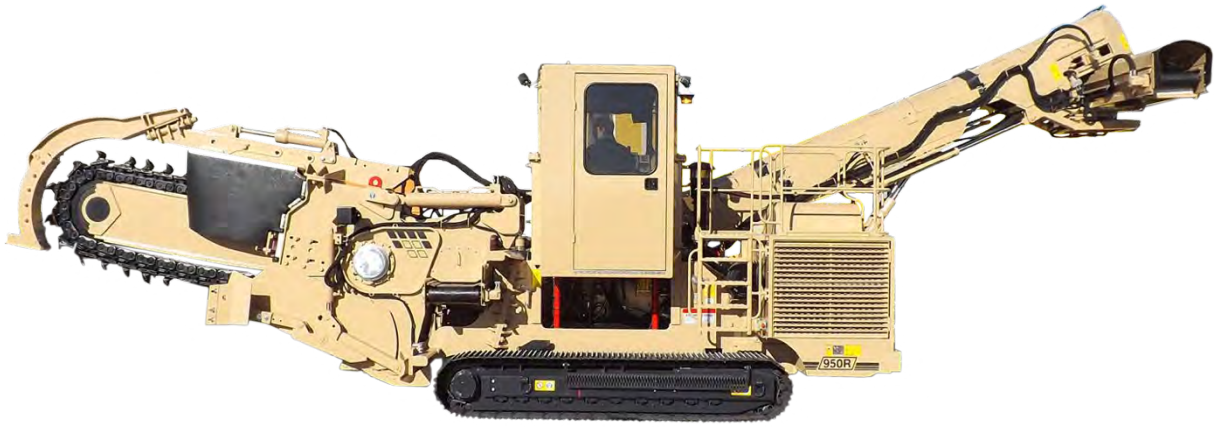
Typical Road Installation Schemes

It will be essential to create intermediate joint holes along the land route to connect the cable segments and for any maintenance operations. It is planned to build 22 holes intermediate joints to divide the course into segments from 700 to 950 meters long each. These holes will be made as part of the excavations for the cable duct. The joint holes will have a total length of about 28 meters, with a total width of 2.4 meters, of which 1.2 meters will be used for the bypass system.



Typical intermediate Joint Bay

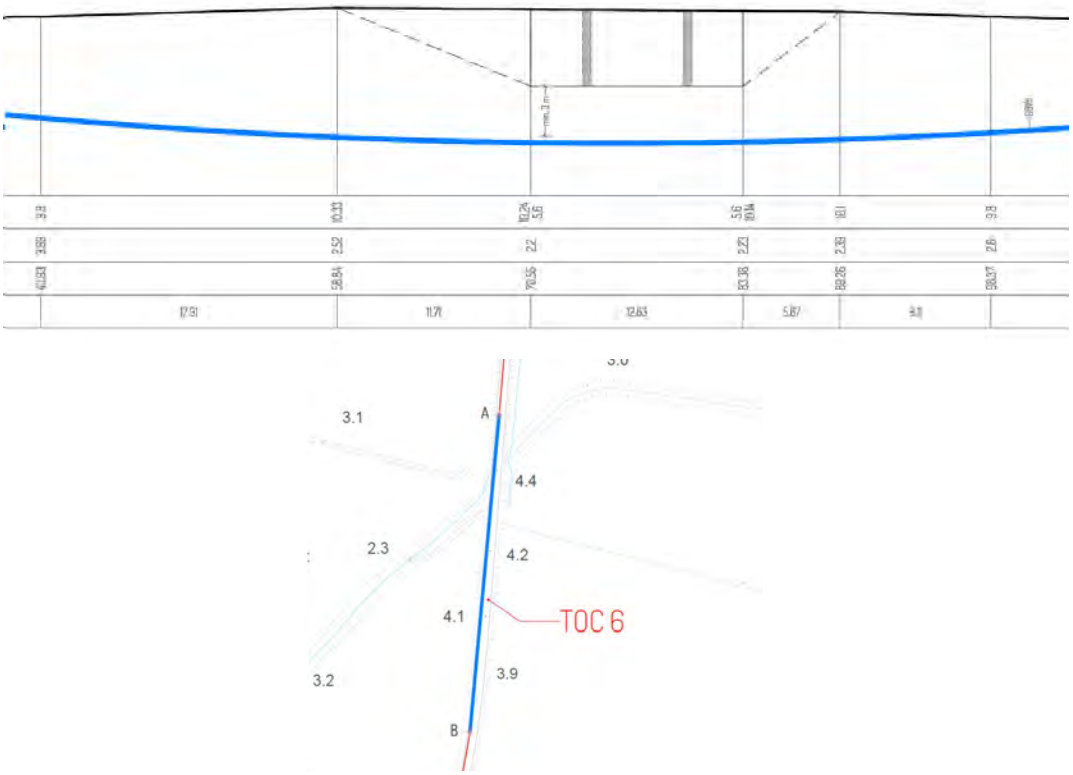
For the realization of the excavations, where the geological characteristics of the land allow it, theThe use of train machinesThese machines offer greater efficiency and precision in the creation of grooves to accommodate cable ducts underground. Using this technique reduces significantly reduced excavation time and costs compared to traditional methods, allowing for quick installation of the duct with less disturbance to the road surface and surrounding traffic.



Chain Trencher for Trench Excavation

3.12.1 ONSHORE INTERFERENCE RESOLUTION

Planned 11 main crossings of hydrographic networks or other infrastructures, it will also be possible to interfere with existing underground networks such as AQP water networks, Enel electricity networks, electricity networks of producers of energy from renewable sources (photovoltaic and wind power plants), gas networks and telephone networks. These interferences will be punctually verified during the executive design phase with the bodies/companies owning the networks and the technical methods for laying the HV cables at the intersections will be defined in concert. In the aforementioned 11 sections and in the other crossings, where necessary, the Horizontal Directional Drilling technique will be used. All the details on the installation methods and the management of interferences are detailed in the document *Underground onshore T.5.4.5_ Underground Onshore Transmission Line - schematic profiles of the HDD sections*.



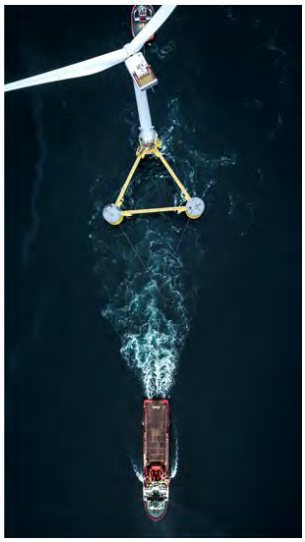
Typical installation with HDD technology

Operating machine for HDD installation

Please refer to the series 5_*Opere of connection to the network*, for more information.

3.13 CONSTRUCTION OF FLOATING FOUNDATIONS AND WIND TURBINES

The semi-submersible platforms are built entirely on land, where the wind turbine is also erected, and then transported afloat, by tugboats, to the installation site.



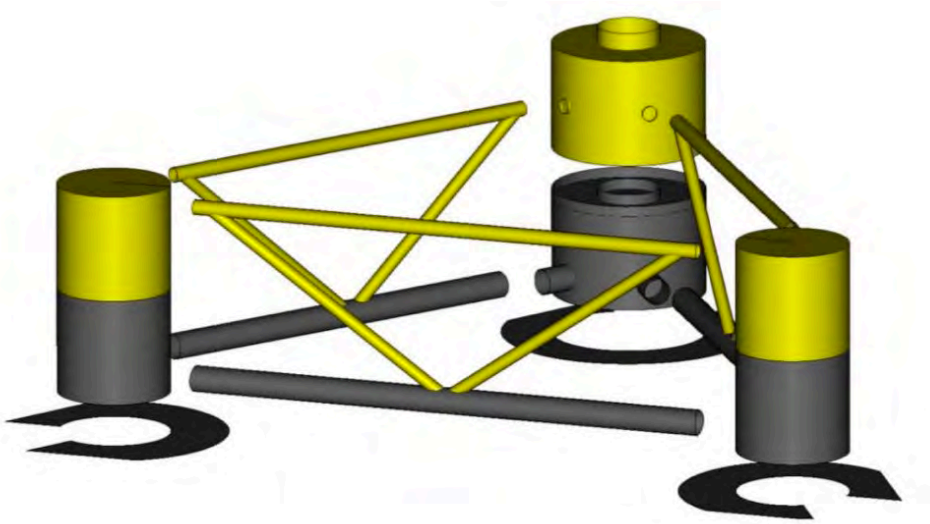
3.13.1 FLOATING FOUNDATIONS

Normally, two possible assembly scenarios can be defined for these structures:

- Manufacturing in a single site: very large construction site areas are obviously required, in which it is necessary to organize the entire supply chain for construction, assembly and storage. In essence, it is a matter of designing a real plant capable of producing hundreds of tons of steel per day, requiring the occupation of space that is difficult to find in port areas. Below is an image of a construction site with three units in parallel.

Construction of floaters at port

- Modular Fabrication: the floater can be made by assembling modules manufactured separately by several local companies, allowing to maximize productivity and minimize the surfaces occupied in the port area. The floater can be divided into three macro-components: the columns, the trusses, the base plates (water entrapment plate). Below is an image in which the key subsets of the floater are depicted.



Structure assembly diagram

The floater assembly process can begin following delivery to the main component assembly site(s). Other necessary components such as secondary structures (e.g.: staging area, I-tube suspension platforms, gratings, handrails, etc.) and equipment (e.g.: cranes) are presumed already stored at the assembly site.

The first step in the assembly process is the positioning of the columns in the respective assembly bay on a previously made and positioned support structure (e.g. wheeled guides). Accuracy in the positioning of individual columns and their relative position is critical and must be performed by means of detailed topographic measurements. As soon as the columns are in place, the areas must be secured in order to allow the general visual inspection of all external and internal spaces and identify any defects/damages that may have developed during maritime transport.

The inspection of the other carpentry elements preferably takes place in the storage area and before they are mounted on the columns. The truss frame sequence assembly begins with moving the complete lower main beams (LMBs) into position between the columns. The welding is then carried out at the joint points. Welding on both ends of the LMB can be done simultaneously. The next operation, which can begin shortly after the installation of the LMBs, is the assembly of the upper main beams (UMBs). After the assembly of the UMB, the assembly of the V-Braces (VBs) to the upper and lower elements of the truss can be started, with the same executive steps described for the UMB and LMB.

Eight welds are required to assemble the truss subassembly to the columns. The quality of these welds must be emphasized because these operations are on the critical path of the assembly process.

Upon completion of these welds, the local coating pattern is applied which, if necessary, can be carried out simultaneously on all connections. Priority will be given to the internal cladding of UMB to allow the start of the works to connect the systems (pipes and electrical) between UMB and columns. As soon as these connections are established and the connection test is performed, you can plan the functional test of the entire system and then run it to complete the pre-commissioning of the platform.

3.13.2 INSTALLATION OF WIND TURBINES

The installation of the wind turbine on the floater should take place as close as possible to the wind farm area to minimize risks and delays in putting the platform into position due to the availability of suitable weather windows. Erection operations are those that place the most stringent requirements on the port infrastructure (e.g. deep-water quay, high bearing capacity), limiting the available options. Different installation methods can be adopted:

- Dock installation by ground crane: The platform is moored at the quay, and a ground crane is used to install the turbine tower, nacelle, and three blades. The floater is moored to the dock using a mooring arrangement that accommodates changes in tide and spaced with fenders to ensure that the WEPs do not come into contact with the dock wall. The wind turbine is installed on the platform using a heavy-duty crane with adequate lifting capacity and outreach.
- Quayside installation by ground crane in areas with shallow draft: Temporary buoyancy aids can be used to reduce the draft of the platform in areas without adequate depth. There are various types of temporary buoyancy aids available on the market, including aerial lifting balloons, inflatable buoyancy units, and steel modules.

Flotation unit

- Installation on the quay by means of a crane on the ground with a platform resting on the seabed: The platform can be placed on the seabed, in case of limited draught or in the presence of significant wave motion. In such a case, preparatory work should be carried out on the seabed: in particular, a seabed survey should be conducted to assess its structural integrity, identify and remove any debris that could damage the platform and determine the necessary seabed preparations (dredging and levelling) necessary to support the platform.
- Installation in a sheltered location near the coast: As a last option, a jack-up vessel can be used in case there is no suitable quay structure to support the installation activities of the wind turbine. This method can be applied on a dock without adequate bearing capacity or land space, or in a sheltered environment near shore if a deep-water dock is not available. The ship would be equipped with a

heavy-duty crane with a lifting capacity and capacity adequate to install all the components. If this activity takes place in a sheltered environment close to the coast, an adequate temporary mooring system of the platform is required to position it next to the vessel for the duration of the erection and pre-commissioning activities. The environment near the selected coast should be sheltered, have adequate water depth, both for the platform and for the ship's stabilizers.

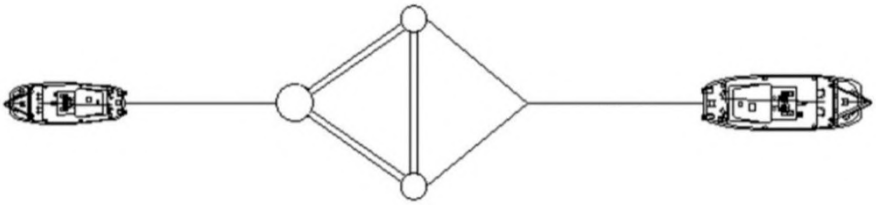
Once the wind turbine is installed, a number of activities are required before towing the platform to the operating position. These activities include the WTG pre-commissioning, as well as the ballasting the platform up to its operating position. The platform is unhooked from the quay, and once the platform is in deeper water, ballasting is done to reach the platform's operational draft.

At that point, once a suitable weather window has been identified, the towing of the platform towards its project position. An offshore tug is required to tow the platform to the site, and an additional tug assistant is required to maintain the position of the platform while mooring operations are in progress. The offshore tug shall be equipped with a minimum DP2 dynamic positioning capability to ensure accurate positioning of the platform during docking.

Towing operations are performed by connecting an offshore tug to columns 2 and 3 via a weir. The towing speed must be limited to 3.0 knots and reduced in bad weather.

Towing configuration

Upon arrival in position, the tug assistant will retrieve the emergency haulage line already connected to Column 1 to precisely position the platform during mooring operations, as in the figure below.



Mooring Line Connection Configuration

The connection methodology will depend on the type of platform mooring connector. The preferred connection method is a detachable "plug and play" connector that allows you to retrieve the mooring line from the seabed, pull it in and connect it immediately, becoming safe against storms in the shortest possible time.

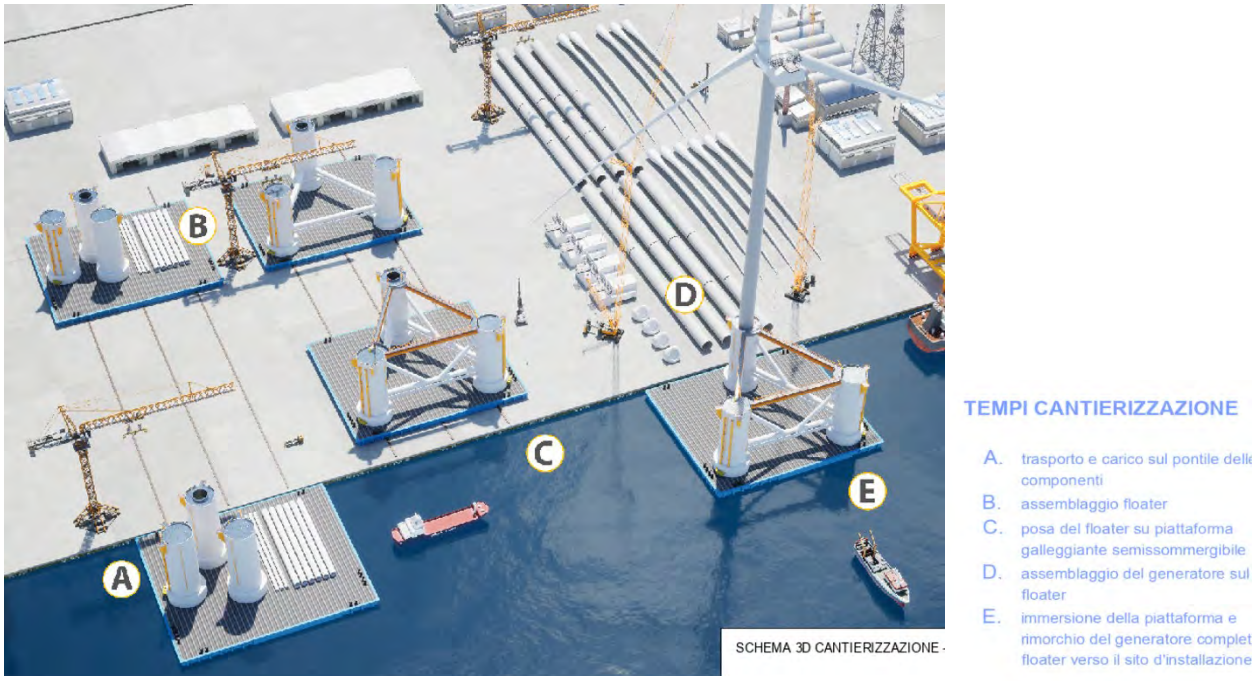
3.13.3 TYPICAL CONSTRUCTION SITE AND IDENTIFICATION OF POTENTIALLY SUITABLE PORT AREAS

In order to be able to build a wind farm such as the one under consideration in a reasonable time, it is necessary to have a production chain capable of assembling a floater every two weeks: to achieve this objective, at least 4 lines should be planned in parallel. For the subsequent integration of the wind turbine, the ideal solution would be, as mentioned above, to have useful areas as close as possible to the final installation site. Given the size of the works to be carried out and the number of wind turbines (63), it will probably be necessary to rely on several port infrastructures, perhaps managing different functions.

Ultimately, the basic characteristics that port infrastructures must have are:

- Dock length: > 250 m
- Draught: > 12 m
- Adequate spaces for the storage and installation of components: approx. 1.5 ha for each floater
- Dock Bearing Capacity: > 15 t/sqm
- Airspace Management Compatibility

Below is the schematization of a typological construction site with 2 lines in parallel and the area equipped for the integration of the wind turbine.



Typical Construction Site

In order to identify the port areas that have the potential to accommodate a shipyard of this type, a reconnaissance of the Apulian ports was conducted: those that possess (or will possess as a result of ongoing or planned adaptation interventions) the characteristics necessary for the installation of floaters are those of Bari, Brindisi and Taranto. In particular, it is verified that:

- the port of Bari can certainly be used for the installation of floaters, but for the installation of wind turbines an exemption from airport constraints would be necessary.
- the port of Brindisi can certainly be used for the installation of floaters, but for the installation of wind turbines an exemption from airport constraints would be necessary.

the port of Taranto is certainly usable for the installation of both floaters and wind turbines.
Please refer to the *Section 7_Cantierizzazione, Maintenance and Decommissioning* of the final project for the detailed layouts of the individual port facilities identified.

3.13.4 CONSTRUCTION OF ANCHORS AND MOORINGS

As reported in the specific project documentation (see chapter 3 of the project), the floating foundations will be anchored to the seabed by means of a system of semi-tensioned catenary moorings and driven poles, as schematized below.

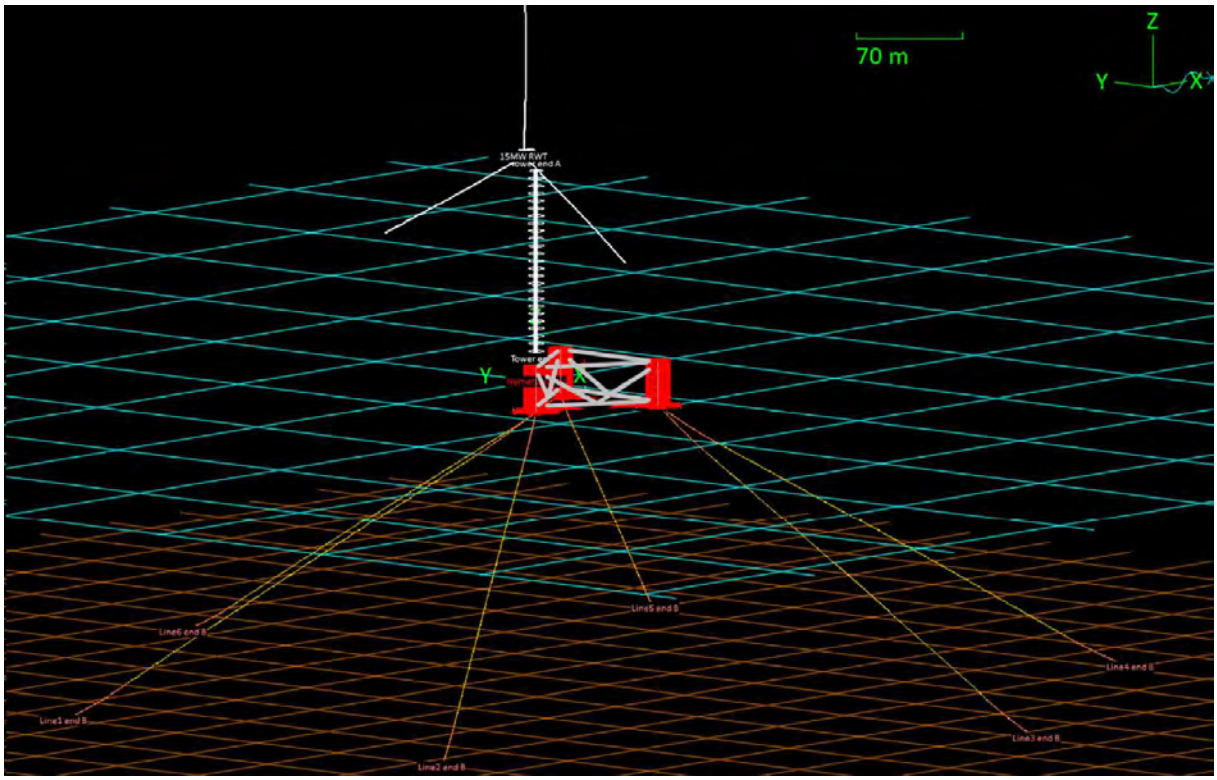
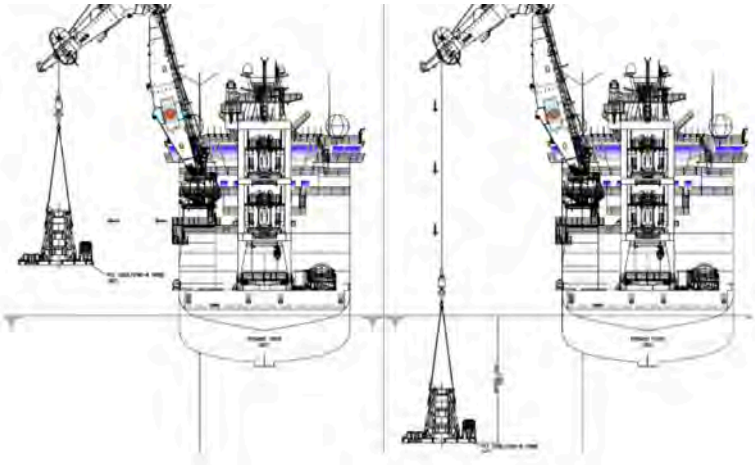


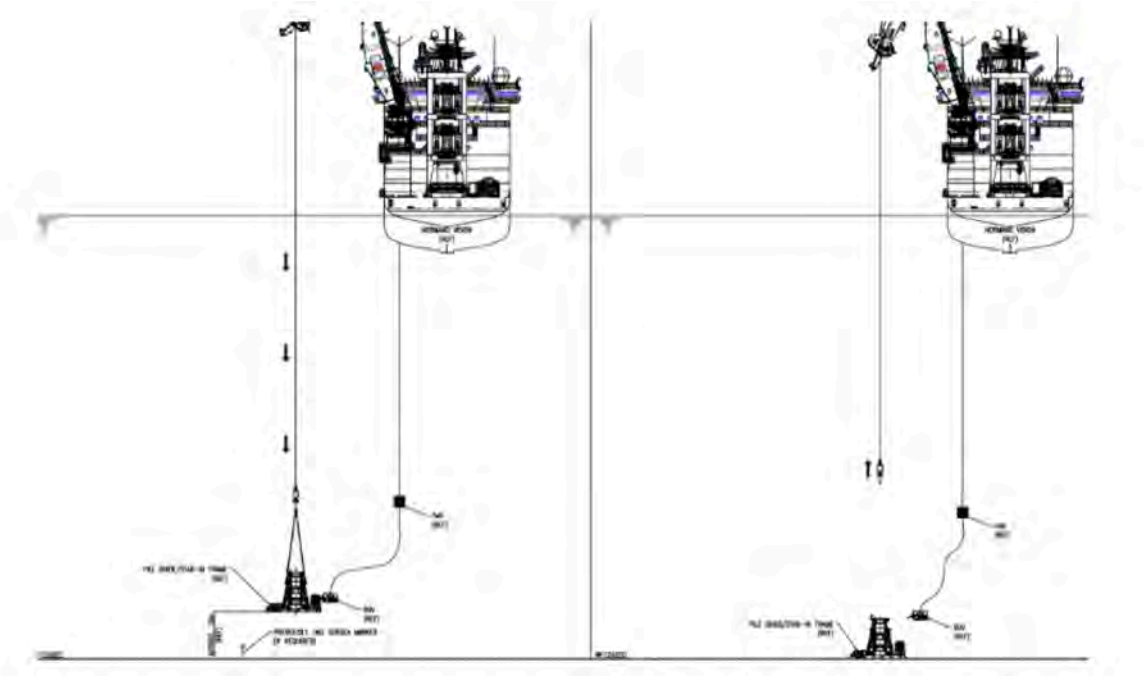
Diagram of the anchoring and mooring system

3.13.4.1 Anchoring by means of driven poles

Below are all the necessary operational phases, referring to the *Section 7_Cantierizzazione, Maintenance and Decommissioning* of the final project for more details.

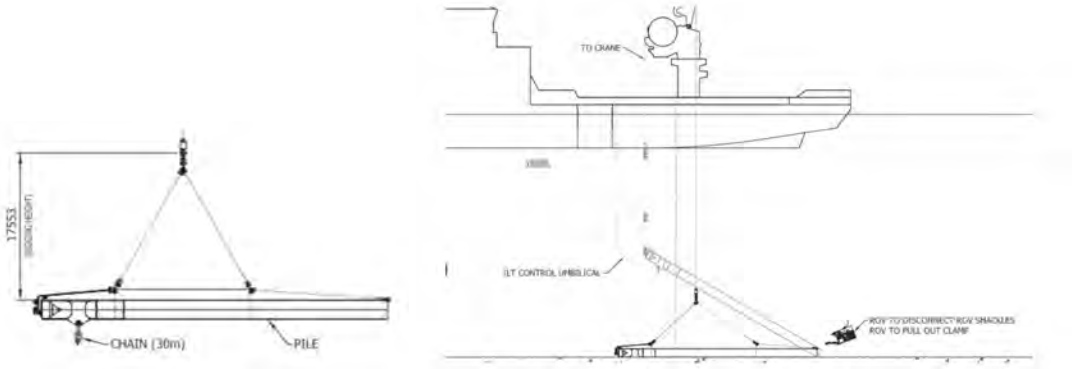
1. Mobilization of the offshore construction support vessel
2. Transportation: Transit from the local port to the designated site.
3. Field preparation of offshore support vessels
4. Installing the Pole Guide Frame - OCV

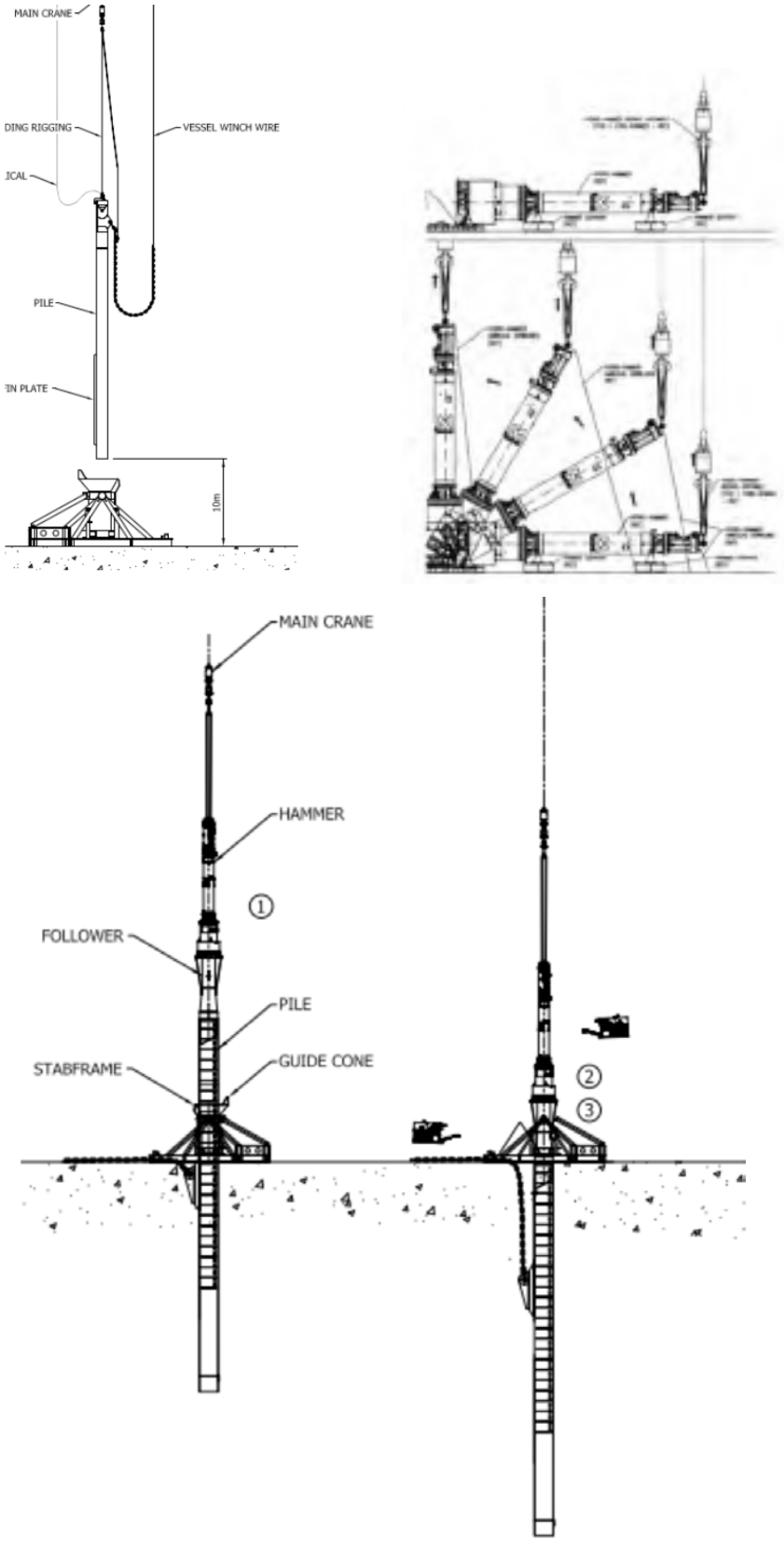




The installation phases of the guide frame

5. Installation of the anchor poles





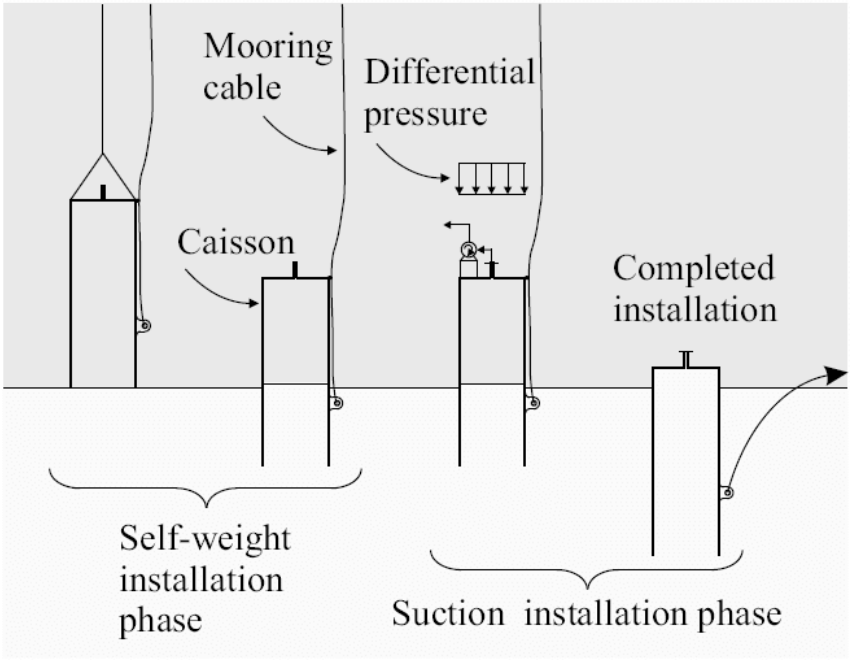
The installation phases of the fixed pole

6. Repositioning and recovery of the guide frame - OCV

3.13.4.2 Installation of suction anchors

The entire process of installing suction anchors should be considered as a management activity, where the expected performance is compared to the actual performance during execution. It is essential to identify and mitigate risks already in the design phase to ensure a safe and efficient installation of Suction Buckets. The installation procedure consists of the following steps: lifting by crane and loading onto the ship,

- immersion at the designated point,
- descent along the water column,
- positioning on the seabed,
- penetration by means of one's own weight and finally,
- penetration using sucking to the desired depth as shown in the following figure



Installation of suction caissons

3.13.4.3 Mooring lines and floater hooking

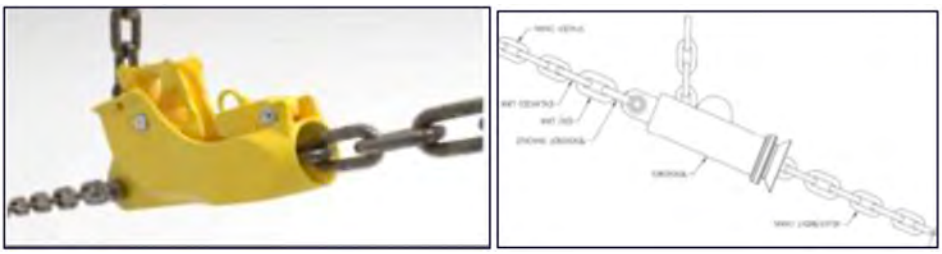
Below are all the necessary operational phases, referring to the section 7_*Cantierizzazione, maintenance and decommissioning* of the final project for more details.

1. Mobilization of the offshore construction support vessel
2. Mobilization of the vessel for the installation of berths – "Anchor Handling Vessel"
3. Transport
4. Field preparation of offshore support vessels
5. Floating Platform Placement
6. Installation of mooring lines and hooking to the floating platform. (*Note: Moorings can be installed before the float, depending on the design details and final timeline*)
   - The offshore support vessel for installation is positioned above the driven pole.
   - The male of the subsea connector is connected to the end of the fiber rope or chain.
   - The AHS offshore support vessel releases the mooring lines until the male and female subsea connectors can be joined by the ROV.

- The AHV support vessel deploys the mooring line towards the centre (towards the floating platform) until it reaches the end of the line.
- The upper part of the chain is connected to the fiber rope and unfolded.
- In the vicinity of the floating platform, the winch traction line on board the float is connected to the messenger line already connected to the first mooring line. The "messenger line" is transferred to the AHV by personnel on board the floating platform.
- The top of the chain is connected to the messenger line and, at this point, the shark jaws mooring line lock system is opened, releasing the mooring line.
- The mooring winch retrieves the guideline. The guide line is then disconnected and the mooring line pull winch is connected directly to the upper section of the chain.
- The traction winch retrieves the chain line until it reaches the set length. The process is repeated for the other mooring lines.
- Considering the relatively deep draft (20 m), the winch must be able to reach and sustain a tension, for the last two mooring lines, of about 110 tons. Ocean tugs can be used to push or pull the floating platform towards the anchors, so as to reduce the tension sustained by the winch.
- After all mooring lines have been docked, ballast is unloaded until the floating platform reaches the operational draft. This will increase the pretension in each line to the design value of ~170 tons.

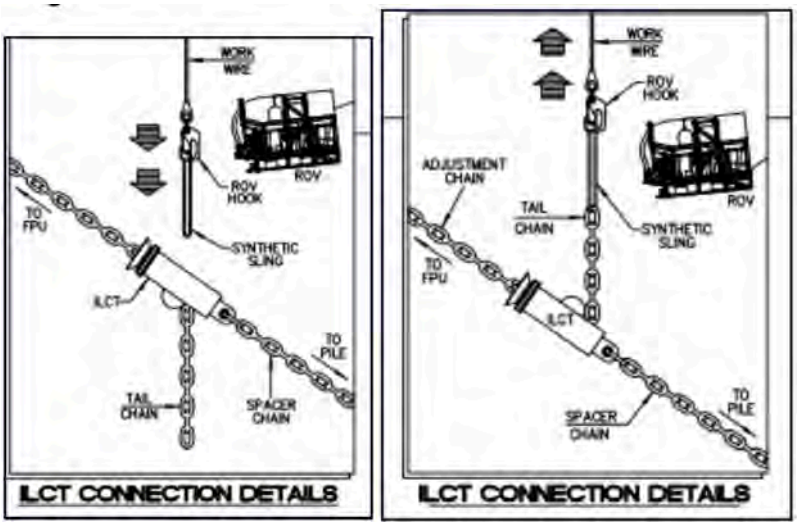
Note: In the event that you decide to use an "inline chain tensioner" (ILCT, a line tensioning system, installed along the line itself) instead of the winch on the floating platform, the following steps are considered:

- Mooring line deployed as in the previous method, with the addition of the ILCT system and an additional chain line to achieve sufficient line slack for docking. It is planned to install the ILCT system at the end of the anchor chain, with the polyester rope connected on the passive side and with a through anchor chain (through the ILCT system).



ILCT System

- The mooring line is connected to the floating platform in one of two ways: either by pulling the upper section of the chain on the deck of the AHV to make the connection, or by a "pull through connector" installed on the floating platform.
- Once all the mooring lines are connected, the mooring system will be tensioned using the ILCT system, the chain line passing through (through the ILCT system) is retrieved until the design length/tension is reached.



Connection system

Please refer to the *Section 7_Cantierizzazione, Maintenance and Decommissioning* of the final design for more details and for the characteristics of the support ships.

3.14 DESCRIPTION OF THE OPERATION, MONITORING AND MAINTENANCE PHASES

3.14.1 ESTIMATION OF THE PLANT PRODUCIBILITY

In order to extrapolate the windiness to the expected hub altitude of 150 m, the measurements underway in the Adriatic Sea were used in preparation for the construction of other offshore plants. In particular, the proposer has access to the measurement data of an anemometric campaign by means of LIDAR instrumentation (https://eolossolutions.com) launched last August 2023 on a site located about 20 nautical miles south of the offshore wind farm in question. At the state of the present anemological study, the Proponent has available **22 months** of consecutive measurements.

The comparison on the basis of satellite data shows that the project site and the measurement point of the above data present **very similar anemological characteristics**. Considering, moreover, that in the case of an offshore wind farm, the computing domain represents an area located in the open sea, free of obstacles and more than 50 km from the coast, it follows that the anemological dynamics are not influenced by the orography of the territory.

On the basis of these considerations, therefore, it is believed that the available measured data can be considered **well representative of the project site**.

On this point, it should also be taken into account that the measurements in progress are bringing out real values that are much higher than those extrapolated from satellite databases: in fact, at the measurement site, satellite data would show an average wind speed of **100 m** equal to **6.9 m/s**, while from the first 22 months of LIDAR measurement would result in an average of about **7.2 m/s**. It can therefore be said that comparative analyses between LIDAR and satellite data show that in the long term it is possible to obtain an **at least 5% higher true average speed value**.

The evaluation of the producibility of the plant was carried out on the basis of hourly ERA5 satellite anemometric data at a height of 100 m above sea level for a total of **30 years** (from 01/01/1995 to 01/06/2025) which from now on will be identified as a virtual anemometer tower. The satellite measuring point has geographical coordinates **17.25°E 42.0°N.**

The Measure Correlate Predict (MCP) procedure consists of identifying the distribution that best correlates two different time series (time series) with each other. In the case of the process of historicizing the wind

data, the two time series are represented by the **series of the data measured in situ** (short-term series) and **ERA5 satellite data series** (long-term series).

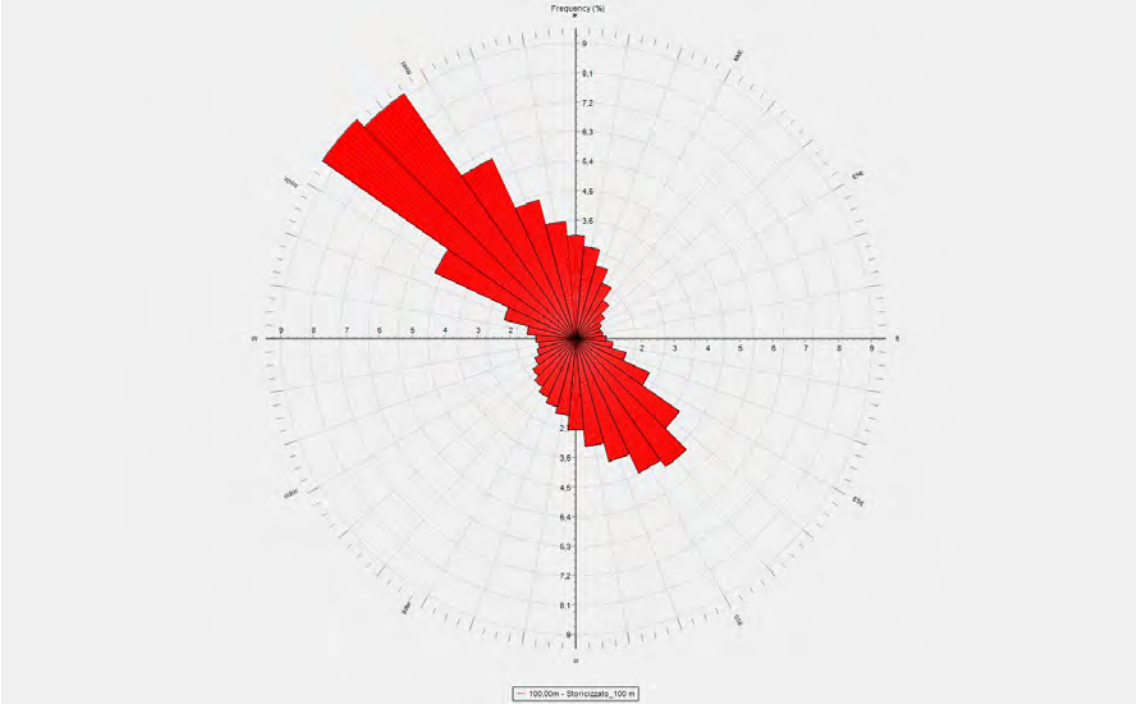
The salient data of the electrical production developed according to the following criteria are summarized:

- the analysis of the anemometric data of the site made available and determination of the characteristic parameters;
- the evaluation of wind roses;
- Calculation of production net of losses per wake through software modeling WindPro 4.0 of the study area centered on the site in question;
- production of the summary report and manufacturability tables.

From the examination of the results reported in the *ES.1_01* it can be seen how the value average of the measured speed from the virtual anemometer and **6.9 m/s**. Using the MCP procedure, once the method with the lowest error rates was identified, i.e. the one that best suits the reference time distribution, it was possible to construct the representative wind statistics of the site.

This value obtained from such an extensive temporal data base is certainly to be considered representative of the long-term windiness. Therefore, as proposed in the following table, the average speed recorded at the Nemetun Island wind farm at 100 m above sea level is equal to **7.28 m/s.**

The anemological data assumed were discretized in the modeling of the wind farm. From the analysis of the following figures the typical directionality of the North-South wind that characterizes the Apulian sites of the southern Adriatic can be observed. The discretization of wind roses is implemented in 36 sectors.



Long-term wind rose at 100 m a.s.l.

It can be observed that in terms of energy the contribution of the northern winds is slightly lower than that of the southern winds.

Once the calculation domain has been defined and the long-term wind data is known, it is possible to start the simulation of the production calculation of the fleet.

The WindPro software automatically applies a vertical extrapolation (wind shear) of the wind data, necessary for the calculation of the producibility at the target height, which in this case coincides with the height of the hub at **150 m**.

The results obtained from the preliminary evaluation of the expected production of the plant, estimated with the required configuration, using the long-period frequency distribution obtained at the proposed hub height, are shown below.

The productions take into account the losses due to the wake that is generated internally between the wind turbines of the plant, as well as the losses due to the density of the air at the height of the site.

Energia annuale calcolata per ciascuna delle 45 nuove WTG, per un totale di 900,0 MW nominali installati

	Tipo di WTG						Curva di potenza		Produzione annuale		
Statistica	Valida	Produttore	Tipo generatore	Potenza nominale	Diametro rotore	Altezza mozzo	Creata da	Nome	Risultato	Perdite di scia	Velocità del vento imperturbato
				[kW]	[m]	[m]			[MWh/anno]	[%]	[m/s]
1 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	65 668,6	1,3	7,71
2 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 604,5	2,9	7,71
3 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 773,4	2,6	7,71
4 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 102,5	3,6	7,71
5 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 365,7	4,7	7,71
6 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 504,2	4,5	7,71
7 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 399,0	4,7	7,71
8 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 108,2	3,6	7,71
9 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 267,8	4,9	7,71
10 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 715,5	4,2	7,71
11 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 608,3	5,9	7,71
12 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 810,4	5,6	7,71
13 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 807,4	4,1	7,71
14 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 496,1	4,6	7,71
15 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 536,9	6,0	7,71
16 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 208,4	6,5	7,71
17 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 290,4	6,4	7,71
18 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 569,8	5,9	7,71
19 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 083,2	6,7	7,71
20 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 081,4	6,7	7,71
21 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 027,3	5,3	7,71
22 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 982,8	3,8	7,71
23 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 194,3	5,0	7,71
24 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 292,9	3,4	7,71
25 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 496,9	4,6	7,71
26 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 823,7	4,1	7,71
27 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 900,8	3,9	7,71
28 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 259,5	3,4	7,71
29 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 135,6	3,6	7,71
30 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 563,6	6,0	7,71
31 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 257,2	6,4	7,71
32 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 009,5	6,8	7,71
33 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 484,3	3,1	7,71
34 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 697,0	4,2	7,71
35 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 056,9	5,2	7,71
36 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 282,5	4,9	7,71
37 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 167,9	3,5	7,71
38 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 761,6	2,6	7,71
39 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 453,0	4,6	7,71
40 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 241,3	4,9	7,71
41 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 069,7	5,2	7,71
42 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 578,2	2,9	7,71
43 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	62 278,5	6,4	7,71
44 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	63 987,3	3,8	7,71
45 A	No	CRRC	WT20000D260-20 000	20 000	260,0	150,0	USER	Power curve (0)	64 000,2	3,8	7,71

Rough estimate of ideal long-term output

The overall results of the production of the wind farm net of technical losses are shown below.

As far as net producibility is concerned, this is normally obtained by considering technical losses of 4,6%.

Risultati di riferimento a 150,0 m sopra il terreno

Terreno UTM (north)-WGS84 Zona: 33

	Easting	Northing	Nome Oggetto Dati di Sito	Tipo	Energia del vento [kWh/m²]	Velocità media [m/s]	Rugosità equivalente
A	644 933	4 651 258	Site data: WAsP (18)	WAsP (WAsP 12 Version 12.09.0032)	4 690	7,7	0,0

Produzione annuale stimata del parco eolico

	Risultati[a)]						
Combinazione di WTG	Risultato PARK [MWh/anno]	Lordo (senza perdite) [MWh/anno]	Perdite di scia [%]	Fattore di capacità [%]	Media per WTG [MWh/anno]	Ore equivalenti [Ore/anno]	Velocità media al mozzo [m/s]
Parco eolico	2 856 004,1	2 993 581,0	4,6	36,2	63 466,8	3 173	7,7

a) Basati su perdite in scia e decurtazioni.

The technical losses due to the transport and management phases of the energy produced were then applied to these data, estimated according to the following table:

Loss Factor	Value [%]
Turbine Availability	2.5
B.O.P.availability	1.4
Electrical grid availability	1.4
Electrical losses	2
Environment	1.2
Turbine performance	1.5
Curtailment	-
Total losses	**10**

Applying the technical losses shown in the previous table to the values calculated net of losses due to the wake effect, we arrive at the producibility commonly known as **P50** shown in the following table:

Net energy [MWh]	Net Hours [h]	Technical Losses [%]	P50 AEP net [MWh/y]	P50 hours net (h)
2,856,004.2	3173	10	2,570,403.8	2856

Net producibility **P50** is, therefore, equal to **2,570,403.8 MWh/year**, corresponding to a net production value of equivalent hours per year of **2.856 h/y**, which corresponds to the **annual consumption of about 817,000 households**.

For the necessary in-depth analysis and detailed analytical evaluation, please refer to the report "*ES.1_01_ Expected Energy Yield Analysis"*, attached to the environmental impact study.

3.14.2 PLANT MANAGEMENT AND MAINTENANCE

As with all types of works, maintenance activities can be divided into:

- Preventive maintenance
- Inspection
- Corrective maintenance

In general, all the planned works are designed and built with quality standards such as to require minimal maintenance under normal circumstances. The control systems, in particular, are equipped with safety features that allow you to maximize the protection of the integrity of the system in extreme environmental conditions during operations: if extreme weather conditions occur during normal operations, the on-board sensors of the floater and wind turbine will trigger the shutdown of operation.

Inspection and maintenance personnel will monitor the performance of the various components by interpreting the warning issues of the various equipment and components in the system. On-board cameras and a full range of other sensors can be used to enable surveillance and remote interaction with the system. The range of sensors that can be installed has three main objectives: monitoring, diagnosis, enabling and supporting remote interventions.

3.14.2.1 Preventive maintenance

Preventive maintenance activities must be undertaken according to manufacturers' manuals, on a periodic basis, to monitor system condition, prevent component degradation, and intervene (repair/replace) before equipment fails, avoiding unexpected downtime.

The evolution of the condition of the equipment and structures over the course of life will guide the continuous updating of the maintenance plan. The technical maintenance specifications depend on the equipment to be maintained, which must be defined during the engineering phases. Most of the works are made up of industry-standard components that require little maintenance.

3.14.2.2 Inspection

The purpose of periodic structural inspections is to monitor the integrity of structures, both above and below the average water level, including inter-array cables and mooring systems. The scope and frequency of periodic structural inspections shall be determined by the classification body in charge, where applicable.

For less accessible rooms without stairs, technicians with specific skills are also required. To minimize the deployment of this category of technicians, inspections can also be carried out by market-ready unmanned aircraft or, for submerged compartments, by portable ROVs.

Large underwater inspections must be performed by an ROV deployed from any vessel with DP2 dynamic position capability and crane suitable for ROV deployment.

3.14.2.3 Corrective maintenance

Corrective maintenance will be performed when a part of the equipment fails or if deteriorating conditions increase the risk of failure, requiring corrective action to prevent subsequent failures. The floating platform is designed to allow the replacement of offshore components. Emphasis will be placed on material handling equipment to enable the quick and safe removal and reinstallation of parts. Large components can be repaired on the ground whenever possible.

3.14.2.4 Replacement of main components and extraordinary maintenance

In the event of replacement of an important component of the floater-wind turbine system, the return to port must be envisaged. It involves towing the platform to port so that the affected component can be replaced using onshore structures in a protected environment.

The platform is designed with plug-and-play platform mooring connectors and a detachable I-Tube, which can be easily connected in the reverse process of installation, both of which need to be done in less than 24 hours. The floating I-Tube solution prevents a loss of array-level power production resulting from potential large-scale corrective maintenance, thus ensuring uninterrupted production from the remaining units while the affected unit is in transit and under repair.

The towing operation to port is carried out according to the following phases:

- Logistics set-up in port
- Platform set-up
- I-tube deployment

- Mooring system disconnection
- Offshore towing and related ballasting activities
- Platform mooring on the quay side
- Extraordinary maintenance intervention
- Offshore towing and I-tube reconnection and mooring system

Other intervention strategies, currently being developed for this type of work, may include ships with floating cranes for heavy loads.

3.14.2.5 Replacement Parts and Storage Requirements

Given the importance of the work, an inventory of critical and non-critical spare parts must be provided. It can be divided into 6 categories:

- Ballast System: Includes ballast pumps, portable bilge pumps, VFD panels, ventilation fans, and associated spares such as gaskets, couplings, seals, bearings, etc.
- Piping and Valves: Ballast piping, valves, and connections.
- Power systems: power cords, power outlets, UPS power module, power switches.
- Field support equipment: seawater pumps, crane spare parts (grease, bolts, etc.) and mooring winch spare parts.
- Secondary structure: bolts and brackets for grating and handrails, anodes • Instrumentation: navigation aids, inclinometers, pressure transmitters, level transmitters, leak detectors, among others.
- As for mooring and inter-array cable systems, spare parts recommendations are driven by the items with the longest lead time, which are typically the mooring line and inter-array cable.

3.15 GENERAL DESCRIPTION OF THE DISPOSAL OPERATIONS

The decommissioning of an offshore wind farm substantially follows the construction phases in reverse, making it necessary to reactivate the port yards used during construction for the dismantling of wind turbines and the cutting of steel structures.

To date, the only decommissioning operation carried out has been conducted by Principle Power, which performed the deactivation of WindFloat 1, its first pilot project, operated between 2011 and 2016. The following sections describe the decommissioning activities, presenting the outcomes derived from Principle Power's experience.

3.15.1 OFFSHORE OPERATIONS

In the specific case under consideration, the boundary conditions have made it possible to create low-pretension mooring systems that can be easily hooked with an on-board winch, easily detachable mooring connectors and dynamic cables for connecting the turbines that can be easily disconnected.

Cables, mooring lines and anchors must be disconnected following the reverse process to their installation.

In particular, the phases of the deactivation process are:

- Unplugging the power cord (approx. 12 hours)
- Disconnection of mooring lines (approx. 12 hours for 3 mooring lines)
- Towing from site to port (duration dependent on transit distance)

Once the operations of detachment of the moorings and decommissioning of the electrical connection have been completed, the floater-wind turbine complex can be towed to the port where dismantling and

dismantling operations have been carried out. Also in this case, the installation is carried out in reverse. Towing operations are performed by connecting an offshore tug to columns 2 and 3 via a weir. The towing speed must be limited to 3.0 knots and reduced in bad weather.

Towing configuration

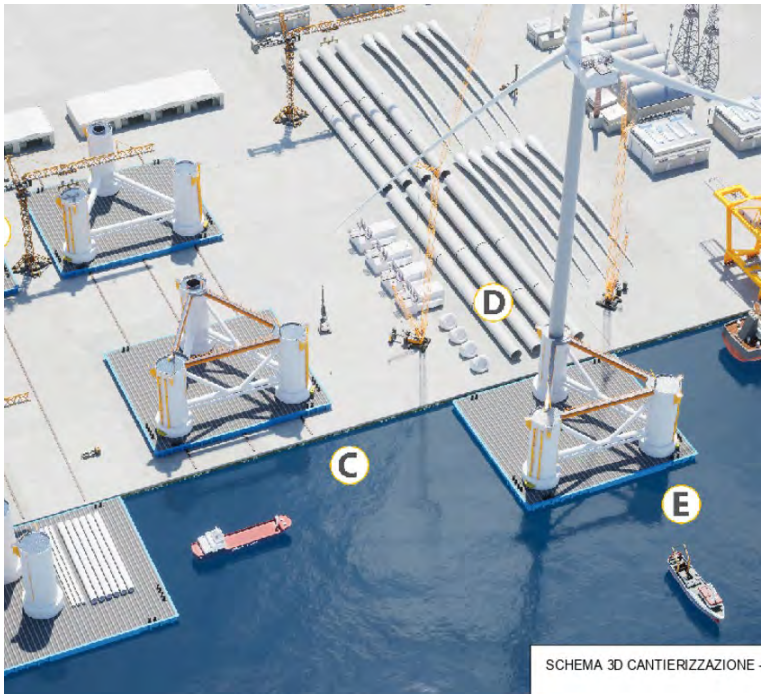
The same procedure will be carried out for the substation, first removing all the electromechanical components and then removing the topside and finally the jacket, reversing the loading and transport operations.

3.15.2 ONSHORE OPERATIONS

The dismantling and dismantling operations of the floater-wind turbine complex will require substantially the same logistical organization as described in the report *R.7.1_01* for the realization.

It will therefore be necessary to have a production chain capable of guaranteeing at least 4 lines in parallel. relying on multiple port infrastructures, perhaps managing different functions.

By way of example, the schematization of the construction site area is proposed below, in which the operations must be carried out in reverse, from the disassembly of the components of the wind turbine to the dismantling of the floater: the spaces to be occupied do not vary with respect to the construction phase.



The same will be done for the substation by providing for the dismantling of the metal parts on the port quay.

3.16 MATERIAL RECOVERY AND END OF LIFE

All the structures of which the offshore wind farm is composed have a primary steel structure. The process of dismantling and decommissioning these types of works is well experienced in the O&G sector, where semi-submersible floating production units and drilling platforms are recycled. Typically, all steel recovered from the offshore site can be recovered and recycled on land

(https://kishornport.co.uk/services/decommissioning).

Synthetic ropes can also be recovered and used as fuel in a thermal power plant (energy from waste), but manufacturers have also developed processes to recycle ropes into polymer products such as bridge covers

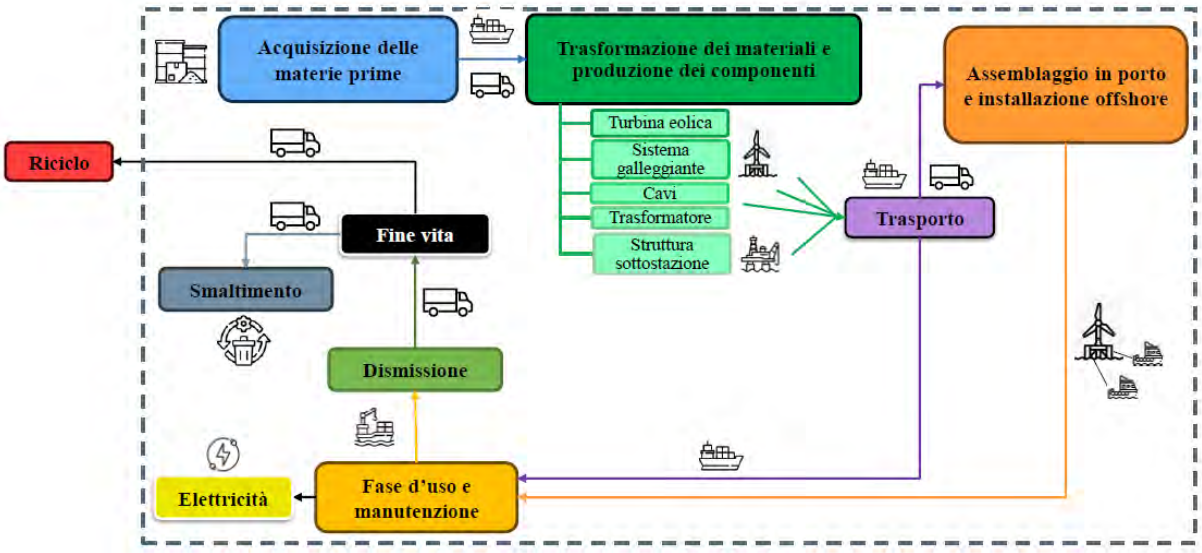
(https://www.lankhorstropes.com/information/recycling-of-ropes).

Cables and accessories can also be fully recovered to be processed by an already existing dedicated recycling sector

(https://k2polymers.com/recycling-services/sub-sea-cable-recycling/)

In addition, for structures of this type, the possibility of extending the duration of the works will also have to be evaluated: for example, Principle Power's WindFloat 1 unit has been decommissioned from the Povoa do Varzim site in Portugal and has been reinstalled at the Kincardine Offshore Wind Farm, in Scotland.

As part of the Nemetun Island project, a life cycle study was carried out on the plant to assess emissions *"From the cradle to the grave"* The phases included in the life cycle are: procurement of raw materials, processing of materials and production of components, transport of the components produced, assembly in port and installation with specialized boats, maintenance during the operational phase, decommissioning and end of life.



Flowchart of the boundaries of the system

Please refer to the following paragraphs and to the report *ES.5_01_ Life Cycle Assessment of the Offshore Wind Farm* for more information.

3.17 COMPENSATION AND ENHANCEMENT MEASURES

Probably the most important issue in this initial phase of the twenty-first century, the transition to sustainable energy sources and, at the same time, the energy autonomy (energy security) of individual states has become an imperative in recent years, to achieve this goal it is now unanimously recognized that offshore wind has a decisive role: **the European strategy proposes to increase Europe's offshore wind capacity: from the current 12 GW to at least 60 GW by 2030, and to 300 GW by 2050.**

This is an ambitious goal that must be aimed at quickly, but while maintaining **the high level of quality of the projects and the planning of related interventions.**

On this point, a passage from the PPTR of Puglia is reported, which in the guidelines on renewable energy, reports:

- *… An energy project that has as its general objective the development of renewable sources and among these wind power will have to deal with the territory in an increasingly clear way and at the same time build a landscape project ... with the aim of also preparing a shared vision among the actors who are part of it.*
- *Wind power becomes an opportunity for the redevelopment of degraded territories already affected by strong transformation processes. The construction of a plant moves resources that can be channeled into the start of redevelopment processes of parts of the territory, for example through infrastructural adaptation projects involving roads and networks, in ecological reconversion processes of areas affected by strong environmental degradation, in the economic revival of some areas, also using compensatory mechanisms with the municipalities and bodies concerned.*
- *Orient wind power towards forms of partnership and widespread shareholding to better redistribute costs and benefits and increase the social acceptability of plants, helping to provide greater reassurance on environmental and social protection profiles.*
- *Promote inter-municipal planning tools that we have a vision on a territorial scale of the relationships that wind farms will have with the territory, with its structuring elements and identity characteristics (Inter-municipal and Provincial Energy Plans)".*

As reported, therefore, offshore wind farms will be the protagonists of the future energy transition, and if on the one hand they are the essential tool to achieve the goal of sustainability and autonomy, on the other hand they are also a unique opportunity to strengthen and launch territorial redevelopment interventions and to activate a new prolific satellite industry. Therefore, in the light of these considerations and the provisions of the Ministerial Decree of 10.09.2010, it being understood that the compensation measures will be punctually identified within the framework of the service conference, in this project we have proceeded to define the overall framework within which the compensation interventions have been identified, attributable to the following topics:

- **Enhancement of the landscape and natural heritage**: it is certainly the issue most immediately attributable to the concept of compensation, the resources that will be made available will be able to guarantee the implementation of a large area project capable of covering the infrastructural needs of the territory and starting virtuous environmental redevelopment paths. The basic paradigm is based on a more modern concept of "seascape", which synergistically includes biotic, abiotic, meteorological elements, but also human settlements and human activities that take place along the coast overlooking the intervention area. To this end, a memorandum of understanding with IN/ARCH for the development of design concepts and design competitions.

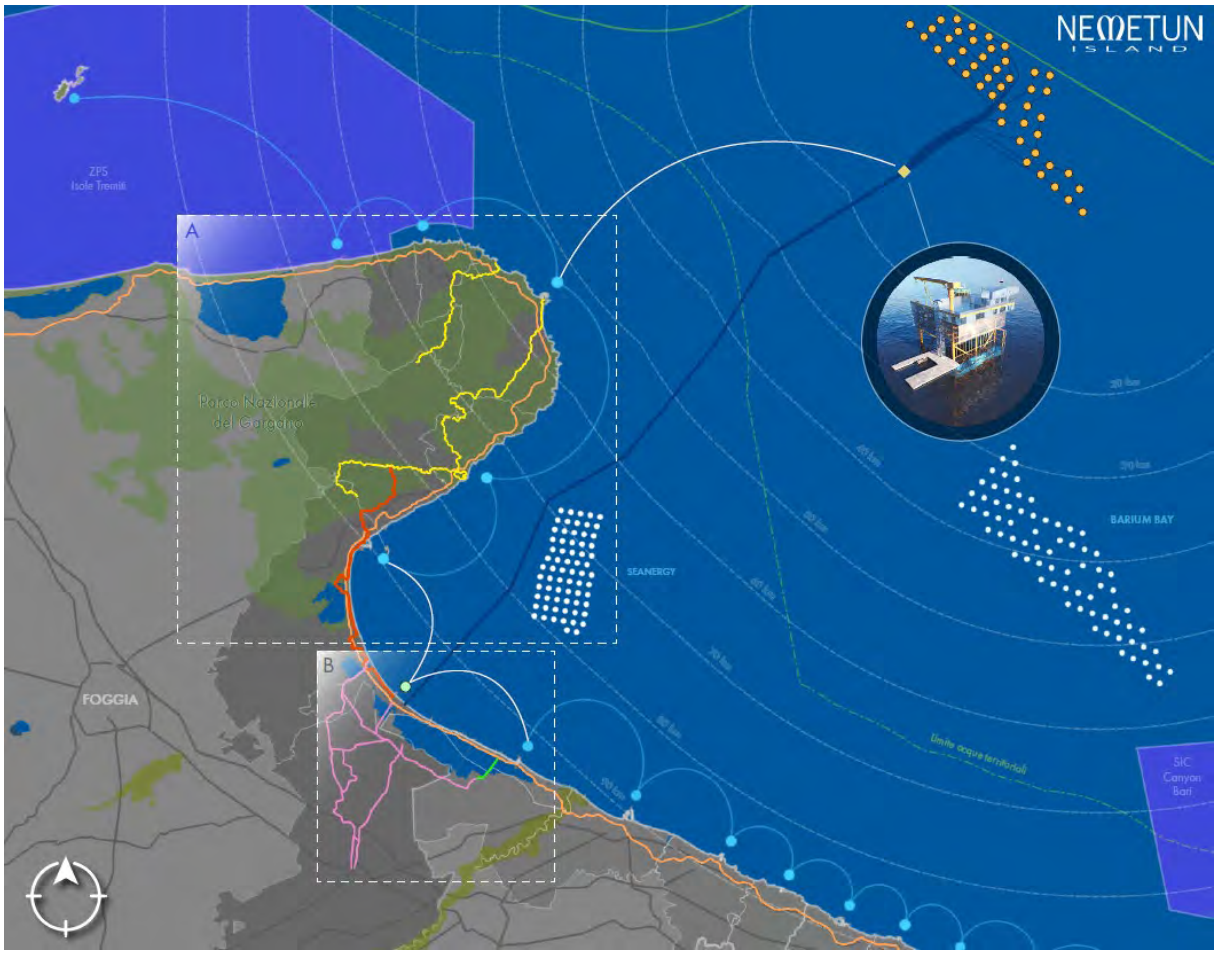
In the current design phase, a compensatory criterion has been adopted for the territories involved, in order to identify a list of interventions that could be started and supported thanks to the construction of the offshore wind farm. In particular, considering also a possible, albeit minimal, impact on the areas of the Natura 2000 Network, it is proposed to implement a series of interventions envisaged in the **Plan of Management of the Wetlands of the Capitanata and the Marshes at the Gulf of Manfredonia**. These areas Protected are partially involved in the transit of the road transmission cable necessary for the connection of the wind farm. The system of proposed interventions considers two macro-areas: the Gargano National Park and the Margherita di Savoia Salt Pans.

The system of choice and cataloguing of interventions is based on the idea of promoting the **Slow mobility** in the context of sustainable tourism. We have identified cultural itineraries linked to religion and folklore, working to enhance them. This process can be supported by resources from the Nemetun Island plant.

- **Support and training for local communities for the green economy**: dissemination and awareness raising are essential activities to be supported by projects such as the one under consideration, through which local communities will be able to become aware of the energy transformation path undertaken and the great opportunity underlying the implementation of renewable energy.
  To achieve this, we have planned a series of Cycles, Speeches and seminars who together with the creation of experiential stations along the coast can illustrate the operation of the Nemetun Island wind farm and its relationship with the marine environment in which it is placed.
- **Support for the research and specific training sector**: the construction of offshore wind farms is an important opportunity to activate and/or strengthen research activities for the study of marine flora and fauna, to analyze the state of health of the seabed, determining the elements of threat and strategies to defend them. The idea of creating a laboratory and observatory for Marine Sciences on the offshore platform that houses the electrical substation goes hand in hand with the plan to launch a series of training and research activities. These initiatives could include the possibility of establishing specific energy guidelines at the Apulian Higher Technical Institutes (ITS), as well as interventions aimed at training and supporting the local production fabric. Currently, a memorandum of understanding has been established with important research institutions, which defines a series of actions aimed at research on the marine environment.
- **Promotion of creativity and the arts**: these are apparently secondary measures, which instead take on great importance if we think of the appeal and resonance that art can generate, amplifying the already described awareness-raising and training actions, as well as those aimed at supporting local communities. Think of the possibility of providing for art installations at the wind turbines (e.g. murals or light shows) and to be able to view them not only from the sea, but also from the coast, setting up multimedia stations from which to "see" and "listen" to the wind farm.

The intent of the study carried out as part of the project in question is to build a track that can be used as a starting point for the structuring of a planning tool dedicated to the definition and implementation of compensation interventions that will accompany the construction of offshore wind farms.

For a detailed description of all the planned interventions, please refer to section 6 of the final project.



Map of the planned compensation interventions drawn up T.6.1.2_01

3.18 ANALYSIS OF DESIGN ALTERNATIVES

As is well known, the main factors to be taken into account for the adoption of certain design choices and for the subsequent development of the project are:

- purpose of the work;
- location of the work;
- environmental insertion of the work.

The analysis of these factors leads to the definition of different design alternatives, which, concerning different aspects of the same project, can be summarized as follows:

- **Strategic alternatives**:Consist In identification of measures to prevent foreseeable adverse effects and/or different measures to achieve the same objective;
- **Location alternatives**: they can be defined both at the plan and project level, they are based on knowledge of the environment and the territory in order to identify the potential use of the soil, the critical and sensitive areas;
- **process or structural alternatives**: can be defined in the design and consist of the analysis of the different technologies and raw materials that can be used;
- **Compensation alternatives**: can be defined in the design phase preliminary o executive and consist of the search for measures to minimize the negative effects that cannot be eliminated and/or compensatory measures;
- **Zero Alternative**: consists of not carrying out the work and can be defined in the feasibility study phase.

It is clear, however, that it is not always possible to have such a wide range of possible alternatives available, as some of the decisive choices are often made before the start of the project activity, i.e. in a preliminary planning phase.

The comparison between alternatives also requires the solution of problems that are not simple such as, for example, that of using a homogeneous base of parameters that can be adapted to projects that are also significantly different.

As part of this document, the discussion of the alternatives considered for the Nemetun Island wind farm project is summarized, for further information please refer to the report "*S.5_01_ Analysis of Alternatives "* contained in the annexes to this document.

3.18.1 STRATEGIC ALTERNATIVES

The construction of an offshore wind farm is part of the **European strategy** of the fight against climate change that has been defined in recent years starting from the European Green Deal presented in 2019 up to the most recent Fit for 55% package (FF55 - FIT for 55%).

As part of the European Green Deal, in September 2020 the Commission proposed to raise the target of reducing greenhouse gas emissions for 2030, including emissions and removals, to at least 55% compared to 1990 levels as a first step towards the objective of climate neutrality by 2050. The climate objectives are formalised in the European Climate Law Regulation shared between the European Parliament and the European Council, becoming a legal obligation.

To turn climate targets into legislation, the Fit for 55 (FF55) package has been put in place: a set of proposals for new EU legislation with which the EU and its 27 Member States aim to achieve the EU's 2030 climate target. The FF55 package includes a proposal to revise the Renewable Energy Directive. The proposal aims to increase the current EU-wide target of at least 32% renewable energy sources in the overall energy mix to at least 40% by 2030.

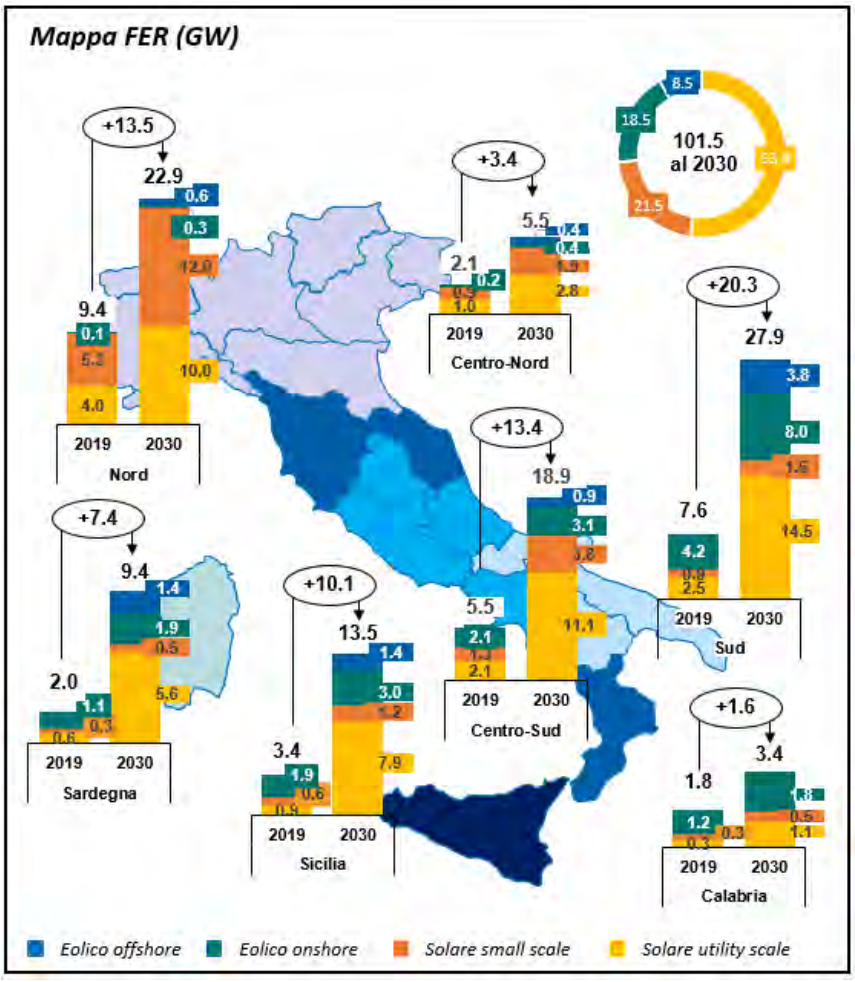
To help achieve the European goal of climate neutrality by 2050, the European Commission presented the EU Strategy for Offshore Renewable Energy on 19/11/2020. The strategy proposes to increase Europe's offshore wind capacity: from the current 12 GW to at least 60 GW by 2030, and to 300 GW by 2050.

In response to the difficulties and disruptions in the world energy market caused by the Russian invasion of Ukraine, the European Commission presented the REPowerEU plan in May 2022, which proposes an acceleration of the already ambitious climate targets by increasing the EU's 2030 target for renewables from the current 40% to 45%.

The Integrated National Energy and Climate Plan published in 2020 establishes the installation of a total of 95 GW for the entire RES sector and at least 900 MW of offshore wind farms in Mediterranean waters by 2030.

According to the **"Scenario Description Document (DDS 2022)"**, recently presented by TERNA and SNAM, in the Fit For 55 (FF55) scenario with a horizon of 2030 it is expected that almost 102 GW of solar and wind plants installed by 2030 will be needed to achieve the policy objectives with an increase of +70 GW compared to the 32 GW installed in 2019. This scenario, which considers installed power targets higher than the PNIEC, **involves the installation of 8.5 GW of offshore wind farms.**

The following image summarises the zonal breakdown elaborated in DDS 22: as can be seen, it is expected **the installation of 3.8 GW of offshore wind off the coast of Puglia.**



Zonal breakdown of installed power targets in DDS 22 scenario FF50

The implementation of the project is consistent with the targets set at European level for the achievement of the objectives to combat climate change and with the implementation strategies of these targets defined at national level.

The only strategic alternatives compatible with the same climate objectives are limited to a reduction in energy consumption of proportions that are absolutely irreconcilable with the maintenance of the current economic status or the nuclear option. These alternatives have already been considered and excluded by the legislator and therefore the need to implement every effort to accelerate the construction of offshore wind farms appears absolutely incontrovertible.

3.18.2 ZERO ALTERNATIVE

In the case of the wind farm project, **The zero alternative has been discarded**, because the intervention covered by this report falls within the types of plants envisaged by international and national planning.

As indicated in the evaluation of strategic alternatives, the construction of the work is consistent with:

- The European objectives of reduction of CO emissions$_2$ produced by power plants using fossil fuels;
- the diversification of primary resources used in the spirit of security of supply;
- the maintenance and strengthening of a production capacity suitable for meeting the energy needs of the Region and other areas of the country in the spirit of solidarity.

However, in order to carefully evaluate the actual reliability of the assumption on the zero alternative, a SWOT analysis was conducted in the following paragraphs to compare the two main alternatives: to build the Nemetun Island plant or not to build it at all.

SWOT analysis is a strategic tool widely used in companies and organizations to assess the strengths, weaknesses, opportunities and threats of a project. This method provides a clear overview of the current situation and future possibilities, allowing you to make informed decisions and develop effective strategies. Essentially, SWOT analysis helps identify internal advantages and disadvantages, as well as external opportunities and challenges, thus providing a solid foundation for planning and implementing business and social strategies.

From the SWOT analysis carried out (see the *S.5_01_ Analysis of Alternatives* to view the SWOT analysis in detail) **it is clear that the construction of the Nemetun Island offshore wind farm is cost-effective compared to the alternative of not building the plant (zero alternative)**.

Component	Strengths	Weaknesses	Opportunities	Threats
Environment	CO reduction$_2$	Impact of new works	Environmental monitoring and restoration	Overcrowding Failure to monitor
Work	Creation of new jobs	Unsuitable port system	Induced development and Specialization in the sector	Raw materials and workers from abroad
Energy	Large production, energy independence	Network system to be upgraded	Production system implementation	Overcrowding of initiatives
Economy	Welfare	Finding local businesses	Large capital injections at the local level	Use of foreign raw materials

SWOT analysis interconnection scheme between elements

SWOT analysis is not a static process. Regularly monitor the effectiveness of the system to make changes to the strategy based on new challenges or opportunities.

The system used is the basis of other projects that national and European programming has used to define its objectives associated with the energy transition. Some of these models have been developed thanks to specific analyses of strengths and weaknesses that have led to quantifying the RES production plants to be built.

A clear example is the Powered project, which uses the cumulative analysis method to identify potential conflicts (environmental and otherwise) between the eventual offshore wind farm (circled area) and the surrounding area.

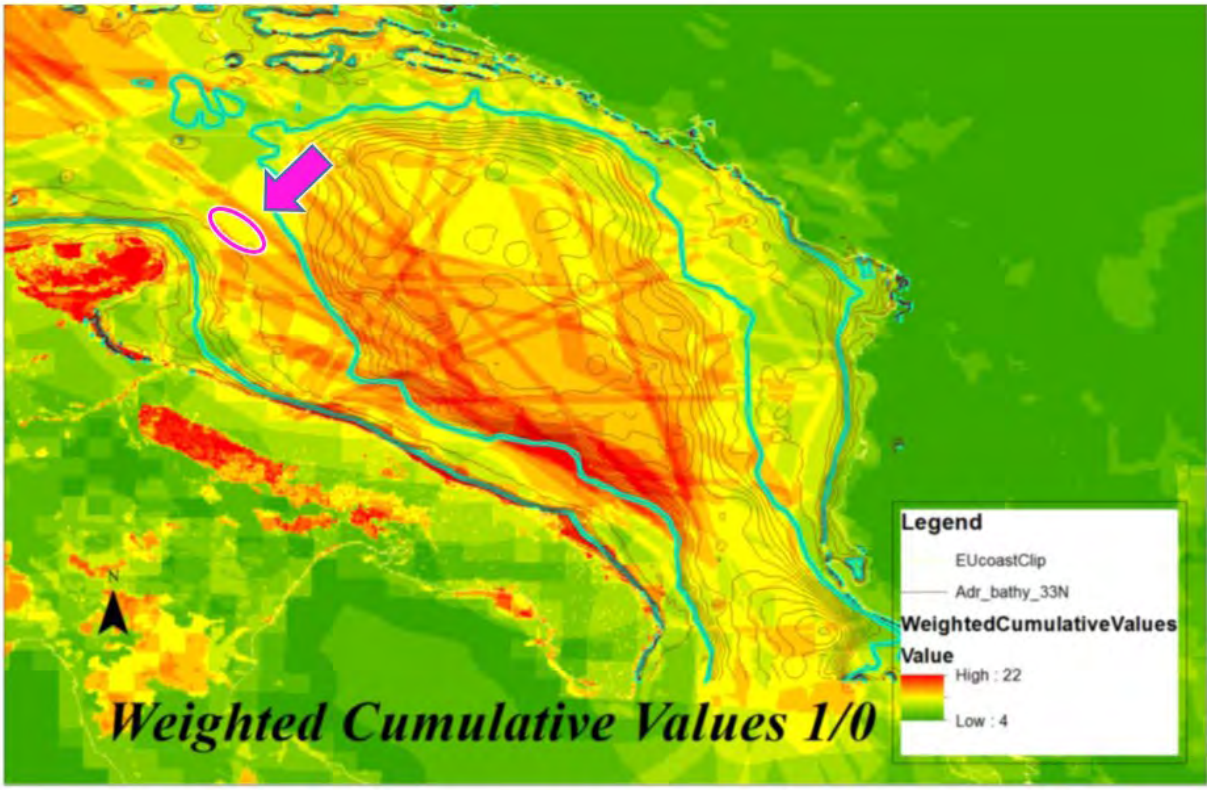


Image extracted from the Final Report of the WP5 Powered project – IPA

3.18.3 LOCATION ALTERNATIVES

The area of interest has been the subject of a detailed study aimed at characterizing the areas from a constraint and environmental point of view, building a reference framework useful for defining the preliminary design with particular reference to the definition of the route of the power line and the work plan of the oceanographic studies to be carried out at sea.

As a preliminary step, the publications and reports of the Ministry of Agricultural, Food and Forestry Policies ("The state of fishing and aquaculture in the Italian seas" edited by S. Cautadella and M. Spagnolo in 2012), the results of the Ipa Adriatic POWERED Project and the studies carried out by the Puglia Region on the *Posidonia oceanica* and on marine bioconstructions (BIOMAP) which have contributed to building a large and documented body of scientific data used for the perimeter of the Apulian sea SCIs. The Environmental Impact Assessment carried out for the Seanergy (ID_VIP_1831), Barium Bay (ID_VIP_10221) and Lupiae Maris (ID_VIP_9333) projects, which are currently in the Environmental Impact Assessment phase or have obtained a favourable opinion with the requirements of the EIA Technical Committee, was also taken into account. or - in the case of Barium Bay (ID_VIP_10221) - have received the positive EIA decree.

The choice of the area in which to allocate the proposed plant took place at the end of a careful examination that considered the following aspects:

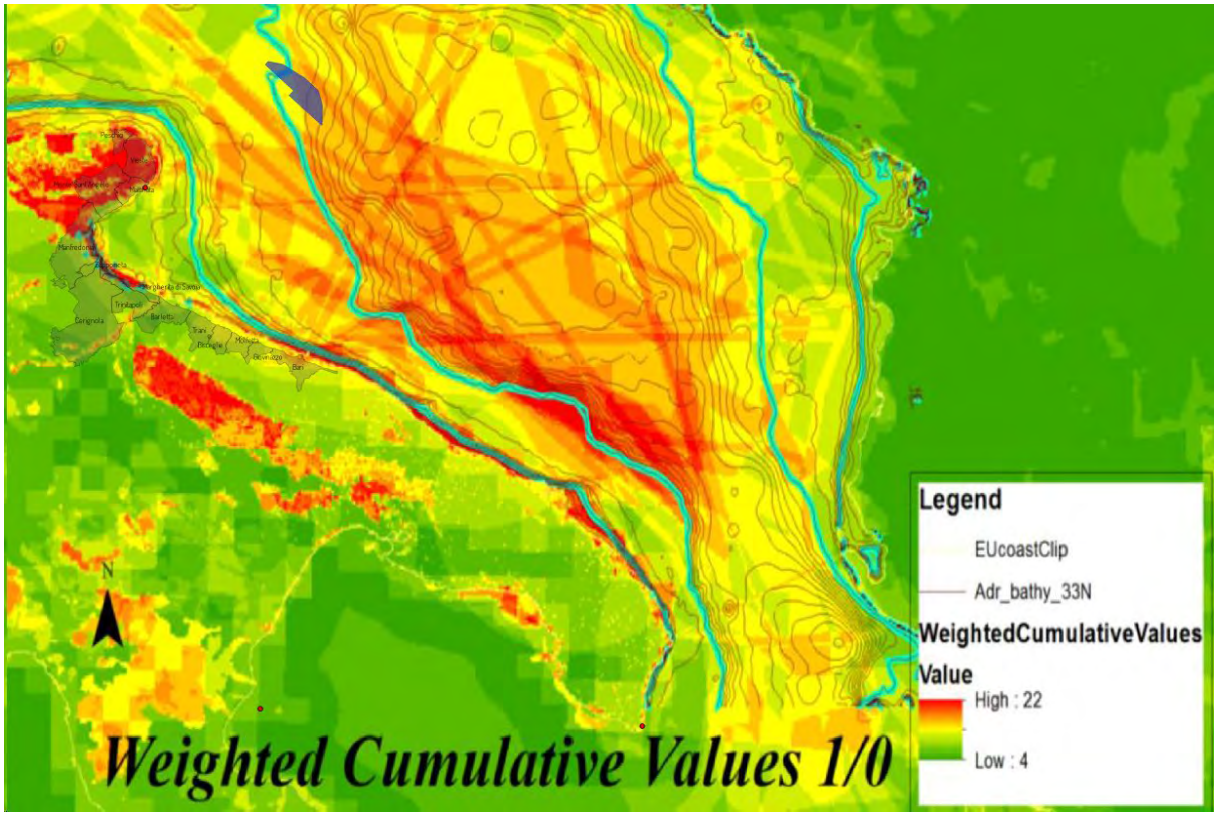
- Availability of the anemological resource
- Bathymetry and compatibility with the technological constraints imposed by the correct functioning of floating support platforms
- Distance from the coast, impact on local fishing and minimization of the intervisibility and perceptibility of the works at sea
- Presence of environmental, military and mining constraints
- Compatibility with the main routes and ship traffic leaving and entering Adriatic ports

- Interference with other offshore works and services.

3.18.3.1 The Powered Project

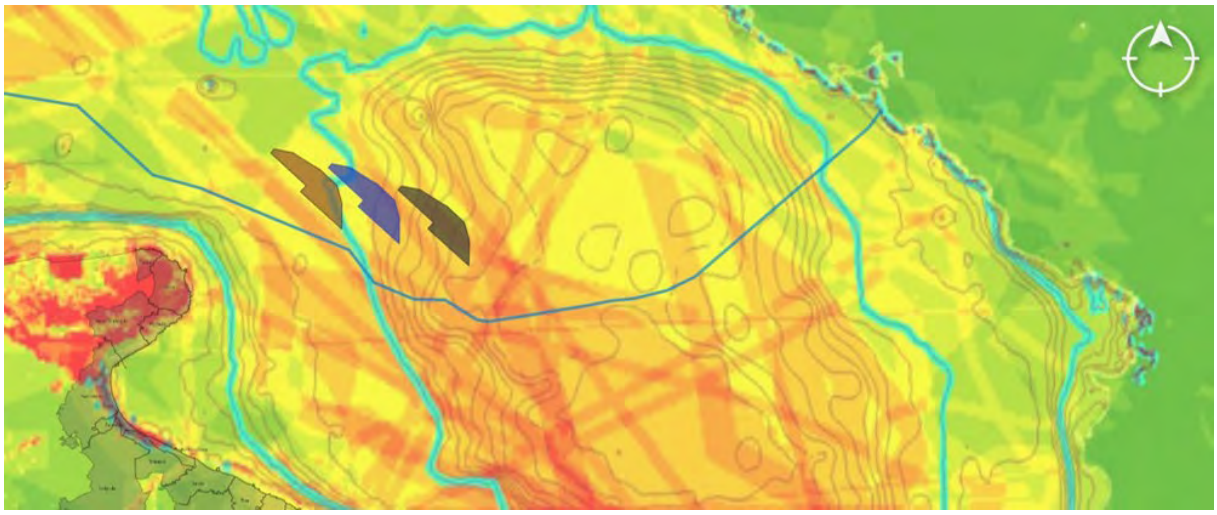
Of great interest for the choice of the offshore site in which to allocate the plant were the results of the Powered Project (Project of Offshore Wind Energy: Research, Experimentation, Development) which has been given an extensive account in the Descriptive Report *R.1.2_01* of the final project and which is summarized here.

In the final report of WP5 there are summary thematic maps useful for **analyze potential conflicts cumulatively** (environmental or sea use) **between the offshore wind farm, if any, and the surrounding area** and among these some are dedicated to Puglia. **The study shows the widespread presence in the northern area of Puglia of areas distant from the coast and characterized by a low level of conflicts and, therefore, the subsequent investigations focused on the stretch of Adriatic Sea between the Gargano and the north of Bari.**



Map of the Southern Adriatic Sea with cumulative analysis of potential conflicts between the eventual offshore wind farm (in blue) and the surrounding area extracted from the Final Report of the WP5 Powered – IPA project. The bathymetric curves at 40 m and 200 m are highlighted in light blue

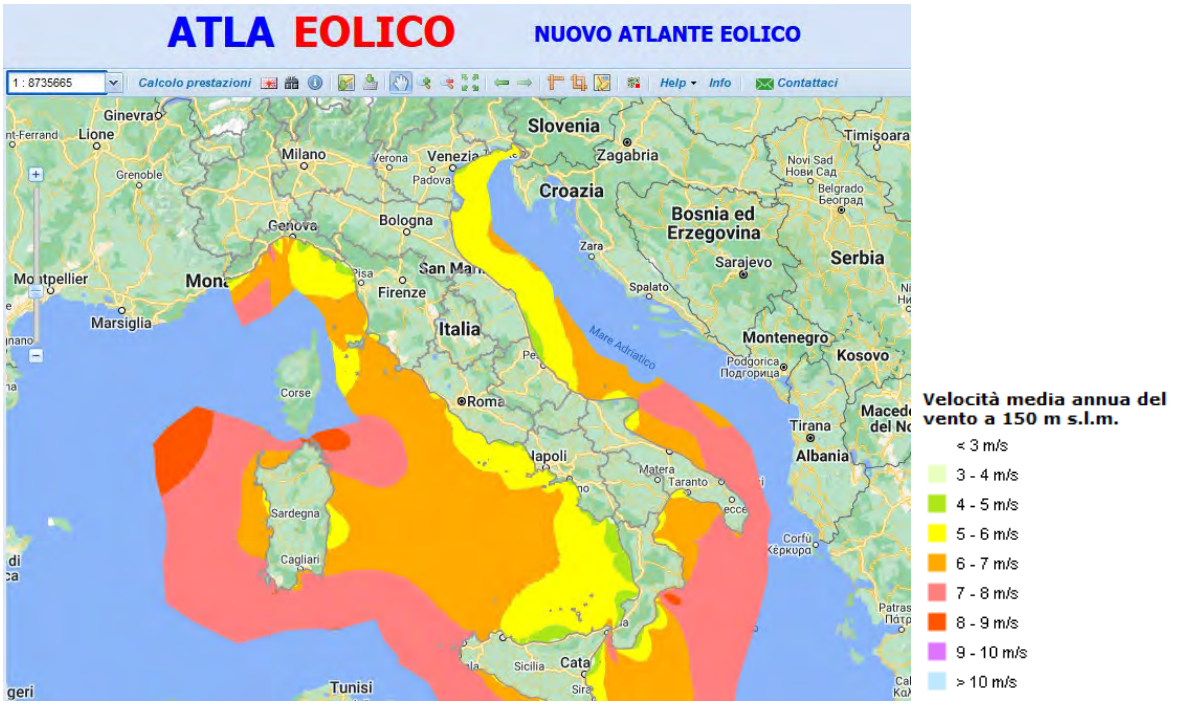
It is important to underline that the option of locating the Nemetun Island plant in the area with least conflicts was also compared with the risk of interference with the linear infrastructures present in this stretch of the Adriatic Sea. An example is the technological infrastructure consisting of the MON submarine power line. ITA, which, however, in its completed route, does not affect the reference body of water of the Nemetun Island plant.



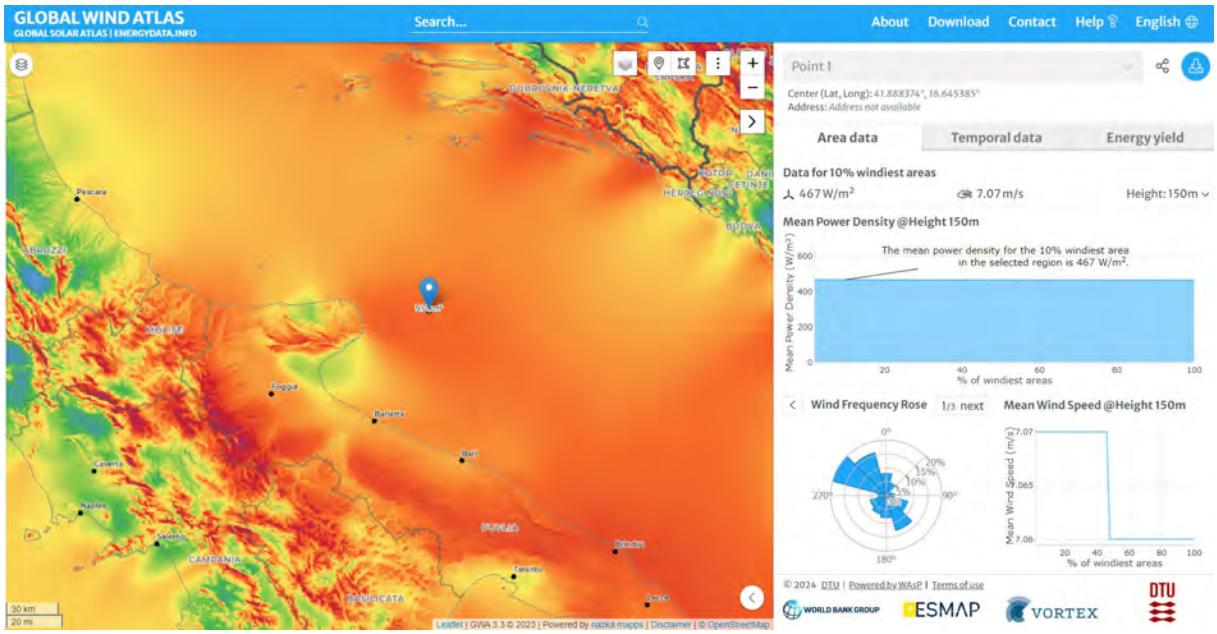
the MON. ITA (in light blue)

3.18.3.2 Availability of the anemological resource

All the available studies and data agree that the areas with the greatest availability of anemometric resources throughout the Adriatic are located in waters overlooking the Apulian coast. Below are some images taken from the wind atlas of the company "Ricerca sul Sistema Energetica – RSE SpA", and from the "Global Wind Atlas" with the average annual wind speeds at 150 m which show results compatible with the map in Figure 3.1 produced by the Powered project.



Average annual wind speed at 150 m – taken from thewind atlas of the company RSE SpA



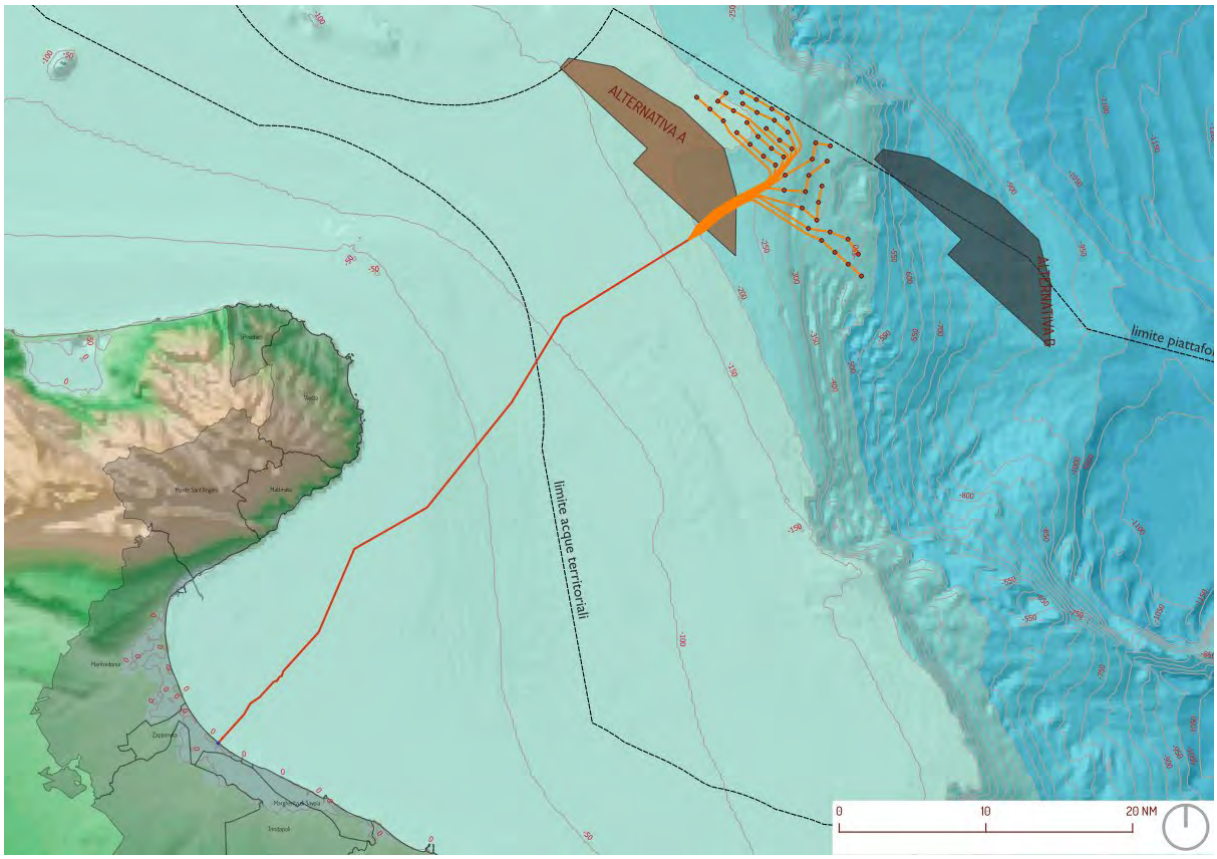
Average annual wind speed at 150 m - taken from the https://globalwindatlas.info/en/ website

Looking at the wind maps in the body of water under examination, it can be seen that the anemological resource is quite scarce in the areas close to the southern slope of the Gargano in front of Manfredonia. In the lower Adriatic the main direction of the wind is in fact from the North West and these winds, in the Gulf of Manfredonia are, at least partially, shielded by the Gargano. **The wind farm must therefore necessarily be located in waters far from the coast beyond the Gargano promontory according to the north-west direction to obtain an adequate long-term average annual production.**

3.18.3.3 Bathymetry and technological constraints

The figure shows an excerpt from the **GEBCO** (**Ge**Neral **B**athymetric **C**hart of the **Or**ceans) referring to the area under consideration integrated with the isobaths extracted from the datasets of the Puglia Region.

From a quick analysis of the bathymetry, it is evident that the Adriatic Sea in the considered sector reaches very high depths that exceed -1000 m within the southern Adriatic trench located in the center between Bari and Dubrovnik. Continuing southwards, the seabed rises up to -780 m to form the threshold of Otranto on the border with the Ionian Sea. In particular, there is a very rapid increase in the depth of the seabed starting from the isobath of -200 m. This delimitation coincides with the edge of the escarpment that delimits the continental shelf.



Assessment of Alternatives in Relation to Bathymetric Depth

In the choice of location of the Nemetun Island plant with respect to the bathymetric altitude, environmental and technological factors were taken into account:

- **The Alternative A**, who hypothesized to position the installations further west at a lower bathymetric altitude, advantageous for the shorter distance of this alternative from the coast, would have led to an increase in the theoretical visibility zones and, consequently, in the visibility of the plant from the coast (environmental factor).
- **Option B**, which proposed to locate the plant further east, would have involved the interception of high bathymetric altitudes, approximately around 1000 meters deep. This technological aspect was key in the decision to rule out this alternative, as the current mooring technologies available on the market would not have been able to handle the installation at such depths. In addition the plant would have been beyond the limit - currently being defined - of the areas under exclusive Italian jurisdiction.

The chosen option balances technological and environmental factors, proposing installation at achievable, albeit high, bathymetric altitudes of approximately 500 meters. Although this involves greater costs for the proponent due to the development of the technical component of the plant in some areas of the area, this choice appeared optimal from an environmental point of view.

3.18.3.4 Offshore Distance, Effects on Local Fisheries and Landscape

- **Localization alternatives and fishing activities**

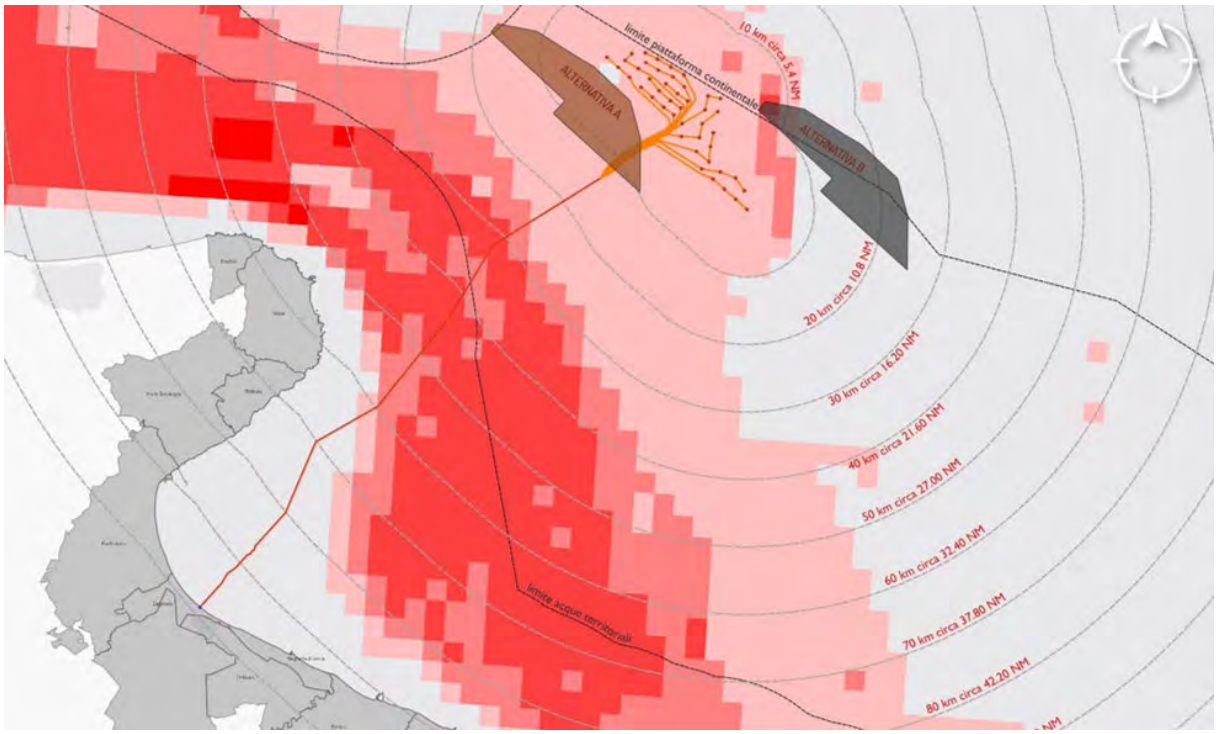
The Adriatic coast and the stretch of sea facing it represent an area characterized by intense human activity linked to the marine environment. There is an important local economy linked to fishing and tourism. Socio-economic considerations, together with a precise desire to minimize the intervisibility and perceptibility of

the works at sea, have led to the complete exclusion from the eligible areas of the strip within 12 miles from the coast, to the coast, locating the plant on the Italian continental shelf.

In fact, this choice allows you to achieve at the same time:

- the neutrality of the presence of the facility for local and surface small-scale fishing,
- the creation of a source of deterrence and potential disturbance for illegal trawling activities within 3 miles from the coast and 50 meters deep: the slowdown, due to the presence of the cable duct on the seabed, of an industrial fishing system, widespread in the area and potentially harmful to the fauna itself and to the biocoenosis of the seabed.
- The reduction of the perceptibility of the plant and related infrastructures and the creation of a new innovative seascape, which integrates renewable energy and the protection of our environmental heritage.

Added to this are the important benefits due to the environmental compensations envisaged with certain repercussions on fishing and tourism.



Distribution of average annual fishing effort (in dark red the greatest effort)

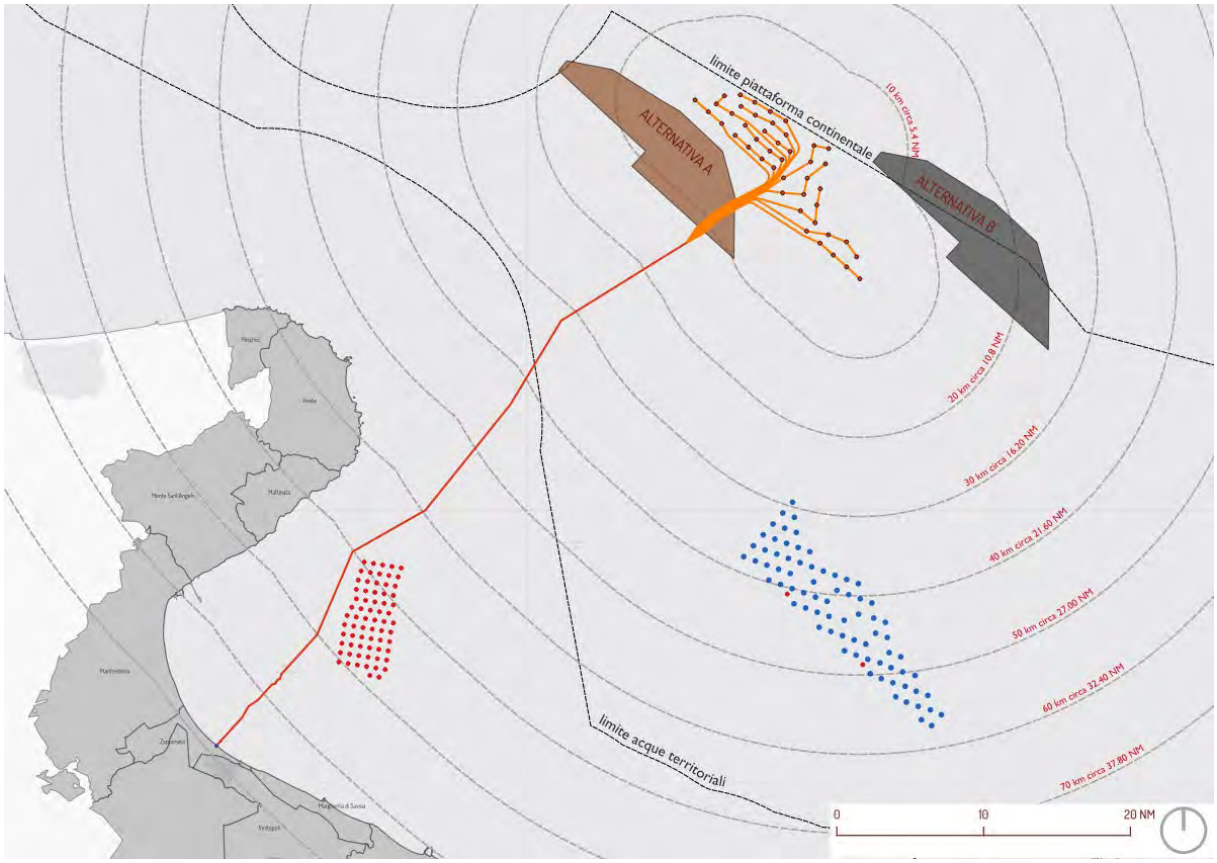
The figure above shows the distribution of the average annual fishing effort in Italy (source MIPAAF – SID) and the distribution of the fishing effort of small local navies (COISPA survey) with the limit of territorial waters highlighted. The cartography does not allow us to appreciate the distinction between the types of fishing, on the other hand it is evident that the areas of greatest pressure due to fishing are concentrated in the strip closest to the coast, while instead, moving away from the shore, the fishing effort decreases until it disappears near the 200 m isobath and therefore the edge of the continental escarpment. Also with respect to this criterion, the choice of location appears to have less impact than a location closer to the coast.

- **Location and landscape alternatives**

The decision on the location of the Nemetun Island wind farm in the reference body of water was mainly driven by the search for the best compromise to ensure technical feasibility and minimize the visibility of the plant.

Considerations regarding visual interference and the overall effect with other initiatives in the reference visual basin (ID-VIP_10221 and ID_VIP_1831) are addressed in the documents *ES.8.1_01_ Landscape Assessment Report* and *ES.8.5_01_ Photomontages*.

However, it is important here to evaluate the alternative between the location currently chosen for the Nemetun Island wind farm, characterized by a minimum distance from the coast of about 30 nautical miles, and a much closer and therefore more visible location, which would be within 12 nautical miles, as in the case of the ID-VIP_1831 plant.



The Nemetun plant Island, the alternatives of location and other initiatives in the area - Barium Bay ID_VIP_10221 (in blue) Seanergy ID_VIP_1831 (in red)

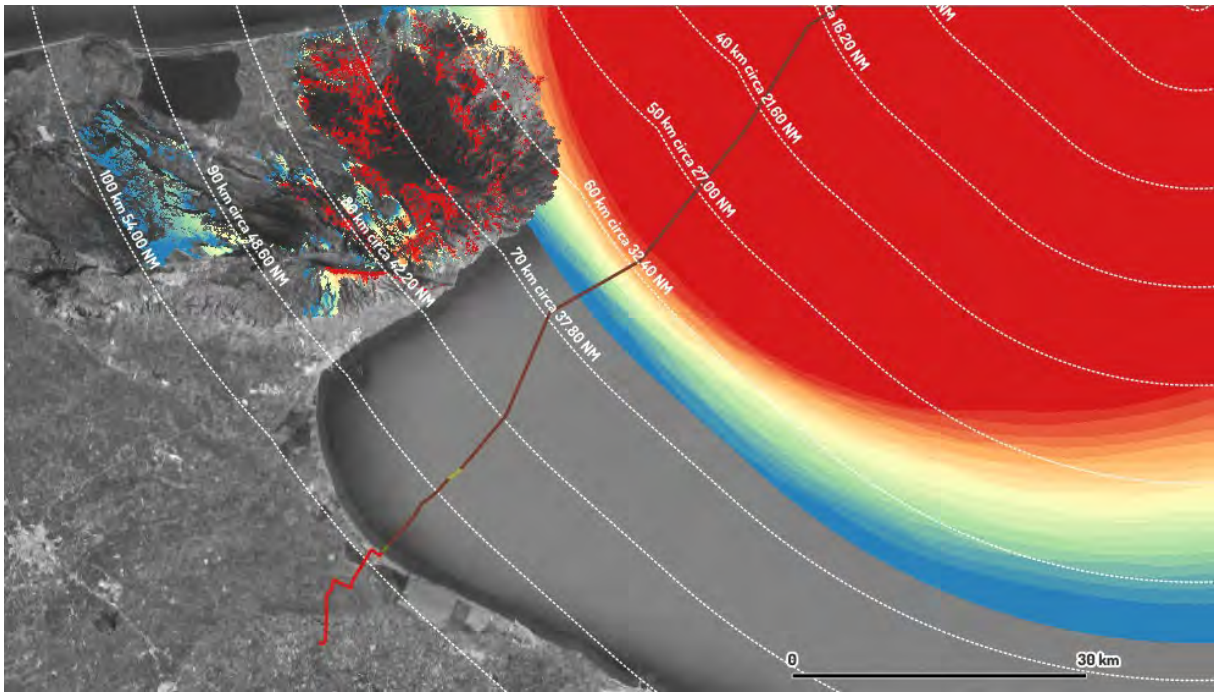
According to the models carried out, we can say that the Nemetun Island plant has an average low visibility over the area of the Gargano peninsula and practically zero along the Bari coast from Bari to Zapponeta up to Manfredonia.

The theoretical intervisibility map highlights the presence of red zones only in some points of the coast and in certain areas of the Umbrian forest. Since visibility towards the sea in inland areas is considered theoretical due to the dense wooded vegetation, the visual survey focused exclusively on the analysis of the locations along the coastline or on the first promontories with a direct view towards the sea.

To evaluate the alternative location within 12 nautical miles, the photographic simulation from Monte Saraceno in the municipality of Mattinata is particularly significant. In the "calculation" view, where the wind turbines are indicated by red circles, it is evident that the ID_VIP_1831 plant is very visible, with the wind turbines clearly distinguishable in their entirety. On the contrary, the Nemetun Island plant is barely perceptible in the background, and the visible portion of the machines includes only the rotor, which is constantly moving. A similar argument applies to the ID_VIP_10221 system, which is also not very visible.

In conclusion, the decision to position the plant within 12 miles from the coast would have significantly increased its visibility, as well as creating a visual cumulus effect with the Seanergy ID_VIP_1831 plant,

this eventuality was averted by the choice to place the Nemetun Island plant in the reference body of water about 30 NM from the coast of the Gargano peninsula.



Map of the intervisibility of the Nemetun Island plant (h 270 m)

Photorendering of the Monte Saraceno visual point

3.18.3.5 Localization alternatives with respect to geomorphological hazard and layout reconfiguration

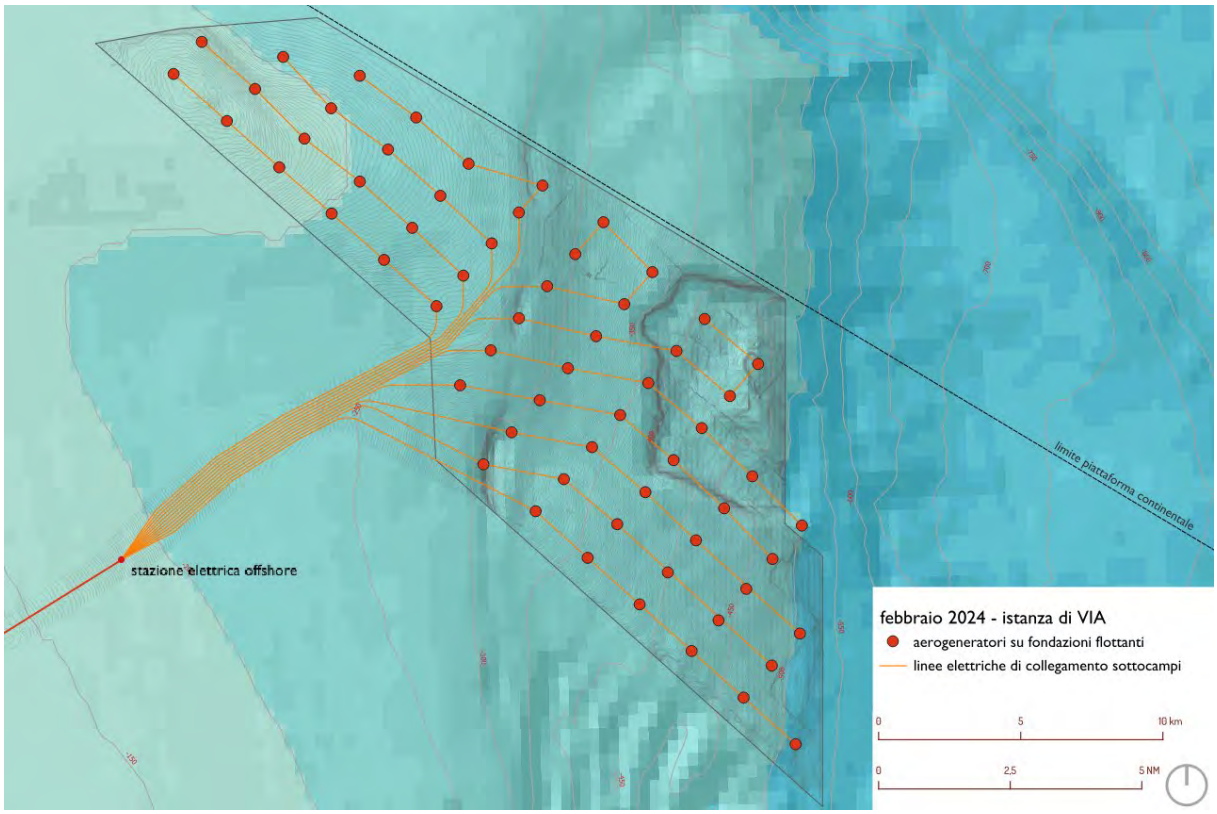
This chapter illustrates the assessments and insights carried out on the geomorphological conditions of the seabed, carried out during the different phases of the Environmental Impact Assessment process (ID 11187) which began in February 2024 and is currently underway. These geomorphological risk analyses made it possible to identify the suitable areas for the installation of the anchors. This led to an overall revision of the layout of the offshore works, with a complete reconfiguration within the reference body of water, **going from the 63 wind turbines initially planned to the 45 positions of the new version.** As a result, the entire project package and all the analyses carried out in this study, as well as in the analysis of alternatives, have been updated and reformulated in the new draft of the Nemetun Island project.

3.18.3.5.1 The February 2024 configuration and the reasons for the insights

In its initial configuration, the Nemetun Island wind farm project envisaged occupying almost entirely the body of water available in the planning phase, providing for the installation of 63 wind turbines, each with a nominal power of 15 MW, for a total of 945 MW installed. This solution was designed to maximize the production of electricity from wind sources, making the most of both the maritime area considered suitable and the high availability of wind in the project area.

In summary, the offshore layout of the Nemetun Island plant filed together with the EIA application in February 2024 can be summarized in the following scheme:

- **63 wind generators** installed on tubular steel towers and their floating foundations
- **11 submarine cable power lines** connection between the wind turbines and the offshore transformer electrical substation;
- **An Offshore Electrical Transformer Station (66/380 kV) (SE)**, Located at a distance of about 45 km (24.30 NM) from the Gargano coast and 12 km (6.47 NM) from the wind farm, in a stretch of sea characterized by bathymetric altitudes between 160 and 170 m deep;
- **An export power line in HVAC** with a length of about 88.7 km (48 NM).



The layout of the Nemetun plant submitted together with the EIA application – February 2024

In the request for additions of the PNRR-PNIEC Technical Commission of the MASE, transmitted with note prot. no. 9499 of 02.07.2024, observations had already been raised on the installation of some wind turbines in areas at geomorphological risk, suggesting the possibility of redefining the layout of the plant.

In response to these observations, a geomorphological study was sent in August 2024 on the seabed of the reference area, based on the data of the geophysical survey. The results of this preliminary study led to an alternative solution that involved the relocation or exclusion from the project of wind turbines located in the areas considered most critical.

Following the communication of 19 February 2025, a joint inspection was carried out on 24 and 25 February 2025 between the members of the PNRR-PNIEC Technical Commission and the technicians of the proposing company, at the maritime areas affected by the works envisaged by the project.

Taking note of the critical issues highlighted by the Commission, Dr. Geol. Fabio Trincardi, former Director of the Department of Earth System Sciences of the CNR, was entrusted with the task of carrying out a specialized geological and geomorphological study aimed at analyzing the areas affected by the intervention.

The in-depth study concerned in particular the detailed characterization of the geomorphological phenomenologies present, the evaluation of their state of activity and the analysis of genetic causes. The study also included an integration of geophysical and geotechnical data, as well as the contribution of scientific findings directly acquired by the specialist in charge.

The results made it possible to define a new installation layout for the wind turbines and the related inter-array connection cables.

3.18.3.5.2 Further Studies on Geohazards and Seabed Geomorphological Conditions

The study, contained in the *R.1.3.2.1_Supplementary Study on geomorphological hazard*, issued in version 01 – which is a replacement for all the studies previously conducted within the Nemetun Island project – provides for a series of objectives and conclusions summarized below and consists of three synthetic parts:

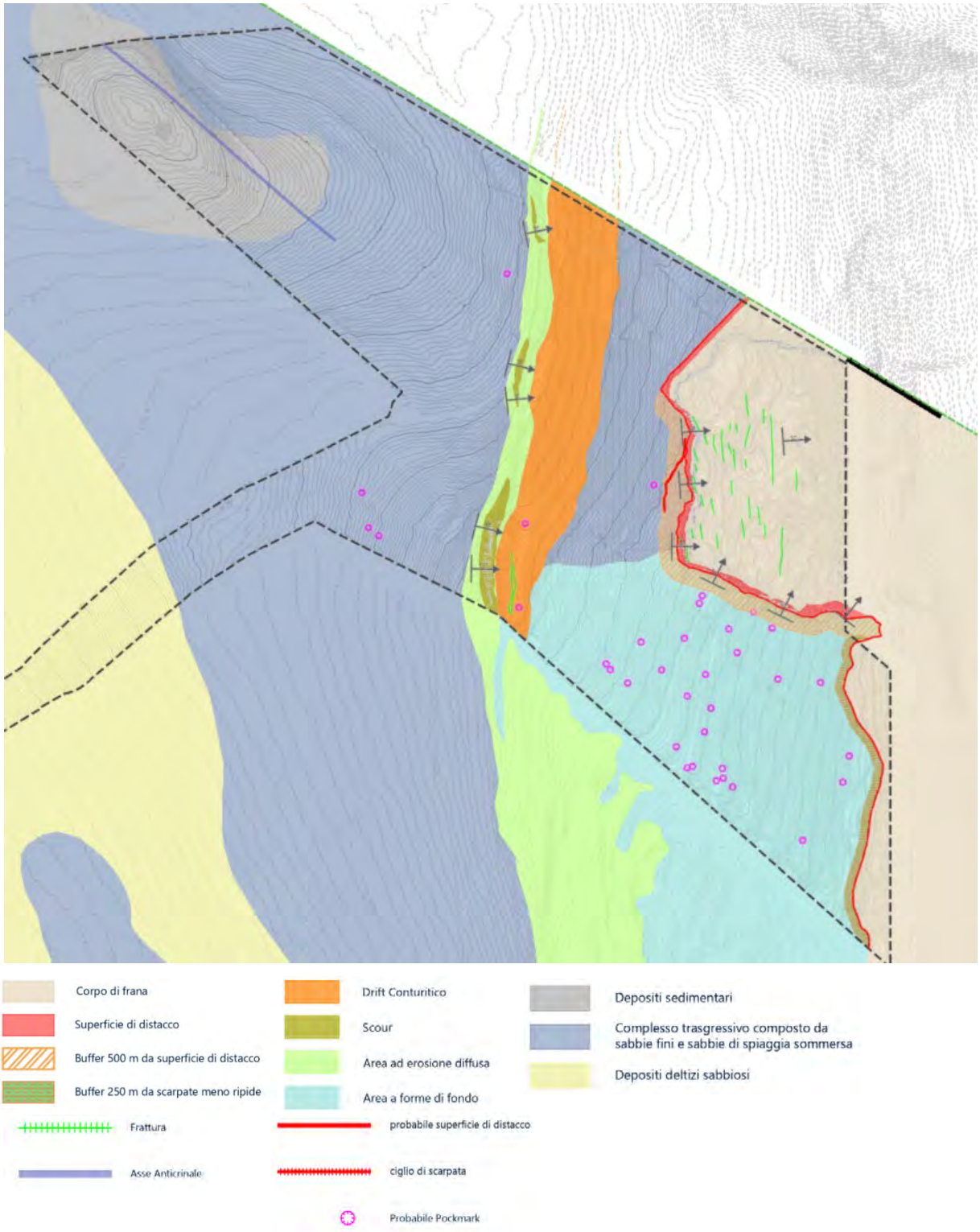
A. **Morphology, geological structure and stratigraphy of the southern Adriatic margin,** with the aim of defining the geological structure and stratigraphy of the areas affected by the project.
B. **Gravitational instability of the southern Adriatic margin**, with the aim of verifying the evidence of possible instability in the area and, in particular, defining a safety strip upstream of the Vieste landslide detachment niche, where it is necessary to avoid installing anchors.
C. **Oceanographic circulation of the Southern Adriatic and morphology of the seabed,** The aim is to provide the fundamental information to be able to interpret the evolution of a series of large-scale erosive structures recognizable on the seabed in the study area and ascertain that there is no genetic link between these erosive structures and the genesis of underwater landslides at greater depths.

The study excludes the installation of anchors inside the body of the Vieste landslide and the area defined with a large safety margin (buffer zone of about 500 m), to which is added another safety zone 250 meters wide in the less steep areas of the escarpment.

In addition, the analysis of seafloor erosive structures related to the interaction between deep water masses and margin morphology clearly demonstrated that **There is no genetic relationship between these erosive forms** (area of diffuse erosion, localized erosive moats, sediment drift, and mud dunes migrating upslope) **and the landslides observed in the easternmost and deepest portion of the study area**. The **Erosive structures** are therefore **expression of independent hydrodynamic processes,** whose **Frequency and intensity** are **limited in time and spatial scale,** and **do not constitute a significant obstacle to the implementation of the project.**

Conclusions of the study

On the basis of the evidence, it is concluded that, with the exception of the buffer areas identified upstream of the Vieste landslide, **All areas included in the newly issued project layout can be considered suitable for the installation of the planned anchorages and subsea infrastructures**. This conclusion is supported by the integrated review of all available bathymetric, seismographic and oceanographic data.



Geological hazard map with buffer areas

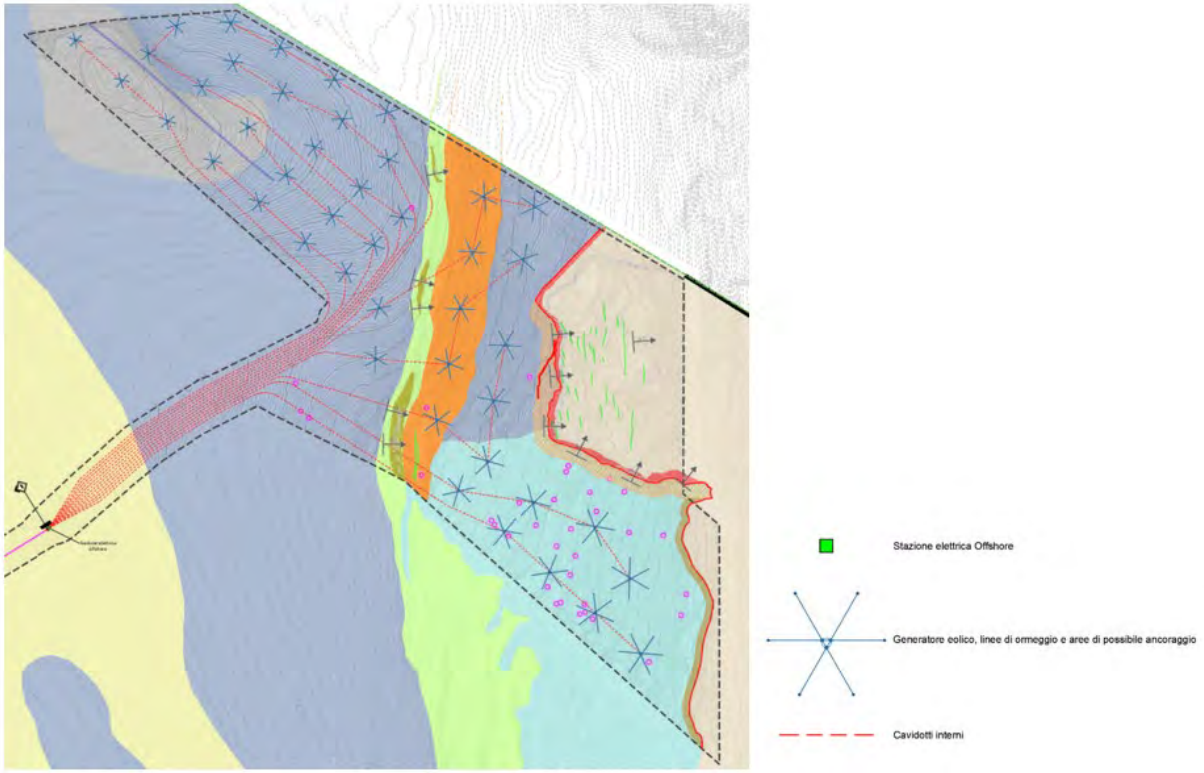
3.18.3.5.3 The new layout of the Nemetun Island plant and the update of the technical documentation

The considerations and conclusions of the study signed by Prof. Trincardi led the proposing company to define a new plant design proposal to make the intervention compatible with the geomorphological and safety conditions of the area concerned.

The reformulation of the Nemetun Island project involves the positioning of 45 wind turbines installed on foundations for a total nominal power of 900 MW.

In summary, the offshore layout of the Nemetun Island plant in the new project issue drafted in June 2025 can be summarized in the following diagram:

- **45 wind generators** installed on tubular steel towers and their floating foundations
- **12 submarine cable power lines** connection between the wind turbines and the offshore electrical collection and transformation station
- **An Offshore Electrical Transformer Station (66/380 kV) (SE),** Located at a distance of about 45 km (24.30 NM) from the Gargano coast and 12 km (6.47 NM) from the wind farm, in a stretch of sea characterized by bathymetric altitudes between 160 and 170 m deep;
- **An export power line in HVAC** with a length of about 88.7 km (48 NM).



The new layout with 45 wind turbines on the geomorphological map

Following the change in the layout and the new analysis of the geomorphological conditions of the site, all the documents of the Nemetun Island project, first and foremost those representative of the geophysical survey, are replaced by the new issue, even the analyses contained in this Environmental Impact Study are updated in a consistent manner.

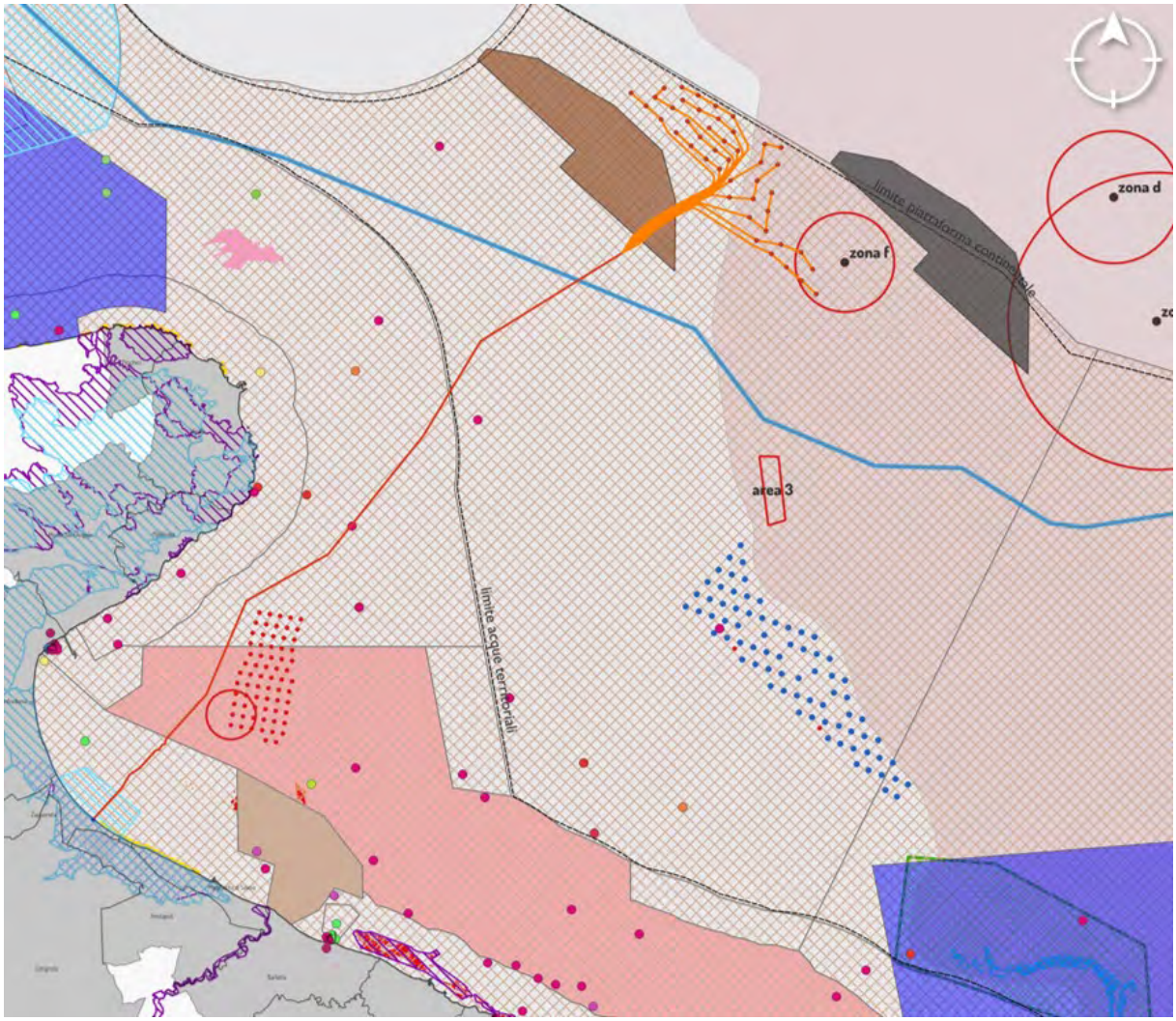
3.18.3.6 Environmental, Military, and Mining Constraints

In the following image, it is Represented the constraint situation superimposed on the location alternatives and the presence of the Seanergy and Barium Bay plants. Compared to territorial constraints, the choice of the reference location for the Nemetun Island plant represents an appropriate compromise. From this we can derive some considerations:

- The interference of the reference area with the possible presence of war ordnance will be resolved during the authorization and executive phases through the reclamation of the sites. It is important to note that the geognostic investigations conducted did not detect the presence of ordnance in the investigated area. However, the selected position was considered more suitable for the presence of interference such as the MON power line. ITA and EBSA 126.

- As far as the route is concerned, the interference with the wrecks concerns some containers that were actually detected by the Side Scan Sonar surveys. However, the selected route was considered suitable mainly for two reasons: the shorter distance from the offshore substation and its suitability as a landing point, which proved to be particularly suitable for connection according to the grid operator's indications.
- The plant does not interfere with the areas of the Natura 2000 network. The interference of the landing of the cable duct with the "Aloisa – Carapelle" IT9110041 marine SPA will be resolved by following the indications provided in the document *S.3_02_Valutazione of Environmental Impact*, to which reference is made for further details and specifications.

The wind farm has been positioned appropriately, taking into account the considerations previously discussed and those made in the previous paragraphs. As a result, localization alternatives in another reference body of water have been excluded.

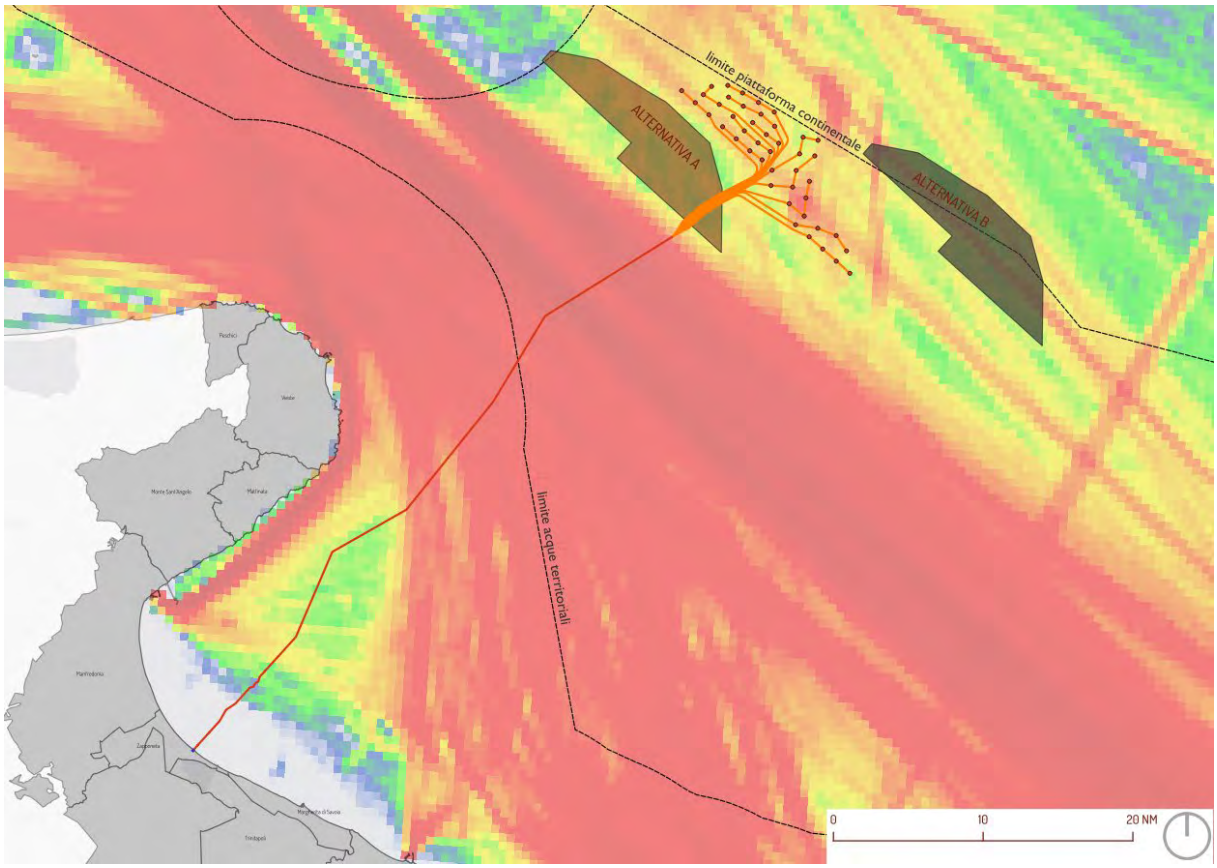


Environmental, Mining and Military Constraints

3.18.3.7 Compatibility with the main routes and ship traffic leaving and entering Adriatic ports

As far as routes are concerned, it should be noted that the entire Adriatic Sea is affected by intense naval traffic. Even without carrying out detailed analysis of the AIS tracks, but simply by observing the cartography associated with the main shipping routes available on the www.marinetraffic.com website, it was immediately evident the presence, for all GRT tonnage classes, of a large traffic corridor that runs parallel to the coast. The image, obtained by reprocessing the data proposed by the European project ADRIPLAN (ADRiatic Ionian maritime spatial PLANning - http://adriplan.eu/), shows the intensity of ship traffic, thus highlighting the corridors of passage of ships in the southern Adriatic. In addition to the main corridor that follows the Adriatic coast, the routes that cross the Adriatic and the routes used by boats entering and leaving the main ports are well noticeable.

The body of water occupied by the wind farm is located outside the areas affected by ship traffic entering/leaving local ports and is located in an area with low intensity of ship traffic beyond the naval corridors that run along the Adriatic along the north-west - south-east route and the naval corridors that cross it (Bari-Dubrovnik). The wind farm marginally interferes with some of these naval corridors which are easily dislocated with slight shifts of course. The study was based on the detailed analysis of the AIS routes presented in the *ES.4.1_01_Assessment of the impact on navigation conditions* offers local verification for compliance with the general criteria described.



Marine traffic (source SID)

3.18.3.8 Evaluation of location alternatives – the offshore wind farm

The final choice of the body of water is therefore the result of the evaluation of all the factors presented so far and summarized below:

- the need to locate the wind farm power in a site with adequate wind characteristics and therefore, as far as possible from the coast to avoid the shielding effects produced by the Gargano promontory;
- the technological limit set out in paragraph 4.3 makes the alternative of a location at a greater distance from the coast incompatible;
- the protection of the landscape which, together with the need not to compromise local fishing activity, is a factor that directs the choice towards bodies of water further from the coast;
- the need to contain interference with ship traffic by ensuring suitable corridors in and out of ports and along the main traffic routes;
- the protection of the marine ecosystem which leads to avoiding protected areas by ensuring the maximum possible distance;
- the project layout considers the alternatives for locating the wind turbines within the reference body of water due to the geomorphological conditions of the seabed;
- Compliance with existing mining titles, also considering the areas affected by applications for exploration permits.

In the previous paragraphs, an overlap of the areas of significant criticality considered is represented, a cartographic representation of the wind data and fishing effort should be added to the themes represented. Looking at the map, it can be seen that the stretch of sea chosen to locate the wind farm represents the best compromise between the needs just mentioned, once the areas affected by constraints deemed incompatible with the proposed works have obviously been subtracted.

Any change to the current location of the plant would therefore be penalizing and would contribute to increasing the potential conflicts of the wind farm with other uses of the sea, human activity and the marine environment.

3.18.4 EVALUATION OF LOCALIZATION ALTERNATIVES – CONNECTION WORKS

Once the location of the offshore wind farm has been defined, it is necessary to identify the size and location of the connection infrastructure required to integrate the energy produced into the electricity grid. These infrastructures include both onshore and offshore works. Connection infrastructures can be divided into two main categories: network works and user works.

The technical connection solution released by TERNA, with connection quote **Code 202201688**, provides for the Nemetun Island plant to be connected by 380 kV antenna on a electrical substation of expansion of the 380/150 kV NTG Electrical Substation (SE) to be inserted in the in-outlet of the 380 kV "Foggia-Palo del Colle" RTN line.

The project process for the offshore wind farm will include the grid works and the user works for the connection indicated by TERNA according to the definitions in Annex A to Resolution Arg/elt/99/08 as amended.

In this specific case:

- The **Network works** consist of the stall assigned in the future 380 kV Electrical Expansion Substation of the 380/150 kV Electrical Substation (SE) currently under construction in the municipality of Cerignola.
- The **User works** consist of the 380 kV power line to be inserted into the antenna for the connection of the offshore wind farm.

In the connection point assignment document (STMG), the NTG management company specifies that, in order to optimize the use of grid facilities, it will be necessary to share the space dedicated to the Nemetun Island plant with other possible production plants. In other words, to connect the energy produced by the Nemetun Island power plant to the grid, the**The user system must be equipped with a condominium electrical substation (SSE), which allows the same connection stall to be shared with other manufacturers.**

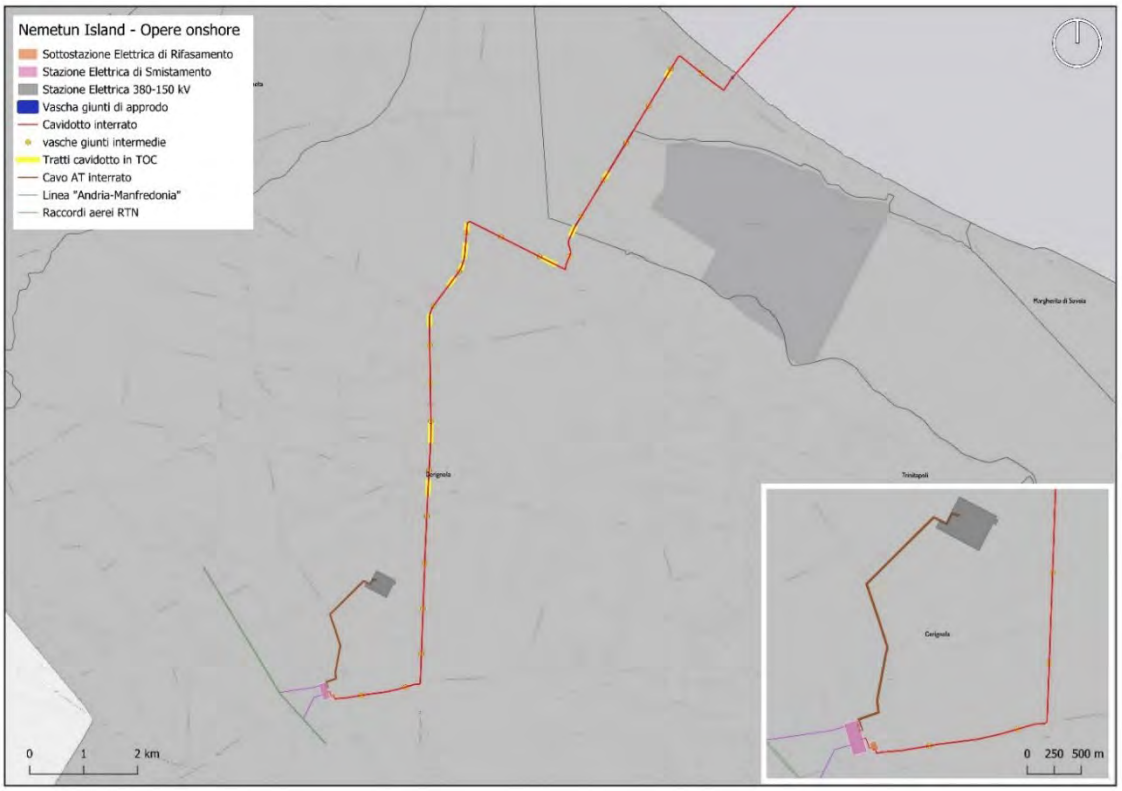
Near the planned landing point in the municipality of Zapponeta, an underground joint hole will be built to transition from marine cable to land cable and from there on the cable will continue with underground laying following the existing public road network. The energy produced will then be conveyed to the condominium electrical substation equipped with a power factor correction unit, planned inside an industrial building near the TERNA electrical substation in Cerignola and its future expansion.

In such cases, the ground works of the**User system** consist of:

- **The underground transition Joint Bay**, located near the landing point in the municipality of Zapponeta, will allow the transition from the submarine cable to the cable intended for underground laying;
- **A 380 kV double circuit underground power line**, extended for about 18 km, will be laid mainly alongside the public road network in the territories of the municipalities of Zapponeta, Trinitapoli and Cerignola, with short transits on agricultural land. The installation will take place mainly through excavations with a fixed section, but to manage interference along the way, **11 sections laid using the excavation-free technique called "Horizontal Directional Drilling" (HDD).** The 11 sections will have variable lengths, as represented in the project documents;
- **A series of 22 Intermediate Joint Bays,** located along the route of the underground cable duct with a variable distance between 700 and 950 metres, the intermediate junctions will be built as part of the excavation with a fixed section envisaged for the laying of the power line;

- **An electrical substation isolated in GIS for sharing the stall and equipped with a power factor correction unit dedicated to the Nemetun Island plant**, with a maximum capacity of 600 MVAr, consisting of two Shunt type reactors. The GIS substation will be located in an industrial building located in the municipality of Cerignola, near the NTG connection point indicated by TERNA and represented by a new Switching Station to be built as an extension to the Cerignola Electrical Substation;
- **An underground power line consisting of a trio of 380 kV cables,** approximately 200 m long, for the connection of the electrical substation to the nearby new Switching Station to be built as an extension to the Cerignola Electrical Substation.

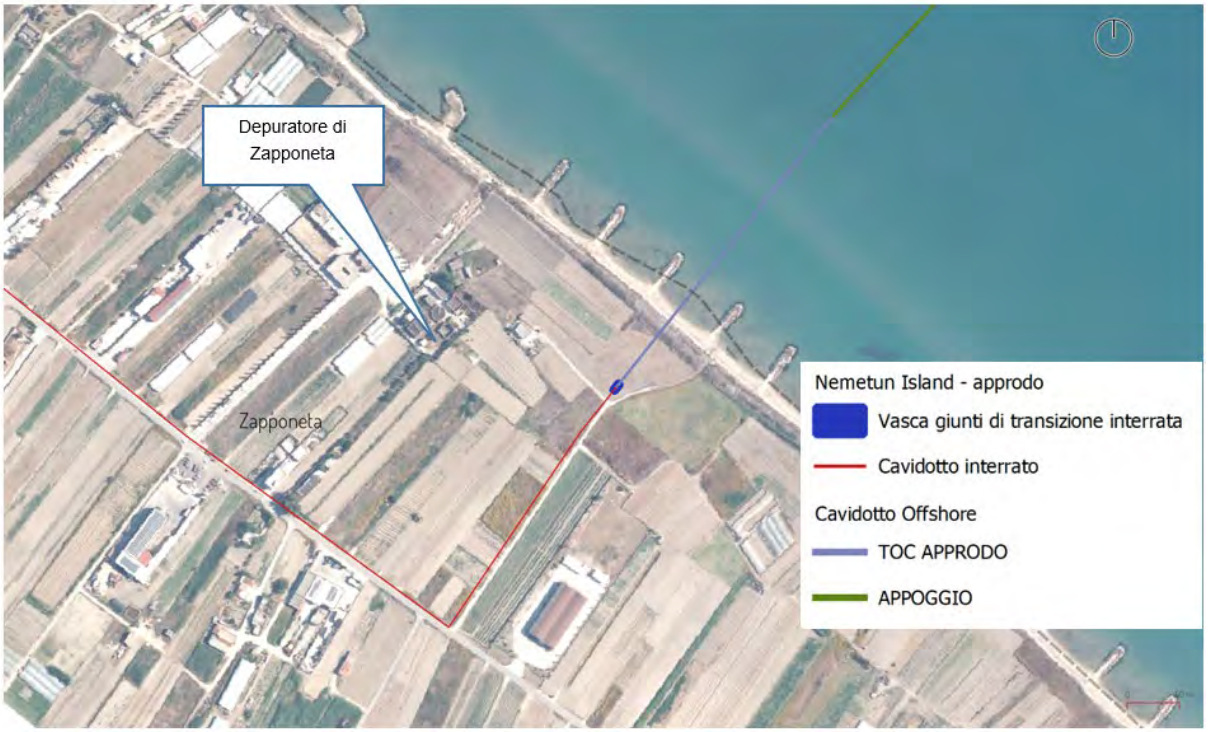
As regards the **Network Works** it is important to note that, according to the decision Arg/elt/99/08 and subsequent amendments of the Regulatory Authority for Energy, Networks and the Environment, the design of the**Extension to Cerignola Electrical Station** it is the responsibility of a 'leader' party, selected by Terna S.p.a. from among the producers involved in the same grid works. This documentation is to be included in the design documentation and in the authorization procedures of all the production plants to be connected to these network works. In this specific case, the role of leader is entrusted to a third party, therefore the complete design package referring to the new 380 kV Electrical Expansion Substation will be included among the design documents and assessed as part of this Environmental Impact Assessment, extracting the project documentation of the documentation drawn up on behalf of the Lead Partner at Terna s.p.a.



Synthetic representation of the works Onshore

3.18.4.1 Localization of the landing point and from the underground Joint Bay

The location of the landing point and the Joint Bay will take place in an area characterized by the presence of the municipal purification plant of Zapponeta. This area was also considered suitable for the presence of a road layout that can be used for the start of the underground laying of the cable duct.

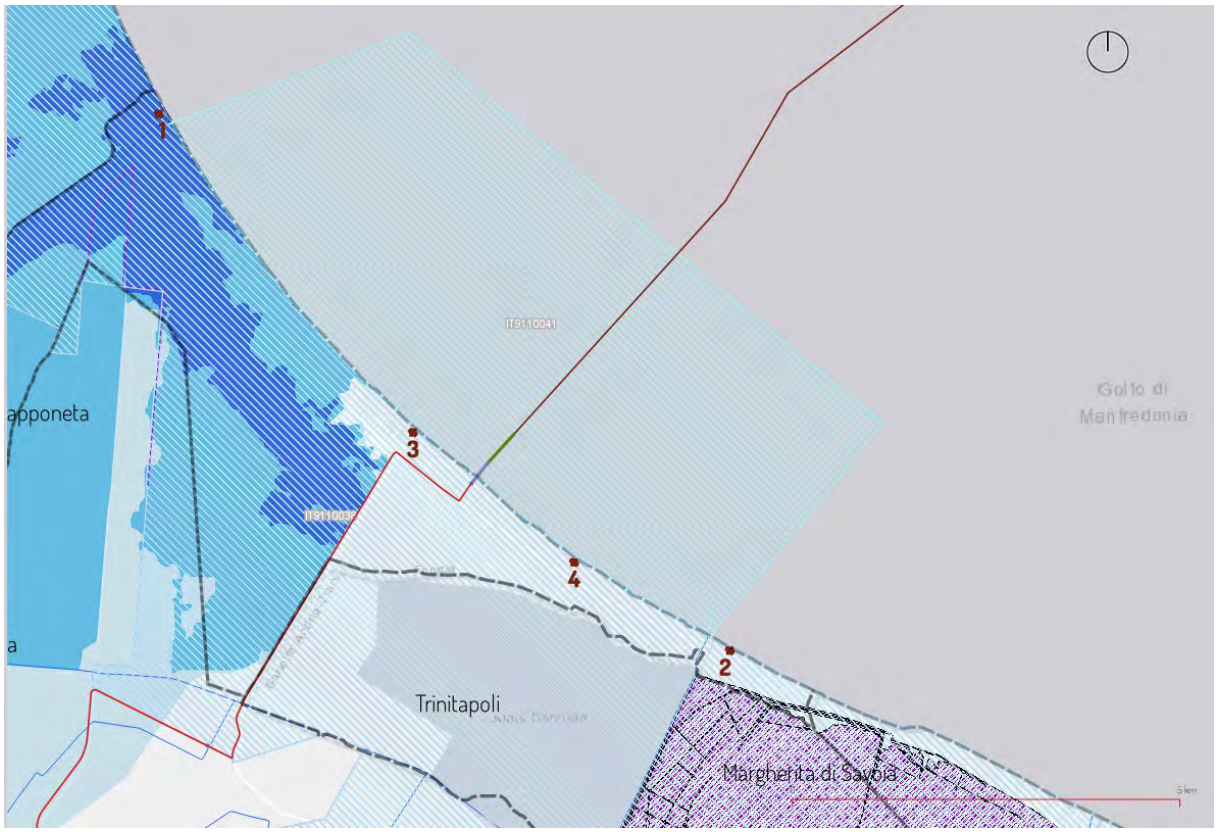


Location of the landing point and the underground Joint Bay

The possible alternatives considered for the location of the Joint Bay and, consequently, for the arrival of the marine cable duct, took into account the need to avoid interference with the "Aloisa – Carapelle" IT9110041 marine SPA. However, it is also important to consider the presence of other terrestrial areas of the Natura 2000 network, which could potentially interfere with the laying of the cable duct on land. After evaluating the characteristics of the IT9110041 SPA and the low-impact technologies adopted for laying the marine cable, it was concluded that landing at the selected point would have had a lower impact on the environment.

As shown in the graph below, in the light of the alternatives evaluated, we can make the following comments:

- **Alternative 1**, located outside the marine SPA, would have caused interference with areas characterized by a high hydraulic risk, defined by the Hydrogeological Asset Plan (PAI), as well as with the IT9110038 SPA. At the same time, the landing points located further north would have required a longer underground cable duct and a greater crossing of the areas of the Natura 2000 network. For these reasons, this option was discarded.
- **Alternative 2** or other positions further south of the landing point, even if they were outside the marine SPA, would have required the laying of the underground cable duct near the Margherita di Savoia salt pans IT9110038. That would have meant the need for a particularly long onshore route and further interference with the hydrographic network. This option was also considered environmentally invalid.
- **Alternative 3** it would have simply been too close to the town and in a particularly attractive area from a seaside point of view, not resolving the interference with the marine SPA area mentioned,
- **Alternative 4** would have affected private land not served by public roads in the face of a non-resolution of the interference with the marine SPA, this hypothesis was also considered unviable.



Landing point location alternatives

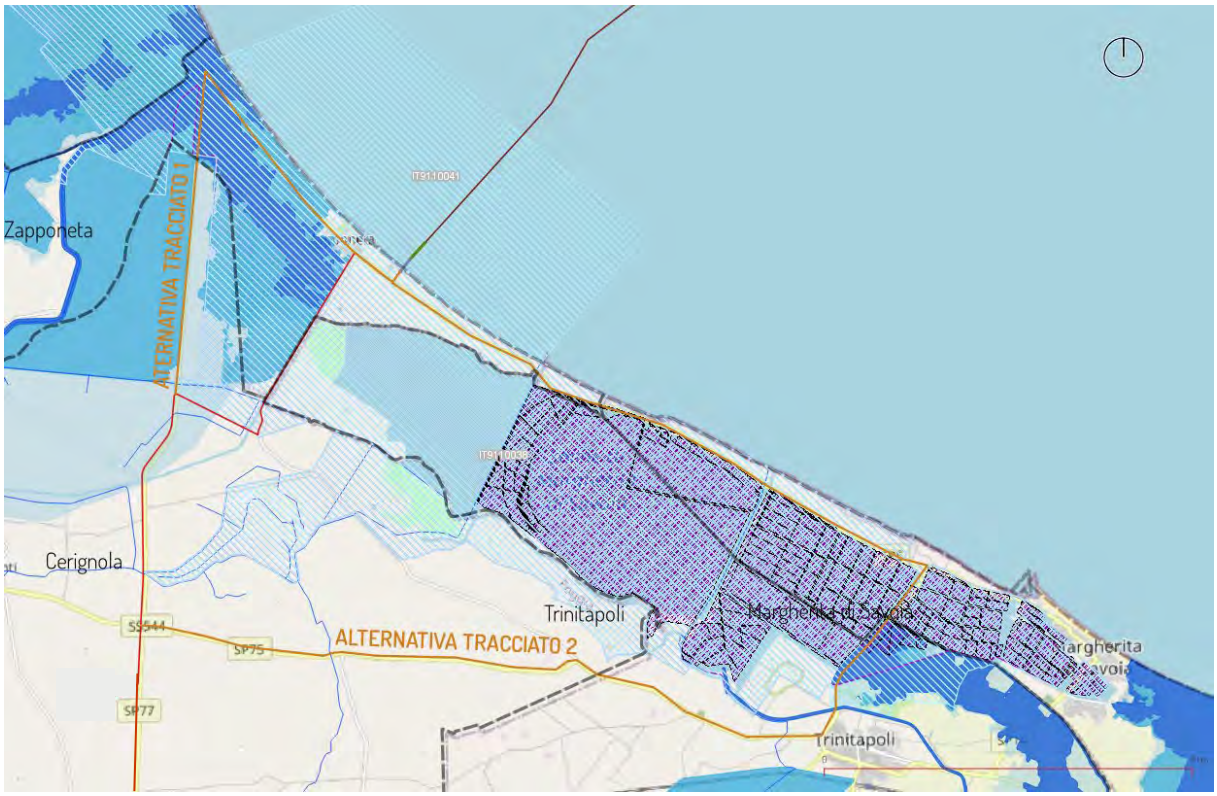
As mentioned above, the interference with the SCI area was examined in the context of the Environmental Impact Assessment Study, as described in the *S.3_02*. Please refer to this document for further details and insights.

3.18.4.2 Route alternatives for the underground power line

The choice of the positioning of the landing place strongly affects the selection of the route of the underground conveyance cable duct from an environmental point of view, making the selected route (in red in the drawing) the most environmentally sustainable and least impactful solution.

- **The alternative of route 1**, in fact, despite having a similar distance to those selected, it would interfere with areas of hydraulic hazard selected by the PAI.
- **The alternative to route 2** would have a much longer length, with greater occupation of public roads, would interfere with the salt pans of MArgherita di Savoia and would generate a greater occupation of agricultural land in the stretches of travel alongside the roadway.

Both alternative solutions are therefore environmentally invalid.



3.18.4.3 Alternatives for locating the Electrical Substation

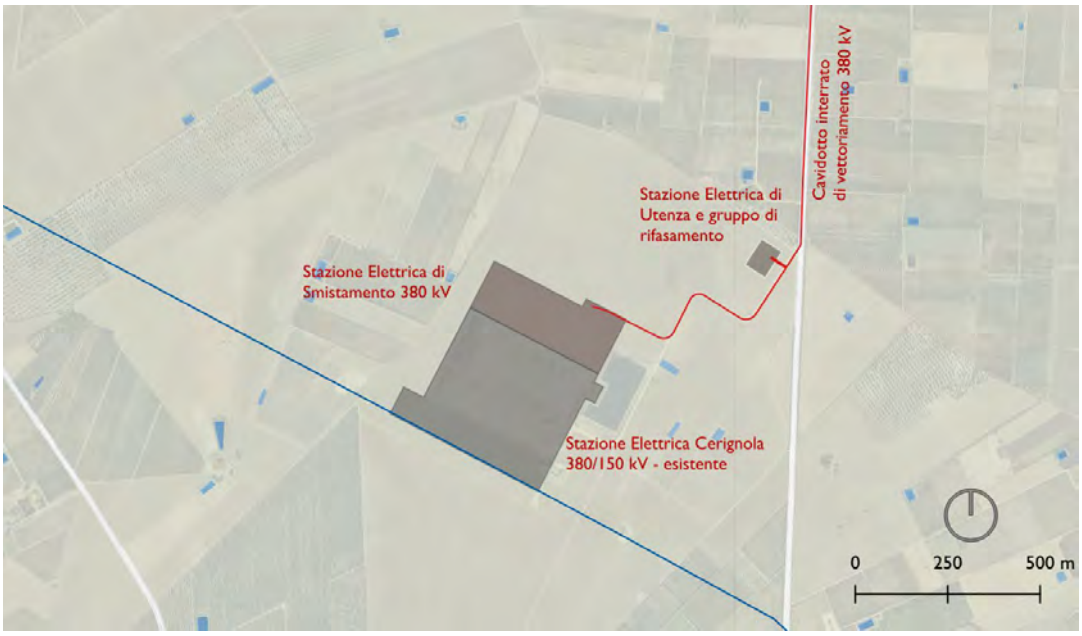
With regard to the connection works, both grid and user, it is important to point out that, following discussions with the lead operator at Terna, changes have been made to the configuration and location of the infrastructure necessary to connect the Nemetun Island plant to the NTG grid. These changes - introduced at a date subsequent to the inspection with the PNRR PNIEC technical commission carried out in February 2025 - led the proposing company to reposition and reconfigure the layout of the onshore connection works. In addition, the new configuration has made it necessary to include in the Nemetun Island project also the works under the responsibility of the NTG and the related environmental assessments, which had initially been excluded.

In particular, the expansion of the Terna station in Cerignola will no longer be carried out alongside the existing station, but through the construction of a **new Switching Station in expansion at the SE of Cerignola**, located in another site (satellite configuration).

This new station will be **Connected**:

- to **380 kV RTN overhead line "Manfredonia–Andria"** through **Overhead connections**;
- to the 380 kV RTN overhead line "Foggia – Palo del Colle" by means of an underground line connected to the existing station **of Cerignola.**

In line with this new configuration, the location of the power factor correction user station has also been modified, which is now planned adjacent to the new Terna Sorting Station.



The location of the connection works in the first issue of February 2024

The location of the connection works in the June 2025 Nemetun Island project update

The update of the layout of the connection works is an integral part of the updated design package drawn up in June 2025, the new connection system and the environmental and visual mitigation systems of the project are updated accordingly.

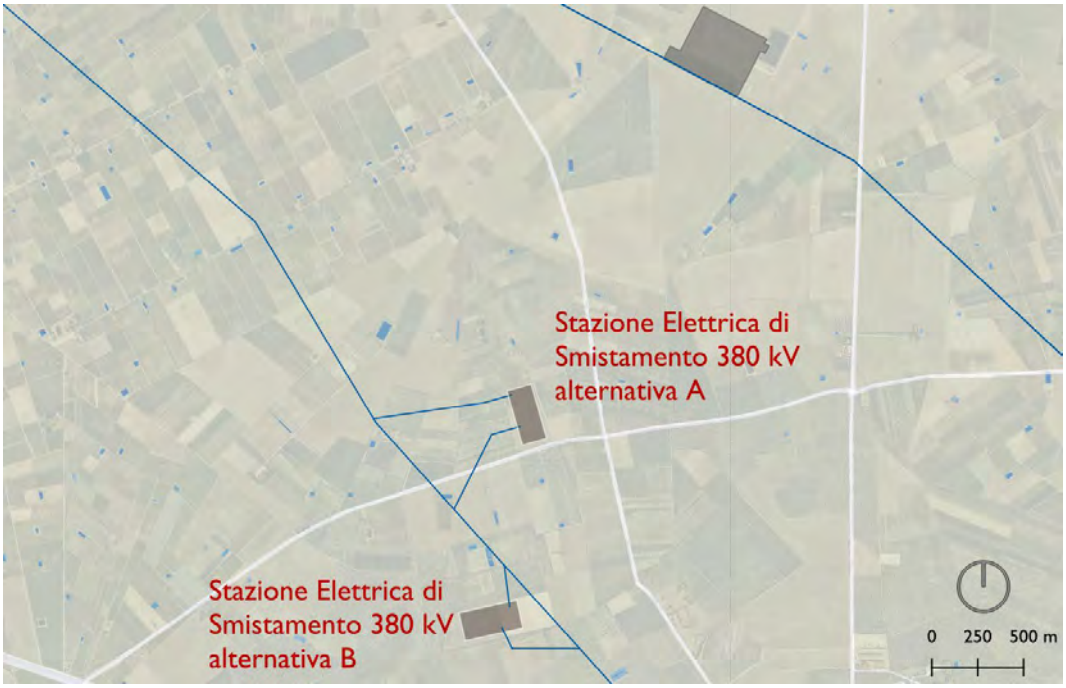
It should be noted that the choice of the new scheme derives from the indications of the Network Operator and the indications of the technical table, and as such is implemented within the Nemetun Island project in which the environmental impacts are assessed and the environmental and landscape integration projects of the new works are developed.

3.18.4.4 NTG works - other localization and connection alternatives

With reference to the network works described in the previous paragraph and their alternative configuration compared to the first version of the February 2024 project, it is considered necessary to illustrate here some location alternatives proposed and analyzed during the technical table. These alternatives concern both the location of the new 380 kV marshalling yard, to which the plant will be connected, and the connection of this station to the NTG network.

3.18.4.4.1 Alternatives for locating the 380 kV Electrical Shalling Station

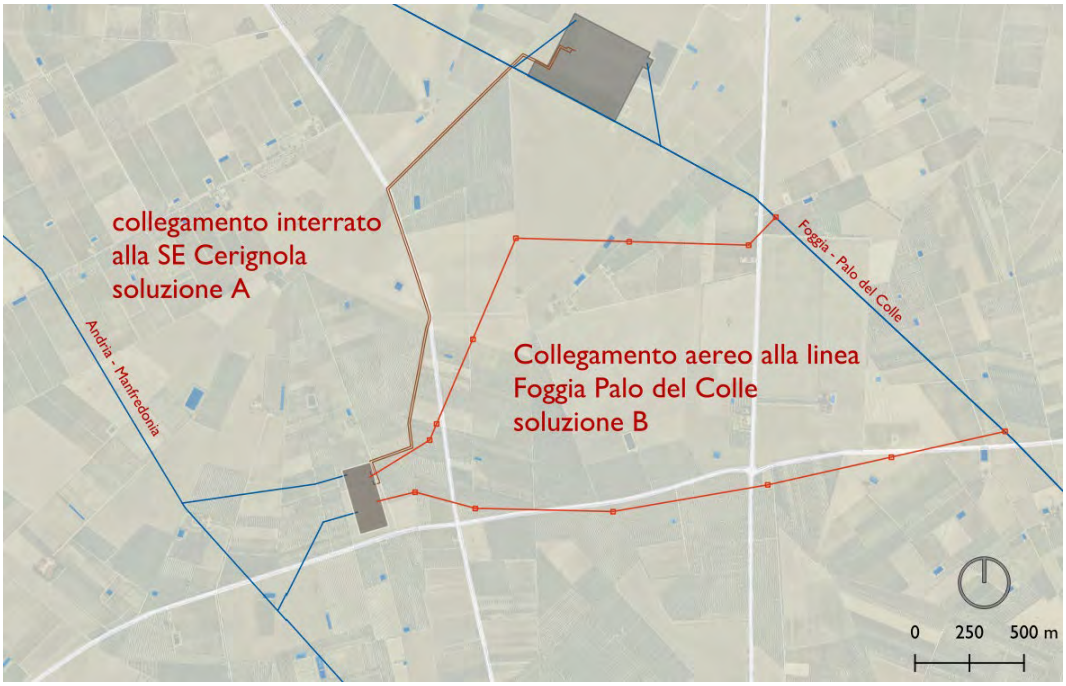
Of the two alternatives proposed for the location of the marshalling yard, alternative B was discarded due to the greater distance from the Cerignola electrical substation and the absence of suitable access roads. From an environmental point of view, these conditions would generate greater land consumption, due to the construction of new access roads and the greater length of the underground cable duct.



Marshalling yard location alternatives

3.18.4.4.2 Alternatives for connection to the Foggia – Palo del Colle RTN line

During the technical table, the possibility of connecting the new station directly, by means of overhead connections in "in-out" mode, to the 380 kV Foggia-Palo del Colle line was examined.



The connection hypothesis: underground to the "Andria Manfredonia" line and air to the Foggia Palo del Colle line

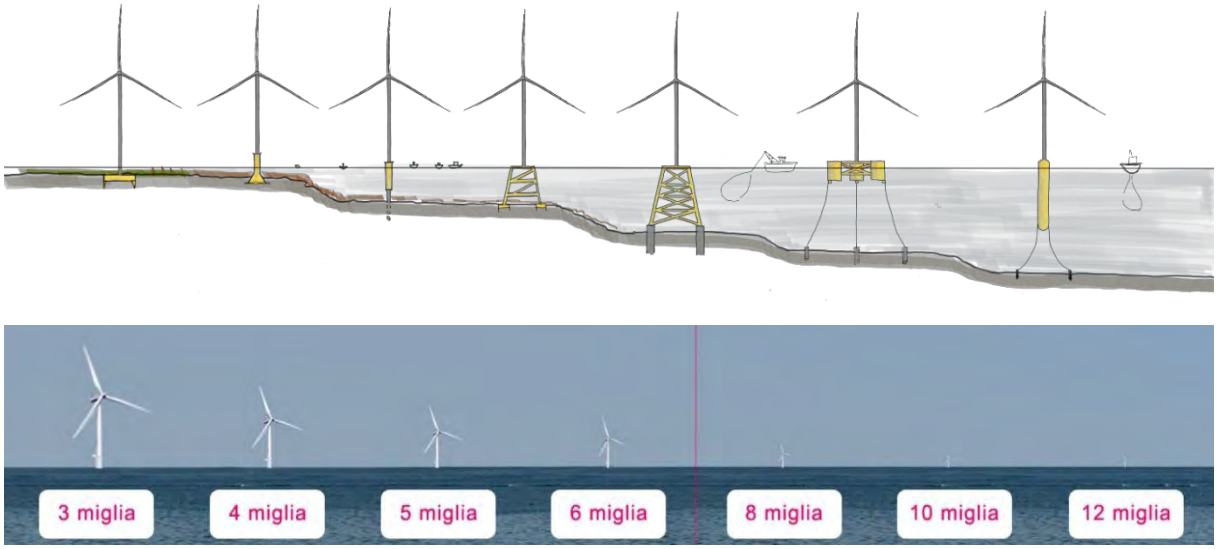
As part of the Environmental Impact Assessment for the Nemetun Island plant, solution B, which involves an overhead connection, was considered unsuitable due to the greater environmental and landscape impact that the connections would have on the context under consideration. This option would in fact involve the construction of two overhead lines, each about 3 kilometers long, for a total of 6 kilometers, and would require the installation of 13 new pylons with an estimated height of 30 meters.

The underground cable solution is certainly preferable as it is decidedly less invasive.

3.18.5 PROCESS OR STRUCTURAL ALTERNATIVES

The definition of the final project was developed in successive steps and went hand in hand with the acquisition of information and data on the marine environment and with the characterization of the seabed.

This project was born, from its conception, as an offshore wind farm project built on floating foundations. The possibility of building the plant on fixed structures has never been taken into consideration for the reasons mentioned in the introduction: the Mediterranean Sea is incompatible in terms of bathymetry, other uses of the sea, environmental and landscape characteristics with the construction of wind farms on fixed structures, unless we consider some areas in the central-northern Adriatic characterized by an unfavorable anemometry.



Conceptual Scheme – Fixed and Floating systems

With reference to the choice of the model of wind turbine to be used, the criterion of maximizing its power was adopted, thus preferring to reduce the number of machines to be installed with the same total power of the system. In this way, a choice has been made that certainly reduces the impacts of the works.

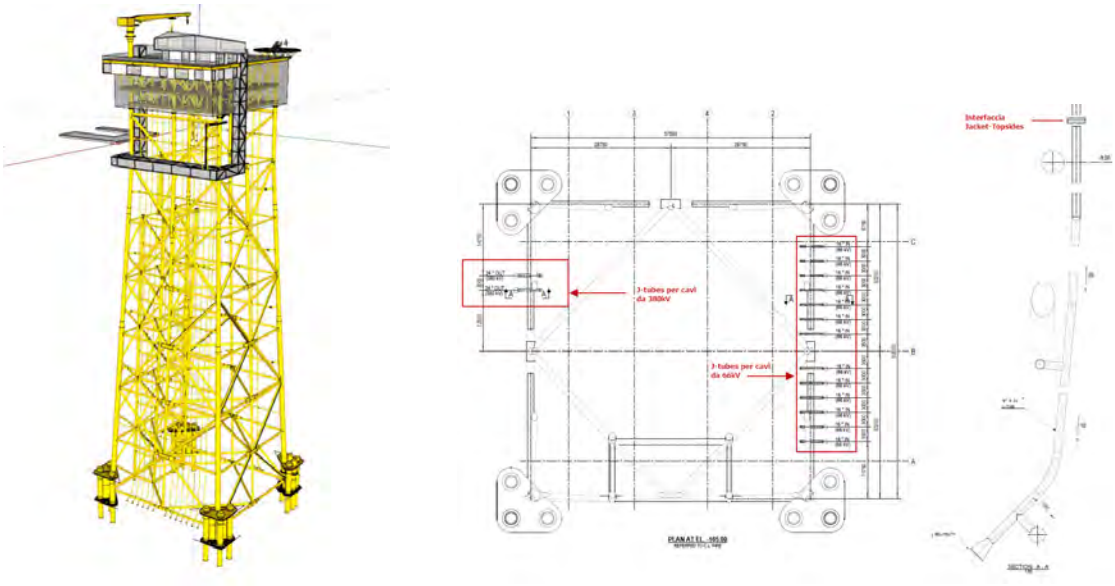
The subsequent examination therefore starts from the choice of the type of foundation, then describes the possible alternatives regarding moorings and anchorages, clarifies and motivates the technical choices regarding the offshore transformation substation, the marine and the land cable duct.

3.18.6 ANALYSIS AND TYPOLOGICAL CHOICE OF THE OFFSHORE SUBSTATION

The Nemetun Island wind farm includes an offshore transformer station. For the choice of the location points and the technology to be adopted for this infrastructure, it was of fundamental importance to determine the bathymetric altitude and to study the technological solutions currently available on the market.

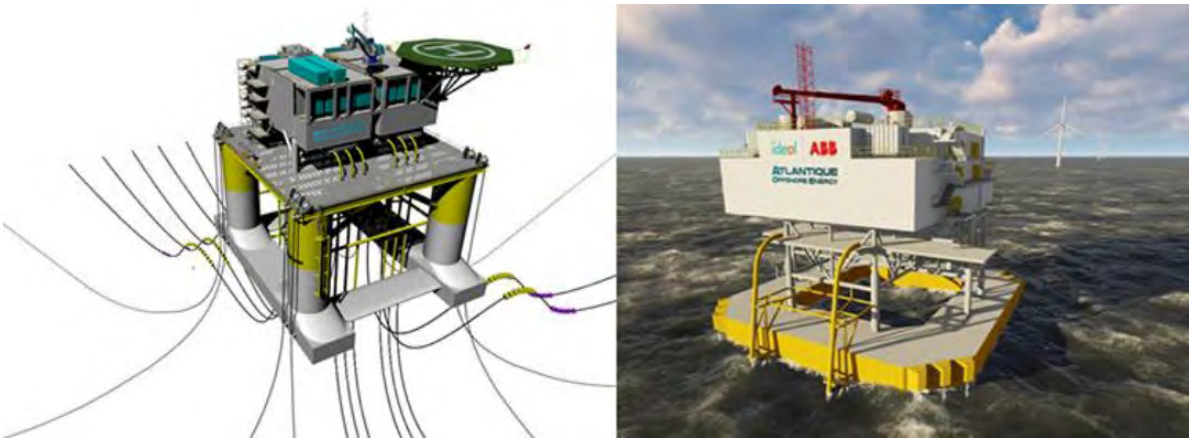
The criteria were oriented towards two alternatives:

- The "bottom fixed" substation, which is installed on a foundation jaket anchored to the seabed and is connected to the ground via 66 kV dynamic cables and 380 kV static cables.



Bottom fixed substation

- The floating substation, which is served by 66 and 380 kV dynamic cables.

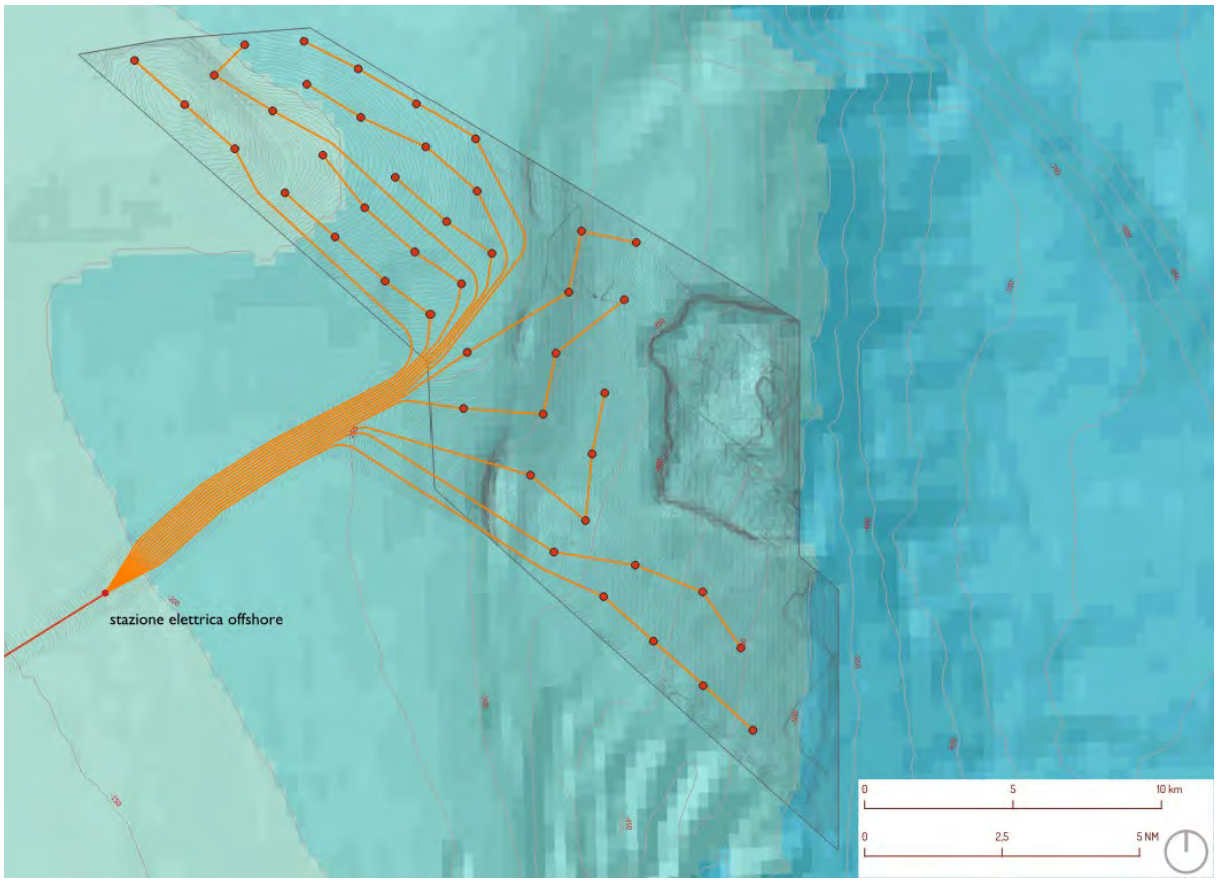


Floating Substation

The first solution sets installation limits within the body of water occupied by the wind space, since the minimum bathymetric altitude, above 200 meters, is not compatible with normal launch operations of a Jaket to be fixed on the seabed. The limit does not relate to the technological solution, but to the presence of port facilities capable of launching a platform of this size.

The second solution, although structurally feasible, places limits on technological development, since there are currently no solutions available on the market for dynamic (i.e. floating) 380 kV cables.

With a view to a design proposal that adopts solutions currently available on the market and realistic from the point of view of feasibility, we oriented ourselves towards the solution of a fixed station installed on Jacket, this type of choice has oriented thethe decision to locate the substation in a separate area, albeit close, to the offshore installation. The installation area is therefore located about 6 nautical miles from the planting area, in a body of water with a bathymetric altitude between 160 and 170 m deep.



The location point of the offshore substation

3.18.7 ANALYSIS AND CHOICE OF THE TYPE OF FLOATING FOUNDATION SUBSTRUCTURES OF THE WIND TURBINES

For the design of the floating foundations, a collaboration was started with the University of Strathclyde, a British university based in Glasgow in Scotland at the forefront of studies on marine renewable sources. The University of Strathclyde has extensive experience and expertise in wind, naval architecture, marine safety and offshore engineering and is regarded as the UK's leading university for research and training in the offshore wind industry.

The study and design activity carried out by the university consists of a preliminary comparative analysis of the different types of existing floating foundations and ended with an initial selection made on the basis of the degree of technological maturity and the degree of compatibility with the depths of the water in the chosen site.

The study carried out made it possible to select the type of foundation and carry out the sizing of the structure according to the weather and sea and bathymetry conditions.

In particular, all the main configurations adopted by floating offshore wind turbines that are already installed and operational or under construction were taken into consideration. These configurations have been classified according to the main characteristics and classified into the three main classes (stabilized with a buoyancy figure, stabilized with ballast and stabilized in mooring). For each configuration, the classification criterion was explained by analyzing the main advantages and disadvantages.
Two main selection criteria were adopted to choose the most suitable configurations for the chosen site:

	Criterion	Description
A	Level of industrialization of the technology	TRL ≥ 7: Development at least at pre-commercial level, i.e. at least one offshore wind farm with multiple units in operational conditions, with a total farm capacity exceeding 5 MW.
B	Minimum operating draft relative to water depth	Configuration compatible with the depths found in the site: Min: 180 m Max: 500 m

The information on the Quest Floating Wind Energy website was used to filter out floating wind turbine configurations that meet the TRL criterion defined as the baseline, and the results are presented below. The configurations identified are (in alphabetical order), they are:

- Ballast stabilized, (SPAR)
- Stabilized by the water surface, semi-submersible.

In terms of TRL level, both configurations reach the maximum TRL level, as both the SPAR and the semi-submersible have complete commercial offshore wind farms, with a total installed capacity of 50 MW or more:

- for SPAR, the Hywind Tampen project, commissioned in 2022, consisting of 11 wind turbines, for a total capacity of 88 MW, is highlighted;
- for the semi-submersible there is the Kincardine project, in Scotland (tranche 2), commissioned in 2021, consisting of 5 wind turbines, for a total capacity of 47.5 MW.

In terms of water depth:

- the ballast-stabilized configuration, if the configuration with the highest rated power is considered, i.e. 8,6 MW of the Hywind III project, requires a minimum operating draft of about 130 m. Taking into account that this project considers a 15 MW wind turbine, with a higher hub height and a higher maximum thrust, it is likely that a minimum operating draft of more than 130 m will be required. However, since the minimum water depth at the site is 180 m, this project would, in principle, be compatible with this water depth.
- the semi-submersible configuration is fully compatible with the depth of the water of the site considered: in fact, the semi-submersible structure used for the Kincardine project requires a minimum depth of 40 m for the 9.5 MW wind turbine. Even increasing the size of the wind turbine (to 15 MW), due to the stabilization mechanism used, the platform will increase in width, but not necessarily in draft, so that the minimum depth required does not change: this can be observed by comparing the three projects made using this technology that have the same minimum operating depth despite but use wind turbines of different rated power.

Principle Power hemi-submersible (left), Hywind spar (right)

Classification	Selection criteria	
	TRL ≥ 7	**Minimum operating draft VS water depth**
Stabilized by buoyancy figure (semi-submersible)	✓ The semi-submersible configuration has reached TRL 9	✓ Even considering the increased hub height and aerodynamic thrust of the 15 MW wind turbine, this platform scales mainly in width, not in draft, so it is reasonable to assume a minimum required depth of about 40 m even for a 15 MW version.
Ballast stabilized (SPAR)	✓ The Spar configuration has reached TRL 9	✓ The Hywind Tampen project, consisting of 11 8.6 MW wind turbines, requires a minimum depth of approximately 130 m. SPAR configurations for 15 MW wind turbines have not been built and installed, but it is likely that they can be installed at a depth of 180 m (minimum water depth considered at the site) and certainly can be installed at 500 m (maximum water depth considered).

3.18.7.1 Selection according to transportability criteria of floaters

Offshore wind turbines can require major maintenance operations during their service life. In the case of the semi-submersible configuration, the so-called "Shore Towing" approach can be adopted, whereby the floating wind turbine is transported to land for major maintenance operations, after disconnecting the electrical power cable and the anchoring system. In fact, a semi-submersible can reach a very shallow transport draft. This is not possible for a SPAR configuration: it is usually very difficult to find a port structure with a water depth compatible with the draft of an entire assembled SPAR floating foundation of the dimensions considered.

The minimum draught depth can be decisive in the choice between the two options, since a draught of more than 100 meters is not compatible with Italian port infrastructures and would lead to significant difficulties during the construction and maintenance of the installed turbines.

This criterion oriented the selection towards a semi-submersible structure stabilized by buoyancy elements.

3.18.7.2 Selection according to assembly criteria

The semi-submersible can be fully assembled within the port infrastructure, i.e. the RNA and tower can be mounted on the floating substructure, as a very limited draft is required. The advantages of this possibility are:

- **Increased cost-effectiveness:** An assembly operation conducted on land or at the pier has a lower cost than the same assembly conducted near the coast or in the open sea.
- **Wider weather windows:** The mounting operation can only be conducted below a certain maximum wind speed and, if subject to wave loads, below a certain significant wave height. On land or near the coast, wind speeds are generally lower than in the open sea and, above all, the assembly can take place in sheltered areas, where wave heights are significantly reduced. Therefore, assembly operations on land or near the coast can take place for a longer part of the year than those in the open sea.

This criterion was also considered favorable for the selection of a semi-submersible foundation.

3.18.8 ANALYSIS AND CHOICE OF MOORING TYPES

Three mooring configurations are typically adopted for FOWT systems:

- Catenary mooring systems: part of the mooring line lies on the seabed in a position of static equilibrium. The weight of the line makes it assume a catenary shape, and the change in the length of the suspended chain as a result of the movement of the offshore structure generates the necessary restoration forces in headway, drift and yaw. Anchors are never subjected to vertical loads.
- Taut mooring systems: No part of the mooring line lies on the seabed in a static equilibrium position, with the line stretched from the anchor on the seabed to the fairlead on the float. The restoration forces are generated by the change in voltage in the lines. Anchors are designed to support vertical (as well as horizontal) loads.
- Semi-taut mooring systems: a hybrid between the two previous solutions, in which part of the line is stretched (typically in polyester fiber or similar) and part takes on a catenary shape (typically a chain). Anchors can be subjected to vertical loads, but to a lesser extent than taut mooring systems.

In the preliminary design phase, the choice of the most suitable mooring system configuration is mainly dictated by the depth of the water, as shown in the table:

Configuration	*Suitable for*
Catenary	*Medium-shallow depths*
Semi-taut	*Medium depths*
Taut	*Deep water*

Mooring Configuration VS Water Depth

The water depth varies from a minimum of 180 m to a maximum of 509 m. Because of this wide range, it was agreed to divide the area of the offshore wind farm into two representative areas, with two different water depth bands:

- Area A: Area of the offshore wind farm with water depth less than 250 m.
- Area B: Area of the offshore wind farm with water depth greater than 250 m.

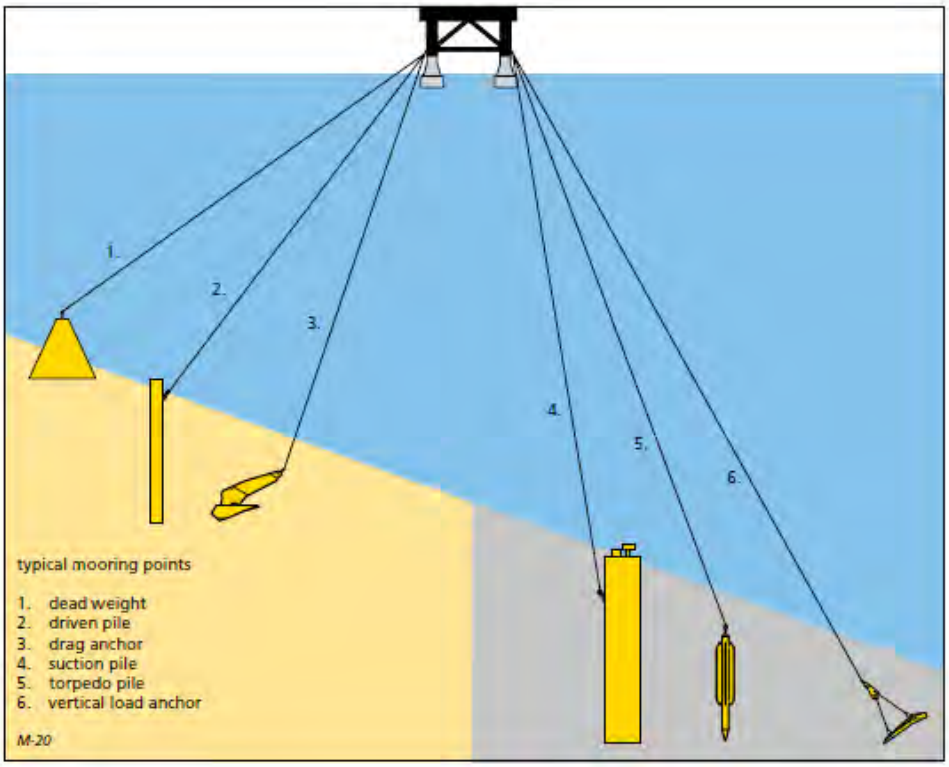
Based on bathymetry, the average water depth in each area was calculated, considering the water depth at the coordinates of each wind turbine in each area:

- Average water depth in area A: ~210 m
- Average water depth in area B: ~375 m

These average water depths during the verification phase were considered as the reference water depth for the two areas.

3.18.9 ANALYSIS AND CHOICE OF ANCHOR TYPES

In the offshore industry, there are several anchoring solutions for floating structures with stretched moorings. The identification of the most suitable system is subject to a series of boundary conditions, which also depend on the geotechnical and geomorphic characteristics of the site.
The following figure illustrates the different types of anchoring points according to water depth (from shallow to deep) and soil characteristics (from high-density or rocky to loose or low-consistency soils).



Types of anchoring

The anchoring solutions for a seabed characterized by rocky sediments, or cemented sediments, are listed below and described in depth in the report *"R.3_02_Relazione on floating foundation structures and anchors"*:

- Gravity anchors (dead weight)
- Drag Embedded Anchor (DEA)
- Suction Buckets
- Driven piles
- Drilled piles

The table presents the different types of anchors in relation to the geophysical characterization of the seabed.

	BACKDROP		
ANCHORING SYSTEM	LOOSE SANDS	MEDIUM/HIGH DENSITY SANDS	ROCKY BOTTOMS
GRAVITY ANCHORS			
SUCTION ANCHORS			
POLI FIXTURES			
BORED POLES			
DRAG ANCHORS			

Not applicable
Partially applicable
Applicable

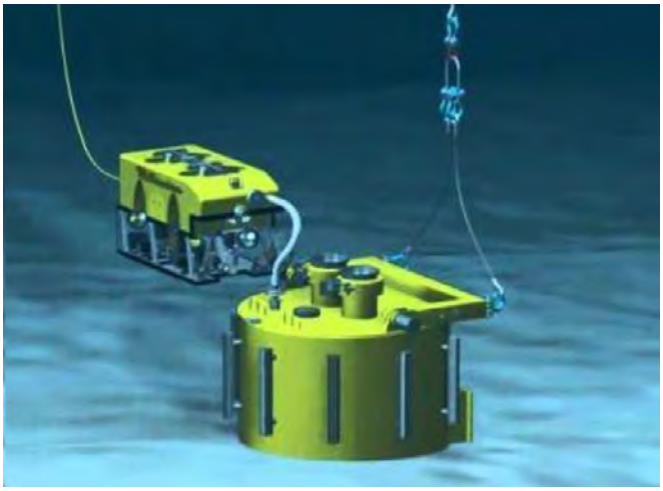
Types of anchors in relation to the geophysical characterization of the seabed

3.18.9.1 Selected anchor types

On the basis of geophysical prospections, which identify a substrate of soft sedimentary deposits, and on the basis of the bathymetric characteristics of the seabed, which identify two areas with different average depths, two main categories of anchors have been selected:

- **Suction anchors:**

Suction buckets are installed on the seabed until they reach the desired depth by sucking water and creating a depression inside the container, which thus sinks. The mechanical characteristics of the soil represent the main constraint for this solution, which can be successfully used in soft or medium clays and in thickened sands, but is not suitable for hard and fractured clays or compact rocks.



Suction Boxes

- **Anchors made of bored or beaten piles:**

The pole is a hollow steel pipe, prefabricated in a single piece, which is driven into the seabed by means of an underwater hydraulic pile driver (hydraulic hammer) or vibrator (vibro-hammer). The holding capacity of the pile is generated by the combination of the friction of the soil along the pile shaft and the lateral passive resistance of the soil itself. The pole is able to withstand both horizontal and vertical loads. Thanks to its ability to carry even very high loads, this solution is often used in the oil and gas industry. When driving by hammering or vibration is not possible, drilling can be used for the installation of the pile. The bored piles are installed in three phases: drilling with soil removal, laying the pile and injecting the cement mortar.

Bored or driven piles

The choice of the method for positioning the anchor posts was made on the basis of an in-depth analysis that considered several aspects. In particular, both the geological characteristics of the site and the acoustic impact deriving from the installation of bored piles and driven piles were carefully evaluated, with the latter factor playing a decisive role in the final decision.

Initially, the laying of bored piles using a dynamically positioned vessel was considered. Although evaluations are underway on more innovative solutions, the standard configuration of the system was opted for, considered the most reliable from a safety point of view.

However, this type of installation was not very suitable for the geological and geomorphological conditions of the site, which is mainly characterized by loose sediments. The solution with drag anchors was also excluded, as it was considered unsuitable with respect to the geomorphological specificities of the area.

Types of anchoring rejected for environmental reasons

3.18.10 ANALYSIS AND CHOICE OF THE TYPE OF WIND TURBINE

The Nemetun offshore wind project was developed, like many similar initiatives, in a context of full technological evolution in the floating wind sector. Initially, one of the few solutions available on the market, already used in several international projects, was the turbine **Vestas V236 da 15 MW**. Although not expressly optimized for low-intensity wind conditions – typical of the Mediterranean area – the V236 has been used as a design reference thanks to its reliability and its diffusion on a global scale.

Lately, the market has seen the entry of new generation turbines, characterized by wider rotors and power curves optimized for low and medium intensity winds. These solutions offer better performance in contexts such as the Mediterranean, at the same cost or with marginal increases. A concrete example is the subsequent project developed by the Hope Engineering team, called Eureka Wind (VIP ID 12926) and filed with VIA in August 2024, where a turbine with a 292-meter rotor was adopted, with very satisfactory results in terms of manufacturability.

In light of these technological developments and in conjunction with the design update prepared following the last inspection carried out with the PNIEC-PNRR commission in February 2025, the opportunity to replace the Vestas V236 turbine with a more performing solution was considered.

Among the alternatives analyzed, the **CRRC20000D260 da 20 MW** with a 260 m rotor was the most advantageous choice, for the following main reasons:

- **Optimized for moderate winds**: the power curve and aerodynamic characteristics of the CRRC are more suitable for the wind regime of the Mediterranean, ensuring greater specific producibility than the V236, especially in hours of low wind intensity.
- **Structural compatibility**: The weight distribution of the CRRC, in particular the turbine centre of gravity and tower loads, is substantially similar to that of the V236. This allows the floating foundations and the anchoring system already designed to be preserved, avoiding changing the configuration already assessed in the Environmental Impact Study.
- **Unchanged visual impact**: despite having a higher power, the increase in size compared to the V236 is limited (260 m rotor compared to 236 m) and does not involve significant changes in the visual perception of the wind farm, especially given the great distance from the coast. In addition, the carrycot has a difference of only 1 meter, while the height at the TIP varies by just 17 meters

In addition, the transition to a larger turbine makes it possible to compensate for the reduction in the number of wind turbines – which fell from 63 to 45 units following the in-depth studies conducted on geological criticalities – while keeping the overall power of the fleet almost unchanged. This translates into a concrete benefit in terms of economic sustainability and overall efficiency of the layout, while maintaining compatibility with the infrastructures already planned.

All the studies on visibility and photo insertions have been updated according to the new layout and the dimensions of the CRRC20000D260, highlighting that the intervisibility of the plant has not undergone significant changes, rather it has decreased as a result of the reduction in the number of wind turbines installed.

The new wind turbine selected

3.18.11 TECHNOLOGICAL ALTERNATIVES FOR THE ELECTRICAL SUBSTATION

In the connection point assignment document (STMG), the NTG management company specifies that, in order to optimize the use of grid facilities, it will be necessary to share the space dedicated to the Nemetun Island plant with other possible production plants. In other words, in order to convey the energy produced by the Nemetun Island plant to the national grid, the user plant must be equipped with a condominium electrical substation (SSE), which allows the same connection stall to be shared with other producers.

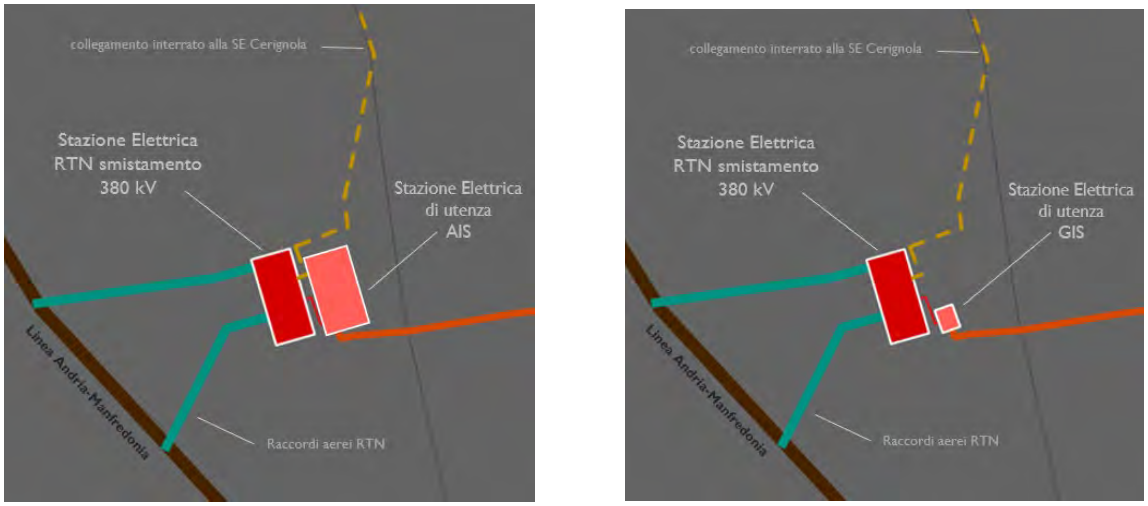
On the basis of this indication, technological alternatives have been evaluated aimed at reducing the landscape and environmental impact of the new user substation, which will be of the condominium type and will have to be equipped with a power factor correction unit that has been appropriately sized for the management of inductive power.

The alternatives studied include the construction of a new station with air-insulated technology (AIS) or with isolated technology (GIS).

In the first analysis, it was verified that the construction of the work in GIS involves a land consumption of between 5000 and 6000 square meters. The construction of the electrical substation with the same specifications and air insulation would have resulted in a footprint of at least 4.5 ha, therefore 9 times higher.

Even in the face of greater costs for the Proponent, it was decided to build an electrical substation equipped with a power factor correction unit with GIS insulation because it involves significantly lower land consumption.

Representative diagram of dimensional differences



Representative diagram of the difference in sizing between the two solutions

GIS technology, based on a gas-insulated structure, requires the construction of an industrial building that can house and protect the electrical infrastructure. In this context, the new substation has been designed with an appearance similar to that of an industrial architecture suitably mitigated and inserted into the agricultural context to integrate harmoniously into the rural landscape. The architecture of the building plays on transparencies and combinations of local materials and construction techniques.

Reference is made to document *T.6.1.4_01_Onshore Electrical Substation – Mitigation Measures*, for further details on the planned architectural integration measures.

The insertion of the electrical substation – conceptual design

On the other hand, the GIS solution has the following potentially negative aspects: 1) the presence of SF6, a gas that does not deplete the ozone layer and does not cause air pollution, but which, however, is almost 24,000 times more effective than carbon dioxide (CO_2) to trap heat, making it a very powerful greenhouse gas; 2) the costs of building a GIS station can be up to 10 times higher than an AIS station.
The first aspect can be controlled and mitigated to the point of nullity thanks to advanced systems for controlling the level and purity of the SF6 gas in the equipment. The latest technological innovations – adopted as a predisposition in the design of the Nemetun Island project user station – allow the use of SF6 gas-free solutions, replacing it with compressed air or other environmentally friendly pressurized gases as insulators. In these cases, the building that houses the GIS room is about one and a half times larger than the SF6 version, but this difference does not significantly affect the overall size nor substantially alter the proportional relationship compared to the isolated AIS solution. The second aspect is justified by the interest of the proponent, in the face of greater burdens, to reduce land consumption as much as possible and minimize the landscape impact of the work.

3.18.12 EVALUATION OF OFFSHORE CABLE LAYING ALTERNATIVES

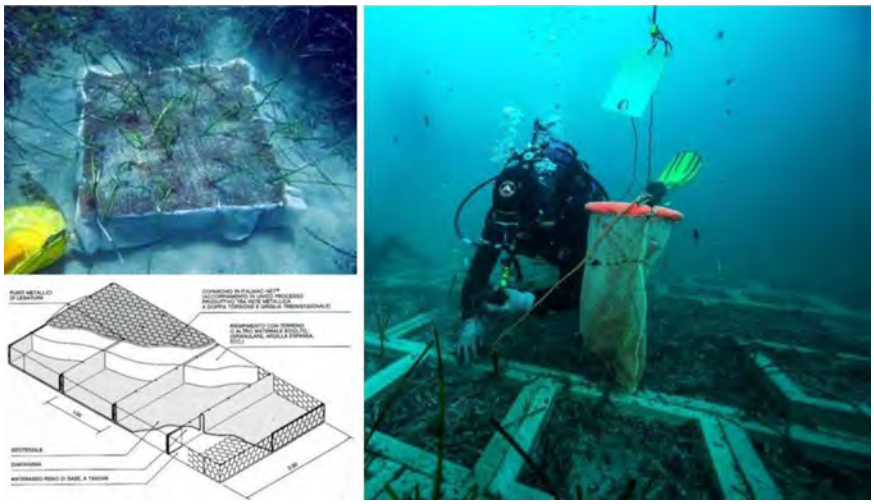
Assuming that the selected types (see chapter 3.6.3) seem to be the most suitable also from an environmental point of view for the construction of the marine export cable duct, some alternatives were examined during the design phases.

The selected types were evaluated as part of the Environmental Impact Assessment procedure for the Nemetun Island plant, which began with the filing of the application in February 2024. During the process, also in response to the requests for additions made by the PNIEC PNRR Technical Committee, some of the installation methods initially envisaged were modified because they were considered to have a greater environmental impact. In particular, the microtrenching installation initially planned for the initial section of the export cable duct has been eliminated and replaced with a HDD installation, which is more respectful of the biocoenoses present.

Microtrenching execution – ALTERNATIVE DISCARDED for environmental reasons

In addition, also as a result of the ROV and ARA in-depth studies contained in the June 2025 re-edition of the project, the laying section has been significantly lengthened to reduce the risk of interference with the bioconstructions detected and measured.

However, alternatives for the protection of the supporting cable duct consisting of mattresses or artificial biocenotic substrates remain valid, which can be used in the executive phase as a possible alternative to laying with protection in cast iron shells, or for the protection of crossings and overlaps with other underground services on the seabed.



Ballasted mattresses for the creation of biocenotic substrates

3.18.13 OFFSET ALTERNATIVES

The alternatives on possible compensation interventions were evaluated on the basis of what was proposed by the PPTR of the Puglia Region and the criteria set out in Annex 2 of the Ministerial Decree of 10.09.2010.

In particular, some extracts from the PPTR concerning the possible compensation interventions to be envisaged for offshore plants are reported:

- *… An energy project that has as its general objective the development of renewable sources and among these wind power will have to deal with the territory in an increasingly clear way and at the same time build a **Landscape design** … with the aim of also preparing a shared vision among the actors who are part of the same.*
- *Wind power becomes an opportunity for the requalification of degraded territories already affected by strong transformation processes. The construction of a plant moves resources that can be channeled into the start of redevelopment processes of parts of the territory, for example through infrastructural adaptation projects involving roads and networks, in ecological reconversion processes of areas affected by strong environmental degradation, in the economic revival of some areas, also using compensatory mechanisms with the municipalities and bodies concerned.*
- *Orienting wind power towards Forms of partnership and widespread shareholding to better redistribute costs and benefits and increase the social acceptability of the plants by helping to provide greater reassurance on environmental and social protection profiles.*
- *Promote planning tools inter-municipal that we have a vision on a territorial scale of the relationships that beyond the administrative limits wind farms will have with the territory, with its structuring elements and identity characteristics (Inter-municipal and Provincial Energy Plans)".*

The compensations for the project under consideration have been built around these key principles, defining the possible lines of action and the synergies that can be activated.

In addition, the construction of offshore wind farms will bring with it socio-economic repercussions of great importance and such as to require an effort of awareness and training to ensure the involvement of local production sectors and the emergence of adequate professionalism, among these we mention:

- Port infrastructures;
- Development of local businesses;

- Creation of new jobs.

Among the key criteria for the definition of compensatory measures defined by Annex 2 of the Ministerial Decree of 10.09.2010, it is important to highlight the parts of greatest interest:

- *Pursuant to Article 12, paragraph 6, of Legislative Decree no. 387 of 2003, the authorisation may not be subject to or provide for compensation measures in favour of the Regions and Provinces.*
- *Without prejudice, also pursuant to points 1.1 and 13.4 of these guidelines, that no monetary consideration is due in favour of the municipalities for the production of electricity from renewable sources, the single authorisation may provide for the identification of compensatory measures, not of a purely patrimonial nature, in favour of the same municipalities and to be directed towards environmental improvement measures related to the mitigation of the impacts attributable to the project, energy efficiency interventions, dissemination of installations of renewable energy plants and raising awareness among citizens on the aforementioned issues, in compliance with the following criteria:*

  (a) the mere fact that an installation for the production of energy from renewable sources is built, irrespective of any consideration of its characteristics and size and its impact on the environment, does not automatically give rise to compensatory measures;

  b) the "environmental and territorial compensation and rebalancing measures" are determined with reference to "territorial concentrations of activities, plants and infrastructures with a high territorial impact", with specific regard to the works in question;

  c) the compensatory measures must be concrete and realistic, i.e., determined taking into account the specific characteristics of the plant and its specific environmental and territorial impact;

  (d) according to Article 1(4)(f) of Law No 239 of 2004, compensatory measures are only 'contingent' and relate to the fact that requirements relating to national strategic guidelines require territorial concentrations of activities, plants and infrastructures with a high territorial impact;

  e) compensatory measures of an environmental and territorial nature and not merely patrimonial or economic may be imposed only if all the conditions indicated in the aforementioned Article 1, paragraph 4, letter f) of Law no. 239 of 2004 are met;

  f) the compensatory measures are defined during the service conference, after consulting the municipalities concerned, also on the basis of what is established by any regional measures and cannot be unilaterally fixed by a single municipality;

  g) in defining the compensatory measures, the application of the mitigation measures already provided for in practice shall be taken into account, including at the time of the environmental impact assessment (if it is carried out). To this end, with specific regard to wind farms, the execution of the mitigation measures referred to in Annex 4 constitute, in themselves, actions of partial environmental and territorial rebalancing;

  h) any environmental and territorial compensation measures defined in compliance with the criteria referred to in the previous letters may not in any case exceed 3 per cent of the revenues, including the incentives in force, deriving from the valorisation of the electricity produced annually by the plant".

Therefore, in the light of these considerations and the provisions of the Ministerial Decree of 10.09.2010, it being understood that the compensation measures will be punctually identified within the framework of the

service conference, in this project we have proceeded to define the overall framework within which the compensation interventions have been identified, attributable to the following topics:

- Enhancement of the landscape and natural heritage
- Support and training for local communities for the green economy
- Support for the research and specific training sector
- Promotion of creativity and the arts.

For details of the measures envisaged, please refer to paragraphs 3.17 and 6.1 of this Study and to section *6 Compensation and enhancement measures* of the final project.

4 ENVIRONMENTAL FRAMEWORK

4.1 DESCRIPTION OF THE CURRENT STATE AND INVESTIGATIONS CARRIED OUT – BASELINE SCENARIO

4.1.1 ATMOSPHERE

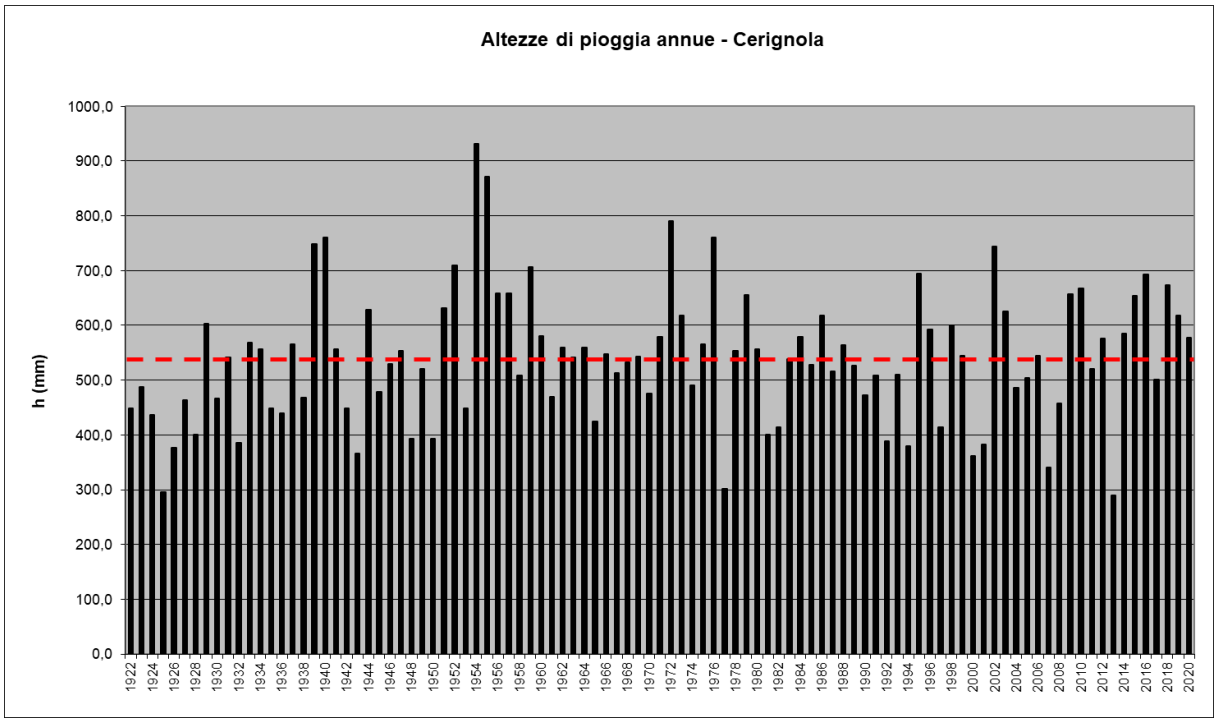
4.1.1.1 Rainfall regime

Below is information and data about the rainfall regime of the intervention area relating exclusively to onshore works, given that for offshore works a specific meteomarine study was carried out in which the quantities relating to the specific types of works were investigated.

As regards the rainfall regime, the data provided by the Decentralized Functional Center of the Civil Protection Section of the Puglia Region were used, with reference to the Cerignola station, for which a good number of observations are available (period 1922-2020). The sufficiently extended observation period (1922-2020) allows some conclusions to be drawn on the following aspects:

- average annual rainfall;
- maximum monthly rainfall intake;
- average monthly rainfall.

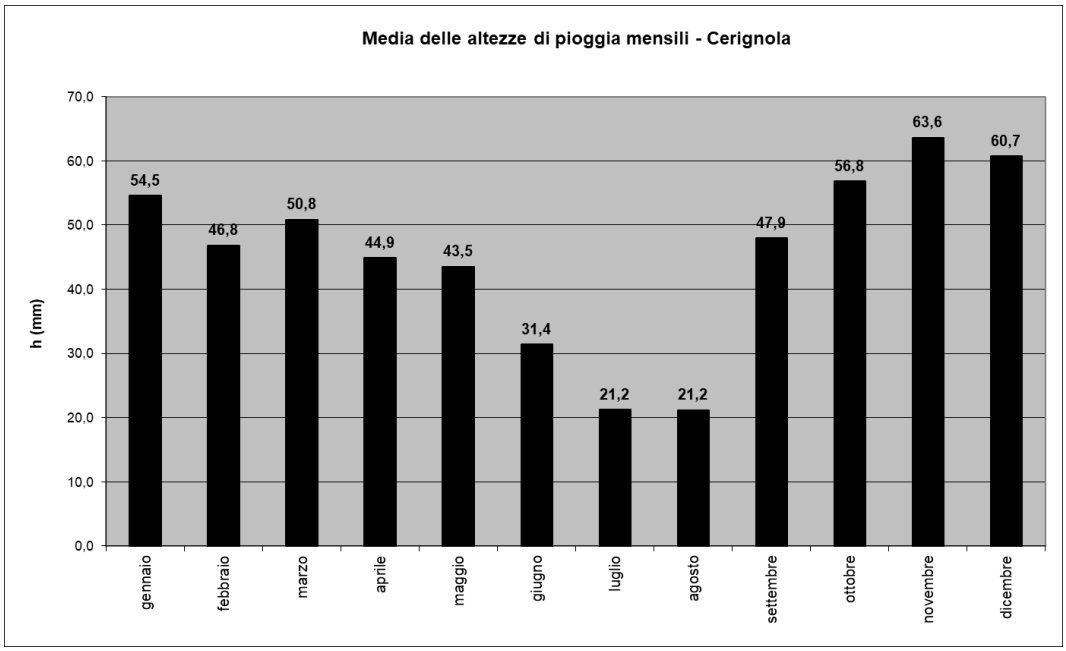
Below are the graphs showing the annual trend of rainfall recorded in the observation period, together with an indication of the average annual rainfall obtained by processing the data available for the Cerignola station.



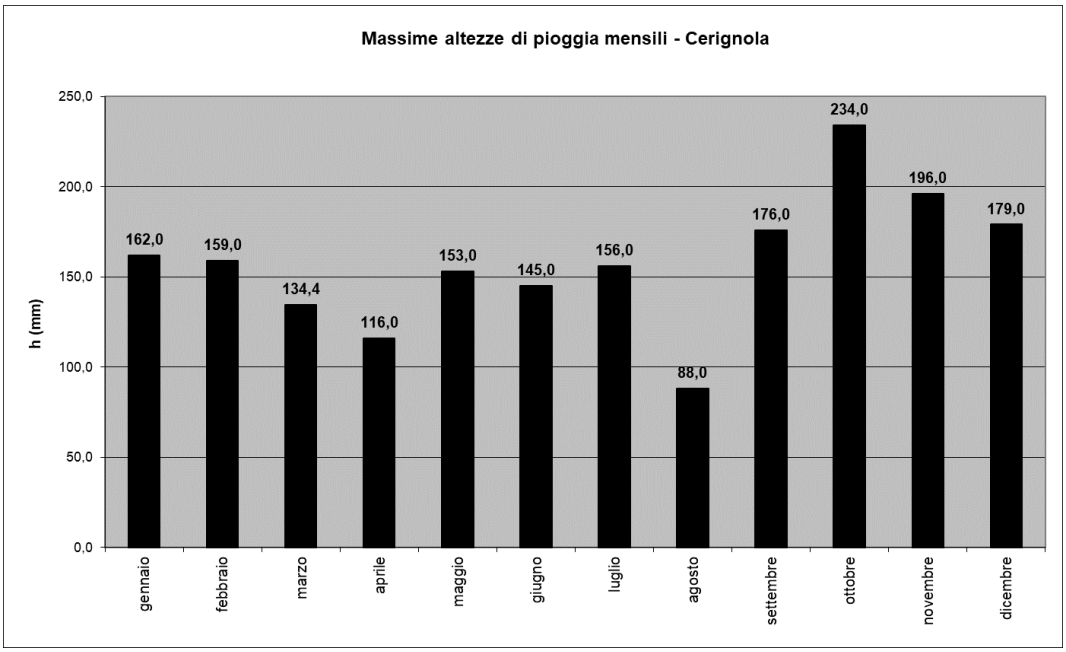
Annual rainfall input – Cerignola station (1922-2020)

The average annual rainfall input can be estimated at about 538 mm/year. However, it should be noted that the annual rainfall input is affected by strong irregularities as the rainfall values recorded are very different from each other: 295 mm/year in 1925 and 932 mm/year in 1954.

Below is a graph showing the average monthly rainfall intake, which shows that the wettest months of the year are October, November and December, while the driest months are July and August.



Average monthly rainfall - Cerignola station (1922-2020)



Maximum monthly rainfall - Cerignola station (1922-2020)

In addition to the information relating to the average annual and monthly rainfall inputs, it was decided to deepen the knowledge relating to the maximum monthly rainfall inputs recorded in the various years of observation. For the aforementioned observation period (1922-2020), the months in which the greatest rainfall contributions were recorded are those of October and November, in which rainfall values of 234 mm/month and 196 mm/month were recorded, respectively.

With regard to the characteristics of rainfall events, again from the analysis of the aforementioned time series, it is possible to state that the rainfall regime of the area under consideration is characterized by the presence of short and intense downpours whose effects are amplified in highly anthropized areas due to the considerable extension of impermeable surfaces that favor the surface runoff of rainwater to the detriment of its absorption by the soil.

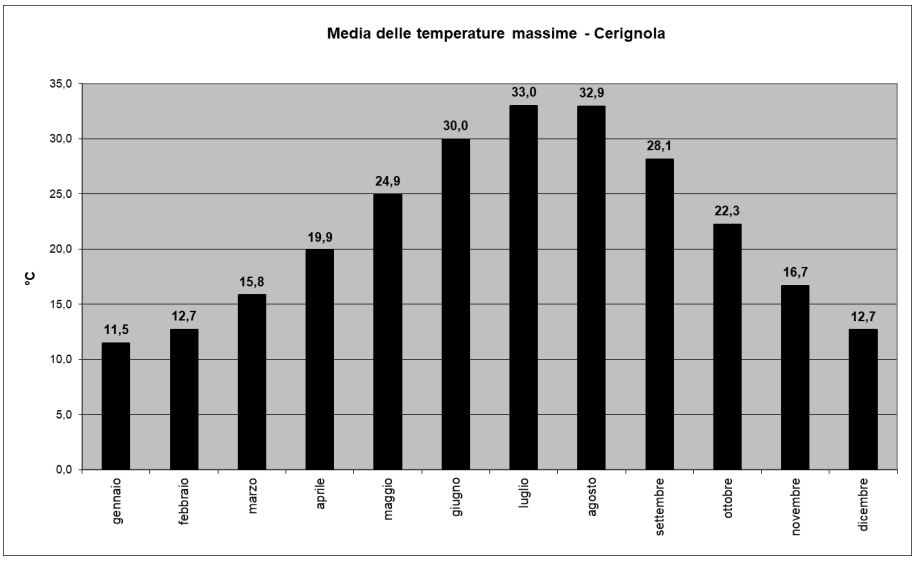
4.1.1.2 Thermometry

Puglia is characterized by a typically Mediterranean climate with mild winters and hot, long and, in most of the region, dry summers. Peak temperatures may undergo limited variations compared to the average values in the different months of the year, except in the summer period during which the temperature fluctuations are more marked.

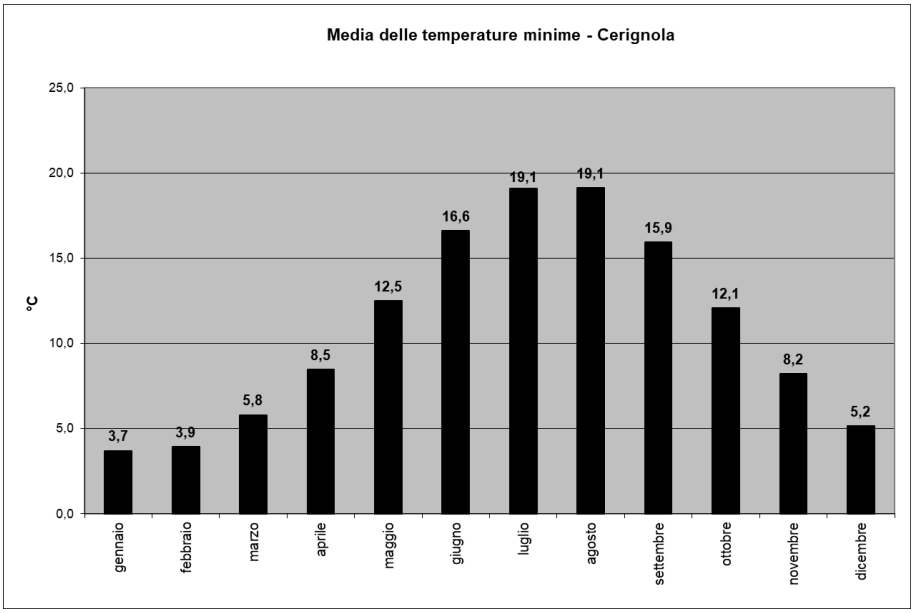
The average annual temperatures of the area are around 16°C with averages of 22°C in the summer-spring semester and 12°C in the autumn-winter semester. Extreme temperatures can frequently drop below 0°C in January and February and exceed 30°C in July and August.

Below is the graph showing the temperature data referring to the maximum and minimum monthly values retrieved from the data provided by the Decentralized Functional Center of the Civil Protection Section of the Puglia Region, relating to the period from 1930 to 2020, and referring to the Cerignola station.

As can be seen from the same, the average monthly maximum temperatures range between 11.5°C in January and 33°C and 32.9°C in July and August, respectively. Also for the average minimum monthly temperatures there is the same trend recorded for maximum temperatures with minimum values ranging between 3.7°C in January and 19.1°C in July and August.



Average maximum temperatures - Cerignola station (1930-2020)



Average minimum temperatures - Cerignola station (1930-2020)

De Martonne, based on the average temperatures of the extreme months, the average annual temperatures and the annual rainfall, has identified six basic types of climate divided into secondary types and, from time to time, also the regions where the latter manifest themselves most evidently. To classify the climate of a given area, he also proposed an index (called **aridity index A.I.**) defined by the report:

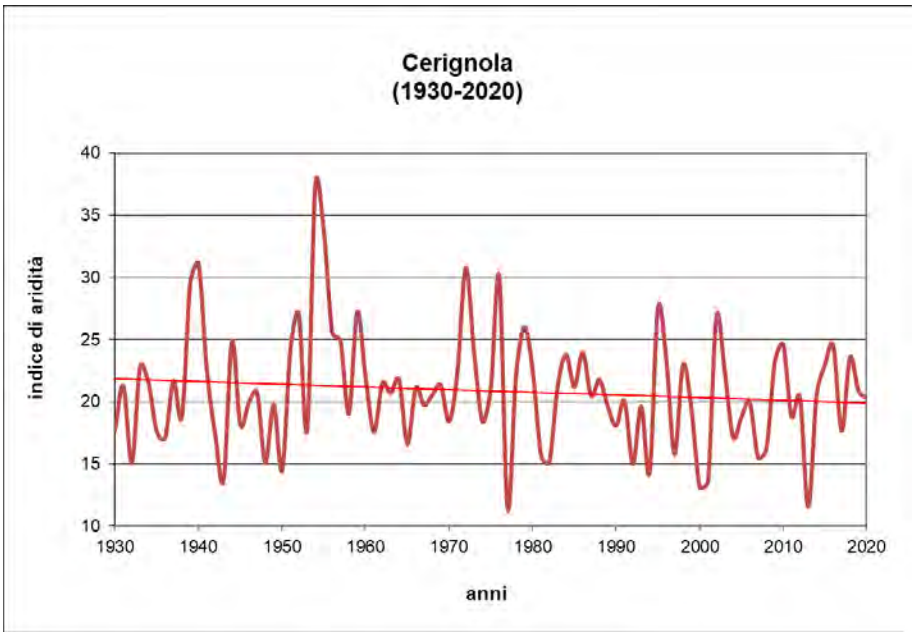
$$A = P/ (T +10)$$

in which P and T represent the average precipitation in mm and the average temperature in °C. This index represents a synthetic expression of the degree of drought in the area (the lower it is, the drier the climate), on which it depends on belonging to one of the six climatic types shown in the following table.

A.I.	0 - 5	5-15	15 - 20	20 - 30	30 - 60	> 60
Tipo climatico	Arido estremo	Arido estremo	Semi-arido	Sub-umido	Umido	Per-umido

A.I. aridity index

Based on the aridity index, the climate in the Cerignola area is sub-humid as the A.I. value is between 20 and 25.



A.I. aridity index Cerignola station (1930-2020)

4.1.1.3 Baseline state anemological regime

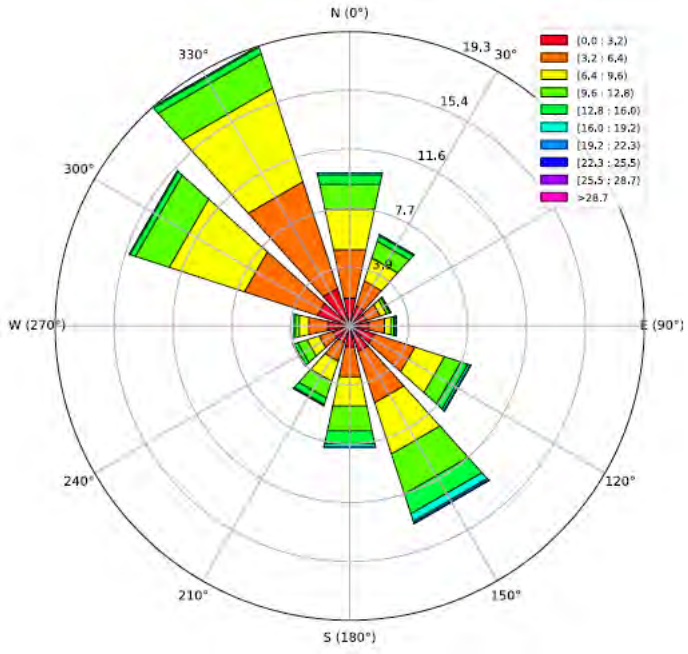
The anemological climate of the area of interest is characterized by periodic winds such as the Bora, the Sirocco and the Mistral and by occasional winds such as the Libeccio, the Grecale and the Tramontana. The most frequent wind states (reigning winds) are associated with the NW, N and NE sectors of origin, while for the most intense wind states (dominant winds) the prevalence of the NW sector is more significant. The Bora, from N-NE to E-NE, a cold wind characterized by strong gusts, and the Sirocco, which blows from South-East to North-West along the axis of the basin, are the dominant winds in winter, and responsible for storm surges in the northern part of the basin (Bertotti and Cavaleri, 2009), while in summer the Mistral blows from W-NW to NW (Katalinić, Ćorak and Parunov, 2014). The Bora and the Sirocco can reach stormy conditions and cause extreme waves, while the Mistral does not reach these conditions. The highest wave recorded in the Adriatic was during a sirocco event, with a wave height of 10.8 meters.

The analyses of the wind variables presented in this section are based on the hindcast reanalysis data from the ERA5 database, for coordinates 42.0 N 17.0 E, For the period from 01/01/1983 to 28/02/2025, with a time discretization of 1 hour, the representative height of the average speed was chosen at 150 m a.s.l., i.e. the most representative level of the wind at the height of the rotor hub of the wind turbine used.

Average wind speeds tend to reach their highest values in the winter months (peak in December) and lowest in the summer months (minimum in August), and this is also reflected in the maximum speeds and standard deviation, although not exactly in the same months: for example, the maximum V100m was recorded in November, while the average maximum V100m is in December. The minimum values, on the other hand, are close to zero, indicating that there are periods without wind (or very low wind) for all months.

		All	Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Sep	Ott	Nov	Dic
V100m,1h [m/s]	Min	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,1	0,0
	Media	6,8	7,4	7,6	7,5	7,2	6,5	6,1	6,2	5,8	5,9	6,4	7,4	7,6
	Max	28,7	24,9	26,3	26,6	23,4	26,6	22,7	18,4	21,5	21,4	25,3	28,7	25,5
	Std	3,8	4,1	4,2	4,0	3,8	3,5	3,3	3,1	3,1	3,3	3,8	4,3	4,3

Monthly and annual wind speed statistics



Wind rose, at 100 m a.s.l..

$V_{100m,1h}$		Velocità vento [m/s] 100m s.l.m.													
		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	25-26	26-28
	TOT	8,858%	17,786%	19,768%	18,442%	15,211%	10,157%	5,520%	2,562%	1,089%	0,413%	0,139%	0,042%	0,012%	0,002%
0	10,232%	0,833%	1,819%	2,052%	1,851%	1,513%	1,115%	0,628%	0,285%	0,099%	0,030%	0,007%	0,001%	0,000%	
30	6,275%	0,709%	1,116%	1,074%	1,004%	0,977%	0,747%	0,402%	0,173%	0,052%	0,015%	0,005%	0,000%		
60	2,819%	0,626%	0,817%	0,564%	0,348%	0,214%	0,135%	0,078%	0,021%	0,014%	0,001%	0,001%			
90	3,101%	0,647%	0,984%	0,611%	0,341%	0,194%	0,122%	0,096%	0,056%	0,033%	0,015%	0,002%	0,001%		
120	8,318%	0,752%	1,642%	1,747%	1,473%	1,103%	0,695%	0,468%	0,236%	0,122%	0,052%	0,021%	0,006%	0,001%	
150	13,601%	0,770%	1,818%	2,254%	2,275%	2,088%	1,786%	1,254%	0,680%	0,375%	0,186%	0,073%	0,029%	0,010%	0,002%
180	8,115%	0,698%	1,241%	1,230%	1,206%	1,216%	1,101%	0,740%	0,431%	0,181%	0,056%	0,013%	0,002%		0,000%
210	5,486%	0,609%	0,869%	0,777%	0,848%	0,900%	0,741%	0,462%	0,201%	0,068%	0,011%	0,001%	0,000%		
240	3,904%	0,635%	0,779%	0,592%	0,522%	0,507%	0,422%	0,247%	0,137%	0,050%	0,009%	0,003%	0,001%		
270	3,718%	0,723%	1,140%	0,765%	0,468%	0,302%	0,190%	0,084%	0,029%	0,010%	0,005%		0,000%	0,000%	
300	15,162%	0,921%	2,397%	3,265%	3,421%	2,929%	1,548%	0,494%	0,130%	0,037%	0,013%	0,006%	0,001%	0,000%	
330	19,270%	0,935%	3,164%	4,838%	4,685%	3,269%	1,556%	0,566%	0,181%	0,048%	0,020%	0,007%	0,001%	0,000%	

Direzione [°N]

Frequency tables of wind speeds at 100 m a.s.l..

4.1.1.4 Air quality

Air pollution is defined by Italian legislation as *"any modification of the normal composition or physical state of atmospheric air, due to the presence in it of one or more substances with qualities and characteristics such as to alter the normal environmental conditions and healthiness of the air in such a concentration as to constitute a direct or indirect danger or prejudice to human health, to compromise recreational activities and other legitimate uses of the environment, to alter biological resources and public and private material assets"* (D.P.R. 203/88).

The air can undergo alterations due to the presence of polluting foreign components in it. These pollutants can be divided into gaseous, dusty and microbial.

The air can undergo alterations due to the presence of polluting foreign components in it. These pollutants can be divided into gaseous, dusty and microbial.

Gaseous air pollution comes from the products of combustion of industrial and domestic origin, or from specific emissions.

Dust pollution, on the other hand, comes from activities such as the cultivation of quarries, or derives from the exercise of agricultural activity (dust of plant origin) whose presence-absence is in any case defined by precise temporal scans.

Microbial pollution, on the other hand, is localized in fairly restricted areas as well as occasionally present by particular types of industrial plants (aerosols from biological purification plants, spreading of liquid and solid fertilizers of animal origin).

In general, the substances responsible for air pollution are:

Nitrogen dioxide (NO_X): the main sources in the atmosphere are the vehicular traffic and industrial activities related to the production of electricity and combustion processes. The toxic effects on humans, in forms of varying severity, occur at the level of the respiratory system. Nitrogen oxides are also responsible for the phenomena of necrosis of plants and aggression of calcareous materials.

Sulfur dioxide (SO_2): it is a secondary pollutant that is formed as a result of the combustion of sulphur-containing materials. The main sources of SO_2 Knowplants that use carbon-based fossil fuels, the metallurgical industry, volcanic activity. Exposure to SW_2 it generates irritation of the respiratory system and eyes, necrosis phenomena in plants and the decay of calcareous materials.

Carbon Monoxide (CO): it is a typically urban pollutant, it is a highly toxic substance because, by binding to haemoglobin, it reduces the blood's ability to transport oxygen, causing damage to the cardiovascular system.

Ozone (O_3): it is a secondary pollutant, which is formed in the atmosphere by the reaction between primary pollutants (nitrogen oxides, hydrocarbons) in conditions of strong solar radiation and high temperature. While stratospheric ozone exerts a protective function against UV radiation directed at Earth, in the lower atmosphere it can generate harmful effects on human health, with damage to the respiratory system that, in the long term, can lead to a decrease in respiratory function.

PTS and **PM10**: Particulate matter is a mixture of solid and liquid particles ranging in diameter from 0.1 to 100 pm. The fraction with a diameter of less than 10 mm is indicated by PM10. The main sources of particulate matter are: thermoelectric power plants, metallurgical industries, traffic and natural processes such as volcanic eruptions. Particulate matter causes damage especially to the respiratory system; Some damage is due, in a significant way, to the species absorbed or adsorbed on the inhaled parts.

Benzene (C_6H_6): The largest sources of benzene exposures to the human population are cigarette smoke, car service stations, industrial and automotive emissions. Benzene is classified as a known human carcinogen, being proven to cause leukemia.

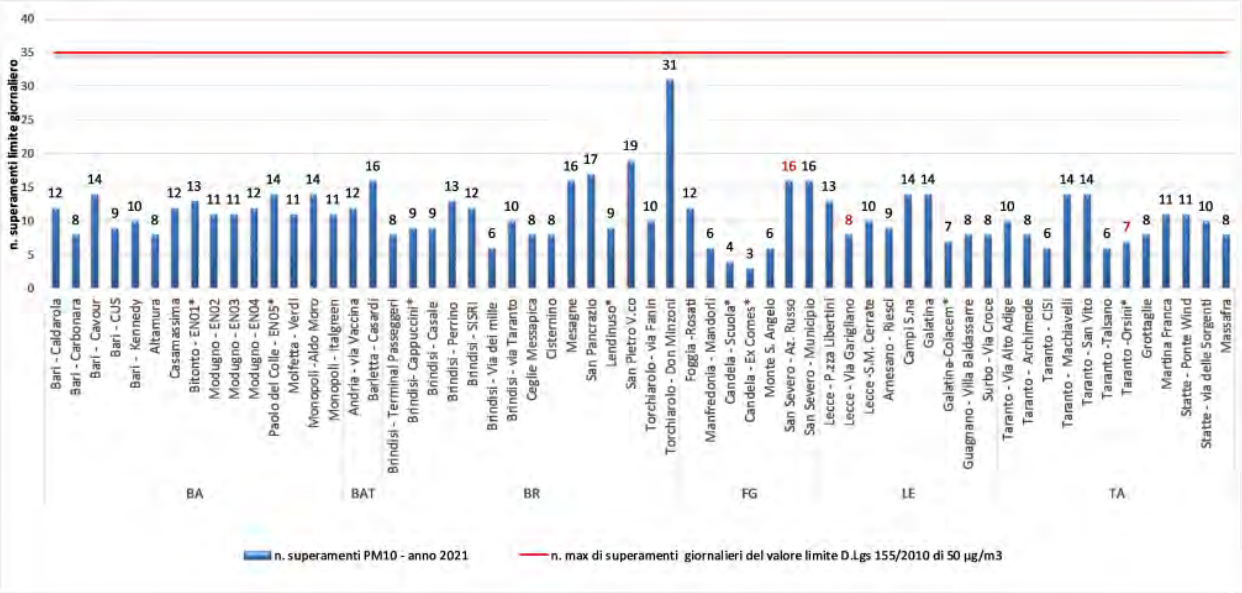
Polycyclic aromatic hydrocarbons (PAHs) – Benzo[a]pyrene: PAHs are formed as a result of the incomplete combustion of carbon-containing organic material. The main sources of immisemissions into the atmosphere are: motor vehicle exhaust, cigarette smoke, wood and coal combustion. The most dangerous of PAHs is benzo[a]pyrene as it is indicated as the main cause of lung cancer.

Lead (Pb): the main sources of Pb for humans are food, air and water. The lead that accumulates in the body is retained in the central nervous system, bones, brain, and glands. Pb poisoning can cause damage such as abdominal cramps, loss of appetite, anemia and insomnia and in children more serious damage such as kidney disease and alterations of the nervous system.

ARPA Puglia monitors regional air quality through multiple tools. The Regional Air Quality Monitoring Network, approved by the D.G.R. of the Puglia Region no. 2420/2013 and consisting of 53 stations, is flanked by another 7 of local value. The RRQA complies with the location criteria set by Legislative Decree 155/10 and Legislative Decree 155/2010. The control units are equipped with automatic analyzers for the

continuous detection of pollutants regulated by Legislative Decree 155/10: PM10, PM2.5, NO_xOr_3, Benzene, CO, SO_2.

In order to report a significant data on air quality at the project site, it was decided to analyze the ARPA Puglia annual report for the year 2021, in particular, as a relevant data it is preferred to use the "limit of exceedance of PM 10 values", which according to Legislative Decree 155/10 is set at a maximum number of 35 annual exceedances of the limit concentration of 50 µg/m^3.



Exceeding the daily PM10 limit year 2021

Considering the province affected by the wind farm (FG), the exceedances of the daily limit of PM10 for the year 2021 are in line with those found in the stations of the other Apulian provinces. Therefore, the presence of these harmful substances in the area near the project site cannot be considered a risk factor.

4.1.2 MARINE ENVIRONMENT – MARINE WEATHER CLIMATE

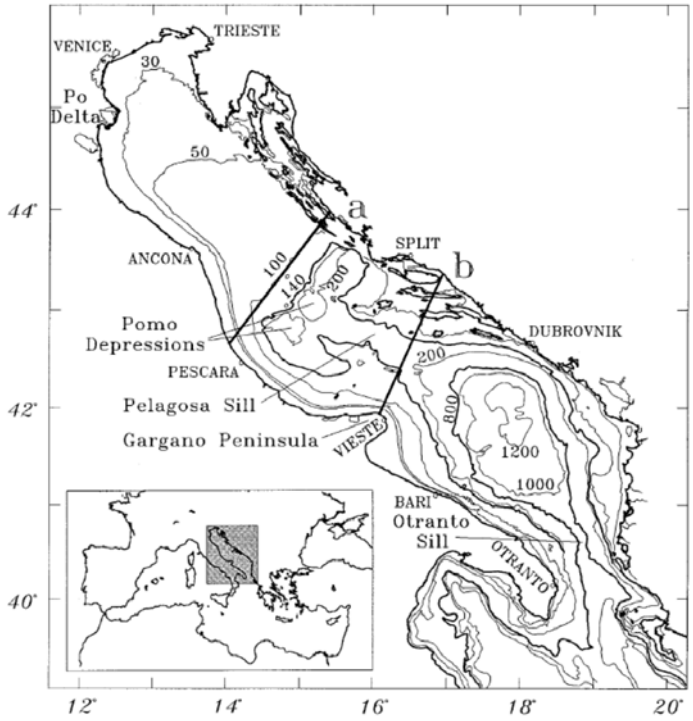
4.1.2.1 General climatology of the marine environment

The detailed meteomarine study of the site is contained in the documents of the section called *"meteomarine ES.7.1_01_Clima"*. Below is an introductory section and a summary of the most significant climatic data used for the design of the works in the project, referring any further information to the specialized documents.

Topography - general data

The Adriatic Sea is about 750 km long and 200 km wide, with only one, limited opening at its southern end (Bertotti and Cavaleri, 2009). As described by (Orlic, Gacic and La Violette, 1992), and represented in Figure 1, its elongated shape and the fact that it is an almost closed sea determines the specific dynamics of its waters. The Adriatic can be considered composed of three parts, of increasing depth proceeding from north to south, where it ends at the Strait of Otranto. The first part, which includes the Gulf of Venice, is relatively shallow, with a fairly uniform slope of up to 100 m which then increases rapidly to 200 m at the beginning of the second part, just south of Ancona. This second part has an important characteristic: a zone of higher depth in its northern part (Mid Adriatic Pit, also called Pomo depressions, about 280 m deep) and in its southern area, the Palagruza (or Pelagosa) Sill. The third part, separated from the second by an imaginary line that goes from the Gargano peninsula to the Croatian coast, presents a very large and deep area, the South Adriatic Pit (about 1200 m), and then goes up towards the Strait of Otranto, where the

Adriatic is connected to the Mediterranean. The Strait of Otranto has an average depth of 325 m, and a width of about 75 km. The western coast of the Adriatic has a more regular course, with isobaths generally parallel to the coast and with a depth that increases uniformly towards the sea. The east coast, on the contrary, is more jagged and has many islands and promontories that impose a rather sudden decrease in depth, also leading to isobaths with a more complex trend.



Bathymetry of the Adriatic Sea, from (Artegiani et al., 1997). The "a" and "b" lines demarcate the division between the northern, central, and southern Adriatic basins

Meteorology – general data

As reported by (Orlic, Gacic and La Violette, 1992), the Adriatic Sea is located between the subtropical high-pressure zone and the westerlies belt, in which atmospheric disturbances generally move from west to east. These areas move throughout the year, causing strong seasonal differences. For most of the year, the effects of the westerlies belt dominate the region, with frequent cyclones and anticyclones appearing in the lower troposphere. In summer, the subtropical zone of high pressure dominates and cyclonic and anticyclonic disturbances, greatly limiting the influence of the westerlies belt. Weather conditions are also influenced by semi-permanent low/high pressure areas: the Iceland Depression and Eurasian High Pressure in winter, the Azores High Pressure and Karachi Depression in summer. In addition to these phenomena on a synoptic scale, planetary waves (Rossby waves) also occur over the Adriatic area, while at the mesoscale level atmospheric phenomena (sea and land breezes, gravitational waves, etc.) can modify local conditions.

Air temperatures reach their highest in July, and their lowest around January. In summer, temperatures throughout the Adriatic are rather uniform, from 22 to 26°C. Winter temperatures, on the other hand, range from around 10°C in the south to around 2°C in the north, with the east coast tending to be warmer (by around 2°C) than the west coast. Relative humidity is at its lowest in summer and at its highest in autumn. However, phenomena on a synoptic scale can substantially change these characteristics: the Bora (see section 2.3) can lower humidity by 60-70% in a very short period of time. The amount of clouds depends mainly on atmospheric phenomena on a synoptic scale, being maximum in late autumn (approx. 6/10) and minimum in summer (1/10-4/10). As a result, the maximum rainfall occurs in late autumn, while the minimum

occurs in summer, with quantities ranging from about 1000mm/year inland to about 400mm/year recorded by coastal weather stations.

Wind and waves – general data

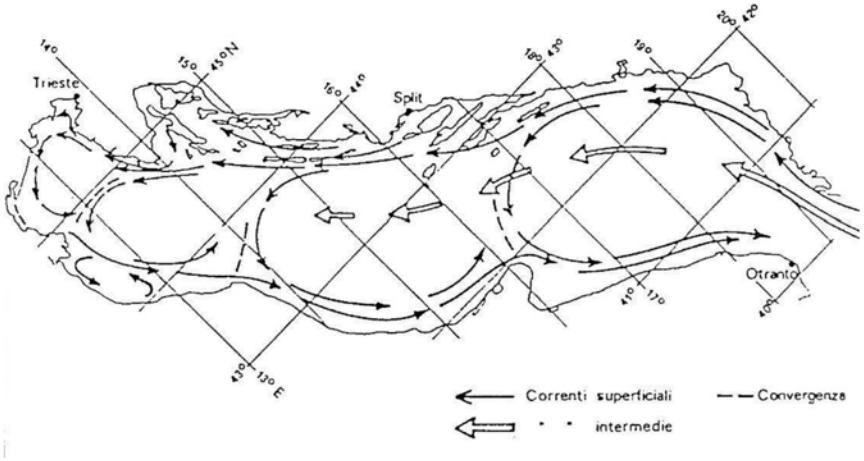
The Bora, from N-NE to E-NE, a cold wind characterized by strong gusts, and the Sirocco, which blows from South-East to North-West along the axis of the basin, are the dominant winds in winter, and responsible for storm surges in the northern part of the basin (Bertotti and Cavaleri, 2009), while in summer the Mistral blows from W-NW to NW (Katalinić, Ćorak and Parunov, 2014). The Bora and the Sirocco can reach stormy conditions and cause extreme waves, while the Mistral does not reach these conditions. The highest wave recorded in the Adriatic was during a sirocco event, with a wave height of 10.8 meters.

As reported by (Katalinić, Ćorak and Parunov, 2014) the Bora is the wind of the strongest intensity. It blows over the Dinaric Mountains, which shape the points where it tends to concentrate, with typical gusts of wind of gale level (72 km/h) speed, but which can also exceed 180 km/h. However, the direction of this wind from N-NE to E-NE causes the fetch length to be relatively short, preventing the generation of substantial wind waves. The Sirocco blows along the Adriatic (from E-SE to SS-E), usually developing for two or three days, until it reaches its maximum speed. The relative wind waves enter through the Strait of Otranto in an already mature state, and continue to develop along the Adriatic leading to sea states with longer waves (both in wavelength and period) than those generated by the Bora, the latter shorter and with a higher height/wavelength ratio. In stormy conditions, the Sirocco can reach speeds of up to over 100 km/h. In general, in addition to storms due to the winds mentioned above there can be other episodes of strong winds, but their relatively limited duration and the typical fetch lengths lead to the development of sea states with waves that are not yet fully developed.

Current - general data

As reported by (Orlic, Gacic and La Violette, 1992), the general surface circulation of the Adriatic Sea consists of a northward flow along the east coast and an opposite, southward flow flowing along the west coast, as also reported earlier by (Mosetti, 1984). In winter, the current on the east coast is of greater intensity, while in the summer season the current towards the south of the west coast predominates. Typical speeds are less than 10 cm/s, but locally they can reach higher values, particularly near the west coast, in winter. (Orlic, Gacic and La Violette, 1992) cite the explanation provided by (Zore, 1956) in terms of density gradients to justify these two main surface currents. During the winter, the waters of the southern Adriatic are warmer and saltier than the waters of the middle and northern Adriatic, with an effect on sea level due to the temperature difference (thermosteric height) being more important than the effect due to the difference in salinity (halosteric height), which generates the northward flow along the eastern Adriatic. During the summer, however, the waters of the northern Adriatic are warmer and less saline than the waters of the middle Adriatic, generating more pronounced currents, southwards, along the western part of the Adriatic. (Zore-Armanda, 1969) also proposes the Sirocco wind as a factor in strengthening the winter flow northwards, along the eastern part of the Adriatic. As can be seen in Figure 2, the southern Adriatic has a separate vortex, well documented by biological hydrographic surveys as presented in (Faganeli et al., 1989).

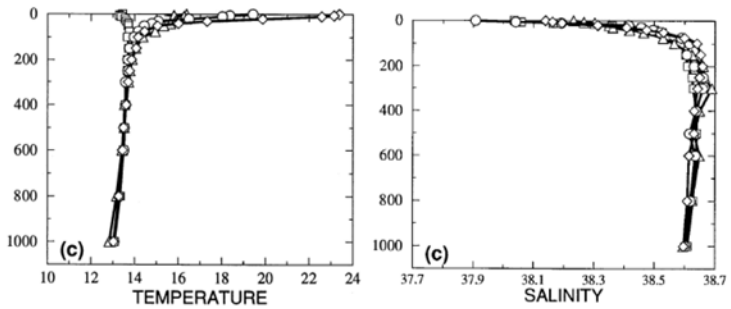
As for the currents caused by the tides, in the Adriatic in general these types of currents are not very pronounced. They can be defined as mixed-type, which can be described sufficiently accurately by seven harmonic components. The diurnal tidal amplitudes increase from southeast to northwest, reaching 18 cm for the main diurnal component (K1) at the northern end of the basin. The semidiurnal constituent of the tide has an amphidromic point at the latitude of Ancona, with a maximum amplitude of the constituent M2 which is equivalent to 26 cm.



General circulation of the Adriatic, from Mosetti, 1984

Temperature and salinity

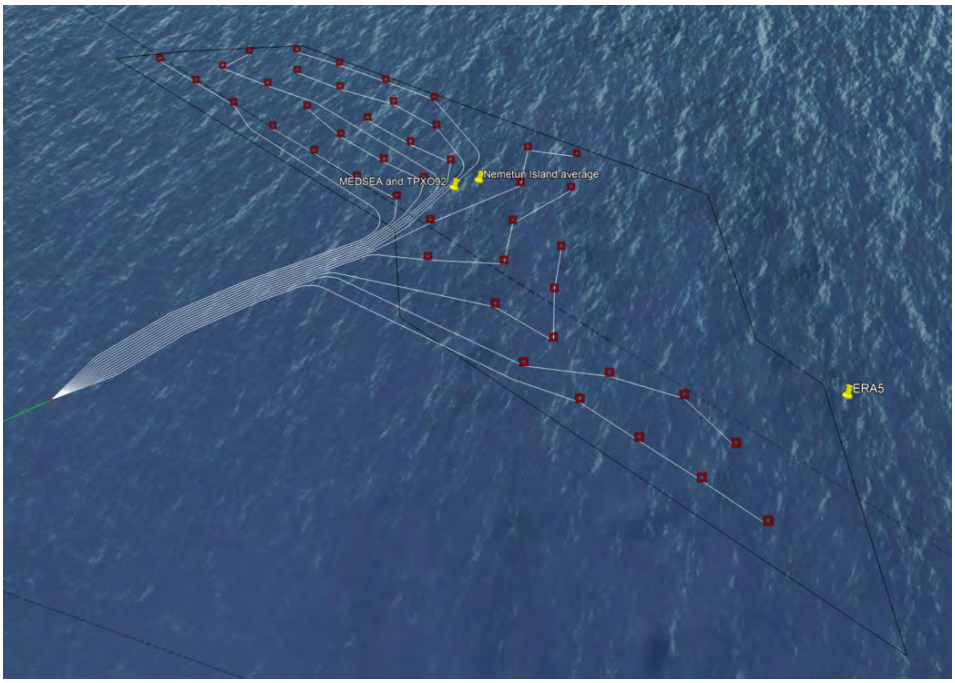
As reported by (Artegiani et al., 1997), in the southern Adriatic the seasonal thermocline extends to about 75 m depth. The seasonal cycle of surface waters is mainly caused by fresh water along the coast, which leads to a decrease in salinity in all seasons and more accentuated during spring and summer. Above 150 m depth, conditions are much more homogeneous and similar to the sea conditions found offshore in the Mediterranean, with a relatively weak seasonal variation up to 300 m, mediated by advection currents and the mixing of the MLIW (modified Levantine Intermediate Waters) water mass. In this region, the MLIW is defined by a salinity greater than 38.6 psu and a temperature greater than 13.5ºC, between 150 m and 400 m deep. The South Adriatic Deep Water (SAdDW) has different average characteristics from those of the corresponding deep water masses of the North Adriatic and Central Adriatic (NAdDW and MAdDW, North Adriatic and Middle Adriatic Deep Water), and has the following characteristics: a temperature of 13.16 ± 0.30ºC, a salinity equal to 38.61 ± 0.09 psu. SAdDW have a higher temperature and salinity than NAdDW and MAdDW, probably due to mixing with MLIW and local surface waters (Ovchinnikov et al., 1985; Roether and Schlitzer, 1991).



Seasonal temperature and salinity profiles in the southern Adriatic, from (Artegiani et al., 1997). Symbols: □ for winter, ○ for spring, ◊ for summer and Δ for autumn

Project Site Modeling

In addition to the general data on the marine climate contained in this paragraph, the specialized study, referred to in the SIA series ES.7, contains more in-depth processing referring to the project site and coming from the ERA5, CMEMS 2022b and MEDSEA databases. The following paragraphs briefly describe the main results of these analyses referring to the project site.



Location of the points from which the meteomarine variables were extracted. Magnification on wind farm: each red square corresponds to a wind turbine. Figure generated with Google Earth

4.1.2.2 Wave motion of the basic state

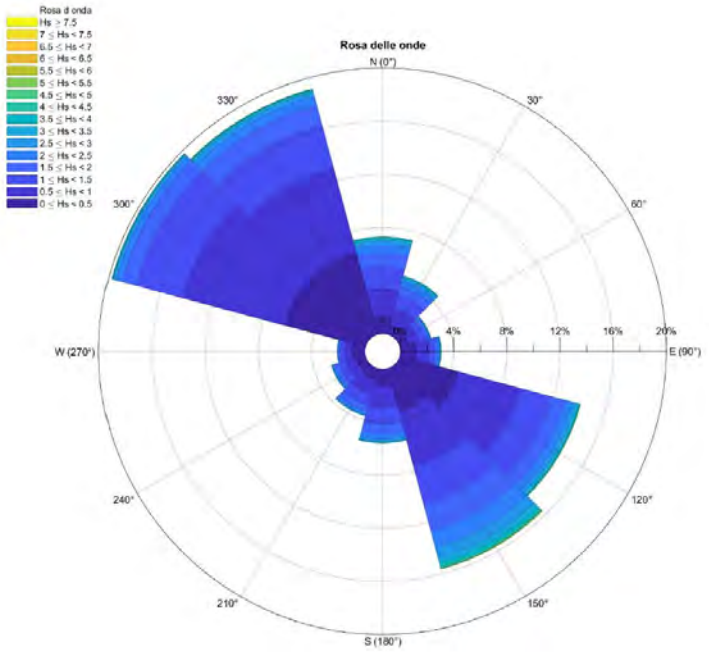
The wave motion was analyzed considering the hindcast reanalysis data of the ERA5 database, for the coordinates 42.0 N 17.0 E, for the period from 01/01/1983 to 31/12/2022, with time discretization equal to 1 hour.

The H_S average has higher values in the winter months and lower in the summer months, with a ratio of about 2:1 (i.e. ~1.35 m in December, compared to ~0.69 m in June/August). The standard deviation of H_S has a seasonal pattern similar to H_S medium, while the H_S maximum has a less regular trend, although in general it tends to be lower in the summer months and higher in the winter months. Let the T_P that the T_Z have a similar seasonal pattern, and close to the seasonal pattern of the H_S medium, with spectrum energy concentrated in higher periods in the winter months and lower periods in the summer months, and with medium period waves (TZ) longer in the winter months and shorter in the summer months.

		All	Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Sep	Ott	Nov	Dic
H_S [m]	Min	0,05	0,06	0,11	0,06	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,06	0,08
	Media	1,01	1,30	1,34	1,21	1,02	0,80	0,69	0,70	0,69	0,80	0,96	1,25	1,35
	Max	7,69	7,06	7,24	7,69	5,47	6,11	6,17	3,70	3,66	5,10	6,57	6,82	6,29
	Std	0,76	0,86	0,89	0,84	0,69	0,58	0,48	0,47	0,47	0,53	0,69	0,87	0,91
		All	Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Sep	Ott	Nov	Dic
T_P [s]	Min	2,16	2,16	2,16	2,16	2,16	2,16	2,16	2,16	2,16	2,16	2,16	2,16	2,16
	Media	5,03	5,60	5,66	5,44	5,19	4,68	4,32	4,27	4,24	4,61	5,01	5,60	5,69
	Max	14,90	14,90	13,90	12,10	12,31	11,48	10,06	9,21	9,01	10,34	12,96	13,41	12,93
	Std	1,54	1,53	1,58	1,58	1,55	1,44	1,15	1,07	1,07	1,26	1,53	1,67	1,62
		All	Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Sep	Ott	Nov	Dic
T_Z [s]	Min	1,67	1,67	1,94	1,69	1,70	1,67	1,67	1,67	1,68	1,72	1,68	1,80	1,80
	Media	3,58	3,94	3,99	3,84	3,64	3,33	3,16	3,14	3,12	3,34	3,56	3,90	4,00
	Max	8,12	7,46	8,12	8,03	7,24	7,25	7,02	5,78	5,99	6,55	7,72	7,75	7,96
	Std	0,88	0,88	0,91	0,91	0,83	0,76	0,66	0,63	0,64	0,71	0,85	0,94	0,94

Monthly and yearly statistics of H_S, T_P and T_Z

The distribution of directions in the wave rose is strongly dominated by the WNW (300º) and NNW (330º) directions, from which come (cumulatively) about 39% of the waves, followed by 30% of waves from ESE (120º) and SSE (150º), from which come (cumulatively) about 30% of the waves. Although not identical, this distribution is similar to that of the wind rose, which means that the waves are largely due to local winds (sea waves) and to a lesser extent due to waves generated by non-local winds and propagated to the place of interest (swell waves). In terms of the directionality of the highest significant heights, it can be seen that if only the H are considered$_S$ higher than 2.5 m (about 5.1% of all H values$_S$), 33% come from SSE (150º), which is also the highest direction of the waves with significant height.



Wave Rose

H_S-dir.		Altezza significativa H_S [m]																
			0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-5.5	5.5-6.0	6.0-6.5	6.5-7.0	7.0-7.5	7.5-8.0
Direzione [deg N]		*TOT*	*28,436%*	*32,714%*	*18,980%*	*9,734%*	*5,029%*	*2,565%*	*1,326%*	*0,637%*	*0,326%*	*0,140%*	*0,068%*	*0,027%*	*0,011%*	*0,006%*	*0,002%*	*0,001%*
	0	*7,317%*	1,400%	1,974%	1,683%	1,037%	0,593%	0,319%	0,179%	0,072%	0,050%	0,009%	0,001%	0,000%				
	30	*4,562%*	0,756%	1,260%	1,037%	0,677%	0,428%	0,202%	0,106%	0,066%	0,019%	0,007%	0,003%	0,001%				
	60	*2,436%*	0,686%	0,772%	0,498%	0,229%	0,136%	0,052%	0,029%	0,015%	0,013%	0,003%	0,002%					
	90	*3,073%*	1,181%	0,978%	0,416%	0,222%	0,134%	0,062%	0,050%	0,017%	0,010%	0,004%						
	120	*14,069%*	4,566%	4,838%	2,350%	1,121%	0,541%	0,305%	0,184%	0,084%	0,044%	0,017%	0,011%	0,006%	0,002%			
	150	*15,641%*	3,382%	4,212%	3,027%	2,086%	1,257%	0,781%	0,403%	0,250%	0,130%	0,058%	0,027%	0,013%	0,008%	0,005%	0,001%	0,001%
	180	*5,567%*	1,273%	1,626%	1,219%	0,737%	0,418%	0,179%	0,071%	0,024%	0,010%	0,007%	0,002%					
	210	*3,688%*	0,830%	1,186%	0,856%	0,485%	0,206%	0,082%	0,034%	0,007%	0,001%	0,001%						
	240	*2,658%*	0,721%	0,787%	0,560%	0,335%	0,161%	0,060%	0,025%	0,005%	0,002%	0,001%	0,001%					
	270	*2,094%*	0,970%	0,567%	0,323%	0,131%	0,067%	0,021%	0,009%	0,004%	0,002%							
	300	*19,765%*	6,307%	7,927%	3,624%	1,137%	0,434%	0,186%	0,079%	0,034%	0,020%	0,009%	0,005%	0,001%	0,001%	0,001%	0,000%	
	330	*19,130%*	6,364%	6,587%	3,386%	1,538%	0,655%	0,317%	0,156%	0,057%	0,024%	0,025%	0,017%	0,005%	0,000%			

Frequency table, as a percentage (%), of H combinations$_S$-direction

4.1.2.3 Base State Marine Currents

The analyses of the speed of the sea current presented in this section are based on the reanalysis data of the MEDSEA database, for the coordinates 42.1042 N 16.8750 E, for the period from 01/01/1990 to 31/12/2019, with time discretization of 1 hour. The MEDSEA data does not include tidal-induced sea currents, which were added based on data from the TPXO9.2 database, considering the same coordinates and the same time instants to calculate the total current speed.

The analysis of the sea current speed and direction data was carried out by distinguishing the three components as follows:

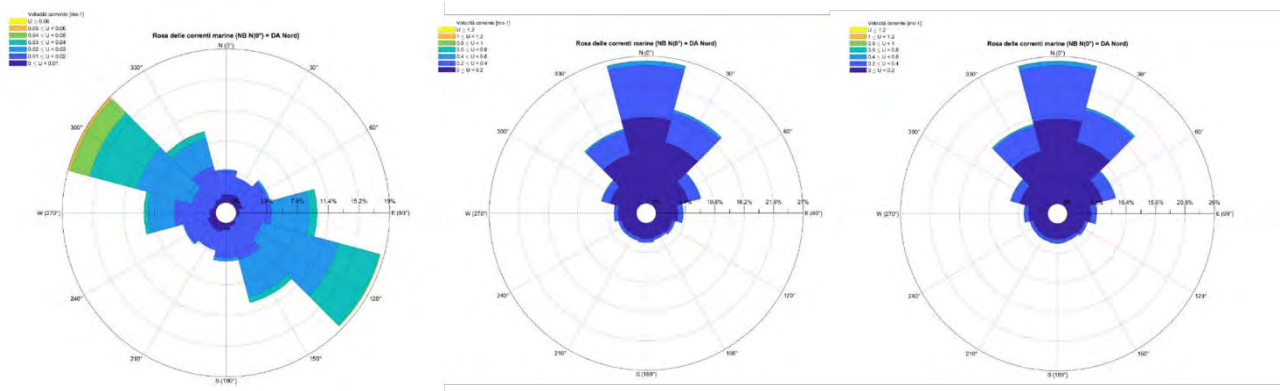
- deterministic component, tidal (tidal),
- non-deterministic, residual component (resid),

- total component (tot).

The tidal component of the average monthly current velocities is very small compared to the residual component (resid), with a generally constant trend throughout the year and marginally higher velocity in June and December. The average velocity of the residual component, on the other hand, tends to reach the highest values in the summer months, and the lowest in the late winter months (February, March), with a similar trend also for the standard deviation. The total current speed is clearly dominated by the stochastic component (resid), from which it takes its trends during the year.

		All	Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Sep	Ott	Nov	Dic
$U_{0m,1h,tide}$ [m/s]	Min	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01
	Media	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03
	Max	0.06	0.06	0.05	0.04	0.05	0.05	0.06	0.06	0.05	0.04	0.05	0.06	0.06
	Std	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
		All	Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Sep	Ott	Nov	Dic
$U_{0m,1h,resid}$ [m/s]	Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Media	0.16	0.16	0.15	0.14	0.15	0.17	0.18	0.19	0.18	0.18	0.15	0.16	0.15
	Max	1.20	0.59	0.83	0.89	0.72	0.79	1.20	0.93	0.79	0.89	0.98	0.86	0.87
	Std	0.10	0.09	0.10	0.09	0.09	0.10	0.11	0.11	0.10	0.10	0.09	0.09	0.09
		All	Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Sep	Ott	Nov	Dic
$U_{0m,1h,tot}$ [m/s]	Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Media	0.16	0.16	0.15	0.14	0.15	0.17	0.18	0.19	0.18	0.18	0.16	0.16	0.15
	Max	1.19	0.64	0.82	0.89	0.72	0.79	1.19	0.96	0.79	0.89	0.98	0.85	0.89
	Std	0.10	0.09	0.10	0.09	0.09	0.10	0.11	0.11	0.10	0.10	0.09	0.10	0.09

Monthly and yearly statistics of current speed (omnidirectional), tidal (top), residual (middle), and total (bottom) components

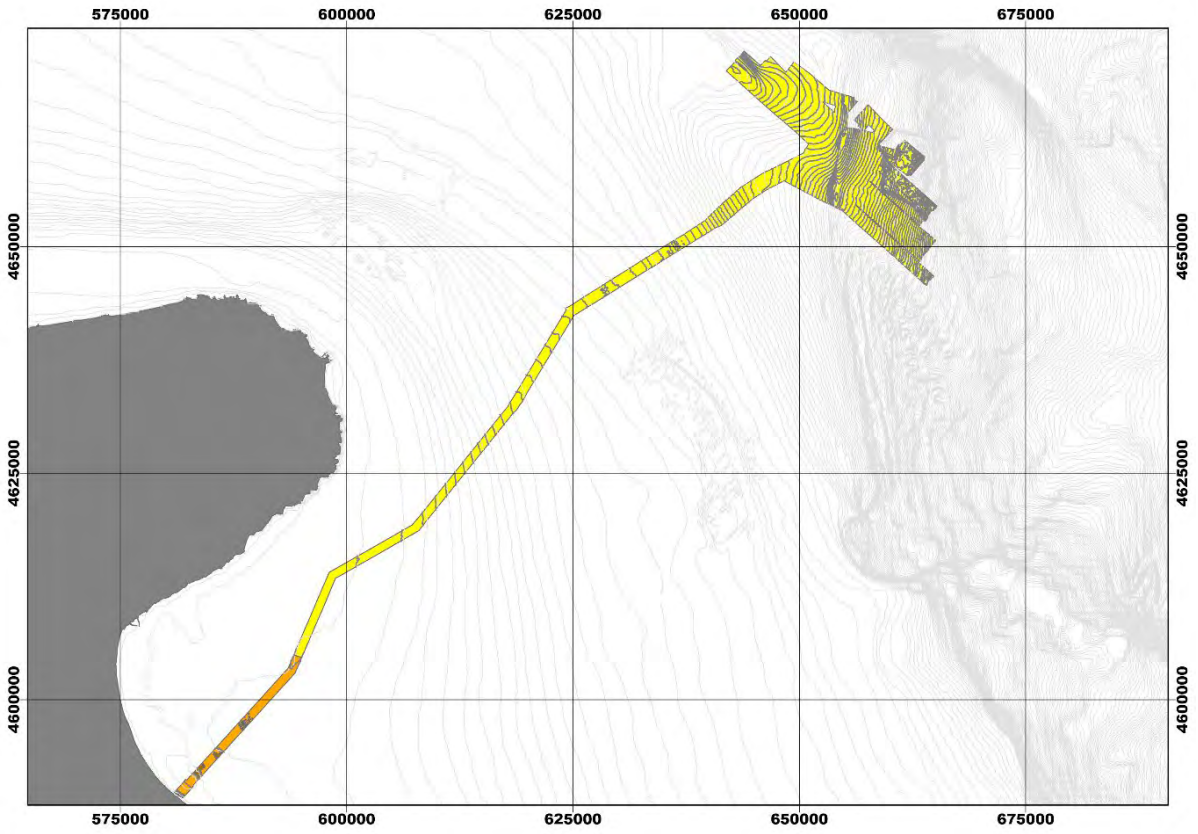


Current pink, tidal component, residual and total

4.1.3 MARINE ENVIRONMENT - SEABED

4.1.3.1 Morphology and bathymetry of the seabed

The investigated area includes the corridor planned for the laying of the transport cable duct with a width of about 1000 m for a total length of about 90 km and the area for the installation of the wind turbines (field) with dimensions of about 6 km X 38 km.



Relief area of the morphology of the seabed

The area affected by the planned works was affected in November 2023, December 2023, and January 2024 by geoacoustic surveys. The planned survey along the connections and cable ducts planned for the plant was carried out along a corridor about 1000 m wide centered on the theoretical route of each cable duct. In the areas where the connection cable conduit is located, in the landing areas and in the areas approaching the coast, visual inspections of the seabed were carried out on 11 and 12 January 2024 using a wire-guided robotic vehicle ROV.

The activities carried out are as follows:

- Bathymetric survey with multibeam echosounder (Multibeam)
- Morphological survey by Side Scan Sonar
- Stratigraphic survey using Sub Bottom Profiler
- Preliminary video inspection by means of a wire-guided underwater vehicle (R.O.V. Remote Operated Vehicle)
- Further Insight by means of ROV video and scuba diving.

Detailed thematic maps have been developed with the geological and geomorphological characterization of the seabed to be used as tools to support the drafting of the project and the identification of technical solutions characterized by the least impact on the environment and biodiversity. The results of these findings are contained in detail in the documents of the section called "*SIA.ES.6_ Seabed Investigations and Characterization*".

- **Boat used**

The surveys were carried out with the help of M/P Marianna. The survey near the coast was carried out using the ARGOS inflatable boat owned by CoNISMa (National Inter-University Consortium for the Sciences of MAre).

The vessel is optimized for the execution of marine geophysical surveys and is equipped with deck spaces for housing all the computers necessary for carrying out the surveys, a generator and an uninterruptible power supply. To measure the relative positions of the various sensors installed on board and calculate systematic errors due to incorrect misalignment evaluation (*Offset*) among these, the boats, before the start of the acquisition phase, were subjected to a dimensional survey through a measurement session with a total station.

Boat Marianna

- **Equipment used**

Below is the list of tools used in the realization of the geophysical survey in the area of the cable duct corridor:

Description	**Type / Model**
Primary Surface Positioning System – RTK-DGNSS	Integrated attitude and positioning sensor R2Sonic INS RTK/PPK System + RTK correction signal GNSS Network Puglia Region
Primary Direction and Attitude Sensor	Integrated attitude and positioning sensor R2Sonic INS RTK/PPK System + RTK correction signal GNSS Network Puglia Region
Multi Beam Ecosounder System (MBES)	R2SONIC 2022
Single Beam Ecosounder System (SBES)	NAVITRONIC NAVISOUND 215
Sound Velocity Sensor (SVS)	VALEPORT MINI SVS probe
Sound Speed Profiler (CTD)	Probe SEABIRD 19 PLUS
Side Scan Sonar System (SSS)	Klein 3000
Side Scan Sonar System (SSS)	CMAX

Description	Type / Model
Sub Bottom Profiler (SBP) System	SES 2000 Compact
Underwater positioning system	Applied Acustics Easytrak USBL NEXUS
ROV System	
Navigation and Bathymetric Data Acquisition Software	Teledyne RESON PDS2000
SSS Data Acquisition Software	Klein Sonar Pro
SBP Data Navigation Software	CT Swan Pro
Dimensional survey instrumentation	TS15 Total Station

Instrumentation used along the cable duct

Below is the list of tools used in the realization of the geophysical survey in the area of the offshore wind farm:

Description	Type / Model
Primary Surface Positioning System – RTK-DGNSS	Integrated attitude and positioning sensor R2Sonic INS RTK/PPK System + RTK correction signal GNSS Network Puglia Region
Primary Direction and Attitude Sensor	Integrated attitude and positioning sensor R2Sonic INS RTK/PPK System + RTK correction signal GNSS Network Puglia Region
Multi Beam Ecosounder System (MBES)	RESON T50 Extended (+ Side Scan Sonar option)
Sound Velocity Sensor (SVS)	VALEPORT MINI SVS probe
Sound Speed Profiler (CTD)	Probe SEABIRD 19 PLUS
Sub Bottom Profiler (SBP) System	SES 2000 Medium
Navigation and Bathymetric Data Acquisition Software	Teledyne RESON PDS2000
SBP Data Navigation Software	INNOMAR SesWin
Dimensional survey instrumentation	TS15 Total Station

Instrumentation used in the wind field

- **Route plan**

On the basis of the basic cartographic information, a detailed navigation plan has been designed, described below:

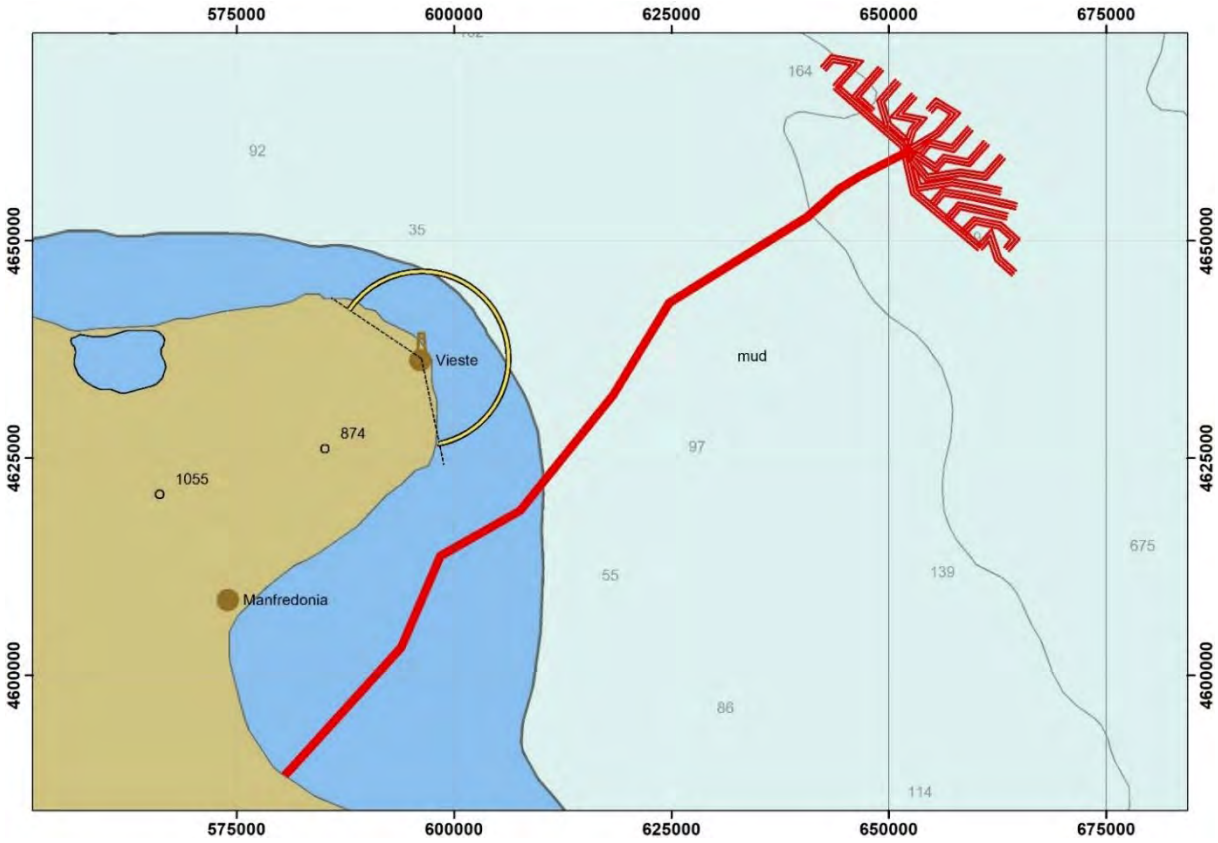
Conduit:

- N° 5 longitudinal lines with a distance of 180 m along the entire corridor to be surveyed

Field:

- N° 3 parallel lines along the alignments and the cable ducts connecting the wind turbines.

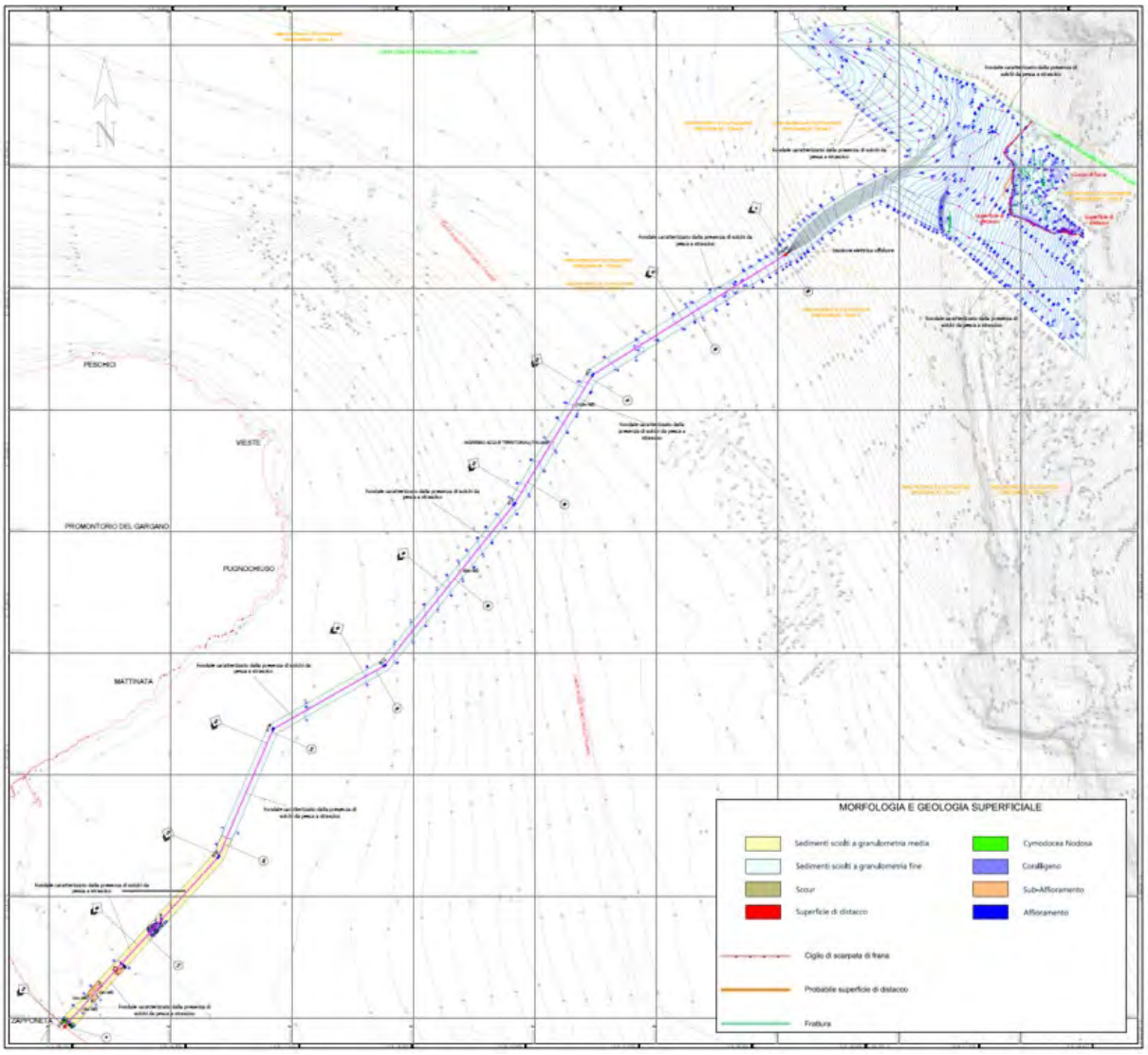
The lines were identified with a unique code and entered into the navigation software.



Navigation Plan Diagram

- **Map of the bathymetry of the study area**

The surveys carried out by multibeam have made it possible to elaborate, in a GIS environment, the map of the bathymetry of the study area. The spatial elaboration of this theme has allowed the production of isobaths every meter of depth.



General bathymetric map

In general, the results of the geophysical survey confirm the bathymetry, morphologies and surface geology expected in this marine area between the coastal part and the current escarpment.

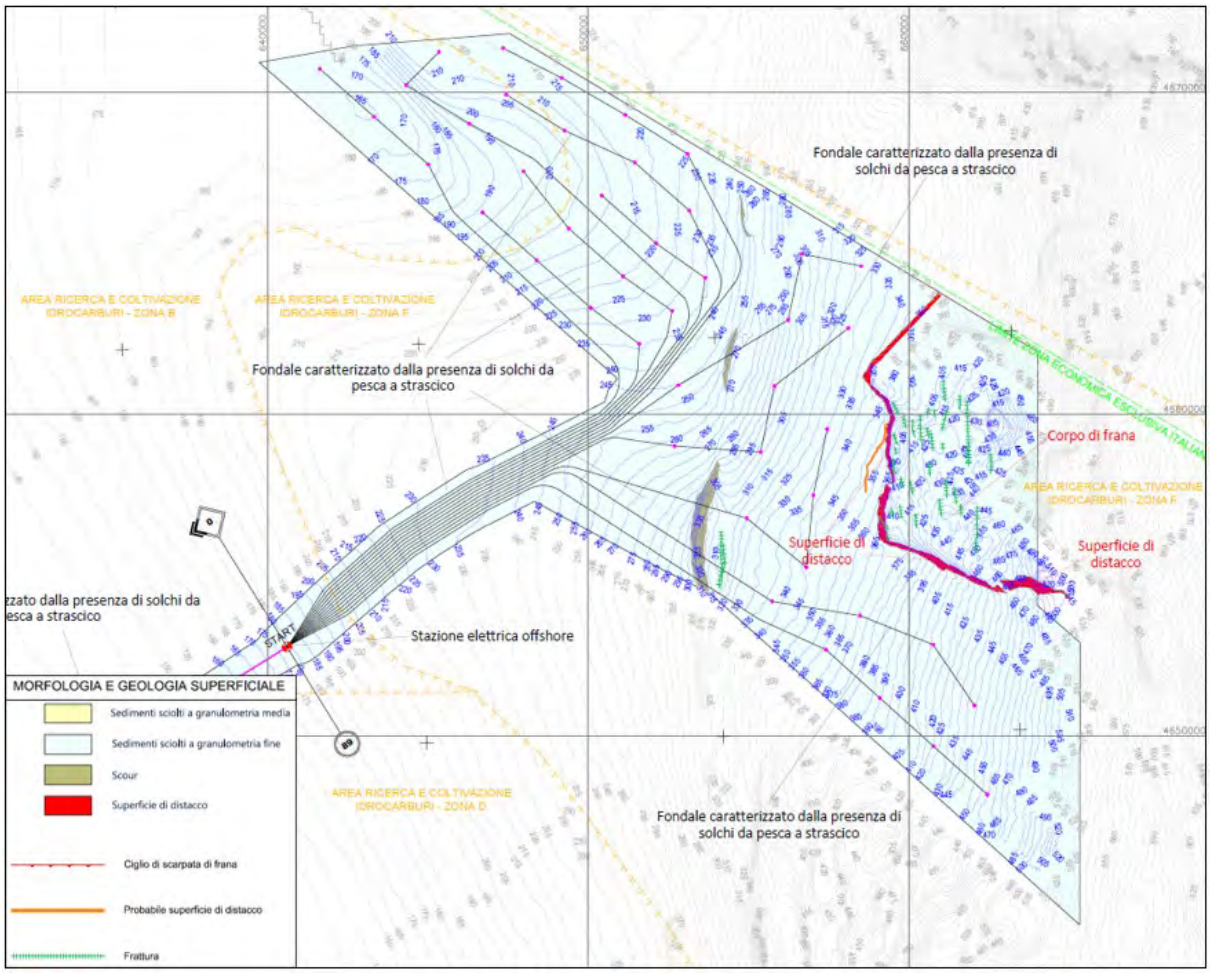
The bottom is flat and with very low slopes throughout the area of the cable duct corridor while in the field area there are articulated shapes such as erosive furrows and in the eastern margin the Vieste landslide.

The analysis and interpretation of the Side Scan Sonar data, from a geomorphological and geological point of view, has highlighted the presence of a surface cover of loose sediments with medium grain size (sands) and fine grain (silts/clays), of *Cymodocea nOdosa*, of some areas of subsurfacing and outcropping of the substrate and of bioconstructive biocoenoses (Coralligenous). The presence of live phanerogam was identified only between the minimum depth of 2,5 m and maximum of 7 m. Diving areas-outcropping and surfacing are limited between 10 m and 15 m depth while bioconstructions were detected between KP 78.7 and 76.9 at about 17 m depth. The coverage of the bioconstructions does not appear continuous within the corridor investigated but is alternated with areas with sandy cover.

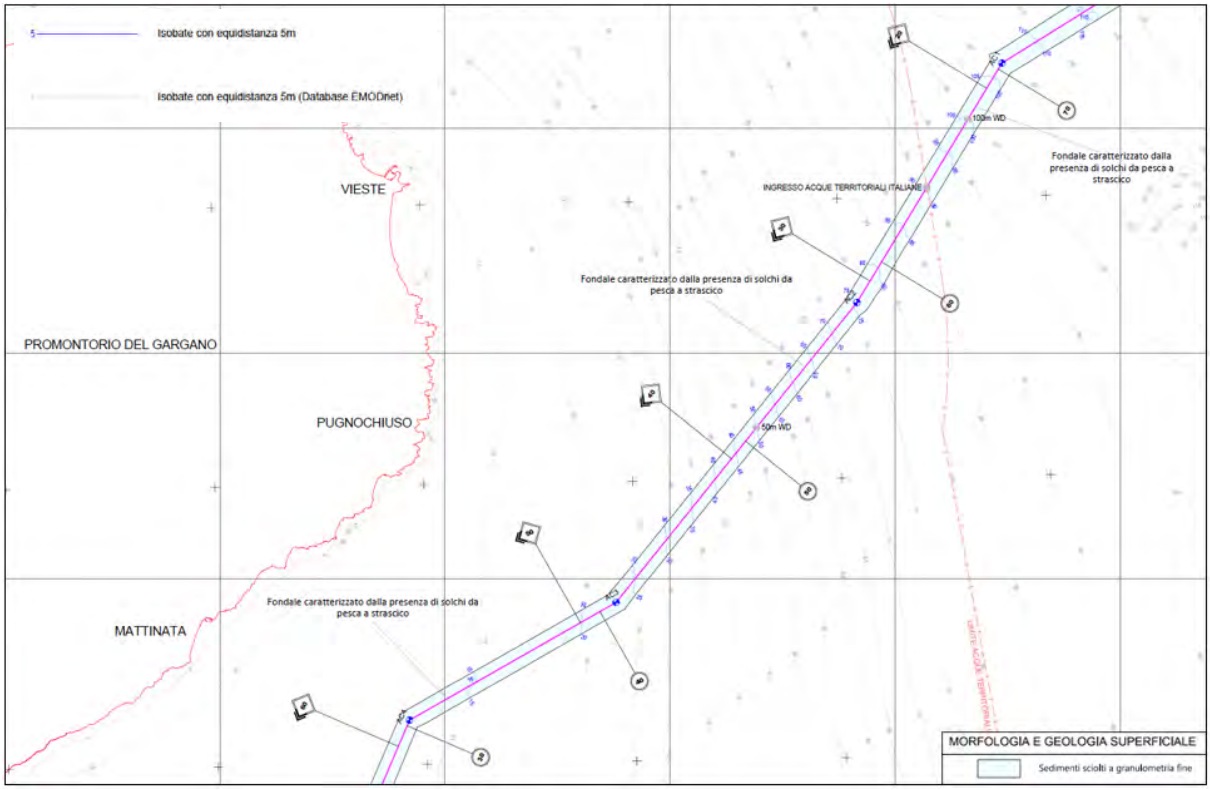
The stratigraphic data show the presence of a sedimentary cover of loose sediments with an average thickness greater than a few meters, which is reduced to less than a few decimeters in correspondence with the areas of subsurfacing of the substrate (between KP 86 and 84.4 and between KP 83 and 82) and disappears in correspondence with the outcrop area (KP 82). In the eastern area of the field, areas of instability have been identified: an existing landslide (also visible in the EMODnet data) and areas of intense

deformation and fracturing that highlight ongoing phenomena that may involve current surface sediments that will serve as a foundation for the anchors of the wind turbines.

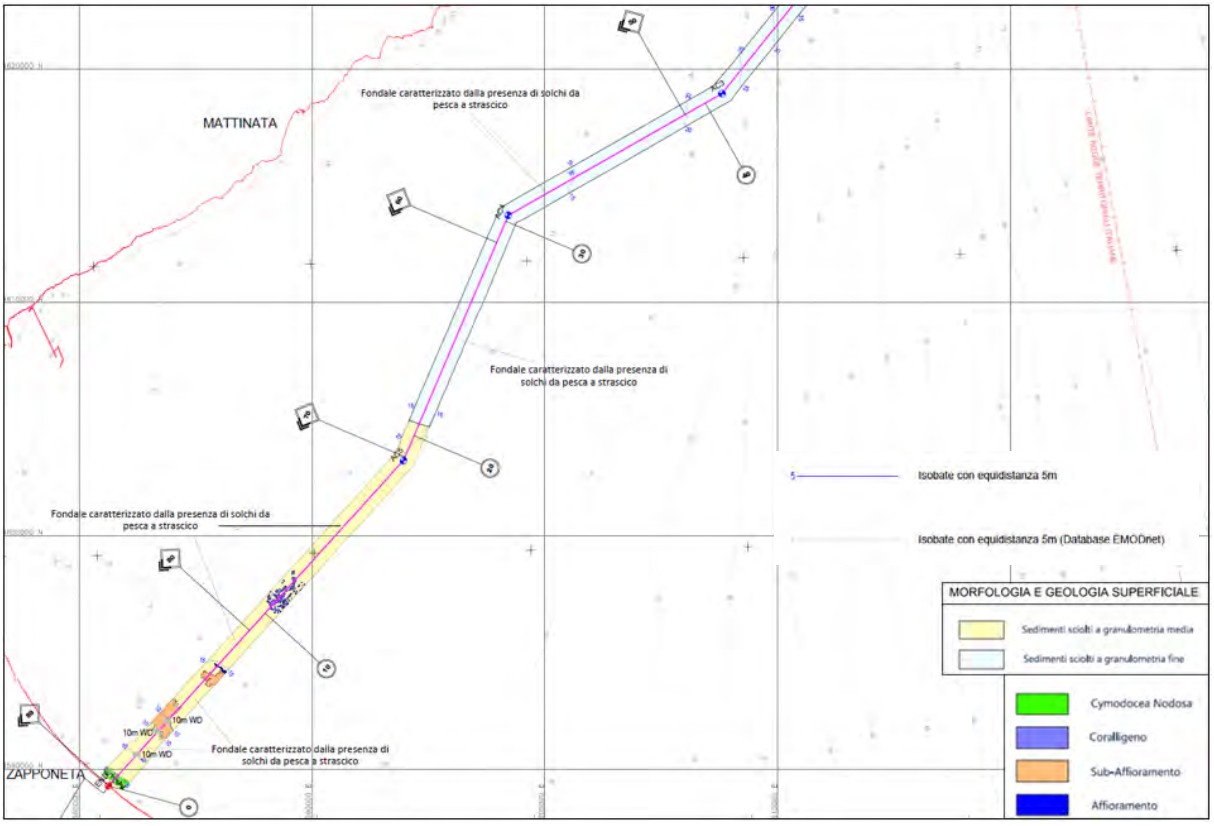
Throughout the corridor where the transport cable duct was laid and in part of the field area, surface morphologies were recorded that could be clearly linked to anthropogenic trawling activities. In particular, grooves have been identified in the sonar data having, at times, very high density, indicating a very strong anthropogenic pressure.



Bathymetric map of the wind farm



Bathymetric map of the cable duct



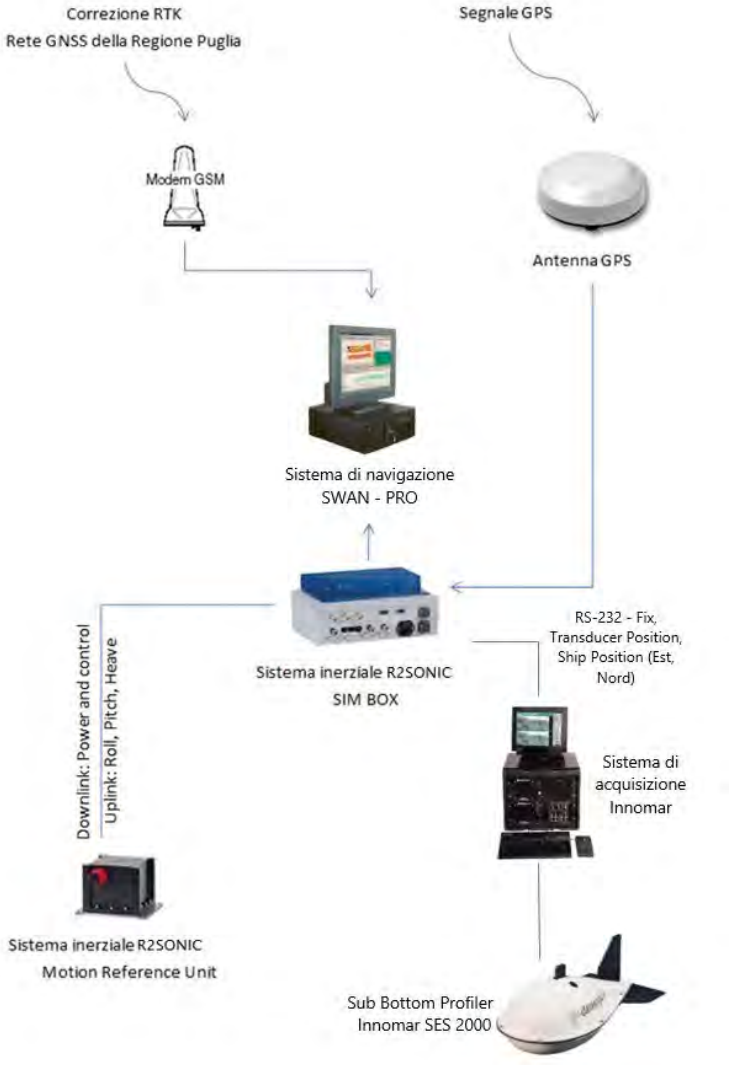
Bathymetric map of the Conduit

4.1.3.2 Geomorphology and geology

The reading of the geomorphological, geological and stratigraphy state of the seabed of the project area was carried out using the Sub Botton Profiler method which was carried out on all the investigation profiles as previously reported.

Penetration and reflection depend both on the physical properties of the material crossed (acoustic impedance is related to the density of the material and the speed at which sound travels through the material), and on the power and carrier frequency of the signal. When there is a change in acoustic impedance, such as at the water/sediment interface, some of the transmitted sound is reflected and some of the sound energy penetrates the sediments. Continuing deeper, additional sound energy is reflected when it encounters deeper layers of sediments with different acoustic impedance.

The stratigraphic survey was carried out using the INNOMAR SES 2000 model Sub Bottom Profiler (SBP) with very high resolution with Chirp technology pulse at 2÷7 kHz and 10÷20 kHz simultaneous double frequency, controlled by proprietary acquisition software that guarantees good penetration of the sediments of the substrate.

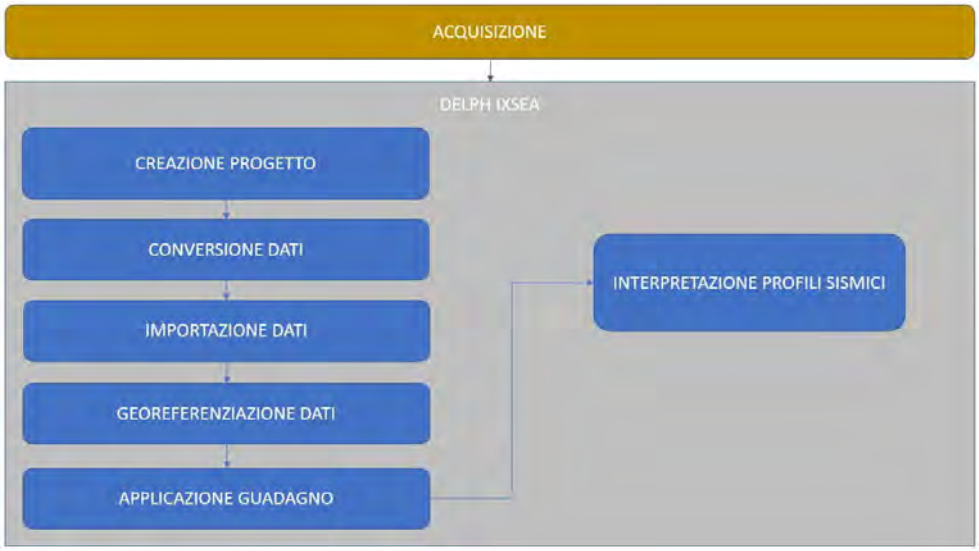


Instrumental configuration stratigraphic survey

The data acquired with the Innomar SES 2000 Sub Bottom Profiler in RAW format were processed with the help of the IXSEA DELPH suite.

The main processing phases are reported below:

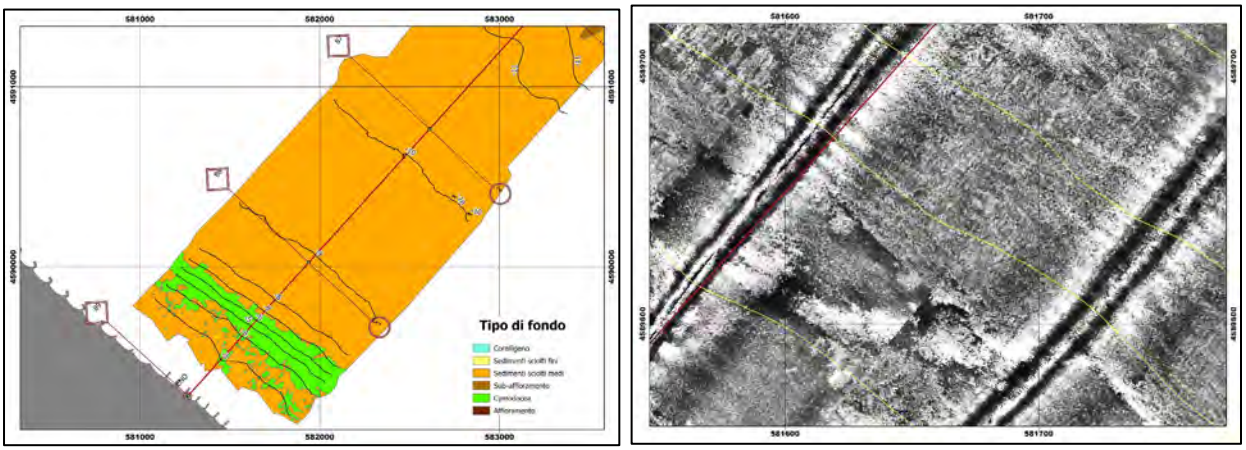
- Creating a new project
- Convert files from RAW to SEGY format with heave application
- Import of seismic lines through the DelphSeismic module
- Georeferencing data through the DelphMap module
- Gain Application
- Interpretation of seismic profiles in the SeismicGIS and DelphMap modules



SBP Processing Workflow

- **Export cable conduit – Landing Area (KP 89 depth: 2.5 m – KP 87 depth: 10 m)**

The landing area of the cable duct consists of a current beach environment with evident erosive phenomena and is characterized, from a geomorphological and geological point of view, by a constant cover of loose sediments with medium grain size (sand). The seabed deepens steadily in the NE direction with very low slopes, on average below 0.2°.

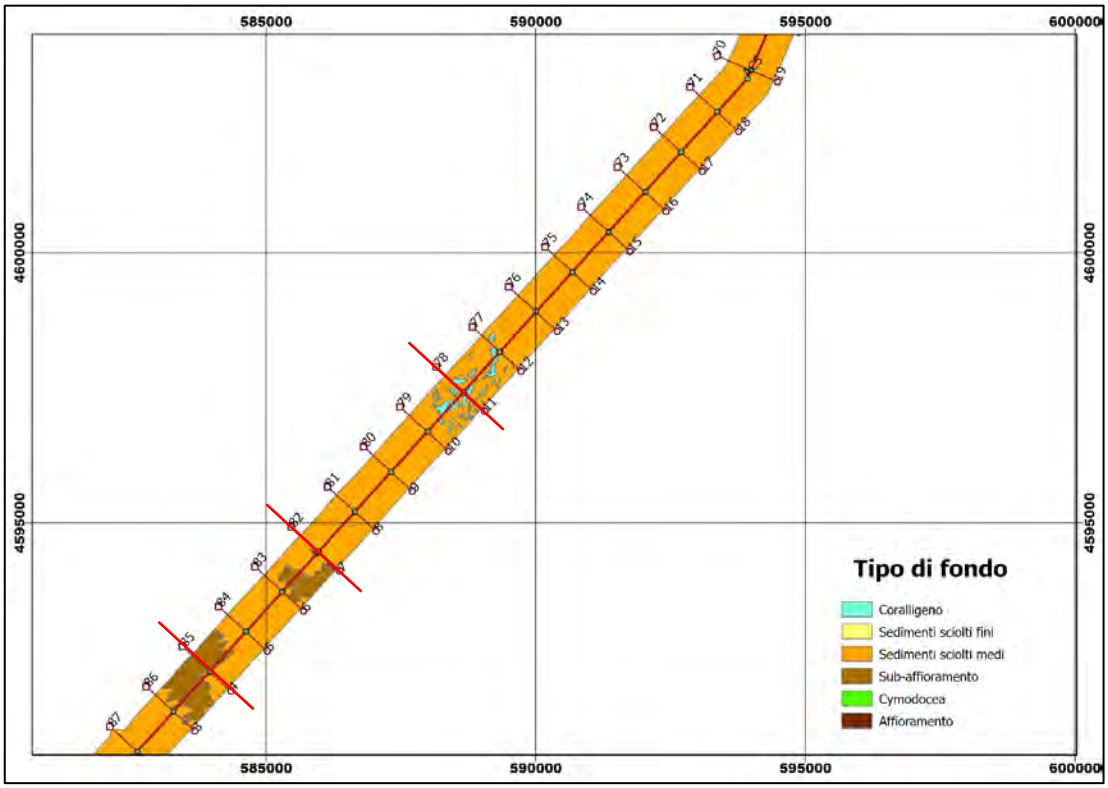


Geomorphological and geological interpretation and SSS photomosaic landing area

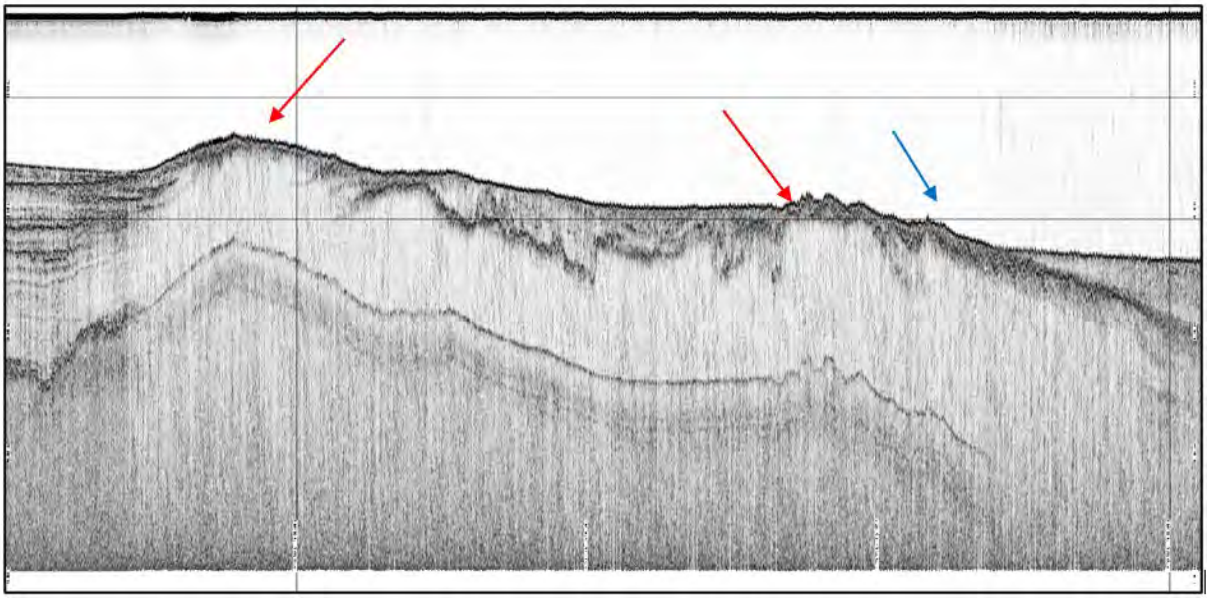
- **Approach Area (KP 87 depth: 10 m – KP 70 depth: 15 m)**

The approach area is characterized by, from a geomorphological and geological point of view, by a surface cover of loose sediments with medium grain size (probably silty sand and/or sandy silts) interrupted by

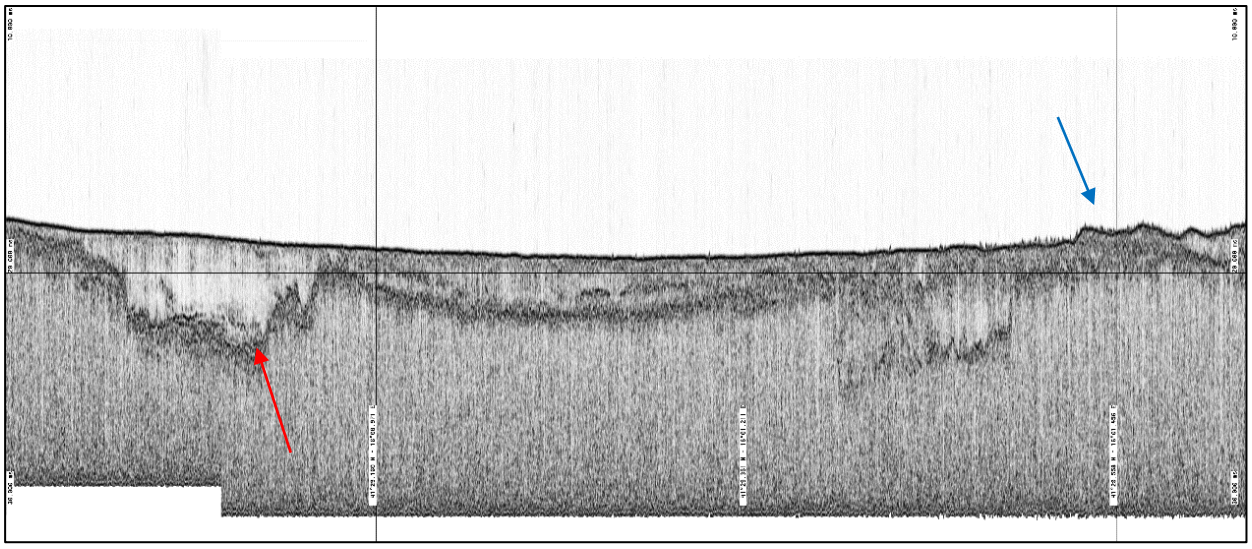
some areas of sub-outcropping and outcropping of the substrate, of an unknown nature, probably hard, sometimes cemented or very consistent as well as an area in which bioconstructive biocoenoses (Coralligenous) are present.



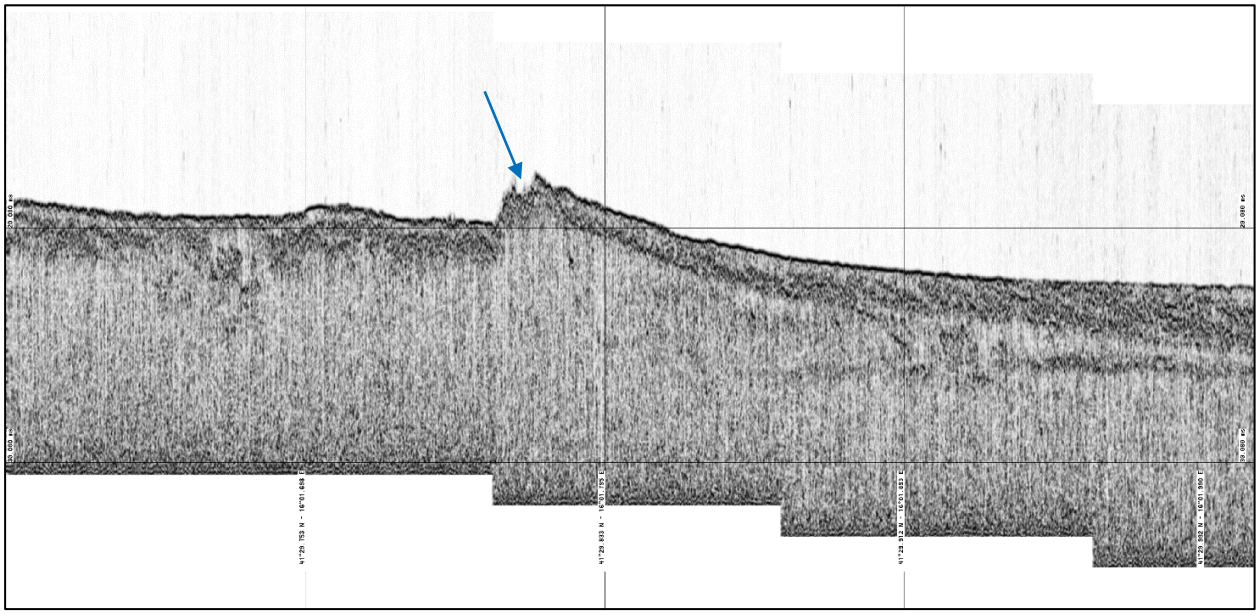
Map geological and geomorphological interpretation of the area of approach



SBP line: A_L1_27122023_070415_LF - Sub-outcrop areas (red arrows) in which the sedimentary cover is reduced to about 30 cm and substratum outcrop area (blue arrow) in which the sedimentary cover is cancelled out



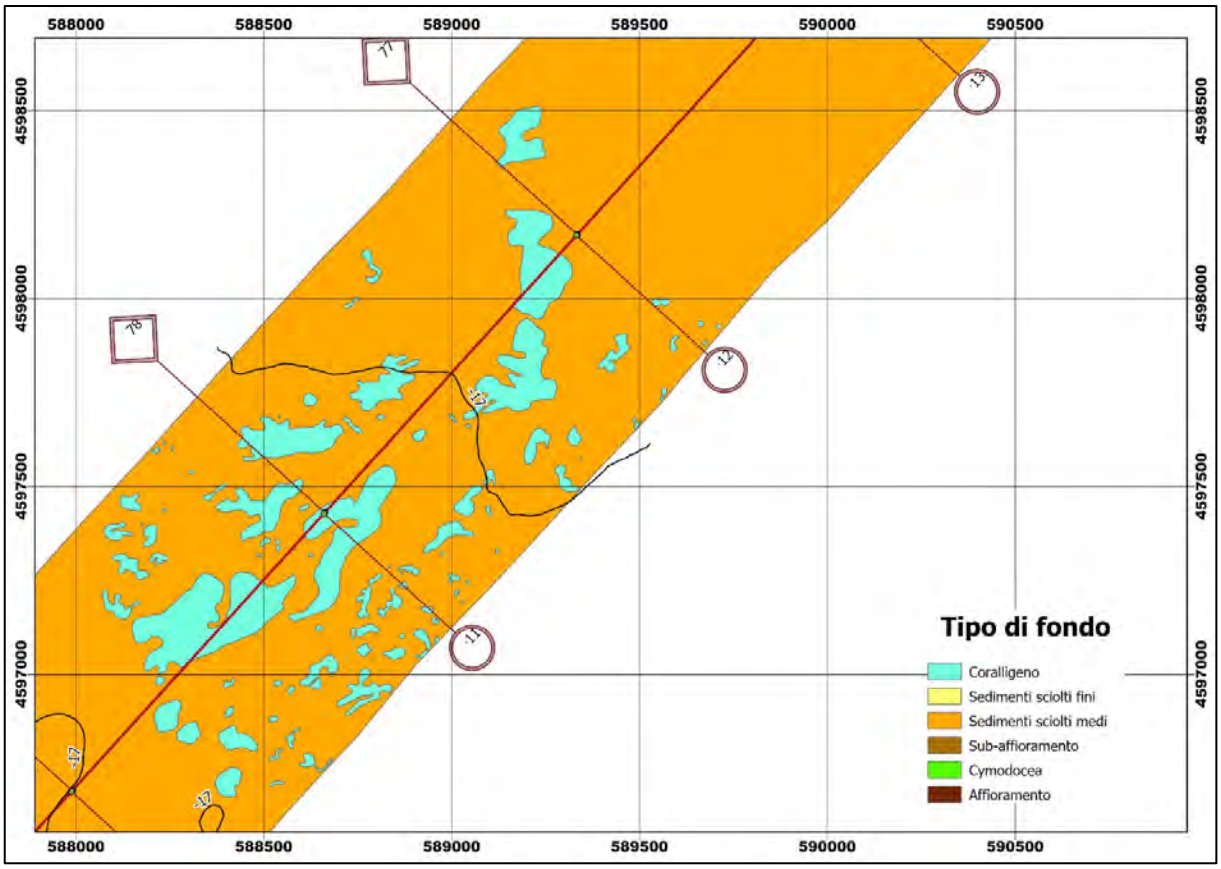
SBP Line: A_CL_Infill_28122023_110339_LF - Subsurface area of the substrate (blue arrow). Note the depression and the geometries of the internal stratification (red arrow), which indicate a probable fluvial origin



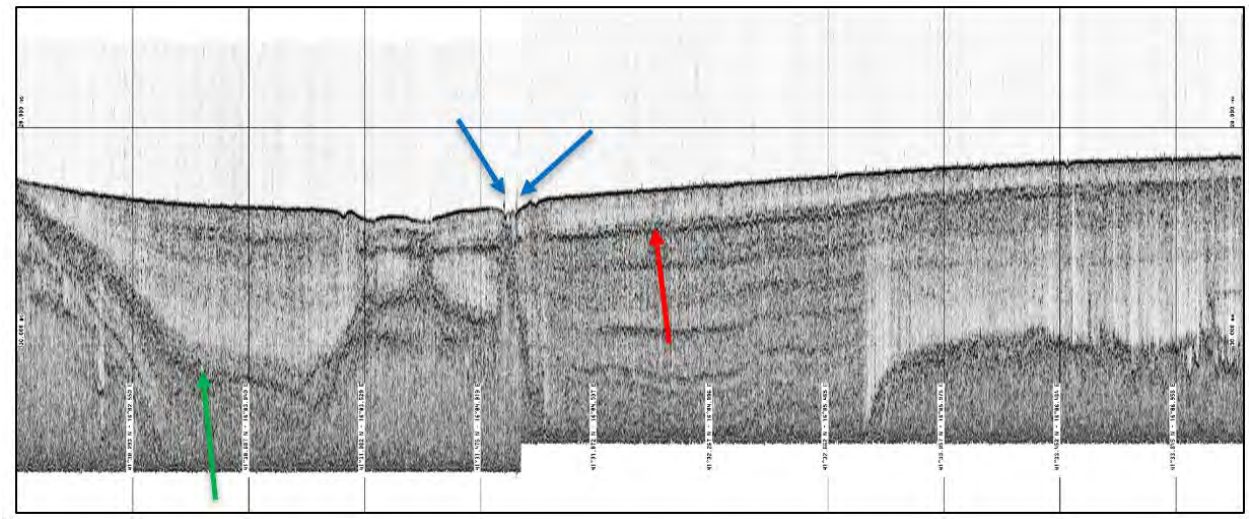
SBP Line: A_CL_Infill_28122023_111502_LF - Substrate Outcrop Area (Blue Arrow)

- **Approach Area (**KP 78.7 and 76.9 **depth.: 17m)**

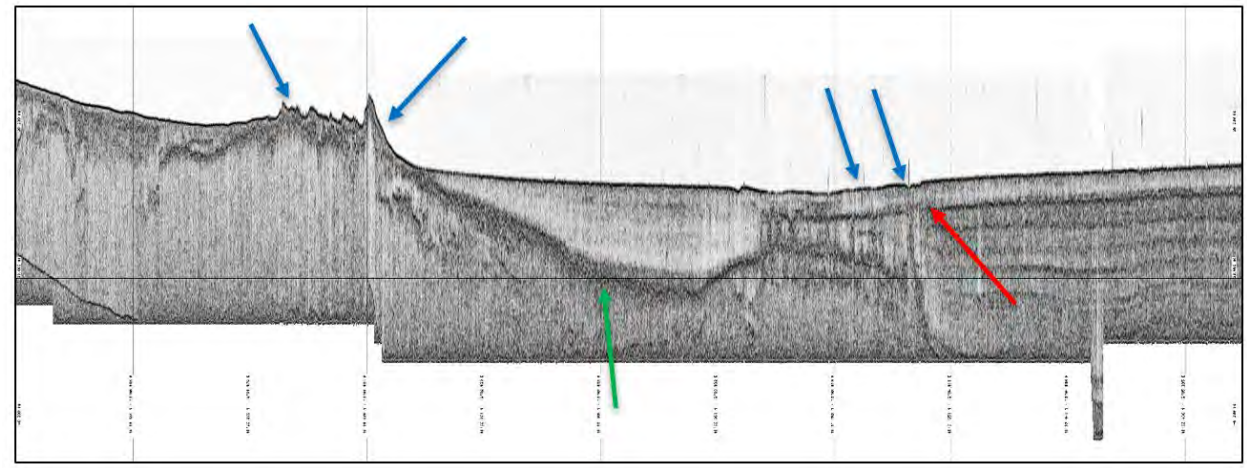
Proceeding northwards, within the geologically and geomorphologically included area between KP 78.7 and 76.9 at a depth of about 17 m, areas characterized by the presence of bioconstructive biocoenoses (Coralligenous) begin to appear. The coverage of the bioconstructions does not appear continuous within the corridor investigated but is alternated with areas with sandy cover. The stratigraphic data show the general presence of a sedimentary cover formed by poorly consolidated plano-parallel sediments with an average thickness greater than a few meters that thins to zero completely in correspondence with the identified bioconstructions. In addition, the stratigraphic data show a correlation between the substrate and the biocoenoses: the bioconstructions appear to be set on the substrate.



Geological and geomorphological map and akingand of bioconstructive biocoenoses (Coralligenous) between KP 78.7 and KP 76.9



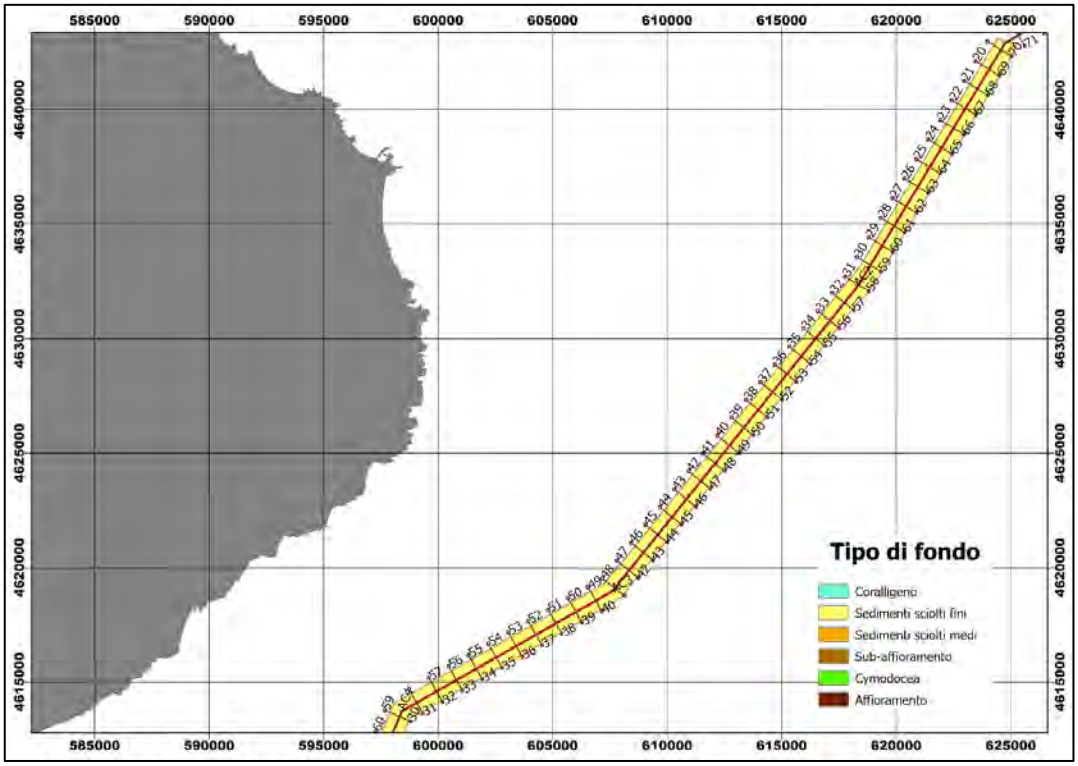
SBP line: A_R1_27122023_202318_LF: note the presence of a deep reflector about 1 m from the bottom (red arrow) which disappears when bioconstructions occur (blue arrows). Note the depression indicated by the green arrow



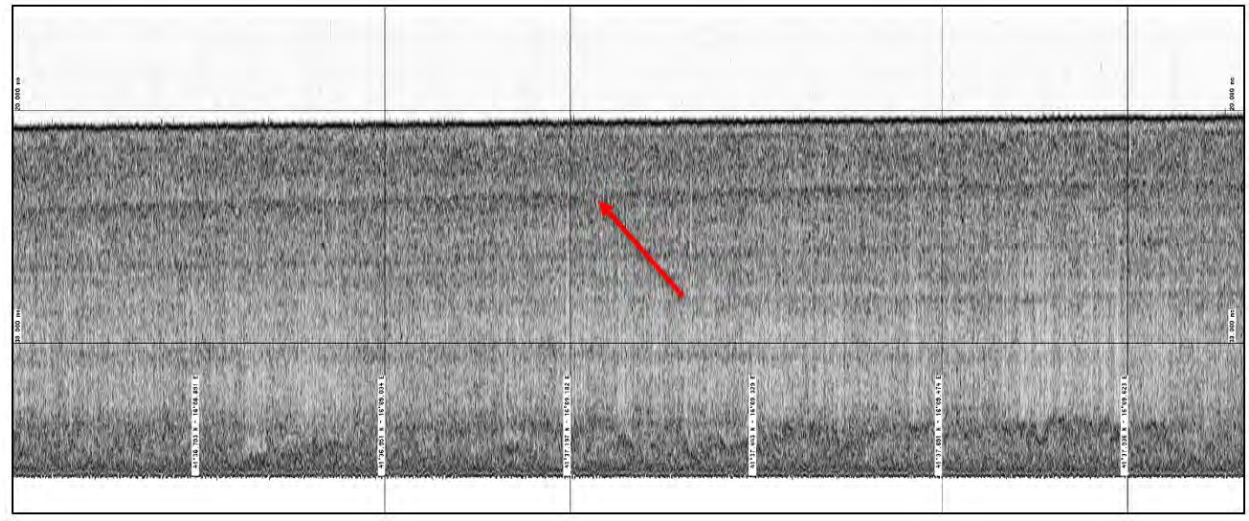
SBP line: A_R2_28122023_092149_LF: note the presence of a deep reflector about 1.5 m from the bottom (red arrow) which disappears when bioconstructions occur (blue arrows). Note the depression indicated by the green arrow

- **Wide length export cable duct (over KP 76.9)**

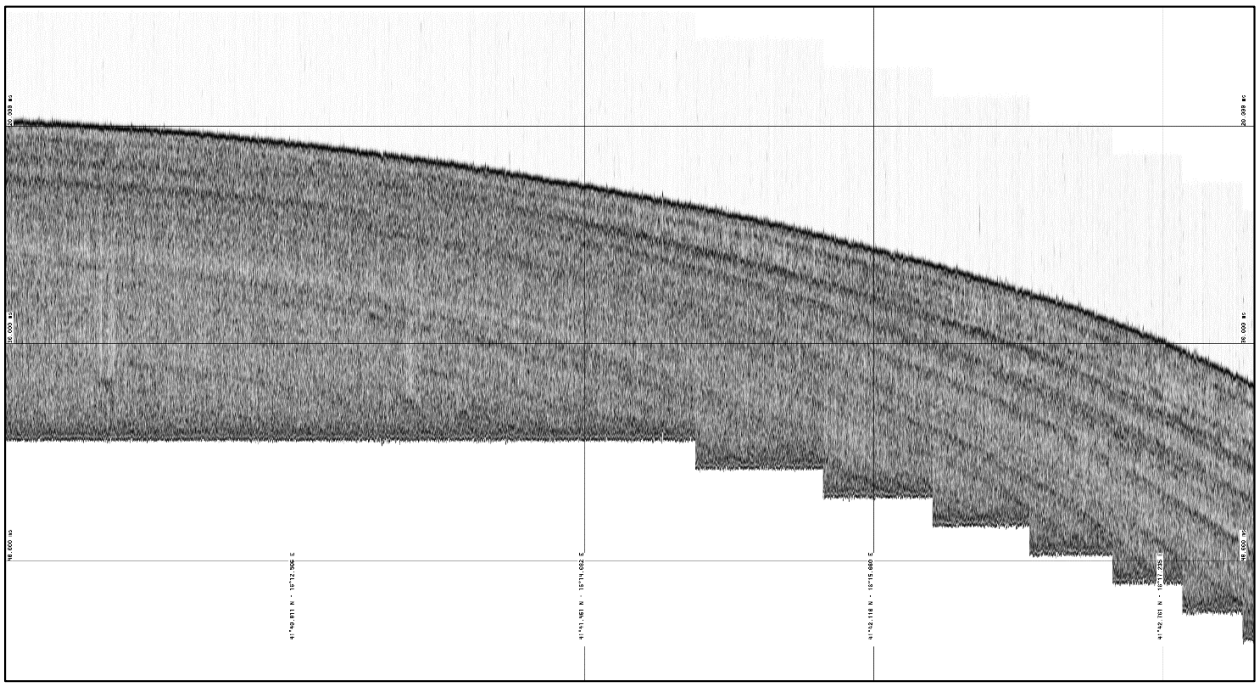
From this point on, proceeding along the investigated corridor towards the open sea, beyond KP 76.9, the seabed always has the same characteristics geological and geomorphological, i.e. a continuous surface cover of medium-grained sediments throughout the area that gradually becomes finer and finer (probably silty sands). The sedimentary cover tends to thicken and the thicknesses take on metric values proceeding northwards. The roof is characterized by a seismic facies with an internal geometry of the plano-parallel reflectors in which some reflectors with excellent lateral continuity and strong width have been identified. The stratigraphy of the first meters is organized in layers of poorly consolidated plano-parallel sediments visible up to about ten meters from the bottom, confirming the expected geological facies of the current internal platform.



Map geological and geomorphological of the wide area



SBP line: B_CL_28122023_125730_LF: note the plane-parallel stratification and the reflector (red arrow) at greater amplitude at about 2.5 m from the fondor

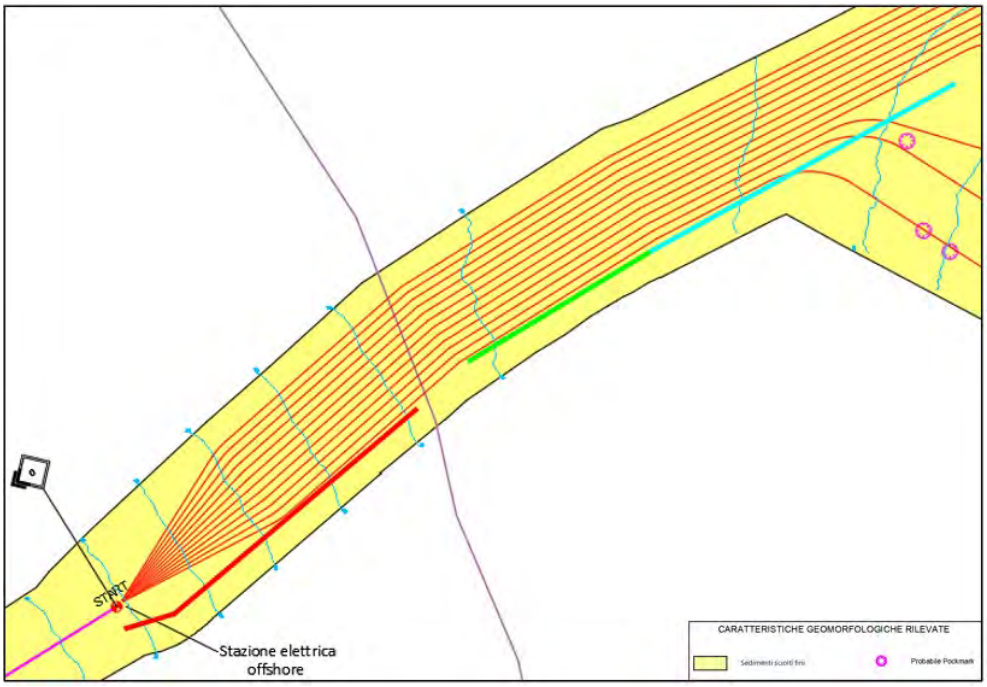


SBP line: C_CL_28122023_134547_LF: note the plane-parallel layering

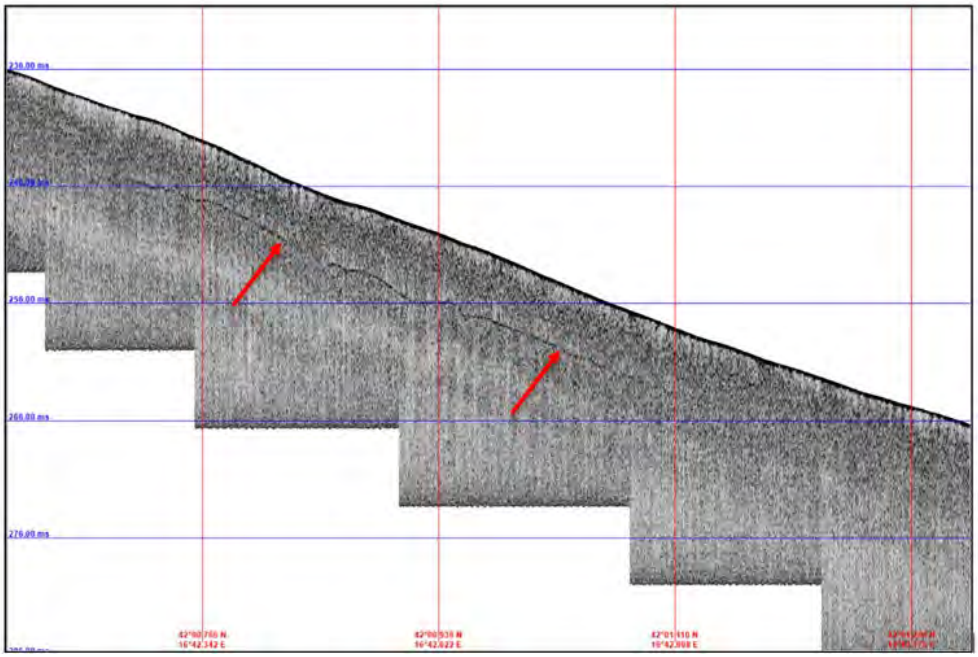
- **Approach to the Wind Field (depth: 180 m – depth: 245 m)**

From about 180 m the seabed deepens with a slight increase in slope. This is the area immediately in front of the external platform, consisting of very fine loose sediments (probably sandy silts) of considerable thickness.

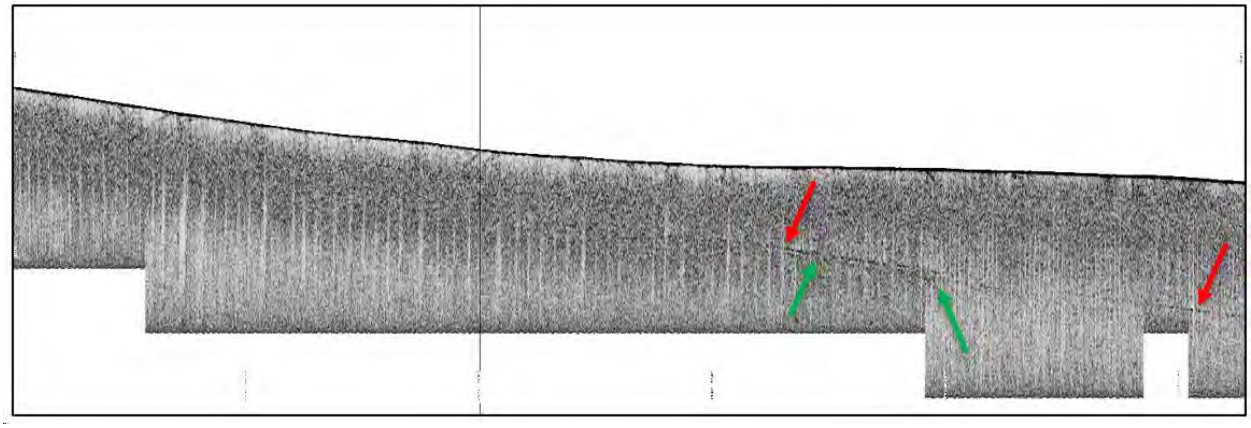
Regarding the geological aspects, the penetration of the SBP signal indicates the presence of a substrate whose consistency cannot be assessed at this stage but probably formed by compact and/or very densely packed loose sediments.



Map of the Wind Field Approach area (geomorphological and geological interpretation). The colored lines indicate the rough position of the SBP sections shown in the following figures



SBP G_R3_202400205_073546 line - a detail at depths between 180 m and 195 m m approx.: note a reflector (red arrows) approximately 5m from the seabed



SBP line H_R3_20240205_081110 – The reflector (red arrows) is visible between about 5 m and 10 m. It is an additional reflector (green arrows) can be observed about 50 cm from the first

- **Wind farm area**

In general, the area intended for the installation of wind turbines and substations has different morphological characteristics than the corridor of the Transport Cable Duct.

The area includes the outer platform (north-western area) and the current escarpment edge (south-eastern area).

The seabed increases from about 165 m to the maximum recorded depths (about 520 m).

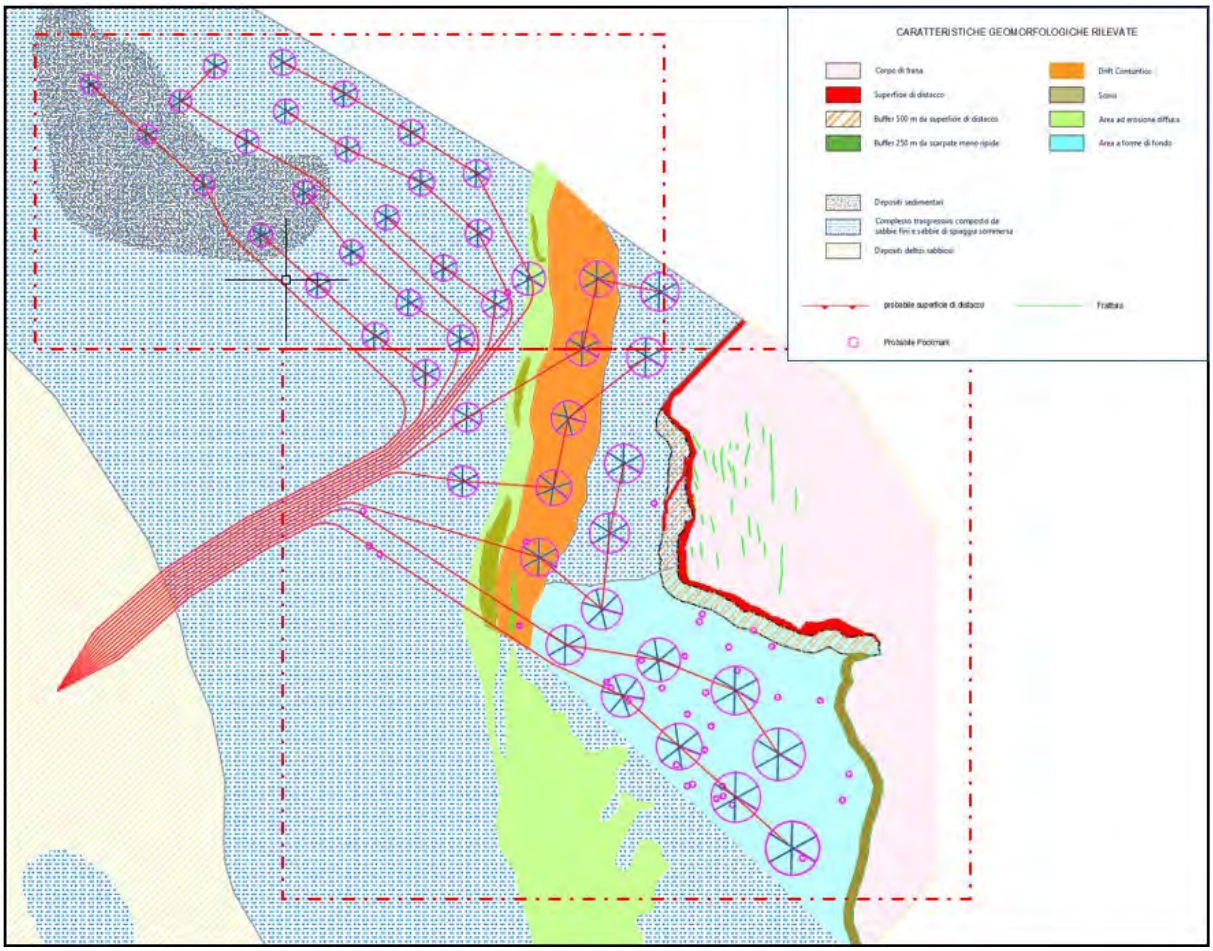
In the north-western area, no surfaces of evident outcrops of the substrate, objects or morphologies attributable to biocoenosis have been identified. An area of instability has been identified in the easternmost area. The seabed is made up of very fine loose sediments (probably sandy silt) of considerable thickness.

In the south-eastern area there are large-scale erosive structures (conturistic drift, scour, areas of diffuse erosion and bottom forms), while in the outermost margin there is the Vieste landslide.

The sedimentary cover consists of very fine loose sediments (probably sandy silts) and, in depression areas, chaotic loose sediments.

Trawling furrows have been identified in the less uneven areas.

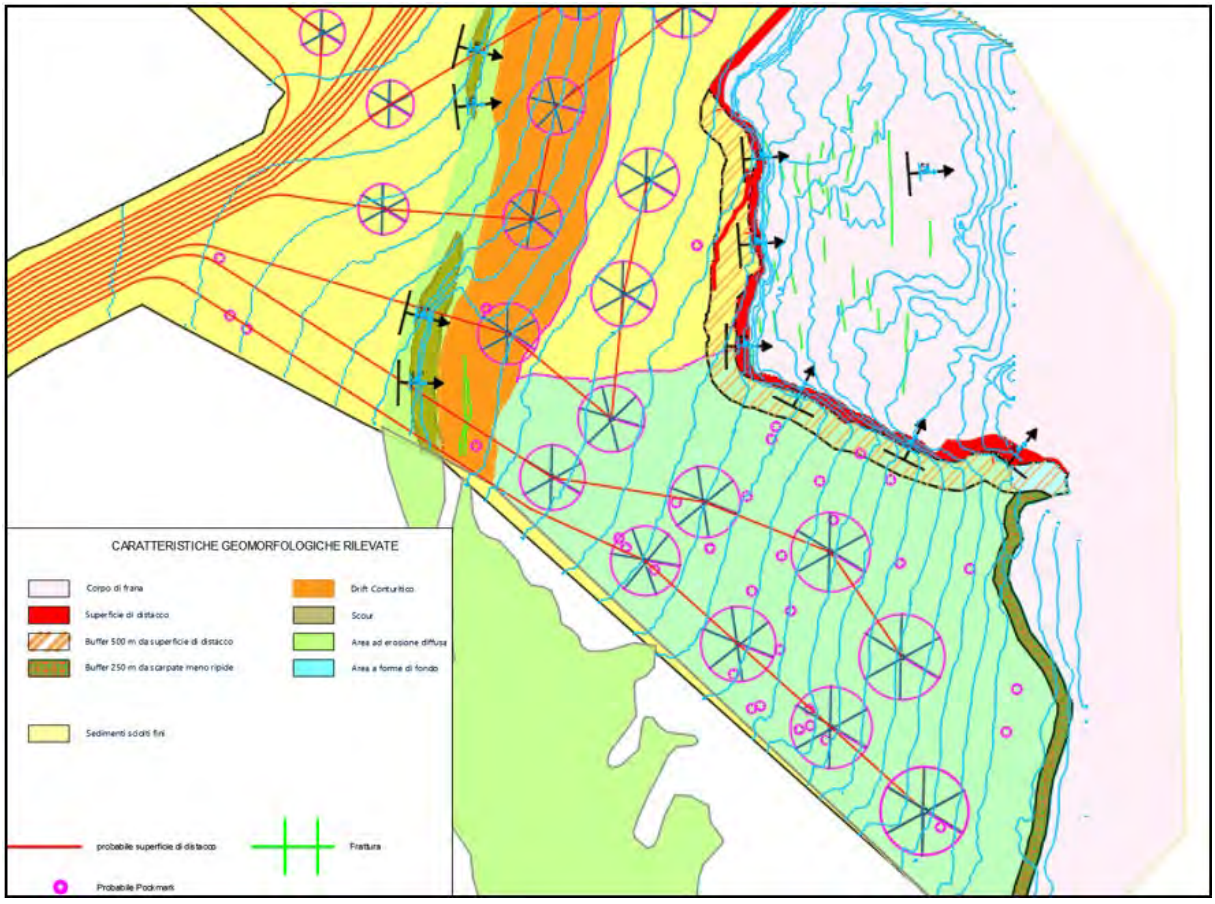
No wreckage or other potentially dangerous objects to the system have been identified.



Outline of results for the Wind Field (Geological and geomorphological interpretation)

- **Southern Area depth: 245 m – 520 m**

As mentioned, there are large-scale erosive structures (conturistic drift, scour, areas of widespread erosion and bottom forms), while in the outermost margin there is the Vieste landslide (Figure below).
The sedimentary cover consists of very fine loose material (presumably silt and/or clays) and, in the escarpment areas, chaotic loose sediments.



Outline of the results for the Wind Field (geomorphological and geological interpretation) – Southern Area. Colored lines indicate the rough position of SBP sections

In the central area (previous figure), as can be seen from the SBP sections, the well-known erosive forms are identified, investigated both in the framework of the MAGIC project and in the Geological Map of the Italian Seas, whose genesis is associated with the passage of dense waters and the interaction of the deep currents associated with them with the bathymetric irregularities of the area.
The SBP data do not provide exhaustive information on the internal organization of sediments in this area, probably due to the nature of the sediments themselves and the surface morphologies present.
The sediments outcropping in correspondence with the erosive furrows are (cf. Offshore geological report), as known, attributable to the so-called pre-Tyrrhenian units (which in correspondence with these erosive furrows outcrop in the form of chaotic sediments) located below the transgressive deposits of marine environment with tabular geometry, which characterize the fine loose sediments widely present in the investigation area (yellow screen).
At this stage it is not possible to determine the nature and thickness of the sediment deposits (probably very remarkable). On the basis of experience in similar data, it can be said that they are chaotic (sandy silt) and prograding fine sediments, the consistency of which cannot be assessed on the basis of geophysical data alone.
In the cartography elaborated, this area has been classified as an "area of diffuse erosion".

For more information on the state of geological-geomorphological activity of the southern area, please refer to the reports *R.1.3.2_01*, *ES.6.1_01* and the in-depth study conducted by Prof. Geol. Fabio Trincardi.

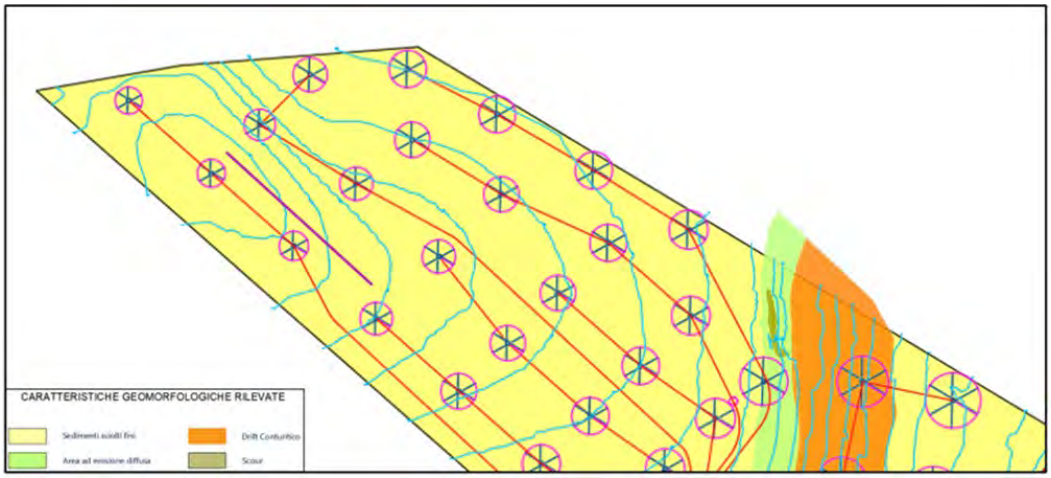
- **Northern Area (depth: 165 m 280 m)**

As mentioned above, in this area the morphological and surface geology conditions are more Homogeneous.

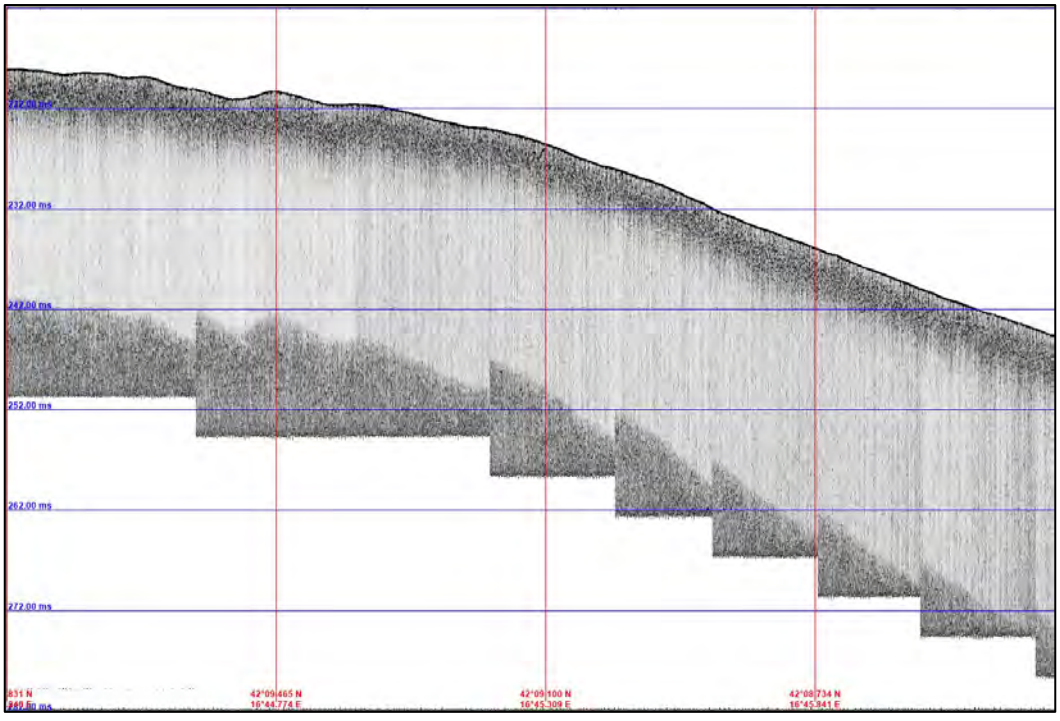
No areas of visible substrate outcrops, objects or morphologies attributable to biocoenoses have been identified.

The seabed is made up of very fine, compact loose sediments (perhaps sandy silt) of presumably considerable thickness.

Areas with a large presence of trawling furrows have been identified.



Scheme of results for the Wind Field (geomorphological and geological interpretation) – Northern Area. Colored lines indicate the rough position of SBP sections



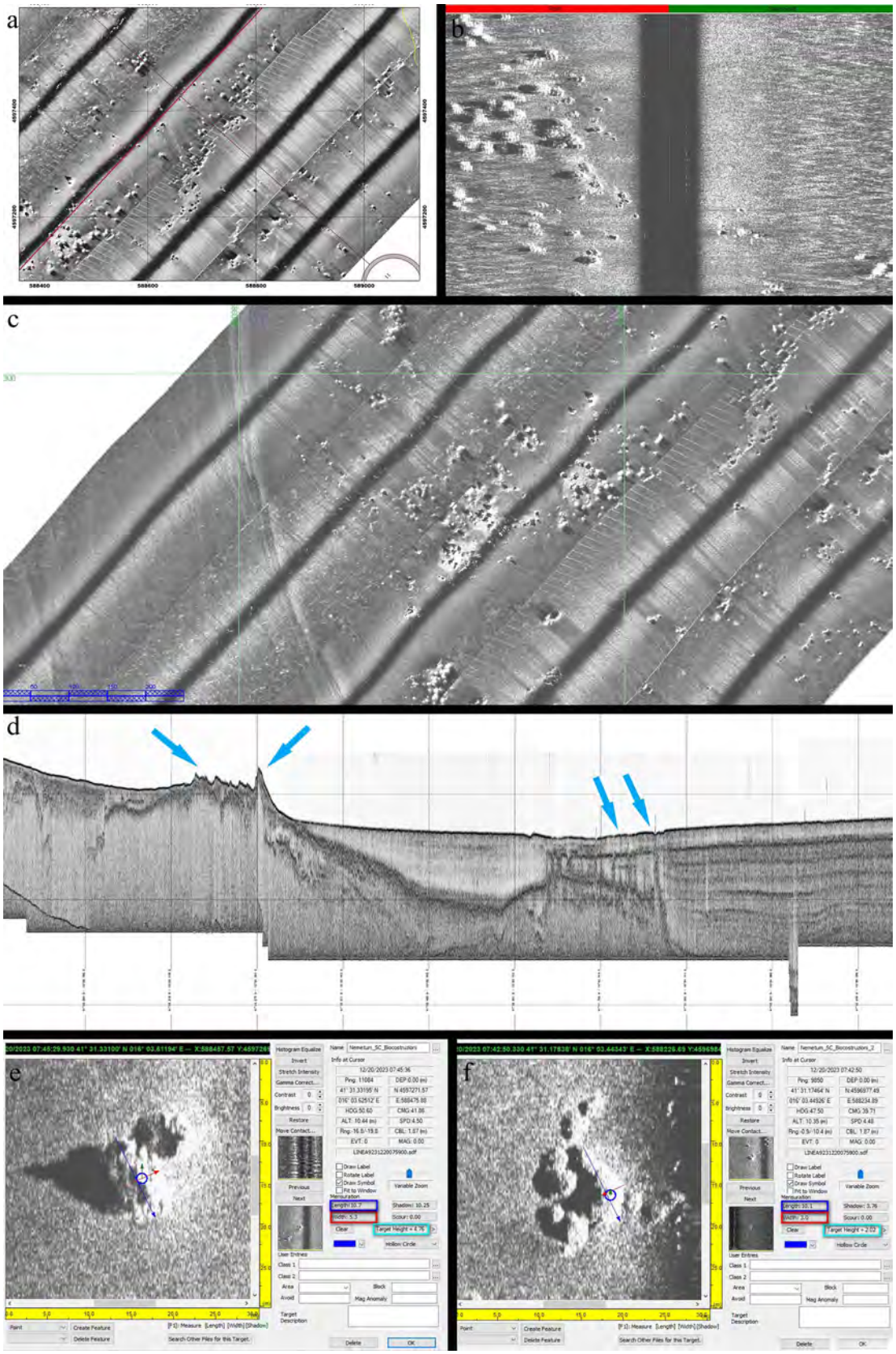
SBP K11D_R_20240206_121751 line: no noticeable reflectors

For more information on the geomorphological conditions of the site, please refer to the report *ES.6.1_ Report on bathymetric and biocenotic surveys*, for the installation criteria in the geomorphological

emergencies indicated, please refer to paragraph 3.4 of this SIA and to the documents of the series *3- Wind turbine foundation structures* of the final project.
In addition, please refer to to the in-depth study conducted by Prof. Geol. Fabio Trincardi, *Offshore geological R.1.3.2.1_01_Relazione - Supplementary geomorphological hazard study*.

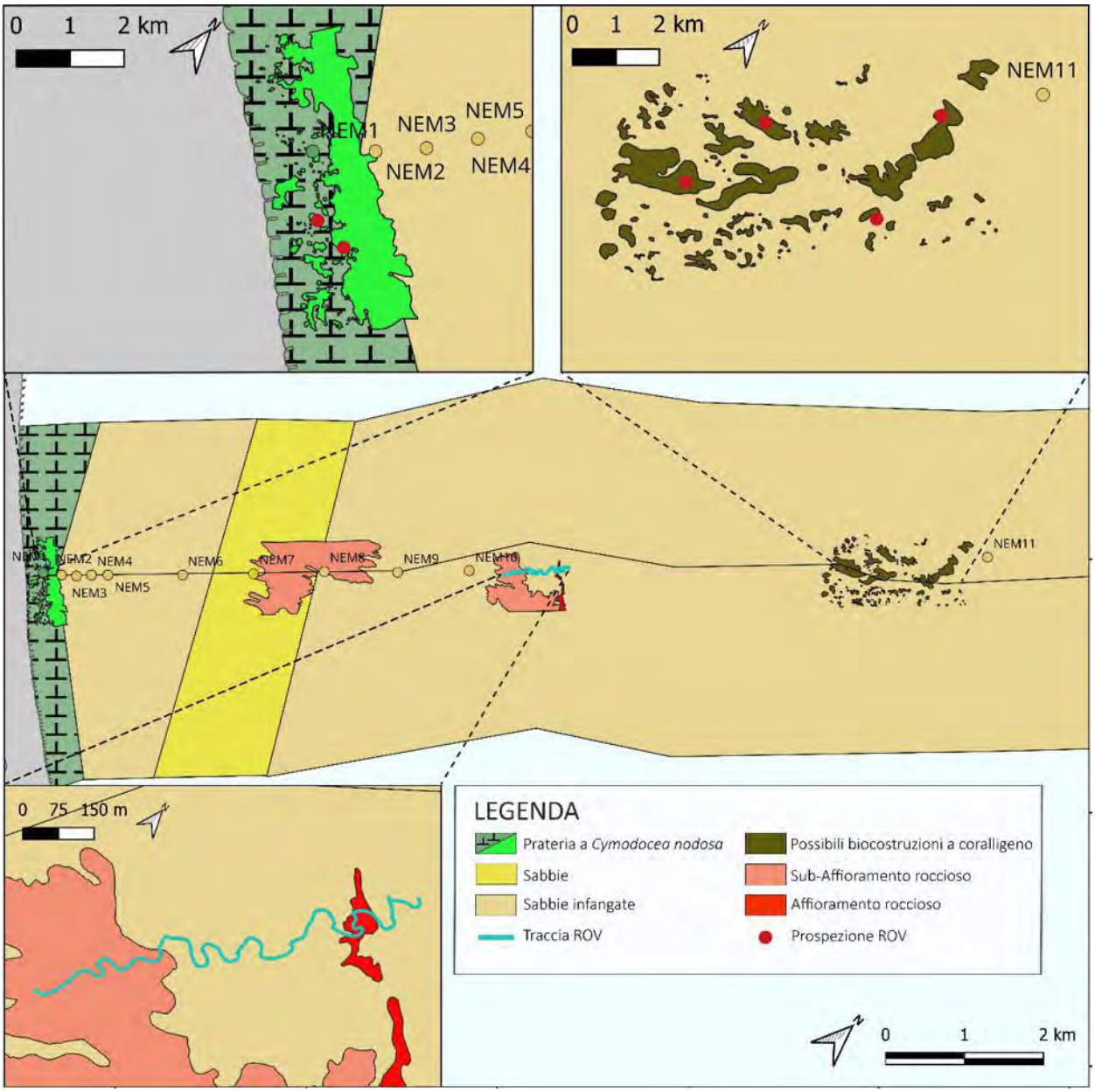
4.1.3.3 Biocoenosis

The geophysical survey of the seabed with Side Scan Sonar and Sub Bottom Profiler has highlighted, along the route of the future cable duct, at stations from NEM 1 to NEM 11, the presence of loose sediments with medium grain size and rocky suboutcrops covered by sediments about 30 cm of sand muddy sediments (habitat UNEP(DEPI)/MED IG.23/23: MB5.5 - Mediterranean infralittoral sand and MC5.5 - Mediterranean circalittoral sand). This type of sediment is associated with particular acoustic signals in some areas that highlight the presence of meadows with *Cymodocea nodosa* (habitat UNEP(DEPI)/MED IG.23/23: MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*) between NEM 1 and NEM 3 stations as well as rocky cores in the vicinity of NEM 10 station (habitat UNEP(DEPI)/MED IG.23/23: MB1.51 - Mediterranean infralittoral rock with Infralittoral algae) and bioconstructions (habitat UNEP(DEPI)/MED IG.23/23: MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*) near the NEM 11 station.

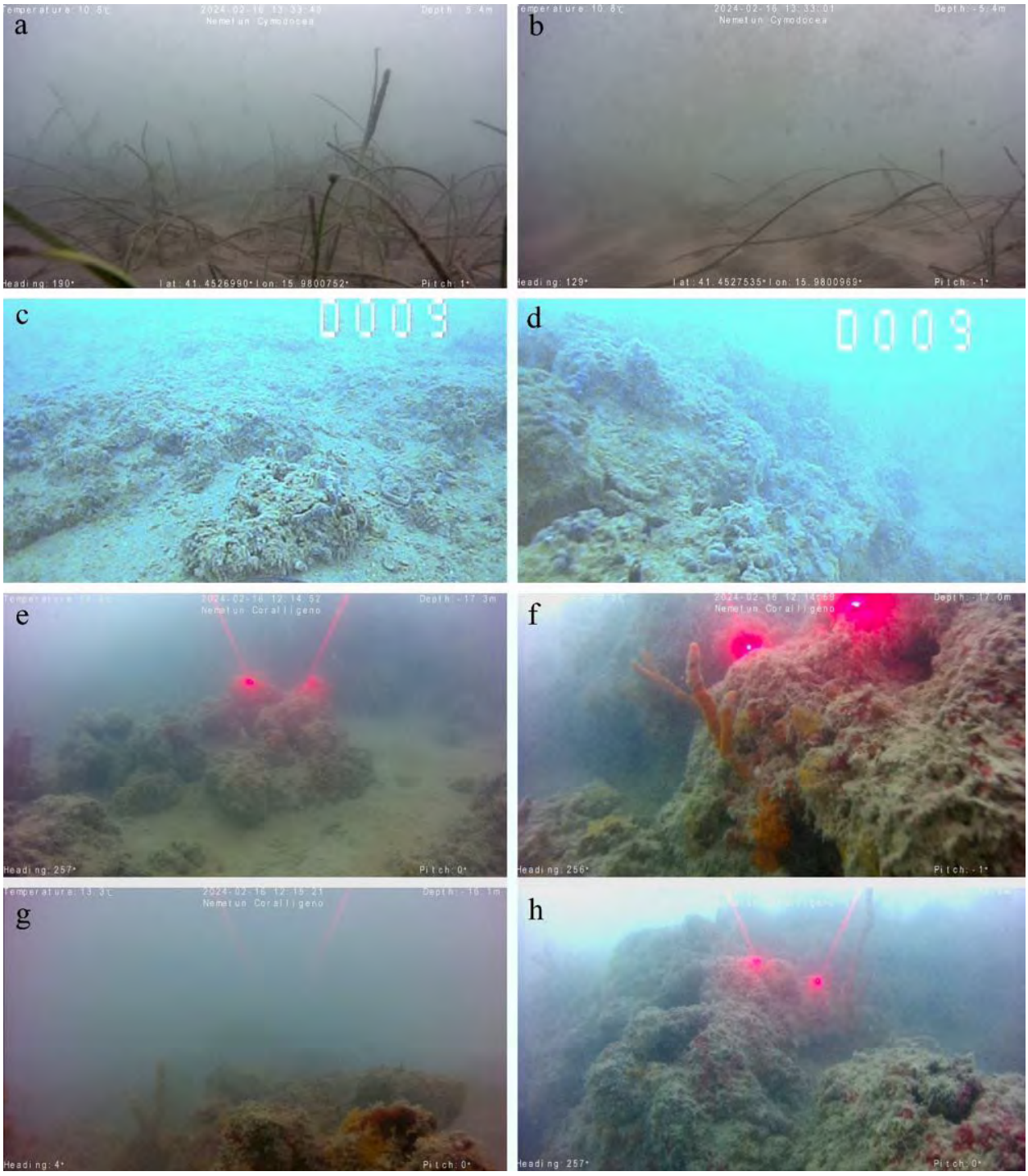


Geophysical survey carried out near the NEM station 11 by Side Scan Sonar – a-c) Bottom scan strip; d) Profile of a stretch of seabed in which there are bioconstructions; e) Bio-construction (Length = 10.7 m, Width = 5.3 m, Height = 4.7 m); f) Bioconstruction (Length = 10.1 m, Width = 3 m, Height = 2.2 m)

For this purpose, a preliminary video survey was carried out with a detailed ROV wire-guided vehicle (truth at sea) of about 1.5 km in the NEM_1, NEM 10 and NEM 11 stations.



Map of video inspections of the seabed by ROV near NEM_1, NEM_10 and NEM_11



Frames acquired through preliminary ROV investigations: at-b) Sparse meadows of Cymodocea nodosa on muddy sands of calm fashion observed near the NEM_1 station (MB5.534 - Superficial muddy sands in sheltered waters with Cymodocea nodosa); c-d) poorly concretioned rocky outcrops observed near the NEM_10 station (MB1.51 - Mediterranean infralittoral rock with Infralittoral algae); e-h) coralligenous nuclei muddy with poor coverage of erect forms (porifera of the genus Axinella) observed near the NEM_11 station (MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly Axinella spp.) and with Leptogorgia spp.)

The acoustic surveys of the seabed and the subsequent preliminary video prospections by ROV have shown that near the NEM 10 station, about 4 miles from the coast, there are rocky outcrops characterized by a scarce and insignificant macrobenthic component, which is also visibly muddy (MB1.51 - Mediterranean infralittoral rock with infralittoral algae). Also near the NEM 11 station, about 11 miles from the coast at a depth of about 15 m, coherent substrates have been detected, this time attributable to nuclei

of muddy coralligenous with little cover of upright fauna (such porifera can be found *Axinella*), habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*

In order to better define this coastal area, affected by the laying of the marine export cable duct of the project, an in-depth analysis was carried out by means of ROV videos and scuba dives in areas where the previous ROV analyses had not collected sufficient information for an exhaustive bionomic characterization (see *ES.6.8*). In addition, the analysis of the available grey literature as well as the consultation of the EMODnet and SITPuglia databases has highlighted, in the area of interest, the presence of vulnerable ecosystems (VME - Vulnerable Marine Ecosystem) and/or valuable biocoenoses in the buffer area of 5 km around the area of location of the future wind farm.

Therefore, in order to better define and know the distribution and conservation status of the areas affected by the aforementioned valuable biocoenoses (seagrass meadows and coralligenous bioconstructions), 15 video surveys were prepared and carried out using ROVs with a length of 200 m each.

In particular, the following 15 transept videos were made:

- video-transects called T1-T4 to better define the coastal area affected by the presence of the grassland *Cymodocea nodosa*
- 2 video-transects called T5, T6 in an area overlooking the Cymodoceto, an area characterized by intense fishing activities, in order to assess the state of the seabed and the suitability of the area for the possible placement of fishing bollards
- 3 video-transects called T7-T9 to better define the areas affected by the presence of rocky sub-outcrops highlighted by the previous survey of the seabed by means of SSS
- 2 video-transects named T10-T11 in order to evaluate the current presence of meadows to Cymodocea nodosa as reported by the EMODnet database
- 3 video-transects called T12-T14 to characterize the areas affected by the possible presence of coralligenous bioconstructions highlighted by the previous SSS survey
- 1 video-transect called T15 in order to better characterize the rocky areas in which, the bibliographic investigations, reported the presence of coralligenous bioconstructions in the areas located south-east of the cable duct route (within the buffer area of 5 km).

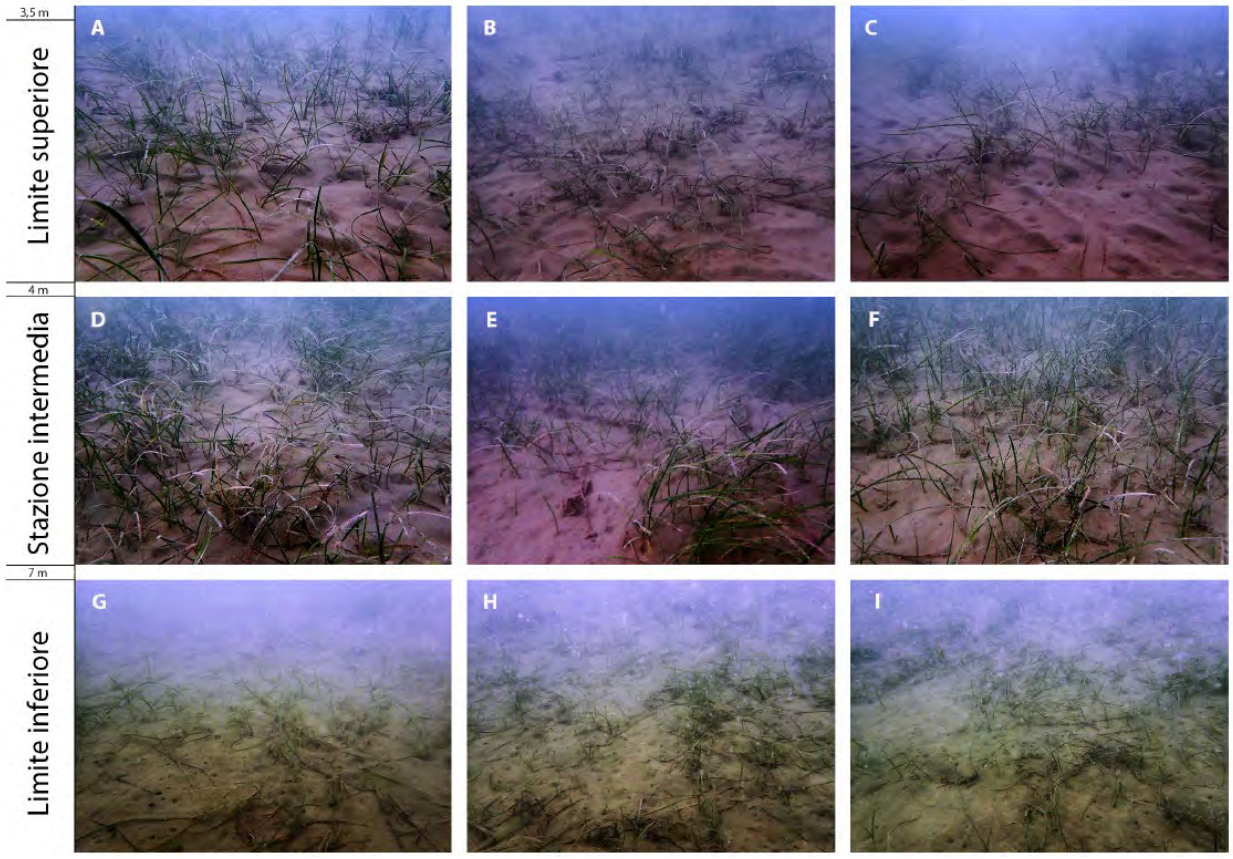
In addition, in order to better characterize the extent and the actual state of conservation of the Cymodoceto found along the coastal strip, three scuba dives were carried out along the T4 transect (upper, intermediate and lower limit). In each station, the coverage area (understood as the surface expressed as a percentage occupied by the fanerogama on a substrate area of about 1 m) was estimated by two divers[2]), and the beam density was calculated by counting the beams over a known surface area of 40x40 cm (two counts per operator for each station). In order to assess the conservation status in the three areas of the grassland, the grassland rating scale was used at *Cymodocea nodosa* proposed by the SELC Water Magistrate in 2002 and used by Molin in 2013. According to this evaluation scale, the following parameters are examined:

- Taxonomic recognition of the species that make up the grassland: pure/mixed
- Distribution of plants on the bottom: continuous/discontinuous/point-like
- Classifications of total vegetation cover into five classes:
  - Class I: 0-5%
  - Class II 5-50%
  - Class III 50-75%
  - Class IV: 75-100%

For more details on the start and end coordinates of the transects, the instrumentation and the methods used, please refer to the *ES.6.8_ Characterization of Biocoenoses through ROV Video Surveys and SCUBA Diving*.

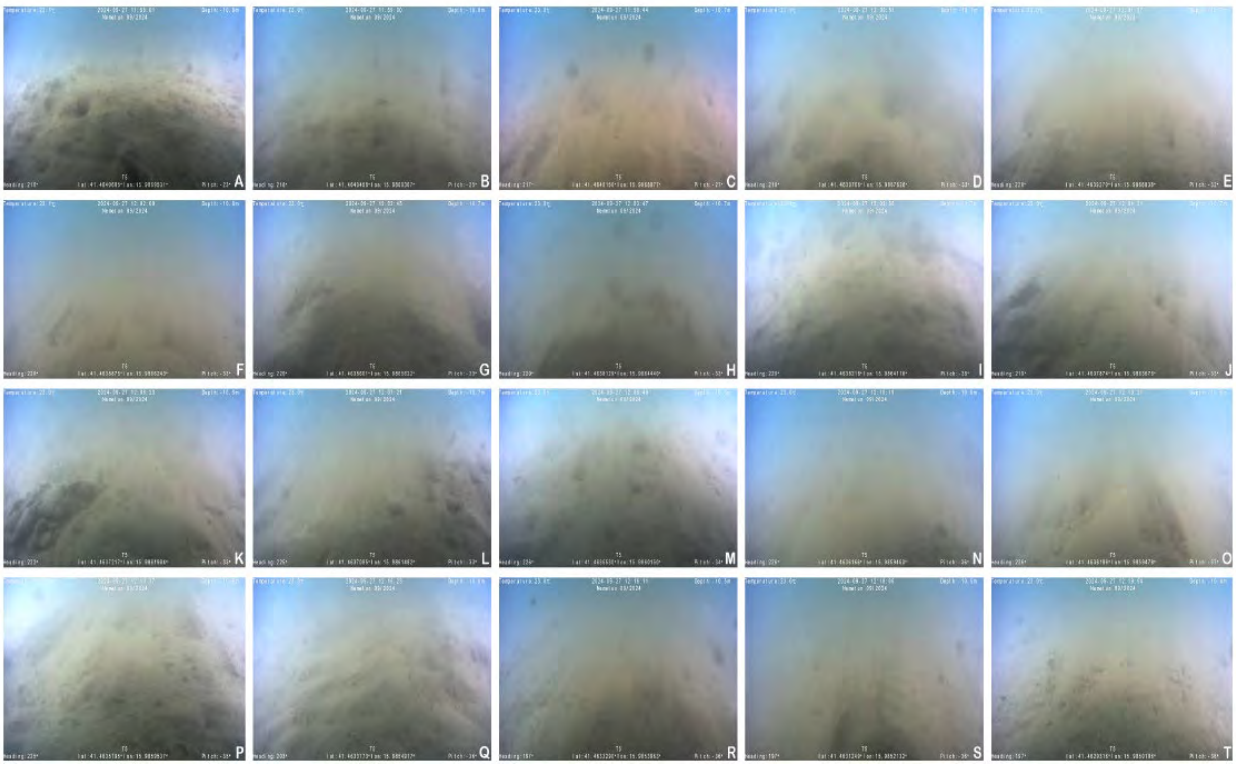
The detailed analysis of the 15 video-transects has made it possible to better delineate and understand the distribution of benthic communities as well as the type of substrate present in the coastal area overlooking the possible route of the cable duct.

In detail, the analysis of the T1-T4 transect videos confirmed the presence of a Cymodocea nodosa grassland from 3 to about 7 m deep (UNEP(DEPI)/MED IG.23/23 habitat: MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*). This prairie, as also confirmed by the investigations carried out in scuba diving, is almost sparse especially along its limits while it appears denser and better distributed in the central part in the bathymetric belt between 4 and 5 m (following figure).



Representative images of the upper (A÷C), lower (D÷F) and middle station (G÷I) limits of habitat MB5.534 - Superficial muddy sands in sheltered waters with Cymodocea nodosa investigated by ROV and scuba immersion

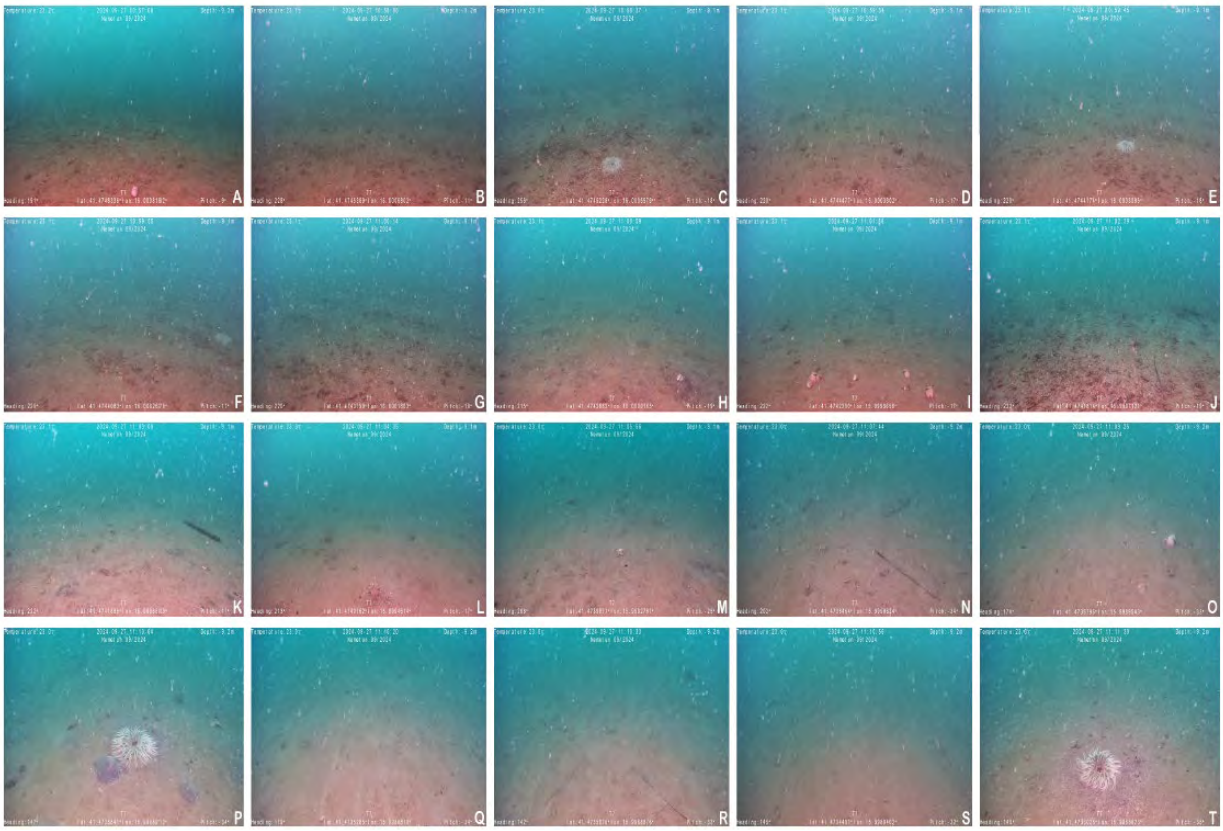
The analysis of the video transects T5 and T6 allowed the identification of an area overlooking the habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa,* but now devoid of this phanerogam, both transects are characterized by a muddy sandy bottom at times bioturbated which, as far as the UNEP(DEPI)/MED IG.23/23 classification is concerned, falls within the generic coding MB5.5 - Mediterranean infralittoral sand. The absence of particular biocoenoses of conservation interest in both transects makes this area particularly suitable for the placement of fishing bollards, which could enrich and diversify the communities present in the area where bollards for trawling activities could be placed (following figure showing as an example some frames of the ROV video of the T5 transect).



Frames captured along the ROV T5 video-transect from offshore to the coast

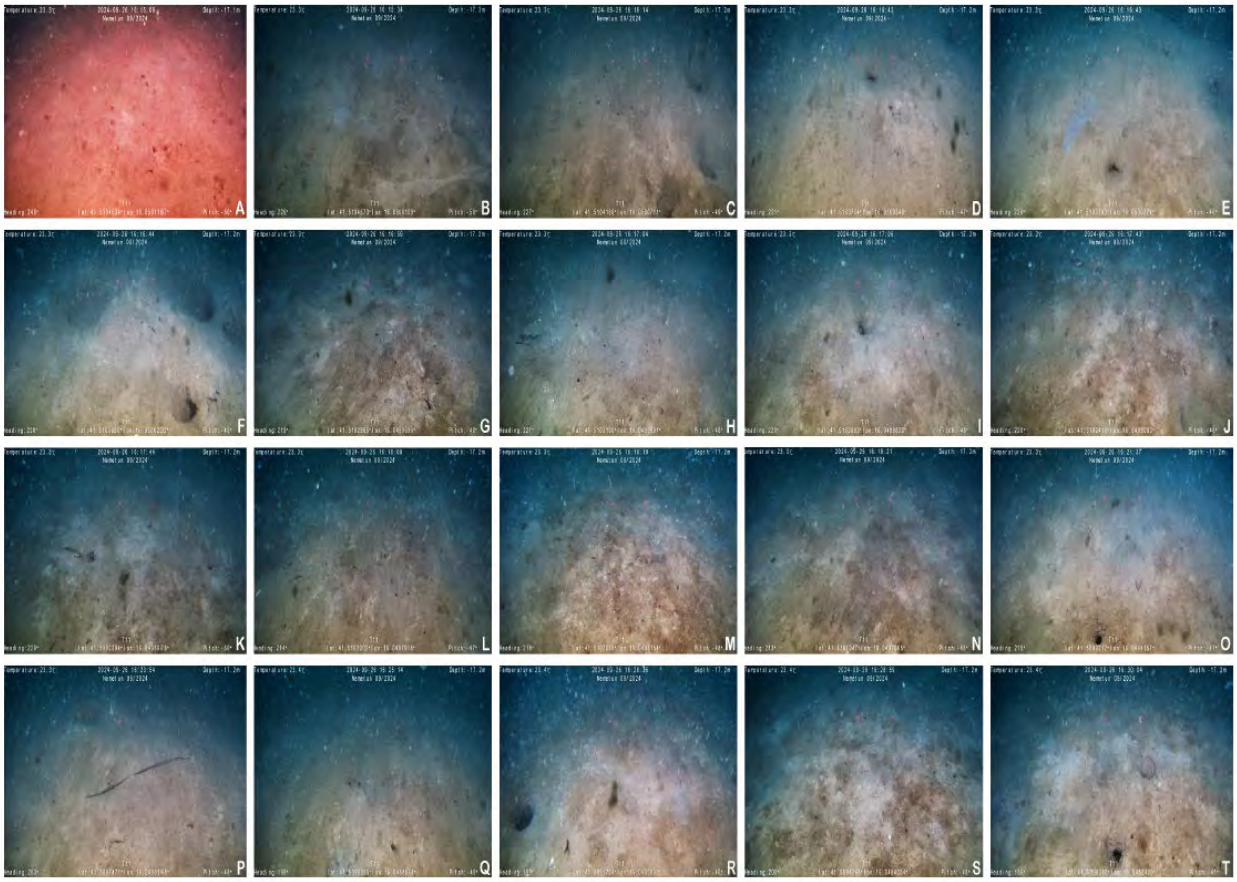
The analysis of the T7, T8 and T9 video-transects gave the opportunity to know the type of sediments as well as the macrobenthic communities present on the rocky sub-outcrops highlighted by the previous investigations by Side Scan Sonar and Sub Bottom Profiler. In this regard, it is evident from the analysis of all three video-transects that the rocky sub-outcrops are now covered by a muddy sandy substrate in which the macrobenthic component is almost scarce and not very present except for the specimens of the fossoria actinia *Condylactis aurantiaca*. This characterization has made it possible to classify the portion of the seabed with rocky sub-outcrops covered by mobile substrates with the generic habitat MB5.5 - Mediterranean infralittoral sand according to the nomenclature UNEP(DEPI)/MED IG.23/23 (following figure showing as an example some frames of the ROV video of the T7 transect).

In the maps presented in the project, however, it was preferred to underline, with a different color, the portions of habitat MB5.5 - Mediterranean infralittoral sand where there are these sub-outcrops that determined the choice to lay the cable duct by means of support with a cast iron shell cover as it would not be environmentally possible to use the jet trenching technique.



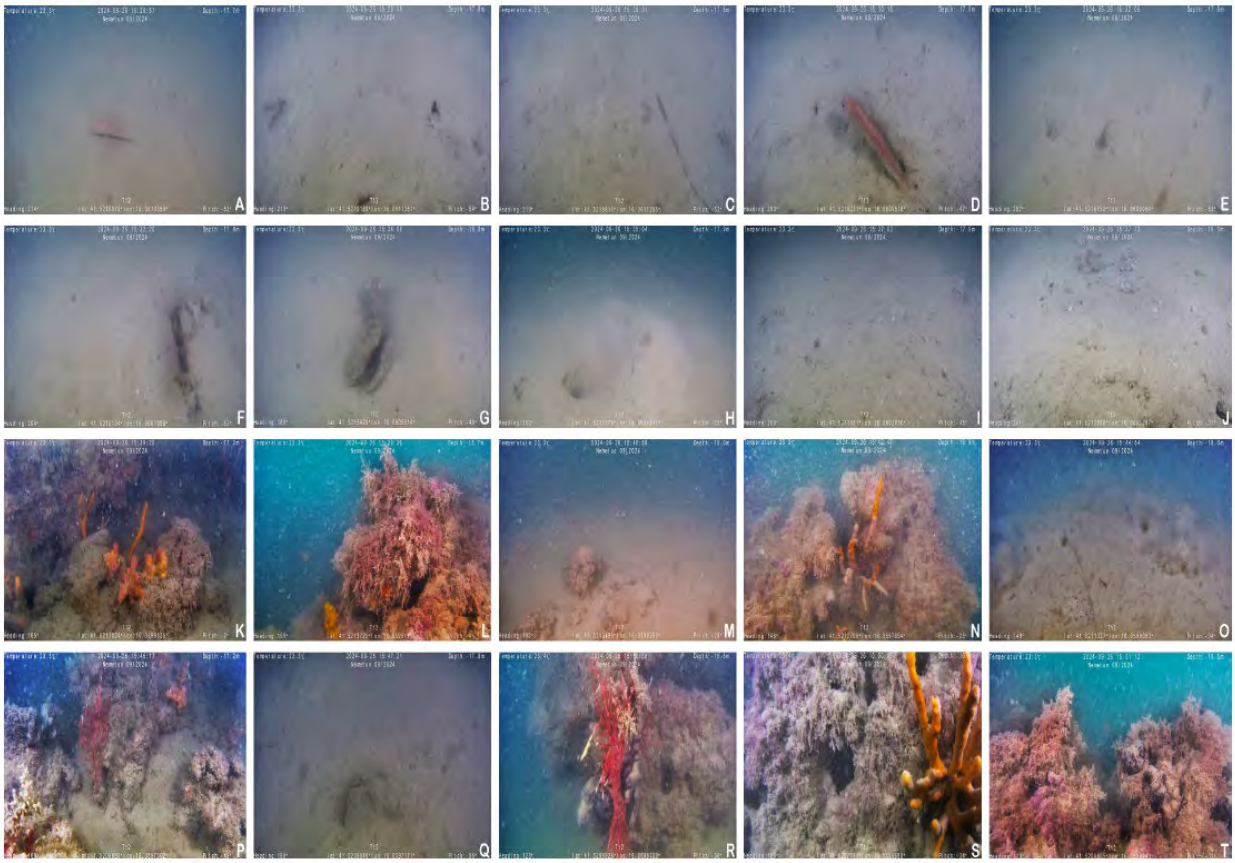
Frames captured along the ROV T7 video-transect from offshore to the coast

The analysis of the T10 and T11 transects, carried out in an area where a grassland was reported at *Cymodocea nodosa* (EMODnet database), has shown that in this area there is no longer the marine fanerogama and that the seabed is characterized by a sediment consisting of muddy debris which, as far as the UNEP(DEPI)/MED IG.23/23 classification is concerned, falls within the generic coding MB5.5 - Mediterranean infralittoral sand (following figure showing as an example some frames of the ROV video of the T11 transect). The observations made in both transects are in contrast with what is reported by the EMODnet database, and corroborate the fact that to date there is no longer a grassland in the area of interest. *Cymodocea nodosa*.



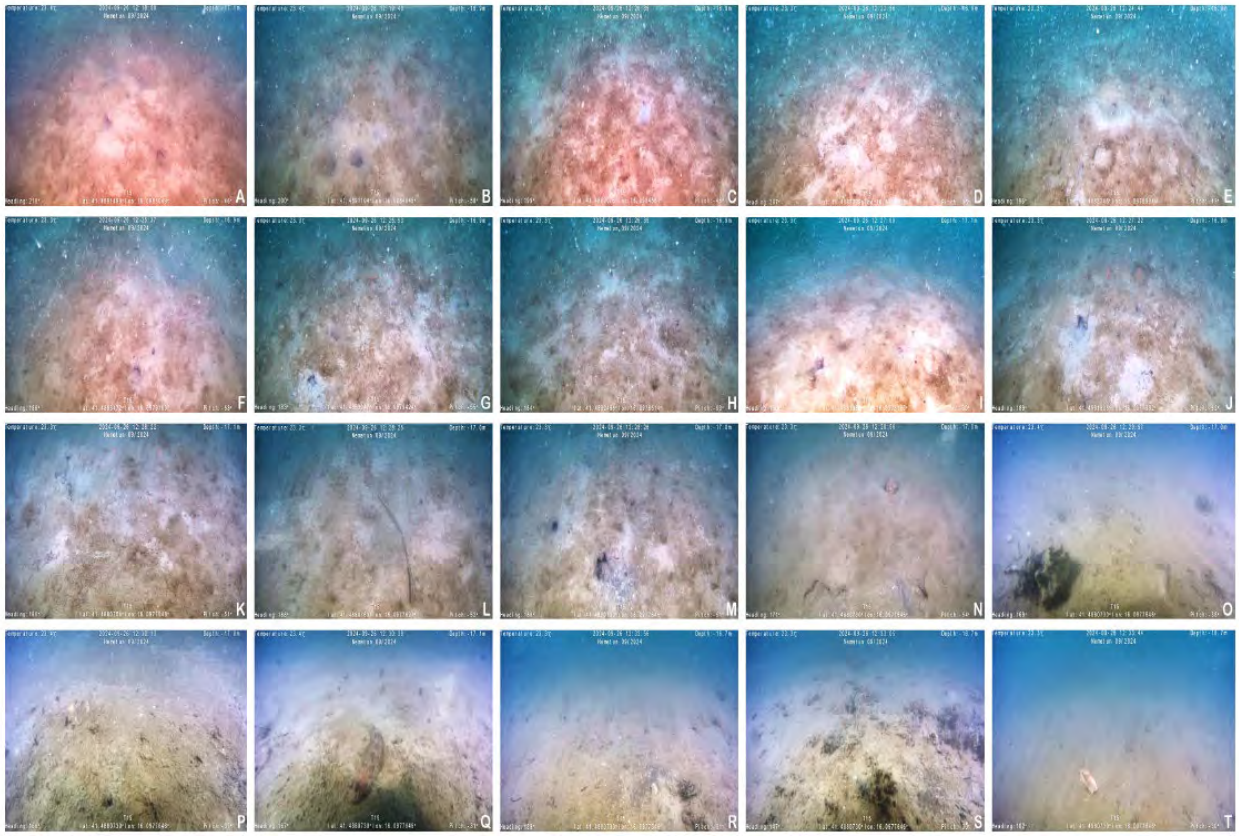
Frames captured along the ROV T11 video-transect from offshore to the coast

The transects T12, T13 and T14 carried out in order to verify the conservation conditions and health status of the coralligenous bioconstructions showed that in the investigation area there are nuclei of platform coralligenous that alternate with areas in which large areas characterized by muddy debris bottoms appear (generic habitat MC5.5 - Mediterranean circalittoral sand according to UNEP(DEPI)/MED IG.23/23 nomenclature). In addition, the nuclei of coralligenous, although presenting erect forms including specimens of the porifera belonging to the genus *Axinella* and gorgonians of the species *Leptogorgia sarmentosa*, appear visibly muddy, these characteristics have made it possible to classify the habitat with MC1.5 Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp*.) and with *Leptogorgia spp*. according to UNEP(DEPI)/MED IG.23/23 nomenclature (following figure showing as an example some frames of the ROV video of the T12 transect).



Frames acquired along the ROV T12 video-transect from offshore to the coast: presence of Axinella (K, N, S) and some gorgonians of the species Leptogorgia sarmentosa (P, R)

Finally, the video-transect called T15 made it possible to verify that in the adjacent areas (within 5 km of the cable duct route) where coralligenous bioconstructions were reported, there are still rocky outcrops entirely covered by muddy debris sediments with little macrobenthic cover. These characteristics have allowed to classify the habitat with MC1.5 Mediterranean circalittoral rock covered by sediments according to the nomenclature UNEP(DEPI)/MED IG.23/23 (figure below showing as an example some frames of the ROV video of the transect T15).



Frames captured along the ROV T15 video-transect from offshore to the coast

4.1.3.4 Sedimentological and macrobenthic characterization of the seabed

As part of the drafting of the EIA and the final design of the Nemetun Island wind farm, a basic characterization of the seabed and benthic communities present in the area where the wind farms are planted and in correspondence with the route chosen for the laying of the marine cable ducts connecting the wind turbines and connecting them with the onshore NTG was carried out. The aforementioned analyses included the physical/chemical, microbiological and ecotoxicological characterization of the sediments, as well as the study of the composition and distribution of the macrozoobenthic communities present.

The monitoring campaign was carried out on board the boat "Marianna" of Soc. "Altomare Antonio & C. S.A.S.", a motor fishing type boat registered at no. ML 1178 of the Registers of minor ships of the Port Authority of Molfetta, having the following characteristics: length 17.88 meters, width 4.85 meters, gross tonnage 9.95 tons and has a large stern used to carry out sediment sampling operations.

Boat Marianna

Sampling of sediment and macrobenthic communities, as required by the Ministerial Decree of 24/01/1996 (directives concerning the preliminary activities for the issuance of authorizations pursuant to art. 11 of the Law of 10/06/1976 for the movement of sediments in the marine environment), has provided for a total of 34 sampling stations, 22 of which along the route of the cable duct (about 100 linear km) and 12 in the area of the future wind farm (about 165 km^2). Following the indications reported in the aforementioned Ministerial Decree, the sampling stations along the trajectory of the cable duct have been allocated with a fixed distance of 200 m in the first kilometer of the cable duct, thus counting 5 stations; moving away from the coast (over 1000 m) and up to 4.8 km, 5 stations have been inserted at a distance of about 1000 m; beyond 4.8 km, a further 12 stations have been inserted along the route of the cable duct. To be precise, during the planning phase of the activities to be carried out, 14 sampling stations had been planned in the last part of the cable duct route, from station NEM 11 to station NEM 24, however for stations NEM 13 and NEM 14 the clearance to operate was not issued by the Hydrographic Institute of the Navy (protocol no. 0008909 of 05-10-2023) due to the possible presence of war devices.

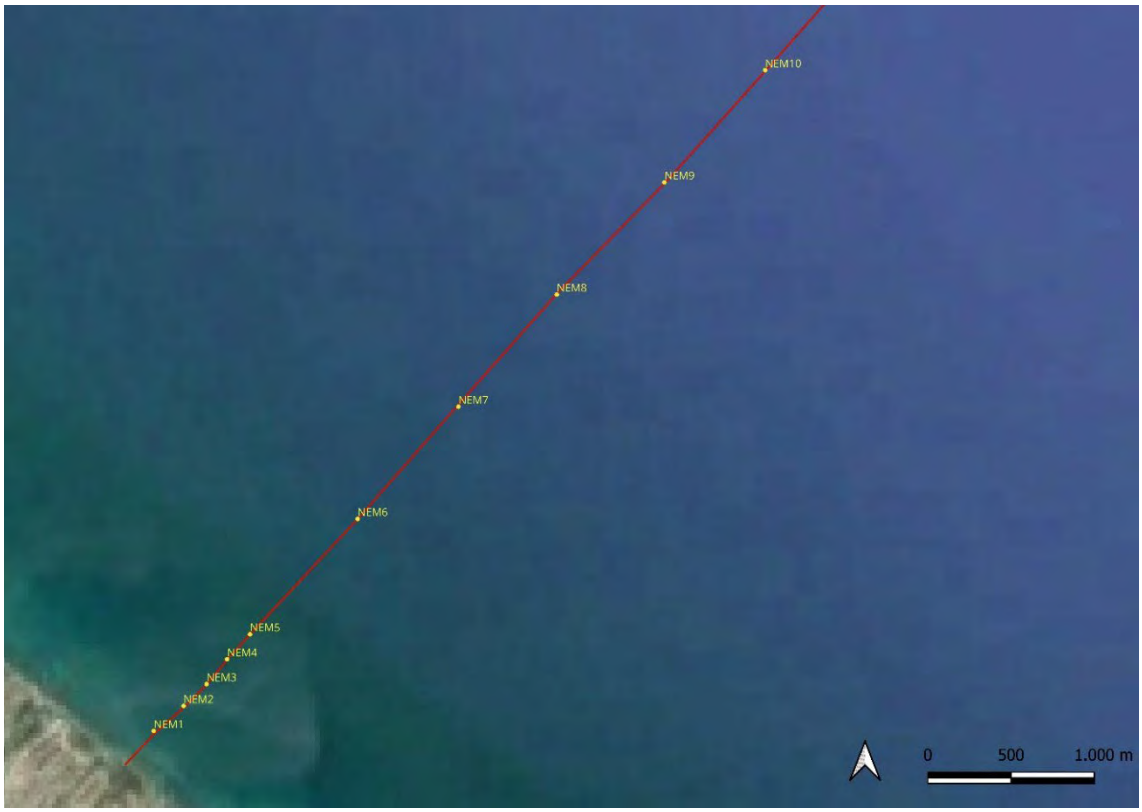
In summary, a total of 22 stations were built along the route of the connecting cable, divided as follows:

– 5 stations within the first km from the coast (from NEM 1 to NEM 5)
– 5 stations between the first km and 4.8 km from the coast (from NEM 6 to NEM 10)
– 12 stations over 4.8 km (from NEM 11 to NEM 24 excluding NEM 13 and NEM 14)

As for the area of the wind farm, which extends for about 165 km^2, 12 sampling stations from NEM 25 to NEM 36 were located and carried out.

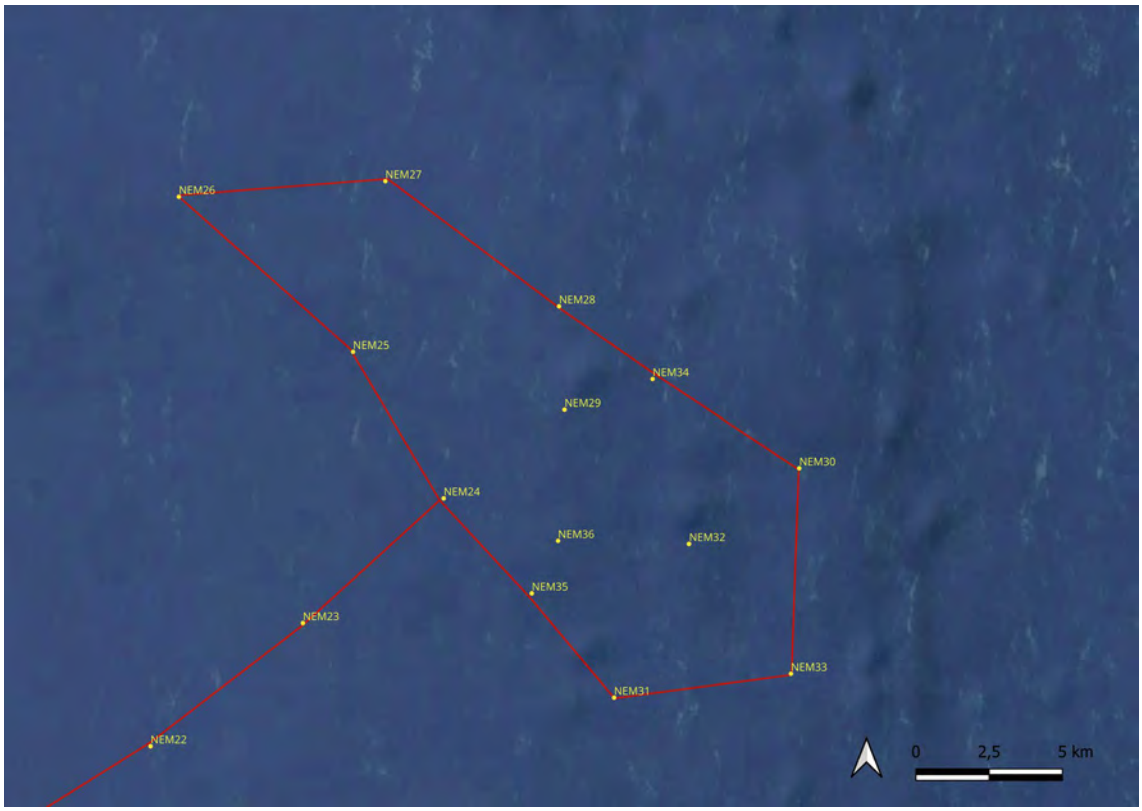
Therefore, considering both the stations built along the route of the cable duct and those built in the construction area of the future wind farm, a total of 34 sampling stations were carried out.

This sampling design made it possible to obtain a sampling of sediments and benthic communities that was as reliable as possible and representative of the biological and sedimentological characteristics of the investigation area.



Sampling stations located within 4.8 km of the coast along the route of the cable duct, near Zapponeta

Sampling stations along the route of the cable duct. Land NEM13 and NEM14 stations were not carried out due to impediments



Map of the sampling stations carried out for the sedimentological and macrobenthic characterization of the seabed affected by the implementation of the wind farm

Area	Data di prelievo	Codice Stazione	WGS84 Gradi, minuti decimali hddd°mm.mmm' Latitudine Longitudine N / E		
			Latitudine	**Longitudine**	**Prof.** (m)
TRACCIATO	01/11/2023	NEM1	41°27,16'	15°58,46'	3
	01/11/2023	NEM2	41°27,24'	15°58,59'	5
	01/11/2023	NEM3	41°27,31'	15°58,69'	6
	01/11/2023	NEM4	41°27,39'	15°58,78'	7
	01/11/2023	NEM5	41°27,47'	15°58,88'	7,5
	01/11/2023	NEM6	41°27,84'	15°59,35'	9
	01/11/2023	NEM7	41°28,2'	15°59,79'	10
	01/11/2023	NEM8	41°28,56'	16°0,22'	8,3
	01/11/2023	NEM9	41°28,92'	16°0,69'	10,5
	01/11/2023	NEM10	41°29,28'	16°01,13'	12
	01/11/2023	NEM11	41°31,91'	16°04,3'	14,5
	01/11/2023	NEM12	41°34,51'	16°07,6'	13,2
	Non campionata	NEM13	41° 40,13'	16° 14,54'	/
	Non campionata	NEM14	41° 42,91'	16° 17,61'	/
	01/11/2023	NEM15	41°58,34'	16°36'	21
	01/11/2023	NEM16	41°45,6'	16°20,72'	33
	01/11/2023	NEM17	41°48,44'	16°23,77'	60
	01/11/2023	NEM18	41°51,36'	16°26,63'	78,8
	01/11/2023	NEM19	41°54,34'	16°29,15'	95
	02/11/2023	NEM20	41°56,82'	16°32,87'	111
	02/11/2023	NEM21	41°58,58'	16°36,91'	126
	02/11/2023	NEM22	42°0,38'	16°40,89'	170
	02/11/2023	NEM23	42°02,6'	16°44,72'	210
	02/11/2023	NEM24	42°04,85'	16°48,27'	240
PARCO EOLICO	02/11/2023	NEM25	42°07,58'	16°46,10'	193
	02/11/2023	NEM26	42°10,51'	16°41,86'	176
	02/11/2023	NEM27	42°10,72'	16°46,99'	206
	02/11/2023	NEM28	42°08,34'	16°51,23'	228
	02/11/2023	NEM29	42°06,43'	16°51,31'	250
	09/11/2023	NEM30	42°05,26'	16°57,90'	423
	09/11/2023	NEM31	42°01,10'	16°52,38'	330
	09/11/2023	NEM32	42°03,91'	16°54,32'	331
	09/11/2023	NEM33	42°01,47'	16°56,77'	397
	02/11/2023	NEM34	42°06,96'	16°53,51'	260
	02/11/2023	NEM35	42°04,02'	16°51,08'	250
	02/11/2023	NEM36	42°03,06'	16°50,40'	260

GPS codes and coordinates of sediment and macrobenthos sampling stations of Nemetun Island sampled (in red the stazionthe not sampledand)

The sediment sampling operations were carried out using a van Veen bucket with a gripping surface of 0.1 m^2 and a collection volume of 0.02 m^3 i.e. 20 litres.

Three samples (three replications) were taken at each sampling station. The samples were considered valid if they contained a minimum sediment volume of at least 5 liters for sandy sediments and at least 10 liters for muddy sediments, as required by the international guidelines for the study of sediments and marine waters (ISO/DIS 16665 – Water Quality Guidelines for quantitative sampling and sample processing of marine soft-bottom macrofauna, 2003). After recovering the bucket, it was housed in special containers and opened in order to preserve the stratigraphy of the sediment collected.

Sampling with the van Veen bucket

SEDIMENT CHARACTERIZATION

In the context of this paragraph, the analytical investigations carried out for the purpose of sedimentological characterization are mentioned. In accordance with the provisions of Ministerial Decree 173/2016, before the analyses, the components of anthropogenic and natural origin larger than 5 mm were manually removed. The physical, chemical and microbiological characterization of the sediment was carried out on all the samples (contained in components with a grain size greater than 2 mm < 80%). The ecotoxicological tests, on the other hand, according to the Manual for the handling of marine sediments APAT ICRAM (2007), were carried out on 1/3 of the samples (12 samples), distributed in a representative manner throughout the volume of material to be characterized.

Please refer to the report *ES.6.5_01_chemical-physical, microbiological and ecotoxicological characterization of sediments and benthic communities and test reports of the analyses conducted*, for the results and detailed descriptions of the analyses carried out.

Physical analysis

- Particle size analysis
- Specific gravity of granules
- Humidity

Chemical analysis

- Total Organic Carbon (HDD) and Total Nitrogen (TN)
- Metals and Total Phosphorus (TP)
- Polycyclic aromatic hydrocarbons (PAHs)
- Light C<12 and heavy C>12 hydrocarbons
- Organochlorine pesticides

- Polychlorinated biphenyls (PCBs)
- Organotin compounds (TBT, DBT and MBT)

Microbiological analysis

- total coliforms,
- fecal coliforms
- faecal streptococci

Ecotoxicological analysis

The estimation of the ecotoxicological hazard associated with the various phases of sediment movement was carried out through the execution of toxicity assays that allowed a direct and quantifiable measurement of the risk of harmful effects on the biota. The battery of assays was composed of three different organisms belonging to distinct taxonomic groups and to different systematic and phylogenetic classes.

- Type 1 – *Monocorophium insidiosum* – Solid phase testing; Acute assay on matrix As It is.
- Type 2 – *Phaeodactylum tricornutum* – Liquid phase test; Chronic assay on seawater extract (sediment elutriate).
- Type 3 – *Paracentrotus lividus* – Liquid phase test; Chronic assay when extracted in seawater (sediment elutriate).

MACROBENTHOS

The samples were taken using quantitative techniques, using a van Veen bucket with a 0.1 m gripping surface^2 and a capacity of 20 liters. All the samples taken were photographed before proceeding to the subsequent phases of investigation. After the photo of the sample, sieving was carried out through a multi-sieve table with a final sieve of 1 mm mesh. The biological material collected was stored in seawater and 70% ethanol and transported to the laboratory for subsequent taxonomic analysis aimed at identifying the macrobenthic species present.

Phases of sediment and macrozoobenthos sampling. a) Setting of the van Veen bucket; b) emptying of the contents of the bucket into plastic tanks; c) taking sediment samples for chemical, physical and ecotoxicological analyses; d) sieving on a table with multiple sieves; e) biological material collected; f) storage in 70% alcohol and labelling of biological material

Example image of the samples collected at the NEM_1 sampling stations – NEM_8

The biological samples, stored in 70% alcohol, were transported to the laboratories of the Department of Biosciences, Biotechnology and Environment of the University of Bari "Aldo Moro" – CoNISMa Local Research Unit. In particular, in the UNIBA laboratories, an in-depth screening of the biological material collected was carried out in order to discriminate the species belonging to the macrozoobenthic community

present in the different sampling stations. Subsequently, the organisms thus selected were identified up to the lowest possible taxonomic level, thanks to the use of stereos and microscopes as well as the most up-to-date taxonomy manuals and books on the fauna and flora present in the Mediterranean (Fauvel, 1923; Fauvel 1927; Tortonese, 1970; Riedl, 199; Falciai & Minervini, 1992; Giannuzzi-Savelli et al., 1994-2002; Pancucci-Papadopoulou et al., 1999; Cossignani & Ardovini, 2011; Trainito and Baldacconi, 2014; Alf & Haszprunar, 2015; Brunetti & Mastrototaro, 2017). Subsequently, all the identified specimens were counted and the data collected were entered into a species/station matrix, useful for subsequent statistical processing of the data.

Laboratory sample identification phase: a) species sorting; b) identification of a biological sample under a stereomicroscope; c) Annelid specimen found during the analysis

STUDY RESULTS

The sediments analyzed showed spatial differentiation of the physical and chemical characteristics described. The **particle size determination** showed sandy and pelitic sediments, with low % of gravel. Some stations of the track, such as NEM 4 to NEM 6 and NEM 11 to NEM 20, showed a higher pelite content, with values >60%; among the stations falling within the area of the Wind Farm, NEM 30 and NEM 33 are the stations with the highest pelite compared to the others.

The sediments showed the minimum value of **humidity** in the most coastal station NEM 1 (22.73%) and the highest in the NEM 5 station (52.46%).

The values of **own weight** do not indicate any spatial differentiation of the stations, as the standard deviation is very low (mean value of 2.24±0.13 N/m^3).

The **HDD** was higher in the stations of the route than those of the Wind Farm with an average (±ds), respectively, of 1.01±0.45% and 0.41±0.12%. The same spatial trend was highlighted for the **TN**, with an average value of 0.063±0.031% in the area of the route and 0.034±0.014% in that of the Wind Farm; the **TP**, on the other hand, showed homogeneous levels between all stations, with an average value of 0.052 ±0.010%.

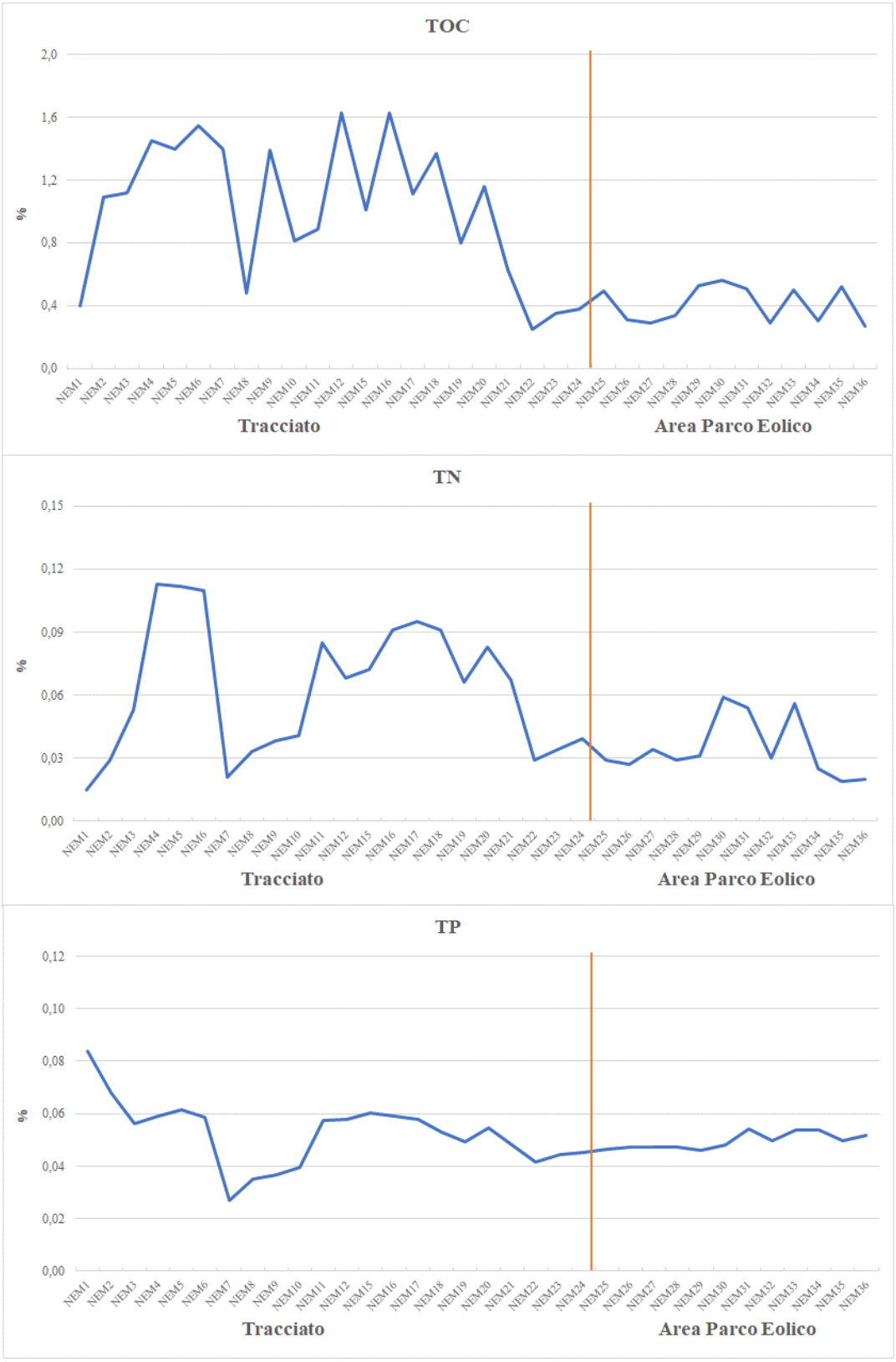
The particle size determination showed sandy and pelitic sediments, with low % of gravel and, in general, without major differences in humidity values and specific gravity between the stations.
By dividing the stations between those falling on the route of the cable duct and the area of the Wind Farm, it is possible to highlight a higher content of HDD and TN in the sediments of the cable duct area, unlike the TP which, on the other hand, showed homogeneous levels between all the stations. In particular, TOC in sediments is considered a good indicator of organic pollution (e.g. Karichknoff et al., 1996). The TOC content measured in the sediments under this study is partly in line with and partly greater than the average TOC content (0.6%) measured in Mediterranean sediments (Emelyanov and Shimkus, 1986; Hyland, 2005).

Area	Stazione	Ghiaia	Sabbia	Silt	Argilla	Scala Wentworth
TRACCIATO	NEM1	0,38	95,68	3,85	0,09	sabbia
	NEM2	0,34	68,89	25,78	4,99	sabbia e pelite
	NEM3	2,67	39,53	48,15	9,65	pelite e sabbia
	NEM4	15,20	5,26	62,28	17,26	pelite
	NEM5	1,11	7,52	68,55	22,82	pelite
	NEM6	0,53	5,60	67,21	26,66	pelite
	NEM7	4,34	88,75	5,62	1,29	sabbia
	NEM8	17,97	66,63	12,35	3,05	sabbia e ghiaia
	NEM9	12,44	65,26	17,35	4,95	sabbia e pelite
	NEM10	7,06	69,56	18,40	4,98	sabbia e pelite
	NEM11	0,44	1,78	79,71	18,07	pelite
	NEM12	0,84	4,38	79,13	15,65	pelite
	NEM15	0,46	6,14	79,01	14,39	pelite
	NEM16	0,37	3,73	79,24	16,66	pelite
	NEM17	0,00	1,58	79,31	19,11	silt e argilla
	NEM18	0,00	1,06	78,84	20,10	silt e argilla
	NEM19	0,34	1,69	70,82	27,15	pelite
	NEM20	0,23	6,18	72,12	21,47	pelite
	NEM21	7,92	34,77	41,38	15,93	pelite e sabbia
	NEM22	11,43	66,70	16,85	5,02	sabbia e pelite
	NEM23	2,51	71,95	20,74	4,80	sabbia e pelite
	NEM24	2,70	70,80	21,12	5,38	sabbia e pelite
PARCO EOLICO	NEM25	3,43	72,12	19,81	4,64	sabbia e pelite
	NEM26	1,73	67,36	24,47	6,44	sabbia e pelite
	NEM27	1,97	68,71	23,60	5,72	sabbia e pelite
	NEM28	2,81	69,30	21,92	5,97	sabbia e pelite
	NEM29	2,35	68,15	24,41	5,09	sabbia e pelite
	NEM30	0,00	15,83	67,02	17,15	silt e argilla
	NEM31	0,18	30,07	56,55	13,20	pelite e sabbia
	NEM32	0,64	65,98	26,73	6,65	sabbia e pelite
	NEM33	0,00	23,73	62,54	13,73	silt e sabbia
	NEM34	1,19	62,85	29,59	6,37	sabbia e pelite
	NEM35	3,85	74,40	17,80	3,95	sabbia e pelite
	NEM36	4,38	78,33	13,65	3,64	sabbia e pelite

Particle size classes found

Area	Stazione	Umidita %	Peso specifico N/m^3
TRACCIATO	NEM1	22,73	2,53
	NEM2	29,35	2,34
	NEM3	34,64	2,17
	NEM4	50,24	2,19
	NEM5	52,46	2,15
	NEM6	52,26	2,07
	NEM7	24,16	2,37
	NEM8	26,54	2,40
	NEM9	29,16	2,40
	NEM10	31,76	2,14
	NEM11	50,20	2,23
	NEM12	42,49	2,20
	NEM15	43,93	2,14
	NEM16	47,35	2,11
	NEM17	49,33	1,99
	NEM18	50,64	2,19
	NEM19	47,83	2,38
	NEM20	51,16	2,10
	NEM21	48,96	2,21
	NEM22	31,97	2,35
	NEM23	38,03	2,37
	NEM24	35,80	2,25
PARCO EOLICO	NEM25	34,06	2,28
	NEM26	33,81	2,32
	NEM27	38,88	2,27
	NEM28	35,41	2,25
	NEM29	40,07	2,30
	NEM30	50,91	2,01
	NEM31	50,30	2,14
	NEM32	36,49	2,48
	NEM33	51,48	2,21
	NEM34	36,20	2,15
	NEM35	37,18	2,28
	NEM36	34,43	2,31

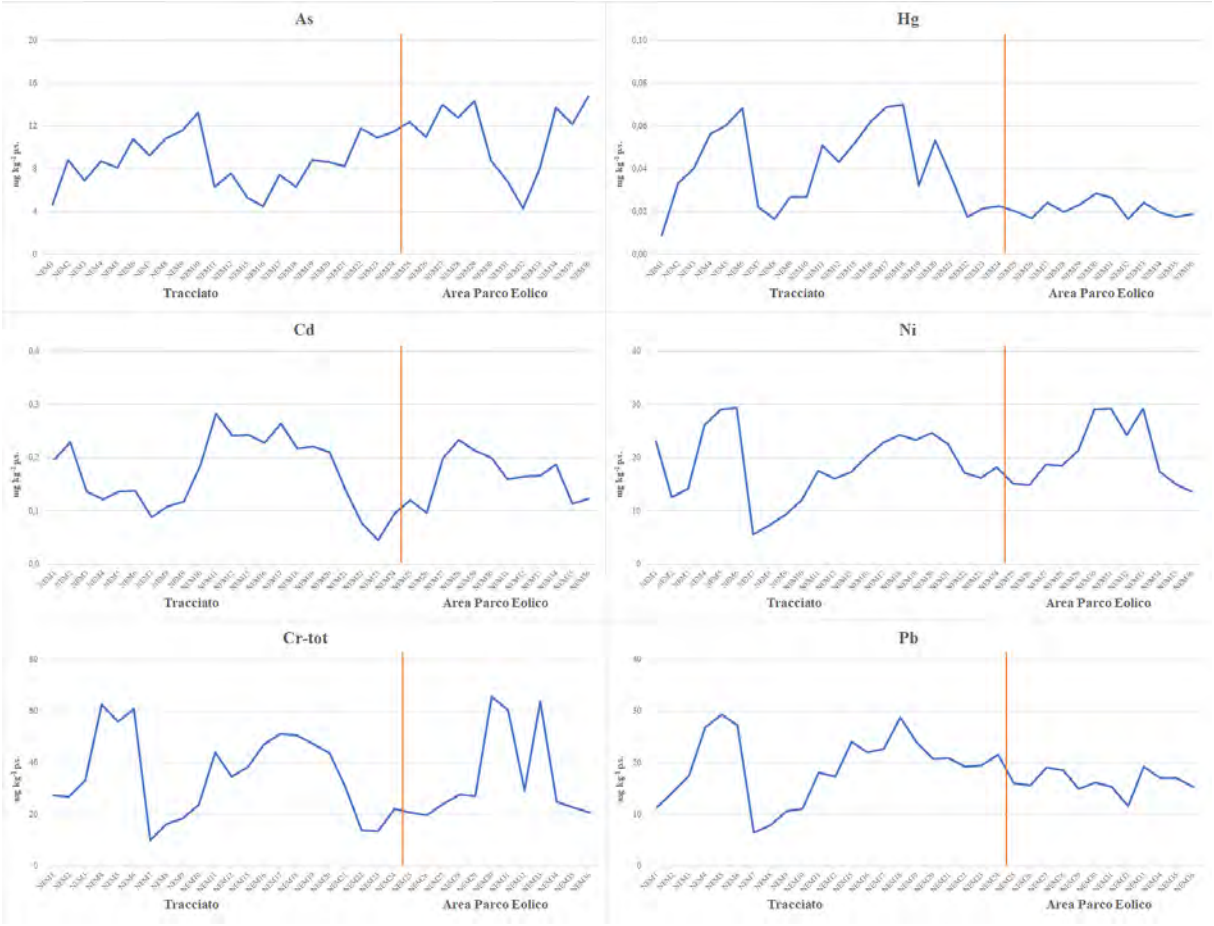
Humidity and specific gravity classes found



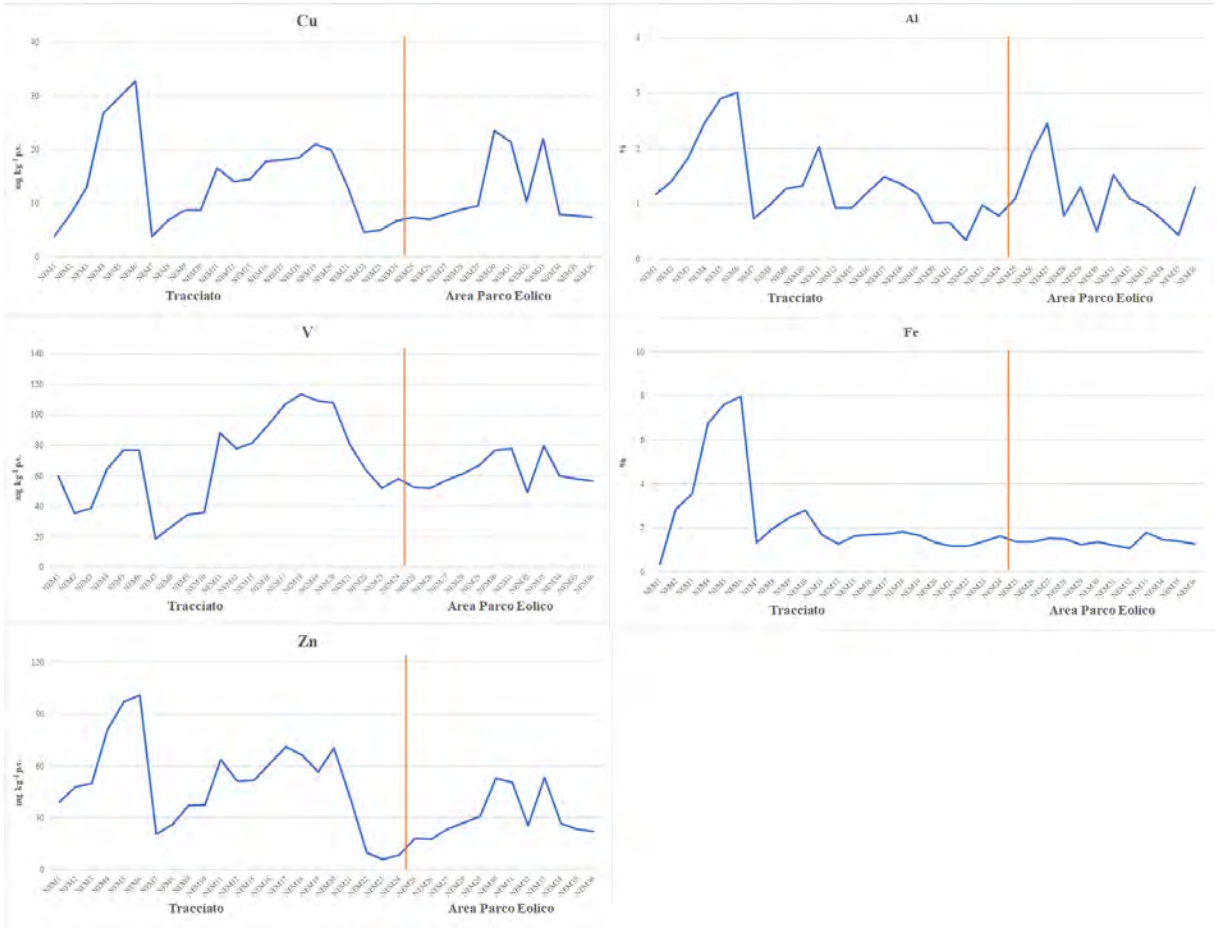
Levels of TOC, TN and TP

The same trend seems to be present with regard to the level of **metals**, which are usually associated with the fine fraction of sediment. The metal concentration range (min-max) of the stations falling on the track was: As 4.522-13.227 mg kg^{-1} p.s.; Cd 0.045-0.283 mg kg^{-1} p.s.; Cr_tot 9.735-62.468 mg kg^{-1} p.s.; Cu

3,731-32,696 mg kg^{-1} p.s.; Hg 0.009-0.070 mg kg^{-1} p.s.; Ni 5.316-29.359 mg kg^{-1} p.s.; Pb 6,422-29,260 mg kg^{-1} p.s.; V 18.539-113.528 mg kg^{-1} p.s.; Zn 6.035-101.015 mg kg^{-1} p.s.; Fe 0.37-7.99 %; At 0.35-3.02%. On the other hand, that of the stations sampled within the area of the Wind Farm was: As 4.278-14.692 mg kg^{-1} p.s., Cd 0.096-0.233 mg kg^{-1} p.s.; Cr_tot 19.663-65.345 mg kg^{-1} p.s.; Cu 6,954-23,563 mg kg^{-1} p.s.; Hg 0.017-0.029 mg kg^{-1} p.s.; Ni 13,699-29,295 mg kg^{-1} p.s.; Pb 11,520-19,115 mg kg^{-1} p.s.; V 49.374-79.876 mg kg^{-1} p.s.; Zn 17.591-53.447 mg kg^{-1} p.s.; Fe 1.06-1.78%; At 0.43-2.46%.
The same spatial trend of TOC and TN has been detected, in general, also for metals.



Spatial trend of the levels of As, Hg, Cd, Ni, Cr_tot and Pb



Spatial trend of Cu, Al, V, Fe and Zn levels

The qualitative evaluation of sediments is obtained through the comparison of the analytical results with the limits prescribed by current legislation and with international quality standards:

Metalli	D. Lgs. 172/2015	D.M. 173/2016		Long et al., 1995		MacDonald et al., 1996	
		L1	L2	ERL	ERM	TEL	PEL
Arsenico	12	12	20	8,2	70	7,24	41,6
Cadmio	0,3	0,3	0,8	1,2	9,6	0,68	4,21
Cromo tot	50	50	150	81	370	52,3	160
Mercurio	0,3	0,3	0,8	0,15	0,71	0,13	0,7
Nichel	/	30	75	20,9	51,6	15,9	42,8
Piombo	30	30	70	46,7	218	30,2	112
Rame	/	40	52	34	270	18,7	108
Zinco	/	100	150	150	410	124	271
Vanadio	/	/	/	/	/	/	/
Al	/	/	/	/	/	/	/
Fe	/	/	/	/	/	/	/

In particular, the sediment samples showed:

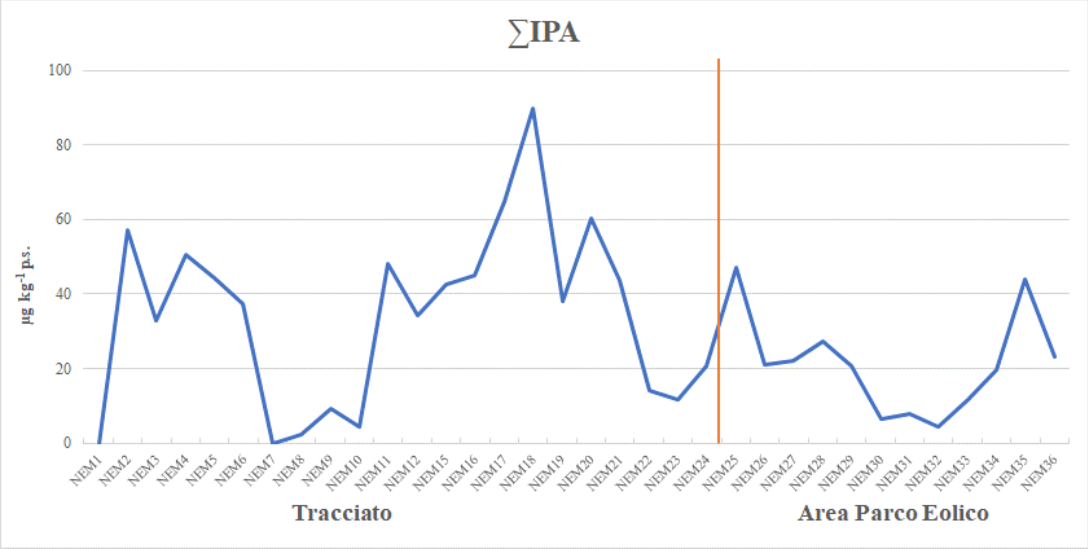
- levels of Cd, Hg and Pb lower than the Environmental Quality Standards of marine-coastal sediments included in Tab. 2/A and 3/A of Ministerial Decree 172/2015. The AS EQS level was slightly exceeded at 1 station along the route (NEM 10) and 5 in the area of the Wind Farm (NEM 27, NEM 29, NEM 34, NEM 35 and NEM 36); that of the Cr_tot in 4 stations of the track (NEM 4, NEM 6, NEM 17 and NEM 18) and in 3 of the Park area (NEM 30, NEM 31, NEM 33).
- levels of Cd, Cu, Hg, Ni and Pb lower than the national chemical reference levels L1 and L2, provided for by Ministerial Decree no. 173 of 15/7/2016. The L2 level of As, Cr_Tot and Zn is never

exceeded, while the L1 level of As and Cr_tot, on the other hand, have been exceeded in 6 and 7 stations (according to the description of the previous point), respectively and the L1 of Zn only in 1 station, but with a difference compared to their EQS (100 mg kg^{-1} p.s.) negligible.

- levels of Cd, Hg, Pb and Zn below the concentration threshold limits determined by Long et al. (1995) and MacDonald et al. (1996):*Effect-Range-Low* (ERL) and the*Effect-Range-Medium* (ERM) and similarly the *Threshold Effects Level* (TEL) and the *Probable Effects Level* (PEL). These levels define ranges of chemical concentration of pollutants, beyond which adverse biological effects on benthic communities are associated. The lowest values proposed by these authors, the ERM and the TEL, for the As and the Ni are exceeded in most of the stations, those of the Cr_tot and the Cu in 5 stations of the route and in 3 of the park area.

The **polycyclic aromatic hydrocarbons** considered are the 16 IPAs included in the list of "*priority pollutants*" by the US-EPA (United States-Environmental Protection Agency) and their summation (ΣIPA) was calculated using a *lower bound*. In general, many PAHs show levels below the LOQ of the method (1 µg kg^{-1} p.s.). Among the stations with slightly higher concentrations are NEM 18 with 89.73 µg/kg and NEM 17 with 64.96 µg/kg total PAHs, followed by NEM20 and NEM 2 presenting 60,32 and 57.15 µg/kg, respectively. The spatial trend of the ΣIPA shows that the highest levels were found in the stations falling on the route of the cable duct.

Compounds above the limit of quantification are all well below the most restrictive legal limit. The sum of the individual compounds shows, in all samples, concentrations much lower than the most precautionary legal limit value (900 µg/kg) and also the concentrations of the individual compounds, when detected, are lower than the respective reference values, reported by national regulations, such as Legislative Decree no. 172/2015 and Ministerial Decree 173/2016.



Trend in PAH levels

IPA	D. Lgs. 172/2015	D.M. 173/2016	
		L1	L2
Esaclorobenzene	0,4	0,4	50
Naftalene	35	35	391
Antracene	24	24	245
Fenantrene	/	87	544
Acenaftene	/	/	/
Acenaftilene	/	/	/
Fluorene	/	21	144
Fluorantene	110	110	1494
Pirene	/	153	1398
Benzo(a)antracene	/	75	500
Crisene	/	108	846
Benzo(b)fluorantene	70	40	500
Benzo(a)pirene	30	30	100
Benzo(k)fluorantene	20	20	500
Indeno(1,2,3 cd)pirene	70	70	100
Benzo(g,h,i)perilene	55	55	100
Dibenzo(a,h)antracene	/	/	/
∑IPA	/	900	4000

Limit values for PAH concentration (µg kg^{-1} p.s.) reported in national legislation (Legislative Decree 172/2015 and Ministerial Decree 173/2016)

In all the champions the **C<12 hydrocarbons** are below the limit of quantification (<500 µg/kg) while more than 90% of the samples have **C>12 hydrocarbons** above 5 mg/kg. However, there are no stations that exceed the legal limits (50 mg/kg of Ministerial Decree 173/2016) as the concentrations are between 5.1 mg/kg of the NEM station 33 and 28.8 mg/kg of the NEM station 2. Among the samples with higher concentrations of heavy hydrocarbons are NEM 6 and the NEM 17, both with 19.6 mg/kg, the NEM 12 with 19.5 mg/kg and NEM 18 with 19.1 mg/kg.

The concentrations of the individual congeners Of **PCB** determined, are either below the limit of quantification (0.1 µg/kg) or with very low values in all samples; among the stations with slightly higher concentrations, NEM 17 and the NEM 18 with the summation (PCB) equal to 0.58 and 0.79 µg/kg, respectively. This summation, in the samples for which it was possible to calculate it, is lower than the most precautionary legal limit (8 µg/kg: Ministerial Decree 172/2015 and L1 value of Ministerial Decree 173/2016).

The concentrations of **organochlorine pesticides** were generally below the limit of quantification (0.1 µg/kg), with the exception of ΣDDT and ΣDDE, which were detected in practically all samples. The station with a higher level of these congeners was the NEM 3 with 0.76 µg/kg of ΣDDT and 1.24 µg/kg of ΣDDE, values that are in any case lower than the more precautionary standard reference values. In addition, ΣDDD was detected in 26% of the samples and hexachlorobenzene is also present in 15% of the stations; However, these variables are also lower than their respective more conservative reference limit value.

Pesticidi	D. Lgs. 172/2015	D.M. 173/2016	
		L1	L2
Aldrin	0,2	0,2	10
Alfa-esaclorocicloesano	0,2	0,2	10
Beta-esaclorocicloesano	0,2	0,2	10
Gamma-esaclorocicloesano	0,2	0,2	1
∑DDD	0,8	0,8	7,8
∑DDE	1,8	1,8	3,7
∑DDT	1	1	4,8
Dieldrin	0,2	0,7	4,3
Endrin	/	2,7	10
Eptacloroepossido	/	0,6	2,7
Esaclorobenzene	0,4	0,4	50

Limit values for the concentration of organochlorine pesticides (µg kg^{-1} p.s.) reported in national legislation (Legislative Decree 172/2015 and Ministerial Decree 173/2016)

All sediment samples from the stations by Nemetun TheSland showed levels of **organotin compounds** (TBT, DBT and MBT) below the limit of quantification of the method (LOQ: 1 µg Sn kg-1 p.s.).

In general, concentrations of all **organic contaminants** (PAHs, Light and Heavy Hydrocarbons, PCBs, Organochlorine Pesticides and Organotin Compounds) in the sediments were, in all samples, either below the limits of quantification or below the most conservative normative reference values.

The evaluation of the **Microbiological quality** of the sediments of the stations by Nemetun Thesland was carried out by searching for microorganisms that indicate predominantly faecal contamination, i.e. total coliforms, faecal coliforms and faecal streptococci. Total coliform levels were found at the most coastal station (NEM 1), but most stations settle at values below 10 CFU/d p.s. or <LOQ (1 CFU/d p.s.). For faecal coliforms and faecal streptococci, all stations had <LOQ levels (1 CFU/g p.s.), with the exception of NEM 7 (2 CFU/d p.s. for streptococci).
For the microbiological variables related to the sediment matrix, there are no defined limit values national legislation.
From Environmental point of view were not detected situations of microbiological pollution in progress. In fact, the absence of faecal streptococci clearly indicates no previous faecal contamination, while the most recent one, identified through the levels of faecal and total coliforms, is zero in terms of *E. coli* (Faecal coliforms) and very low in terms of total coliforms.

Area	Stazione	Coliformi totali	Coliformi fecali	Streptococchi fecali
TRACCIATO	NEM1	24	<1	<1
	NEM2	2	<1	<1
	NEM3	<1	<1	<1
	NEM4	<1	<1	<1
	NEM5	3	<1	<1
	NEM6	5	<1	<1
	NEM7	1	<1	2
	NEM8	15	<1	<1
	NEM9	5	<1	<1
	NEM10	1	<1	<1
	NEM11	<1	<1	<1
	NEM12	5	<1	<1
	NEM15	<1	<1	<1
	NEM16	7	<1	<1
	NEM17	10	<1	<1
	NEM18	<1	<1	<1
	NEM19	6	<1	<1
	NEM20	1	<1	<1
	NEM21	<1	<1	<1
	NEM22	2	<1	<1
	NEM23	1	<1	<1
	NEM24	14	<1	<1
PARCO EOLICO	NEM25	<1	<1	<1
	NEM26	8	<1	<1
	NEM27	1	<1	<1
	NEM28	<1	<1	<1
	NEM29	2	<1	<1
	NEM30	<1	<1	<1
	NEM31	<1	<1	<1
	NEM32	<1	<1	<1
	NEM33	<1	<1	<1
	NEM34	<1	<1	<1
	NEM35	<1	<1	<1
	NEM36	5	<1	<1

Density of cfaecal oliforms, ctotal oliforms and sfecal treptococci

The **Ecotoxicological assays**, finally, showed a picture of a general and widespread absence of toxicity and in relation to the criterion for evaluating the results of the batteries of three species by means of a "pass to fail" classification and by means of a "weight of evidences" approach.

Stazione	*M. insidiosum*		*P. tricornutum*		*P. lividus*		Classe complessiva
	Media	Classe *	Media (%)	Classe *	Media (%)	Classe *	
NEM_1	12,1	A	3,4	A	11,4	A	A
NEM_3	12,1	A	3,9	A	13,3	A	A
NEM_5	19,0	A	3,2	A	12,1	A	A
NEM_7	6,9	A	3,6	A	13,3	A	A
NEM_11	13,8	A	3,6	A	11,4	A	A
NEM_15	15,5	A	3,7	A	14,4	A	A
NEM_19	8,6	A	3,6	A	14,0	A	A
NEM_23	17,2	A	3,2	A	12,5	A	A
NEM_26	6,9	A	3,6	A	12,9	A	A
NEM_29	12,1	A	3,5	A	14,8	A	A
NEM_32	8,6	A	3,9	A	14,4	A	A
NEM_36	8,6	A	3,5	A	11,7	A	A

Ecotoxicity patss to fail

Stazione	HQ Batteria	Livello di pericolo	% elutriato
NEM_1	0,31	ASSENTE	100
NEM_3	0,31	ASSENTE	100
NEM_5	0,31	ASSENTE	100
NEM_7	0,31	ASSENTE	100
NEM_11	0,31	ASSENTE	100
NEM_15	0,31	ASSENTE	100
NEM_19	0,31	ASSENTE	100
NEM_23	0,31	ASSENTE	100
NEM_26	0,31	ASSENTE	100
NEM_29	0,31	ASSENTE	100
NEM_32	0,31	ASSENTE	100
NEM_36	0,31	ASSENTE	100

Ecotoxicity "Weight of Evidences"

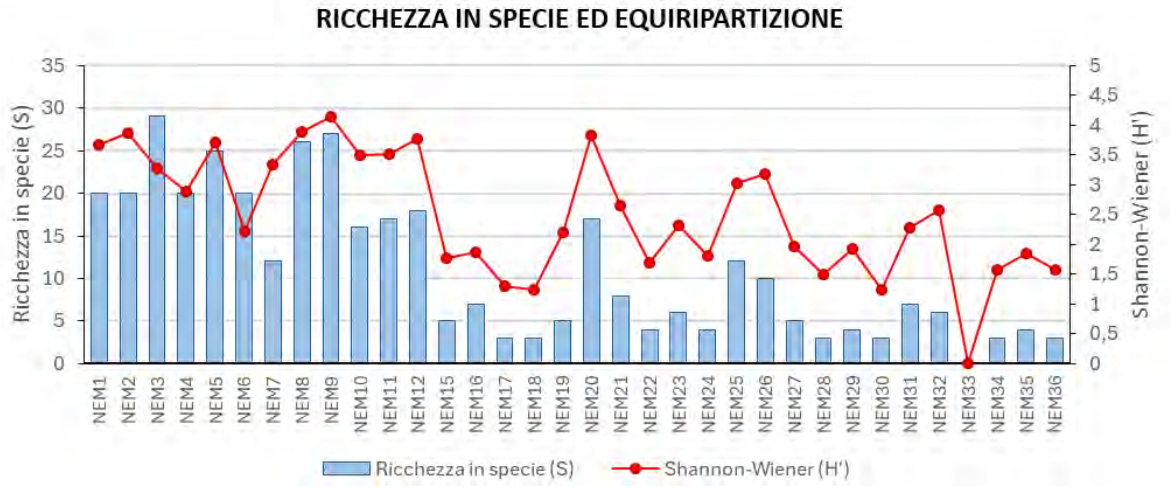
It should be noted that, with regard to the Battery HQ, the values of all samples are calculated by Sediqualsoft® as required by Ministerial Decree 173/2016. Since there was no significant difference in toxicity between the samples, the software assigned a Hazard Quotient (Battery HQ) value of 0.31 for each of them since all the effects were below the threshold values reported in Table B1 of the aforementioned decree.

In general, it can be said that the area affected by the future implementation of the off-shore wind farm as well as the cable duct connecting the plant and the onshore station does not present serious critical issues from an environmental point of view, also considering the exceedances of the EQS of some metals, which could be attributable to specific human activities falling within the territory. In fact, saccording to ISPRA (2018) "*the Apulian coast is characterized by the presence of important industrial and port activities (Bari, Brindisi, Manfredonia, Taranto, of which the last three have been identified as Sites of National Interest) which have had an impact on the surrounding environment, and on the coastal marine area in front, with a contribution of numerous organic and inorganic contaminants*"; The same authors report that the seabed of the area covered by this study "*they are characterized, in the most coastal sector, by sandy sediments which, at greater depths, become pelitic.....with a mineralogical composition of the sediments characterized by the presence of heavy minerals from Mount Vulture, a Pleistocene volcano drained by the Ofanto River*".

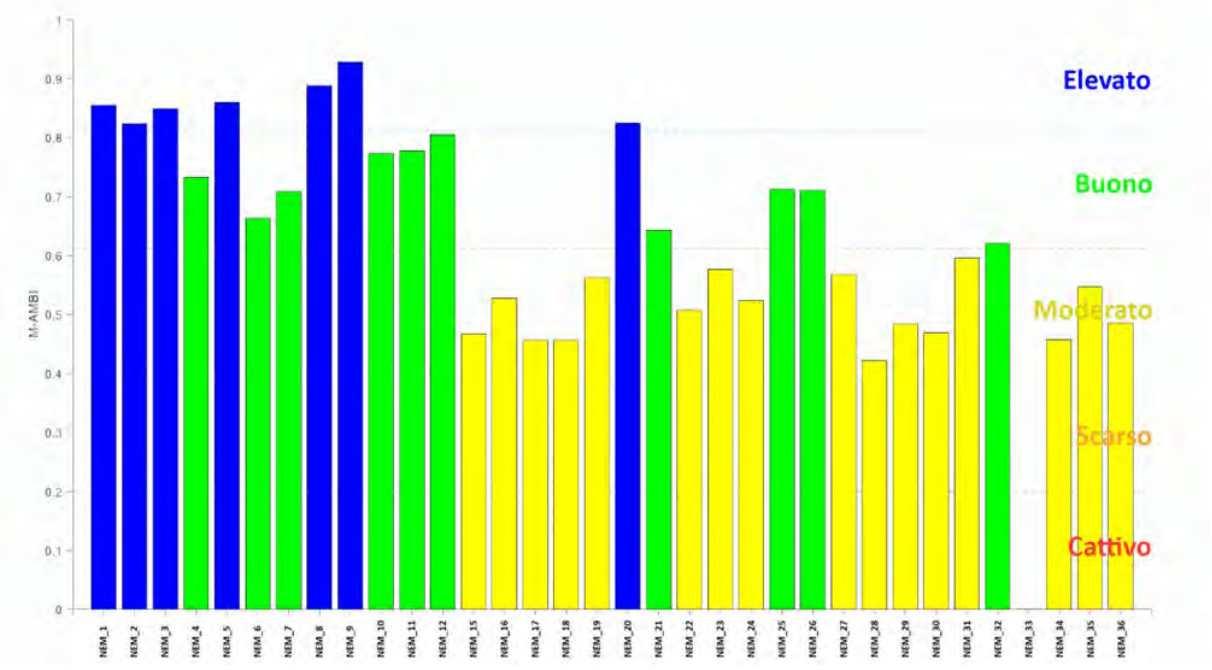
From the analysis of macrozoobenthos of the project area Nemetun Island the presence of a good number of species and individuals emerged. During the analyses, a total of 1208 individuals belonging to 135 animal taxa were recorded at all sampling stations; moreover, in the NEM station 1 (3 m deep) remains of the marine phanerogam have been found *Cymodocea nodosa*. The most abundant taxonomic group was found to be the phylum of Mollusca, followed by that of Echinodermata, in particular, the numerical abundance of this phylum is linked, to the presence in the coastal stations NEM 3, NEM 4, NEM 5 and NEM 6, of a facies of the ophiura *Amphiura chiajei*.
As far as univariate analyses are concerned, the most coastal stations, up to about 15 m deep, are those with a greater richness in species (S), among these the stations that show a higher specific diversity are the NEM stations 3, NEM 5, NEM 8 and NEM 9; while the station with the lowest value of specific richness was found to be the NEM 33 station carried out at 397 m, in which no living organism was found but only biological remains such as old shells.

The more coastal stations, in addition to having higher levels of specific diversity, also have better equipartition values (more homogeneous distribution of specimens belonging to the individual species found) as evidenced by the higher values of the Shannon-Wiener diversity index (H').
The ecological status assessed through the M-AMBI index showed a status from "High" to "Good" especially in coastal stations, where the values of diversity and equidistribution were also higher. Almost the total of the remaining stations showed a "Moderate" ecological status, with the exception of NEM station 33 which has a "Bad" ecological status.

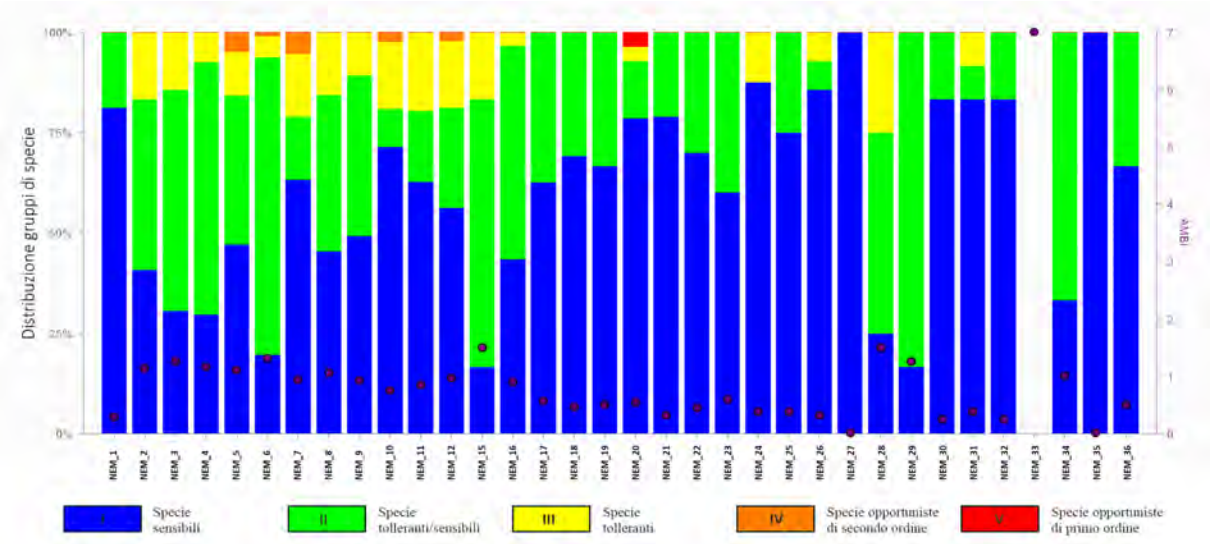
As far as the values of the AMBI index are concerned, most of the taxa identified fall into the categories of sensitive and/or sensitive/tolerant species, testifying that in these areas there is no environmental pollution, which on the contrary, would have favored the presence of opportunistic species, which in fact have been little observed and, if present, contributed to the species richness for percentages of less than 10%.



Combined graph showing the values obtained from the calculation of the Species Richness Index (S) and the Shannon-Wiener Index (H') for each of the 34 sampling stations



Histogram showing the M-AMBI values (ranging from 0 to 1) and classification of the Ecological Status calculated for each of the sampling stations



Percentage of species belonging to each of the five Ecological Groups provided within the AMBI Index for each of the sampling stations

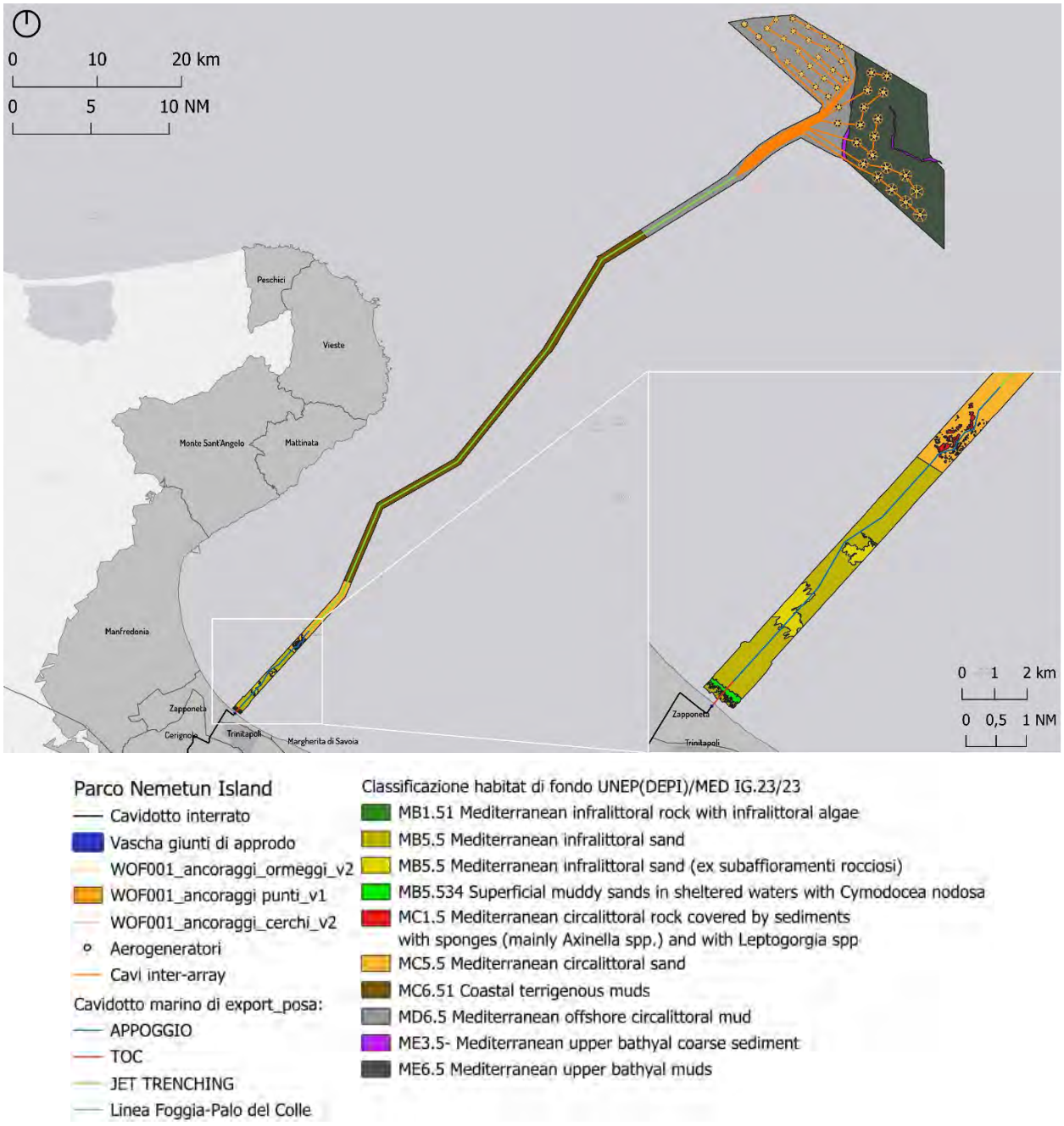
AtThrough the Cluster Analysis, carried out considering the composition in species in relation to environmental factors, the presence of three groups of stations emerges in which it is possible to highlight the presence of three different biocoenoses or populations (sensu Pérès and Picard, 1964 and according to nomenclature UNEP(DEPI)/MED IG.23/23 divided as follows:

- Muddy sands - habitat MB5.5 Mediterranean infralittoral sand - habitat MC5.5 Mediterranean circalittoral sand = NEM 2 – NEM 12 in which indicator species such as ophiura (serpentine star) were sampled *Amphiura chiajei*, a mixciola species with a wide ecological distribution that in this area forms real facies characterized by high densities of individuals;
- Coastal Terrigenous Mud (VTC) - habitat MC6.51 Coastal terrigenous muds = NEM 15 – NEM 20 characterized by the presence of turrid gastropods *Turritellinella triarenata* and *Turritella turbona*;
- Populations of the unstable seabed (MI) - habitat MD6.5-Mediterranean offshore circalittoral mud – habitat ME3.5 Mediterranean upper bathyal muds = NEM 21 – NEM 32, NEM 35, NEM 36 characterized by the presence of only tolerant species such as *Aries Ditrupa*, a polychaete annelid that characterizes the macrobenthic population found in this area. It is, in fact, a transitory population, which appears as a result of a sedimentary imbalance probably linked to the presence, in these areas, of trawling activities which in fact does not allow the establishment of a well-structured benthic community in good health. .

The NEM station deviates from these groups 1 for the presence of marine phanerogam *Cymodocea nodosa* (typical of the muddy fine sands of sheltered environments - SVMC sensu Pérès e Picard 1964 o MB5.534 Superficial muddy sands in sheltered waters with *Cymodocea nodosa* - UNEP(DEPI)/MED IG.23/23); NEM 7 characterized by the presence of sands, with a consequent change in the community, which, however, does not present species worthy of note both from a qualitative point of view and in terms of abundance; NEM 33 and NEM 34 for the presence of no or very few species and individuals.

The ANOSIM (Analysis of Similarities) nonparametric multivariate test showed that the differences between the three groups of stations are significant, with a Global R of 0.85. The pairwise analysis also showed significant ANOSIM values (p = 0.1%). The SIMPER test showed a similarity of 36.57% for the biocoenosis of Muddy Sands, 37.82% for coastal terrigenous mud (VTC) and 29.58% for unstable bottom (MI) stands respectively.

On the basis of the results obtained from all previous analyses on the seabed (geomorphological, geological, by ROV inspections and ARA, sedimentological and macrobenthic diving) it was possible to define the seabed habitats of the project area. Therefore, the biocenotic map with UNEP(DEPI)/MED IG.23/23 nomenclature has been defined, reported below and present in the *ES.6.6_01_ Map of Marine Habitats – UNEP Nomenclature.*



Biocenotic map of the investigation area characterized by the trajectory along which the cable duct will be built and the future wind farm. The different types of benthic habitats found according to the nomenclature UNEP(DEPI)/MED IG.23/23 are reported here

In conclusion, the geomorphological analysis (surveys with Side Scan Sonar, Sub Bottom Profiler and sea truths with ROV and ARA diving) combined with the analysis of sediments and benthic communities showed that the area affected by the future implementation of the off-shore wind farm as well as the cable duct connecting the plant and the onshore station does not have areas of significant naturalistic interest, with the exception of the *Cymodocea nodosa* (habitat MB5.534 Superficial muddy sands in sheltered waters

with *Cymodocea nodosa*), present in the landing area of the cable duct and for the coralligenous nuclei (habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp*) taken along the cable duct at a depth of 17-18 m.
In order to preserve these areas, a cable installation plan has been prepared that provides for minimizing interference and impacts between the cable and marine habitats. The presence of habitat MB5.534 below the coast determined the decision to proceed with a burial of the HDD cable in the last part of its journey starting from a depth of 7 m up to the landing (total length of about 1 km, sea side of about 880 m). In the next portion of the cable duct from about 7 m up to 1 km beyond the habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*), the design choice sees the laying of the cable conduit in support with a cast iron shell covering for about 12.5 km for the following reasons:

- presence of the SPA Aloisa – Carapelle,
- presence of rocky sub-outcrops covered by sediment (habitat identified as MB5.5 - Mediterranean infralittoral sand),
- presence of habitat MB1.51 Mediterranean infralittoral rock with infralittoral algae,
- presence of habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*

Laying on top can:

- significantly reduce the environmental impact on the Natura 2000 network site and on the other habitats along the cable duct,
- be a deterrent of trawling, illegally present in the area as found by geophysical investigations
- represent, thanks to the cast iron covering, a substrate that can be colonized by hard-bottomed organisms that would enrich the coastal area.

From the study of communities macrozoanbenthic cables that will be affected by the future installation of the cable duct and the wind field in the context of the project in analysisthe Almost all of the species observed were closely linked to the movable bottoms, and in many cases they were were infaunal species and therefore could not be impacted by the installation works of the wind farm.
Through this in-depth analysis, the absence of relevant communities and/or deserving of conservation emerges, which could conflict with the project for the construction of the cable duct and the wind farm in this area. The presence of the plant could, on the contrary, favor the development of a richer and more stable benthic community in these environments, as the construction of the plant would cause the prohibition of trawling, present in these areas and probably among the causes of the absence of relevant biocoenosis; moreover, the plants would constitute a hard substrate, which, although artificial, could allow sessile benthic organisms to settle, thus bringing an overall beneficial effect to these seabeds.
The execution of future monitoring will be able to verify the integrity of the wind farm's habitats, both along the cable duct and at the offshore plant, as well as the possible effectiveness of the protective effect mentioned above.

4.1.4 TERRESTRIAL ENVIRONMENT, SOIL, SUBSURFACE AND HYDROLOGY

This section refers to the terrestrial environment, and in particular to the area of the route of the underground power lines for energy transport, the landing point, the electrical substation of users, as well as the municipal territories of Cerignola and Zapponeta.

As part of the implementation of the Nemetun Island wind farm onshore project, a geological study was carried out to outline the geomorphological, hydrogeological, lithological-stratigraphic and seismic

characteristics of the area under consideration as well as to provide the geotechnical characterization of the rock mass.

The aforementioned study was drawn up in order to:

- verify the landscape constraints weighing on the territory with regard to the perimeters, as well as the basic requirements set by the PPTR of the Puglia Region and the PAI of the Interregional Authority of the Puglia Basin;
- to provide information on the geological-stratigraphic and geotechnical characteristics of the investigated site;
- highlight the levels affected by the foundations and verify the presence of anomalous stratigraphic situations that may affect the safety of the works under construction;
- detect the possible presence of the water table and analyze any interference phenomena with the elevated structure;
- provide useful information in order to determine the permissible load-bearing capacity of the foundation soil;
- estimate the value of the VS,eq and determine the category of the foundation soil pursuant to the "Technical Standards for Constructions D. Min. Infrastructures" of 17 January 2018 (Suppl Ord. G. U. 20.2.2018, n. 8).

In an initial analysis, inspections were carried out on the site in question in order to trace the geological characteristics of the surface, frame the area in question in the regional geological context and thus obtain a general picture of the situation and the existing biblio-cartography was also consulted, as there were no geognostic data available.

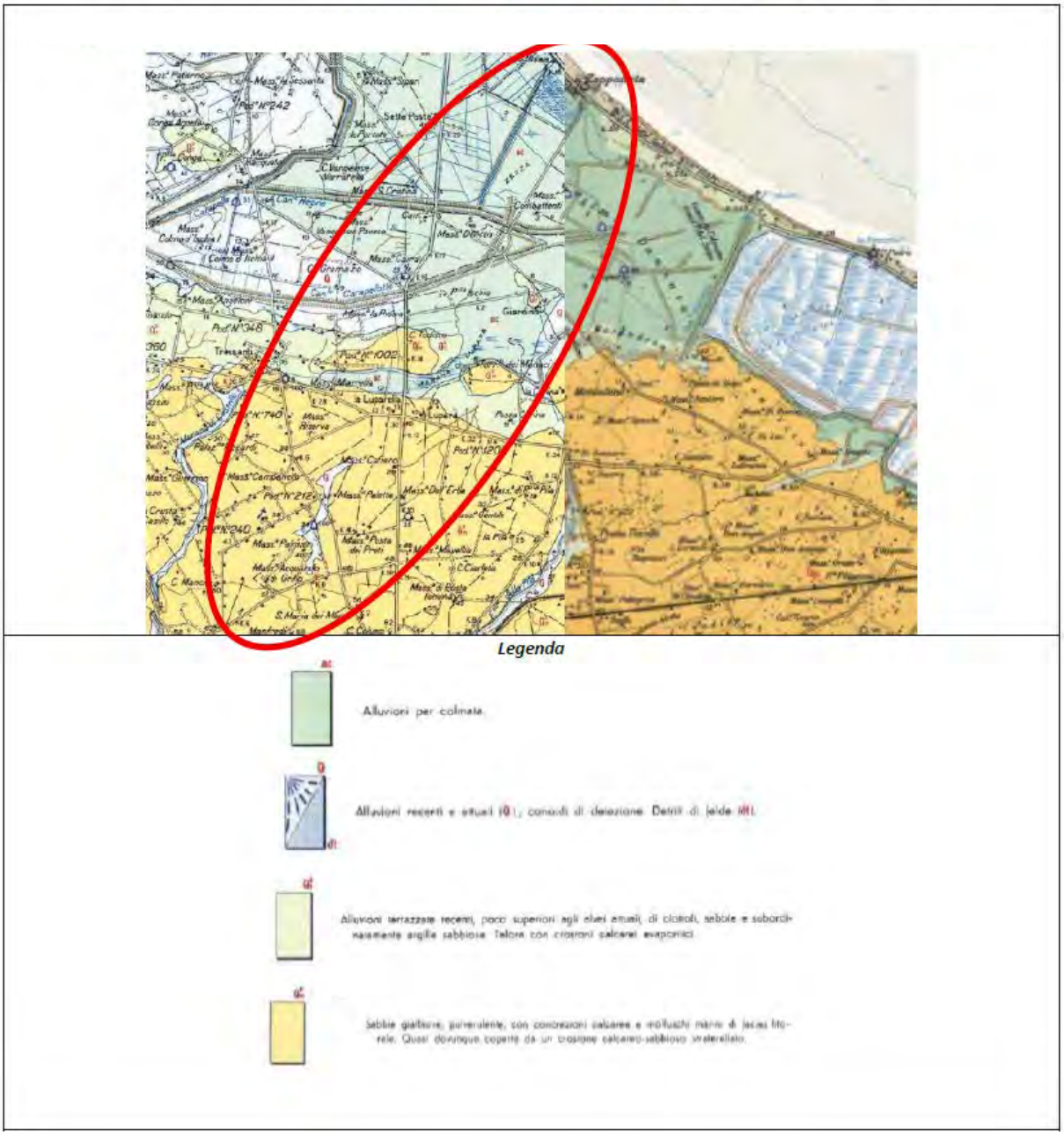
Subsequently, a geognostic campaign was launched consisting of the execution of:

- n. 3 dynamic penetrometric tests of the DPSH type – DPSH01÷DPSH03 all thrusts up to 10.0m depth (depth within which the effects of the pressure bulb loads will be felt);
- n. 3 seismic surveys with surface refraction in P waves, (BS01 ÷ BS03) for the determination of the local seismostratigraphy, through the use of 24 geophones, spaced every 1.5 m for a total length of the BS01 spread equal to 37.50 m and through the use of 24 geophones, spaced every 5.0 m for a total length of each extension (BS02 and BS03) equal to 125 m;
- 3 seismic surveys carried out with the MASW technique for the determination of shear waves (S waves), (MASW01 ÷ MAASW03), located at the same seismic bases, for which 24 geophones with inter-geophonic spacing of 1.5 m were used and the explosion was carried out at 7.5 m from the first geophone for the MASW01 and n. 24 geophones with inter-geophonic spacing of 5.0 m and the explosion was carried out at 10.0 m from the first geophone for the MASW02 and the MASW03; this technique will make it possible to estimate the value of the Vs,eq and therefore attribute to the subsoil in question one of the categories of foundation soil contemplated by the 2018 Technical Standards for Constructions.

4.1.4.1 Geology and hydrogeology

The area in question is located between the territories of the municipalities of Cerignola (FG) and Zapponeta (FG), at an altitude between -1.0 m and 30 m.

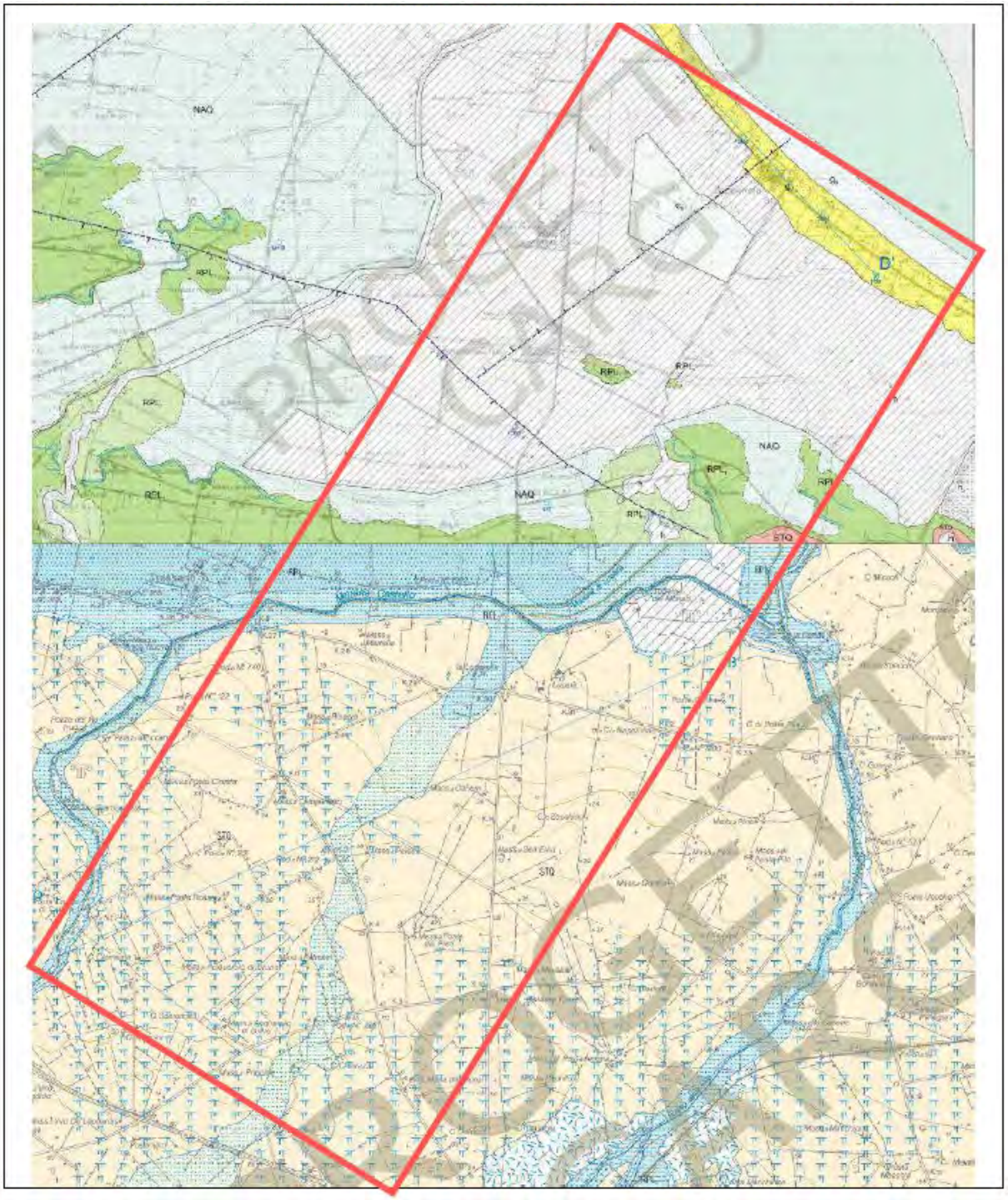
The intervention area straddles sheets 164 "Foggia" and 165 "Trinitapoli" of the Geological Map of Italy, on a scale of 1:100,000, in which the recent terraced alluvial deposits emerge in large part, and a small part the sandy, locally cemented.



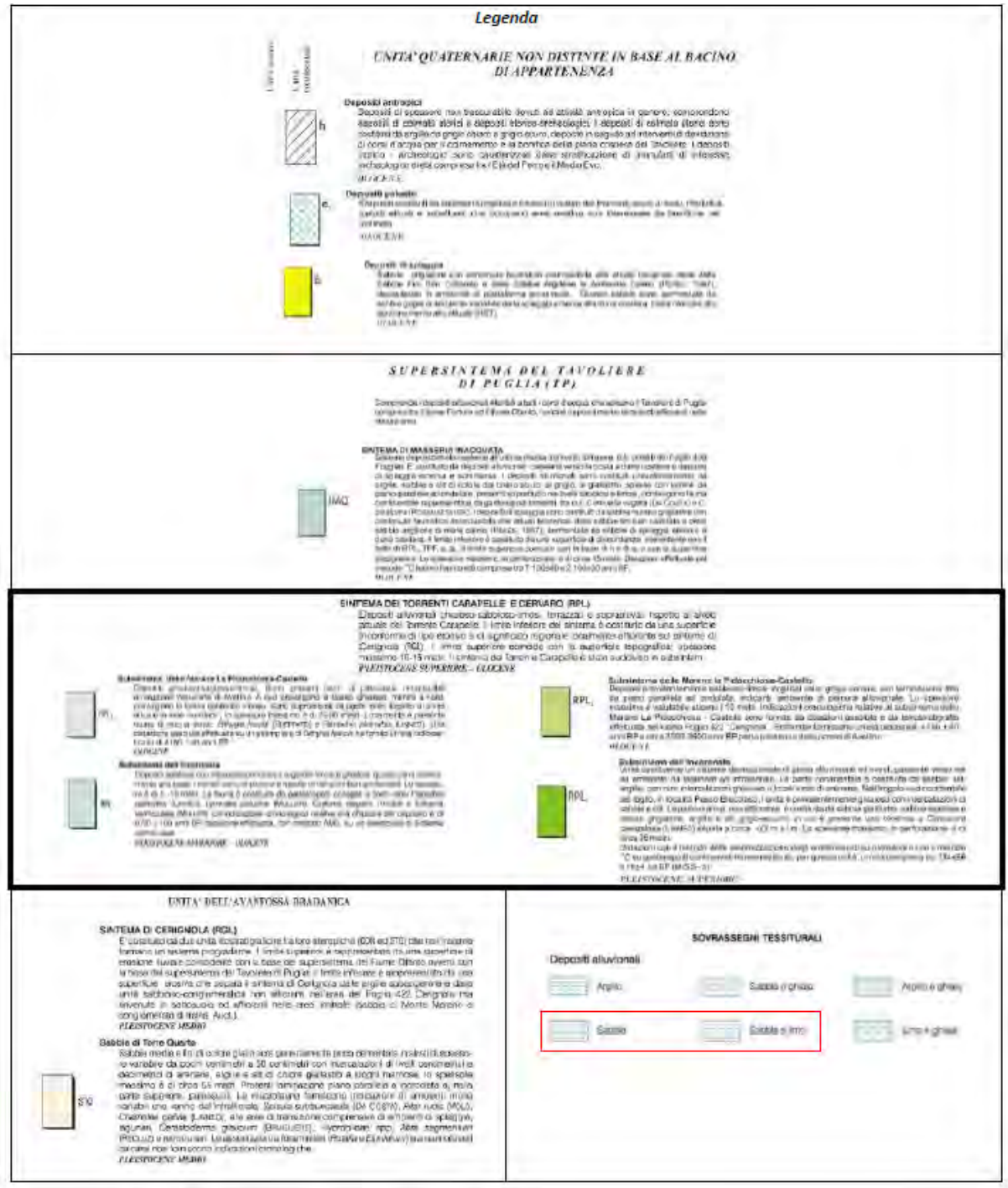
Geological Map of Italy – Sheets n° 164 "Foggia" and 165 "Trinitapoli" with works on the ground of the project

The same area in question has also been located on the most recent geological maps drawn up by the Project CARG, measured on a scale of 1:50,000 not yet published and/or printed, which not only returns a greater detail but also takes into account the substantial reclamation works carried out in the most recent Recent.

The area in question falls between the two sheets: Sheet 422 "Cerignola" and Sheet 409 "Zapponeta".



Geological Map of Italy – Sheets n° 422 “Cerignola" and 409 "Zapponeta" – CARG Project (1:50,000)



Geological Map of Italy – Sheets n° 422 "Cerignola" and 409 "Zapponeta" – CARG Project (1:50,000) – Lithological units

Both sheets, in general, are mostly occupied by the Plio-Quaternary sediments that have filled the eastern part of the Apennine foredeep between Daunia and the Gargano promontory; only in the In the northern part of the "Foggia" sheet, the Mesozoic limestones that make up the southernmost portion of the Gargano uplift emerge: these limestones characterize a back-of-cliff area. Overall, the Mesozoic formations of the back-cliff form two groups with distinct facies. In the easternmost part there are formations characterized by detrital and oolitic limestones, which constitute the substrate of the intervention area, which are probably linked to a nearby cliff; while in the westernmost part they are more compact.

As far as the Plio-Pleistocene sediments are concerned, they are widely represented and are in continuity with the same ones mapped in the neighboring sheets. Only in the Foggia sheet can two distinct tectonic

panoramas be recognized. The Pleistocene sediments do not generally show evident deformations and constitute as a whole a monocline immersed on average towards the Adriatic. The weak inclinations detected mostly reflect the original inclination of the seabed on which the sediments themselves were deposited. The Mesozoic Series, on the other hand, is affected by a disjunctive tectonics, with normal faults with a prevalent ONO-ESE direction.

From a lithostratigraphic point of view, the area under consideration is characterized by a complex geological situation and numerous materials.

Following the route of the cable duct, starting from the sea and going inland there are:

- Beach deposits: greyish sands with faunal content deposited in the proximal platform environment. These sands are surmounted by gray sands of varying environment from the emerged beach to the coastal dunes;
- A wide strip, between the coast and the canals leading to the salt pans, is made up of anthropogenic deposits: deposits of considerable thickness due to human activity in general, including historical reclaimed deposits and historical-archaeological deposits. The historical reclaimed deposits consist of clays deposited following the diversion of watercourses for the filling and reclamation of the coastal plain of the Tavoliere; the historical-archaeological deposits are characterized by the stratification of artifacts of archaeological interest from the Iron Age to the Middle Ages;
- Marsh deposits: deposits consisting of clayey and peaty sediments of a dark brown to black colour, referable to current and sub-current marshes, which occupy residual areas not affected by reclamation by fill;
- Alluvial deposits passing towards the coast to coastal dunes and deposits of emerged and submerged beaches: consisting mainly of sandy clays and silts of a dark brown to grey to yellowish colour, often with plano-parallel to wavy sheets, present above all in sandy and silty levels;
- Silty-clayey sandy deposits: unit consisting of an alluvial plain deposition environment to the west passing eastwards to a lagoon to infralittoral environment. Locally there are gravelly intercalations and sandstone layers;
- Sandy - calcarenitic deposits, deposited in a foredeep environment, consists of medium and fine yellowish sands, poorly cemented in layers of variable thickness with intercalations of centimeter and decimetric levels of sandstone, clay and yellowish silt, with marly places; in the upper part there are coarse reddish sands with cross lamination. The maximum thickness of the unit, in perforation, is about 30 m.

From a hydrogeological point of view, for underground hydrology, three different types of water can be distinguished: **phreatics**, **artesian** and **Karst**.

The entire portion of the Tavoliere enclosed between the Gargano promontory, the Gulf of Manfredonia and the Ofanto River is affected by fresh groundwater and brackish water distributed occasionally and difficult to delimit.

Wells drilled in the limestone, in the area of Manfredonia, have detected the presence of water of karst, fresh and brackish origin while always in the area of Manfredonia flows the spring of a saline and cold nature which comes to light naturally.

In the specific area under investigation, as can be seen from the hydrogeological map, both the presence of the surface phreatic aquifer (Detrital Aquifer) and the presence of the deep aquifer emerged, which, considering the heights of the area under consideration, is located at depths between 30.0 m a.s.l. and 35.0 m below sea level.

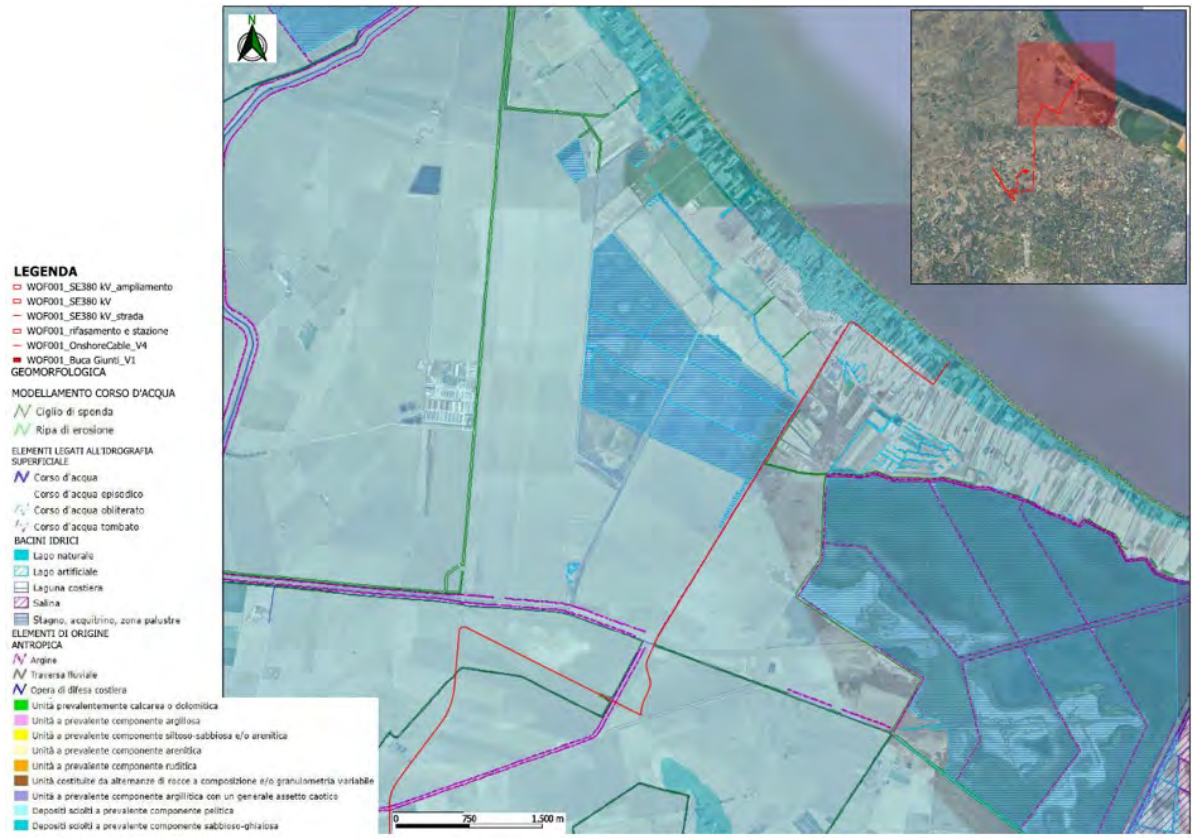
From a geomorphological point of view, in the area of the "Foggia" sheet there are two areas where the modeling action of exogenous forces has been affected by different geological situations. South of the Candelaro watercourse, the morphology is that of the whole Capitanata, that is, with vast esplanades inclined weakly towards the sea, interrupted by wide valleys with rather steep sides. The area is crossed by three important streams: the Candelaro, the Cervaro and the Carapelle and by a whole network of tributaries that often have an exclusively seasonal outflow.

The general eastward slope of the esplanade represents, most likely, the original inclination of the regression surface of the Pleistocene sea and of the fluvial deposits that have settled on it

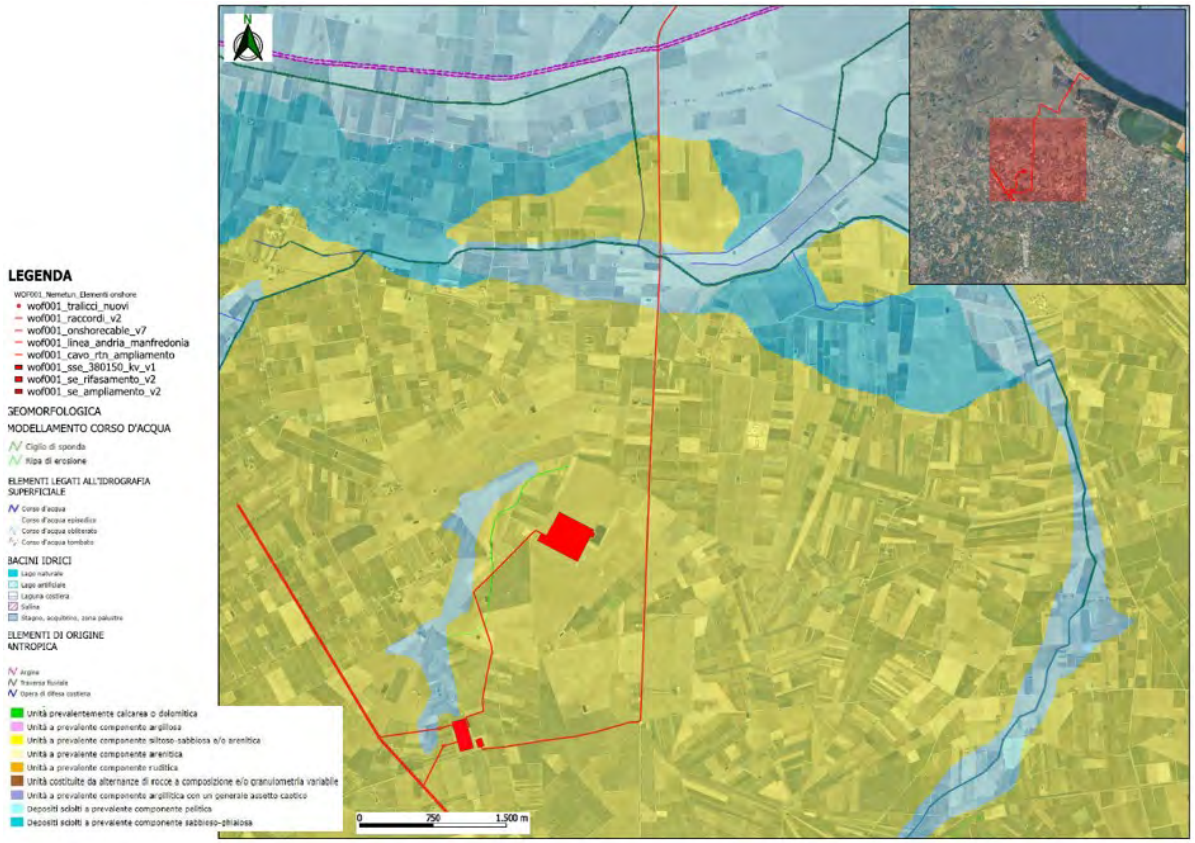
Laid. On the beach, limited to the area of the "Trinitapoli" sheet, dune cordons can be observed, a few meters high, parallel to the coast line. Furthermore, in this sheet. the ancient Lake of Salpi, now the salt pans of Margherita di Savoia, would have been established following the formation of coastal cordons, later raised into dunes.

Finally, as can be seen from the Hydro-geomorphological Map, the intervention area falls within a non-urbanized area, and for the most part develops on a sub-horizontal surface at an altitude between 30 m (in the territory of Cerignola) and altitudes close to 0 and even below it; in fact, in a large strip close to the coast, reclamation works have been carried out in some areas by conveying the waters into canals that flow into the sea, in others the possibility of creating salt pans for the production of sea salt has been exploited; finally, other areas have not been included in some reclamation works and therefore appear to be marshy areas.

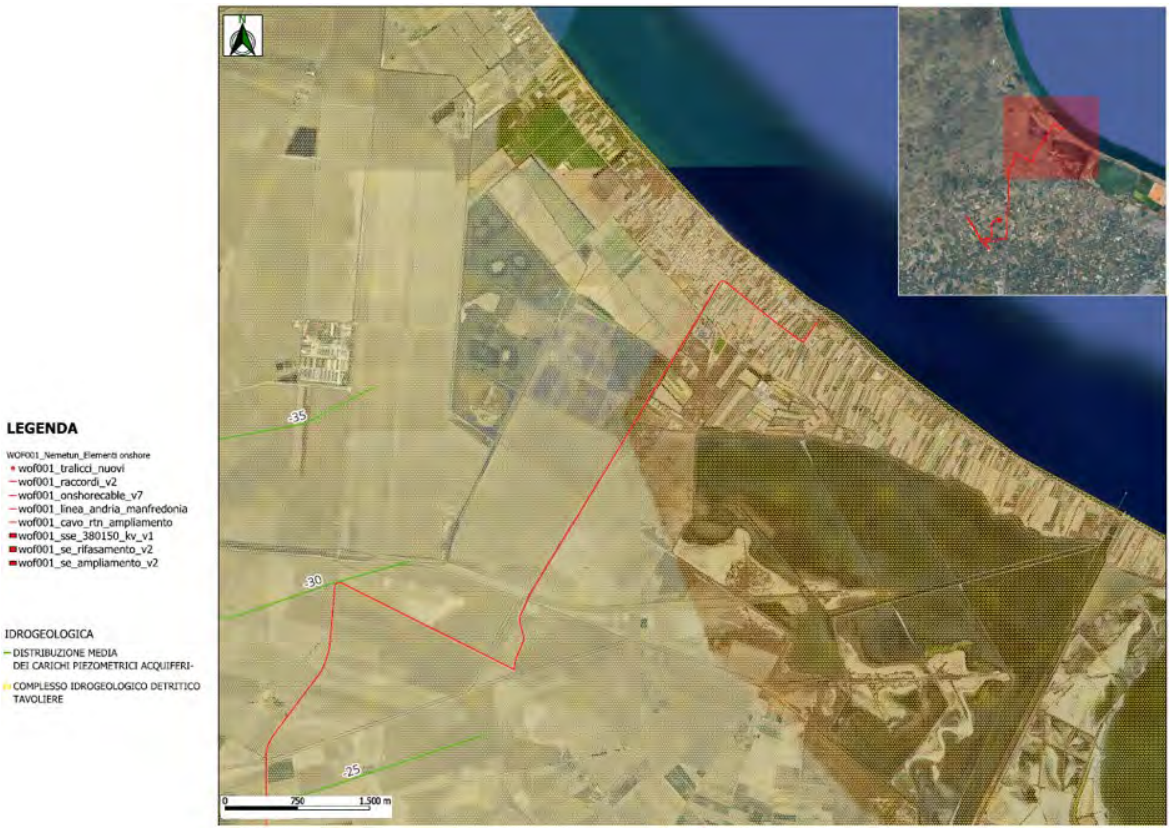
Since there is no real fluvial hydrographic system, the territory is affected by numerous erosive incisions concerning the limestone mass, originating from fracturing of the rock due to tectonic causes and subsequently affected by the short flow of surface waters which have eroded and deepened these incisions, some of which end in endorheic basins (more depressed areas that connect surface waters with deep waters), others reach and flow into the sea.



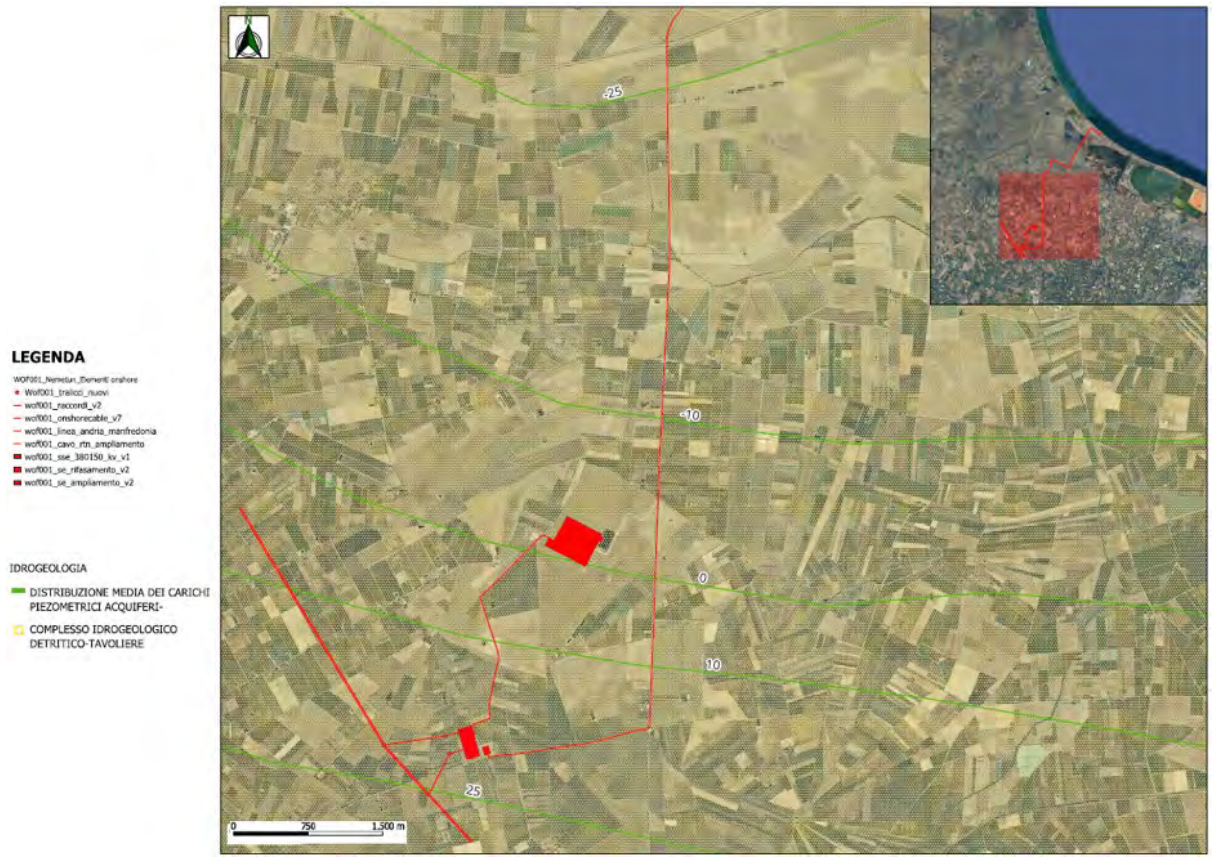
Classification on geological and hydro-geomorphological map – Part N-E of the onshore wind farm



Classification on geological and hydro-geomorphological map – S-W part of the onshore wind farm



Frameworks on hydrogeological map – Part N-E of the onshore wind farm

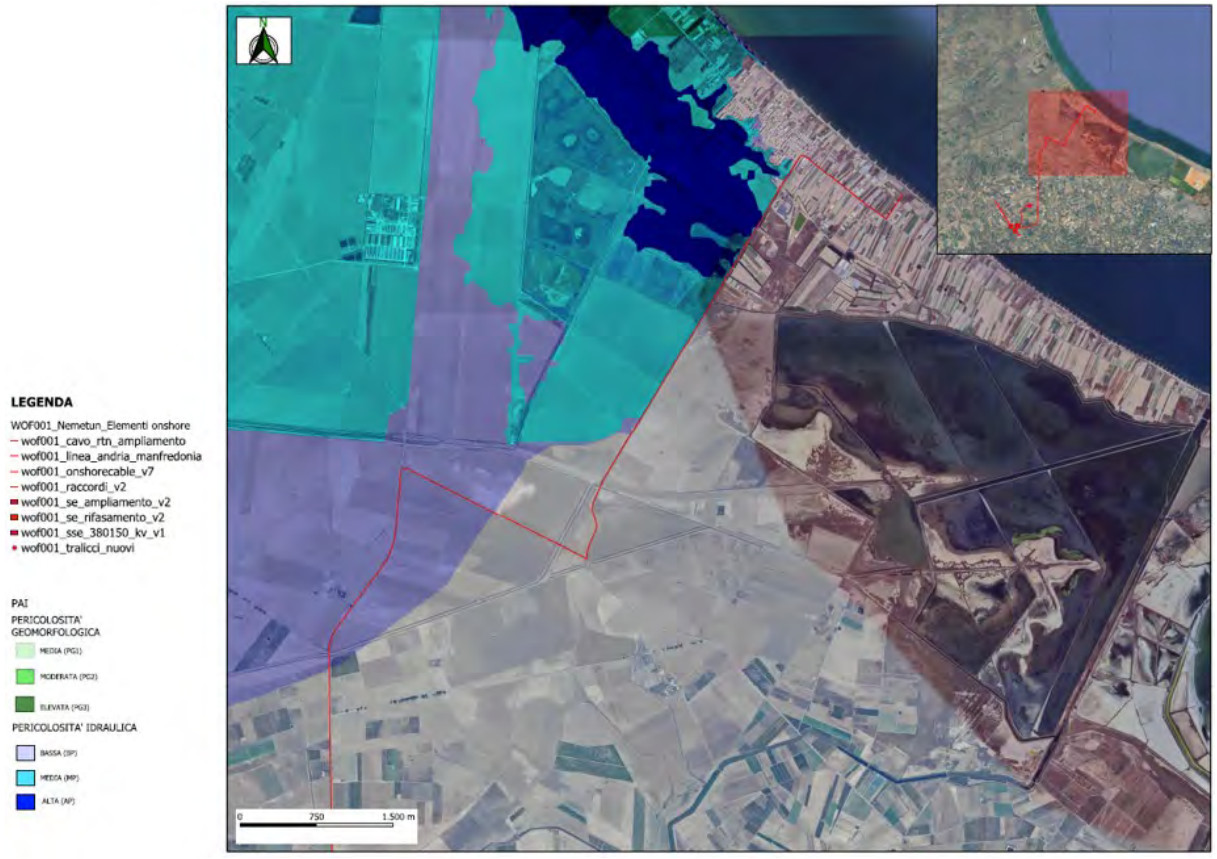


Frameworks on hydrogeological map – S-W part of the onshore wind farm

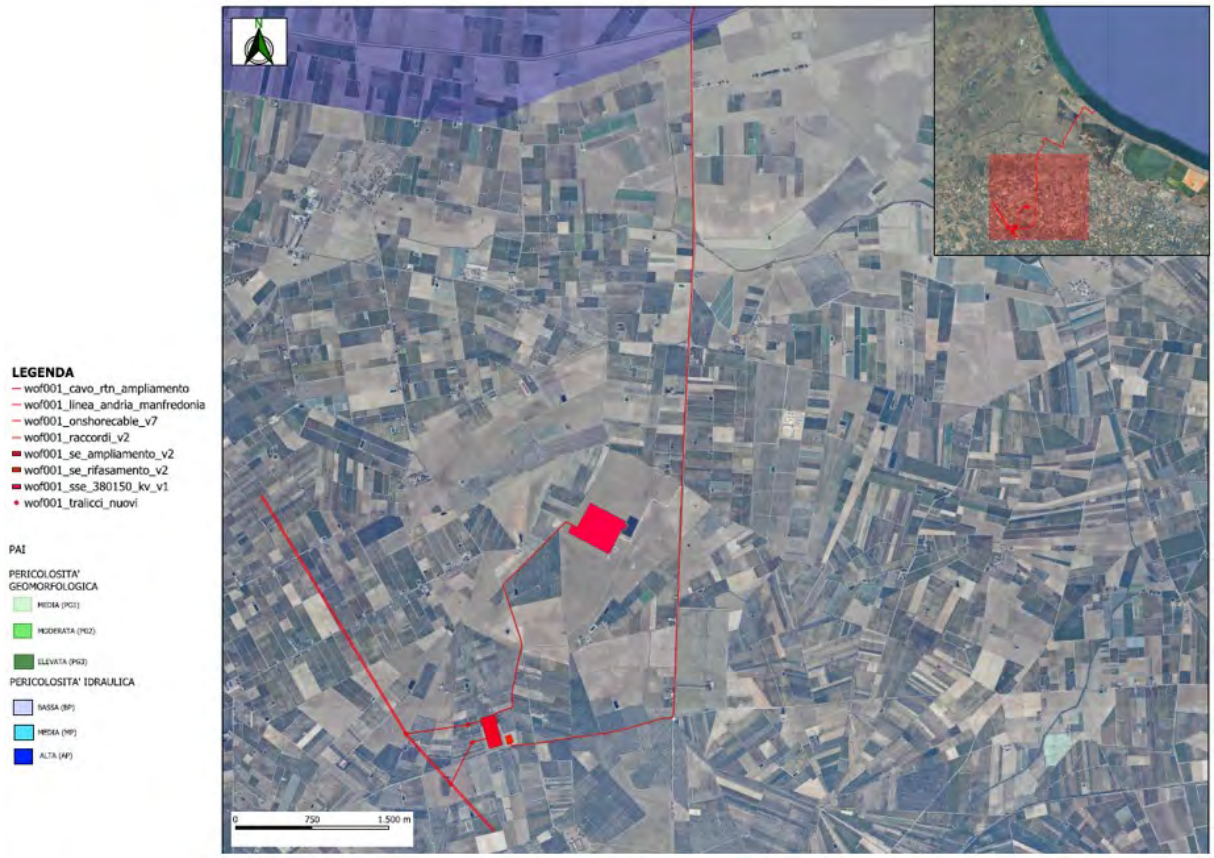
Permeable rocks due to interstitial porosity

This category includes alluvial deposits and anthropogenic deposits, which can be assumed to be permeable **K** Between **$1*10^{-3}$ m/sec and $1*10^{-4}$ m/sec**, while for sandy-calcarenite deposits the value of permeability **K** Between **$1*10^{-4}$ m/sec and $1*10^{-5}$ m/sec**.

Finally, from the Consultation of the "Risk Map" of the Plan for the Defense from Hydrogeological Risk of the District Basin Authority of the Southern Apennines of Puglia, it emerged that in the area under consideration there are PAI perimeters with grade **low, medium and high** with regard to the **Hydraulic hazard**.



Project ground works reported in the updated PAI excerpt of the former AdB Puglia – Part N-E of the onshore wind farm



Project ground works reported in the updated PAI excerpt of the former AdB Puglia – S-W part of the onshore wind farm

4.1.4.2 Seismic framework

From a seismic point of view, Cerignola and Zapponeta are classified in seismic zones no. 2 (low hazard level – areas where fairly strong earthquakes can occur) pursuant to D.G.R. no. 1626 of 15.09.2009, confirmed by the new seismic classification of the Italian territory (March 2022).

Seismic classification 2022 - Ordinance PCM 3274 of 20 March 2003

On the basis of the lithological characteristics of the subsoil that characterizes the site in question (silty sandy alluvial deposits and sandy-calcarenite deposits), it is hypothesized, from a seismic point of view, that the subsoil on which the works will be located is distinguished:

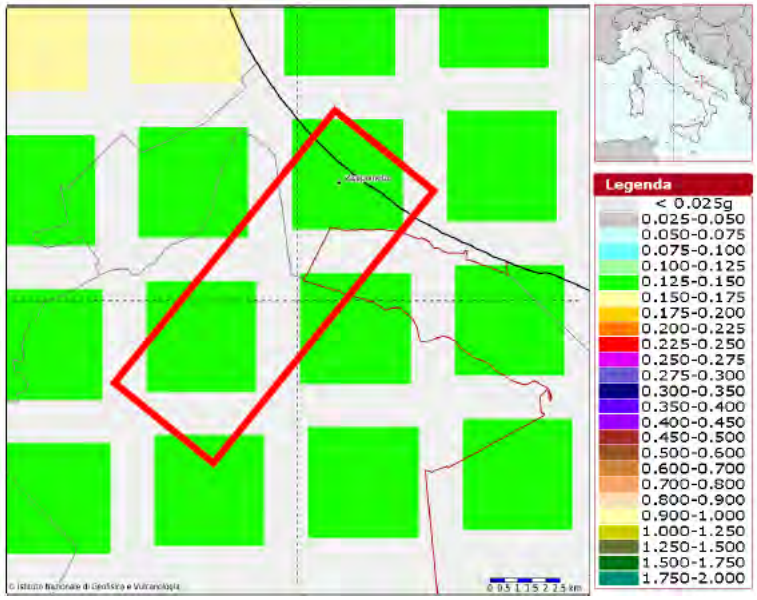
• in the event that alluvial deposits are present that are almost loose, from values of 180 m/s<Vs<360 m/s, for which the soil category of class "C" foundations is assumed, defined according to the NTC 2018, as follows: "Medium-thickened coarse-grained soil deposits or medium-consistent fine-grained soils with a substrate depth greater than 30 m, characterized by an improvement in mechanical properties with depth and equivalent velocity values between 180 m/s and 360 m/s";

• in the event that sandy-calcarenite deposits are present, from values of 360 m/s<Vs<8000 m/s, for which the soil category of class "B" foundations is assumed, defined according to the NTC 2018, as follows: "Soft rocks and deposits of very thickened coarse-grained soils or very consistent fine-grained soils with a substrate depth of more than 30 m, characterized by an improvement in mechanical properties with depth and equivalent velocity values between 180 m/s and 360 m/s".

In the light of current knowledge, it is believed that no particular problems arise in the realization of the work in question. Of course, it will be taken into account what is reported in the Technical Standards for Constructions of January 2018 that the work must be attributed a maximum horizontal acceleration with a probability of exceeding 10% in 50 years between 0.15 g and 0.25 g, equal to a horizontal acceleration of anchoring the elastic response spectrum on the base formation (category "A" soils) equal to ag = 0.25 g.

Seismic zone	*Horizontal acceleration with 10% probability of exceeding in 50 years [ag/d]*	*Horizontal acceleration of anchoring elastic response spectrum [ag/g]*
1	***> 0.25***	***0.35***
2	***0.15 – 0.25***	***0.25***
3	***0.05 – 0.15***	***0.15***
4	***< 0.05***	***0.05***

According to the NTC, the area in question is characterized by an acceleration between 0.125 – 0.150 g, as shown in the figure below, which shows the seismic hazard map for the site in question, with a probability of exceeding 10% in 50 years, referring to rigid soils (category A, Vs>800 m/sec).



Seismic hazard map of the national territory expressed in terms of maximum ground acceleration with probability of 10% excess in 50 years referred to rigid soils (Ordinance 3519-06)

In the light of what has been obtained from the **geological survey and official cartography available**, for the subsoil in question, some considerations are reported below:

- the **foundation soil is largely characterized by silty sandy alluvial deposits** but also from **earth deposits remodeled by human activity and reclamation** while only a small part is affected by the presence of cemented sandy deposits;
- **the foundation soil is to be considered permeable due to porosity**, and considering the shares of most of the territory in question, it is assumed that **the presence of a surface aquifer even within the first 3.0 m from the p.c.**;
- from detailed detection **no evidence of instability was detected** (small landslides or collapses).

From the point of view of **morphological**the **Site of interest**, generally occurs **sub-flat**, locally occupies in both places a summit position of small tabular reliefs, bordered by more or less pronounced escarpments. These escarpments are represented by the walls of the erosive incisions (blades) resulting from tectonic activity first and then from erosive action.

From the point of view of the**hydrography**, **the area of intervention falls within a non-urbanized area**, which contains **widespread natural hydrographic ramifications and artificial canals that flow into the sea**. The proximity of the area to the sea and the very low altitudes compared to it, have meant that marshy areas and anthropologically modified areas for the production of sea salt (Saline di Margherita di Savoia) have formed along the coast.

From the point of view of **hydrogeological**, **Below the area under consideration there is both the deep aquifer and the shallow aquifer** defined as a detrital aquifer, **the latter will probably interfere with the works in the project and with the excavation phase**.

From the consultation of the "Risk Map" of the Plan for the Defense from Hydrogeological Risk of the District Basin Authority of the Southern Apennines of Puglia, it emerged that the entire area close to the coast falls within perimeters with Hydraulic Hazard of Low (BP), Medium (MP) and High (AP) degree.

Since the soil categories in which the land affected by the works would fall have been hypothesized to be "C" where there are alluvial and anthropogenic deposits, and "B" where there are sandy-calcarenite deposits, it is appropriate to carry out seismic tests on site; the same thing for the determination of geotechnical parameters, it is advisable to carry out DPSH type tests also to assess the possible potential for susceptibility to liquefaction.

4.1.5 NATURE AND BIODIVERSITY

4.1.5.1 Birdlife – bibliographic data and monitoring

The analysis data are contained in the monitoring and analysis reports on nature and biodiversity referred to in the series contained in the specialized documentation "*SIA.ES.9_Nature and Biodiversity"*.

The basic documentation transcribed here consists of bibliographic data from the literature and specific analysis data deriving from field monitoring that took place from 2012 to 2019 and in 2022 and 2023.

Birdlife - bibliographic data and reference studies

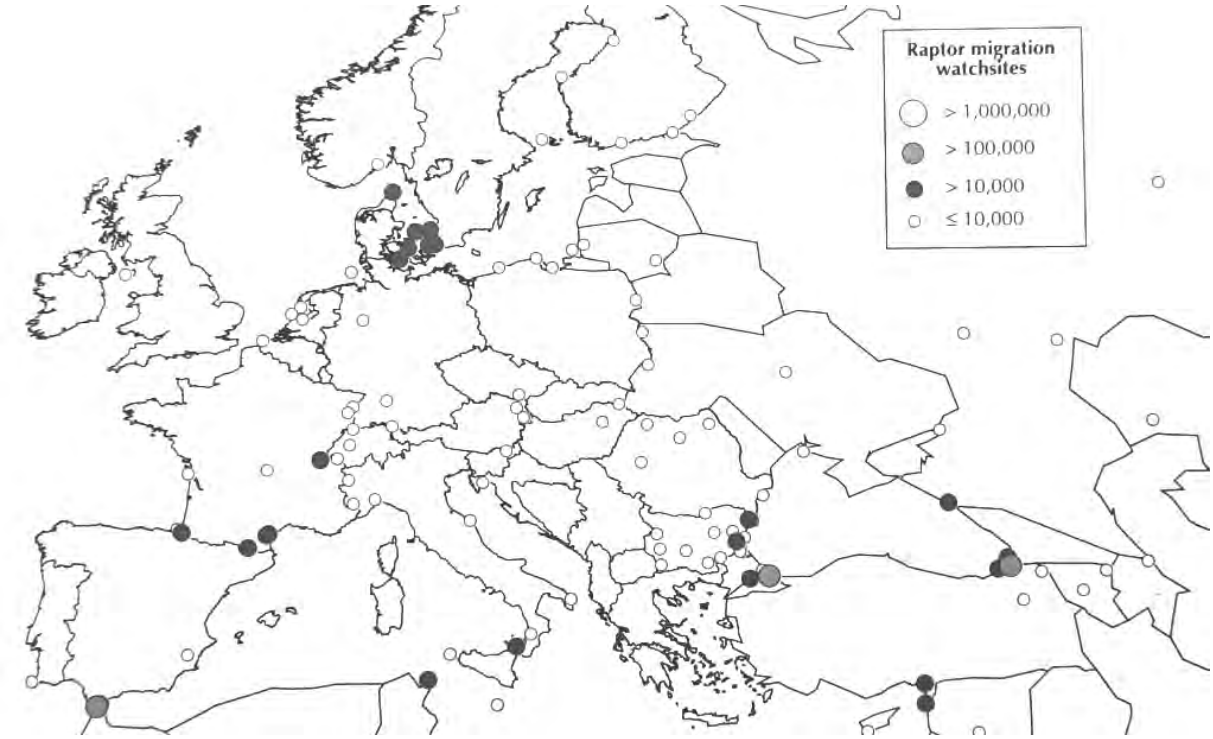
With reference to possible interference between the routes of migratory birds and the plant, it is observed that migration is a very varied phenomenon: there are "vertical", "short-distance" and "long-distance" migratory birds or they are distinguished according to the flight arrangement and even the times (daytime, night). During migration, birds follow very complex routes, dictated by the geomorphology of the territory, the ecology of the species that practice it and on the basis of a historical development of migration.

Diurnal birds of prey (Order Falconiformes) are a rather diverse group of predatory birds, with wide distribution, essentially terrestrial and with a wide capacity for movement that allows them to occupy a wide range of habitats on all six continents. As for the top of the food webs, their populations are particularly sensitive to the alteration of ecosystems (Meyburg & Chancellor, 1994). At least 183 species of birds of prey, about 62% of all birds of prey, show seasonal migratory movements (Zalles, and Bildstein, 2000) and, according to Kerlinger (1989), can be classified into total migratory (19 species), partial (104), and local or irruptive (60). The first two categories include the diurnal birds of prey that are most associated with the idea of migration, with many species that present massive movements, often of tens of thousands of individuals, concentrated in areas of limited extension (bottlenecks – *bottleneckes*) which offer the rare opportunity to observe huge concentrations of birds of prey and monitor their population. Total migratory birds of prey have species in which all individuals of a given population move between a nesting and a wintering area, with little or no overlap. Partial migratory birds, on the other hand, have movements that are carried out only by some members of a population, with a variable degree of overlap between the reproductive and non-reproductive range (Zalles, and Bildstein, 2000; Agostini, 2002). As far as the species of birds of prey present in Europe are concerned, 11 are total migratory and 27 partial migratory; none shows irruptive migratory movements, characteristic of the species of the most extreme climates (Zalles, and Bildstein, 2000).

Birds of prey (especially Accipritiformes) have relatively large dimensions, large wing area and low wing loading that give them ample gliding capabilities, which allows them to take advantage of thermal currents to quickly gain altitude (*Soaring*) and move over long distances by gliding (*gliding*) from one thermal to the next with minimal effort (Brown & Amandon, 1968; Zalles, and Bildstein, 2000; Agostini, 2002; Newton, 2008). Thermal updrafts are formed by differences in air temperature on land, while they are almost completely absent on large water surfaces. It follows that migratory species over medium-long distances tend to concentrate in certain locations near bodies of water that tend to act as natural barriers, or have an "attraction" towards mountain ranges or land formations capable of generating impressive thermal updrafts (Newton, 2008). Birds of prey that use the so-called soaring-gliding flight technique are those that show a greater tendency to migrate in groups (Kerlinger, 1989), an adaptation that allows them to find thermals with greater probability.

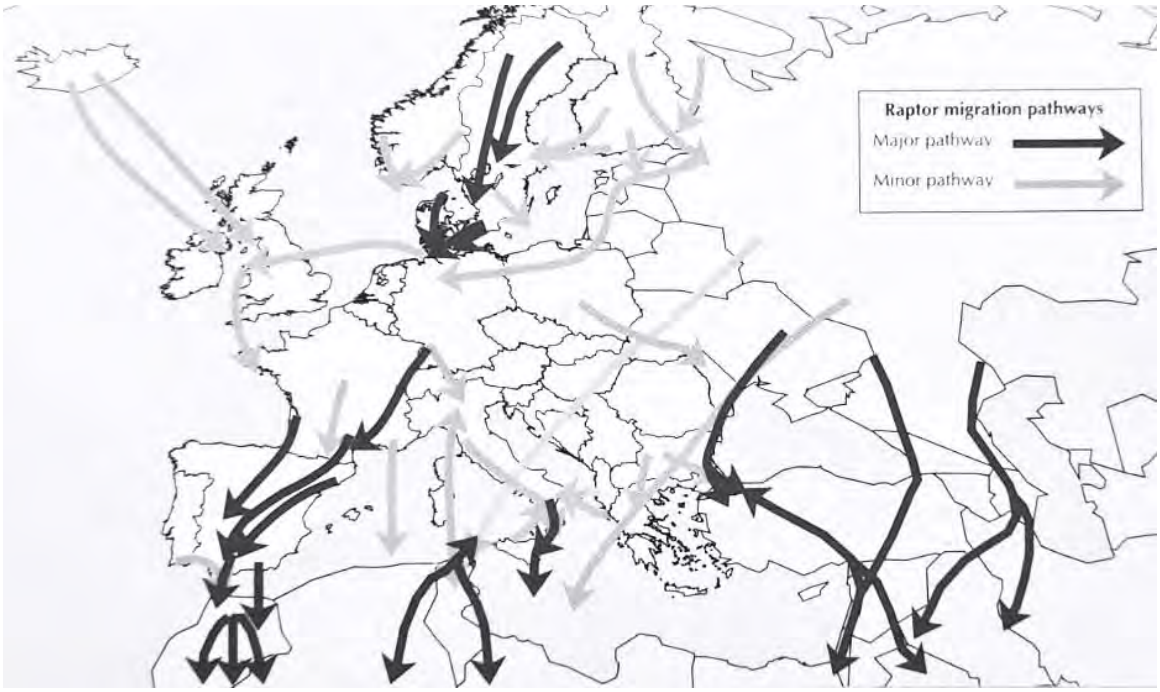
The use of thermals by birds of prey, and other groups such as storks, pelicans and cranes, means that they migrate almost exclusively during daylight hours, when thermals are at their most developed, avoiding long crossings of vast surfaces of water without thermals (Newton, 2008). This migration strategy means that these species tend to use specific crossing points, where the crossing of the stretches of sea is minimal, often with thousands of individuals, concentrated in areas of limited extension (bottlenecks – *bottleneckes*) which offer the rare opportunity to observe huge concentrations of birds of prey and monitor their population.

Zalles and Bildstein (2000) have identified 106 important sites for the migration of birds of prey on a global scale (Figure 2), through which more than 10,000 individuals pass annually. In Europe, 34 sites have been identified, of which 16 concern the central Mediterranean area; of these, 14 are located in Italy, one in Tunisia and one in Malta.



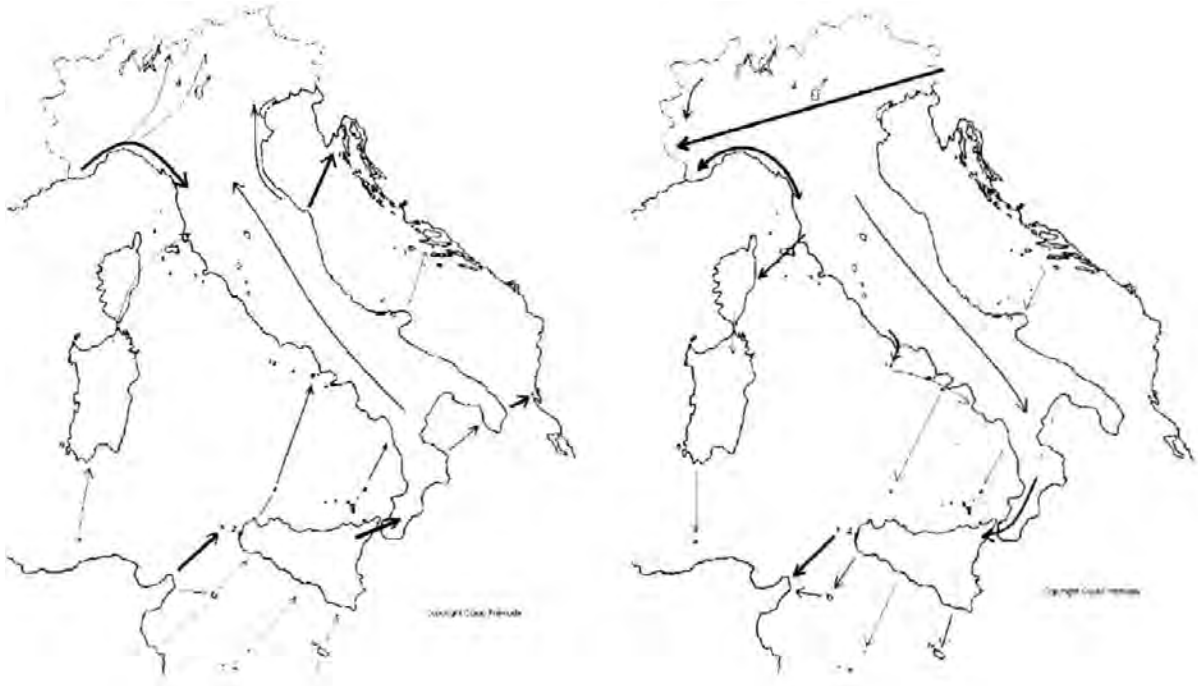
Important sites for the migration of birds of prey in Europe (from Zalles and Bildstein, 2000 modified)

The analysis of the studies conducted in each of the investigated sites has made it possible to elaborate the main migration routes on a global and European scale.



Main migration routes used by birds of prey in Europe (from Zalles and Bildstein, 2000 modified)

On a national scale, Premuda (2005) carried out an analysis of the available data describing the following migration picture. In spring, two main contingents affect our peninsula: one front coming from the west, from the Strait of Gibraltar, then Spain and France and Liguria and then central-northern Italy, while the other from the south/south-west from Tunisia towards the circum-Sicilian islands and the Strait of Messina, the main *bottleneck* Italian with over 10,000 birds of prey observed every year.



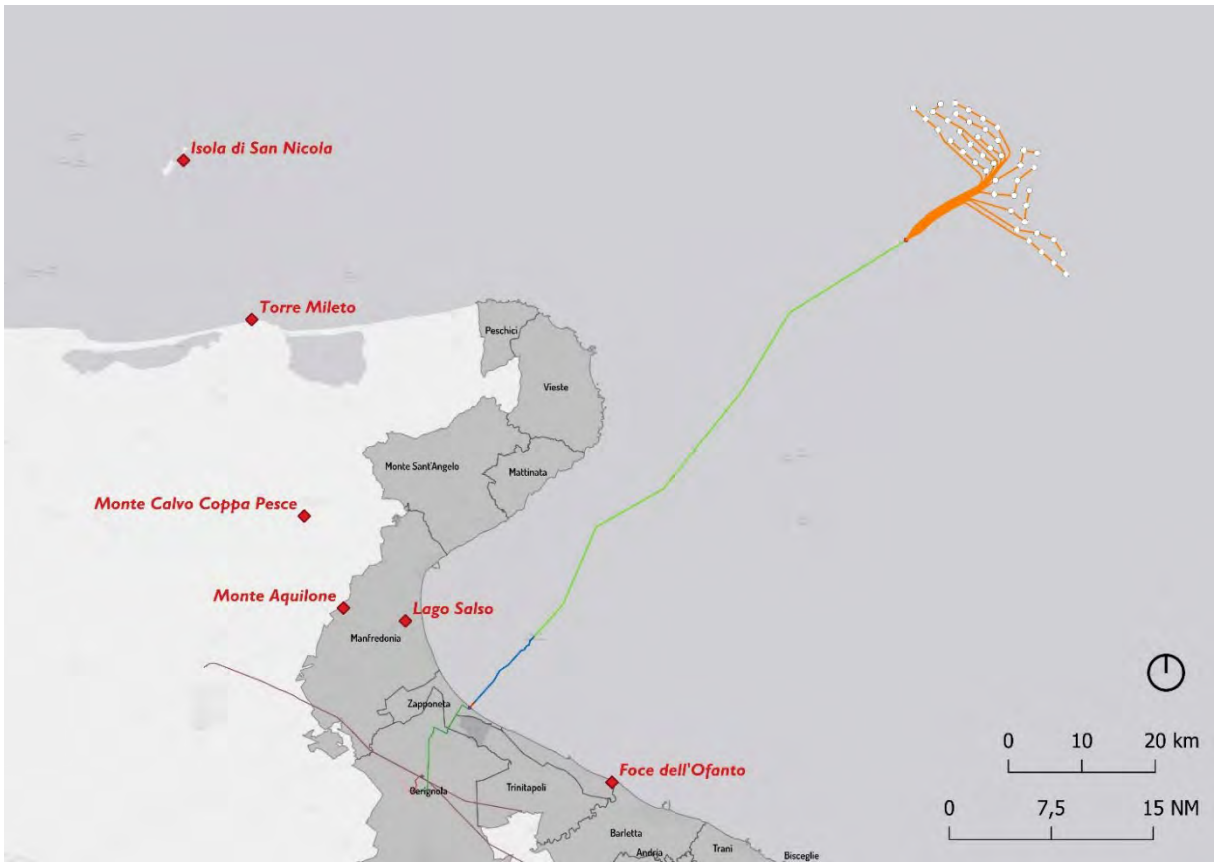
Spring (pre-nuptial) and autumn (post-nuptial) migration of birds of prey in Italy (Premuda, 2005). The main routes are highlighted in bold, while the others are those considered secondary. At the time of the creation of this map, the migratory front of the "Balkan bridge" between the Gargano/Tremiti Islands and the Balkans was considered secondary and of lesser importance compared to more well-known routes, both north and south

The migratory movements that take place across the Adriatic Sea are intense, as documented by the analysis of the "capture" and "recapture" data of ringed birds. The movements are all the more intense the smaller the sea stretch to be crossed. In spring, a good contingent of birds of prey rising along the southern part of the peninsula then tends on two fronts: one heads towards Capo d'Otranto, at the southern end of Puglia, while the other follows the Apennine chain and the Adriatic coast to cross the sea at Monte Conero and other Marche mountains. Precisely between the latter two routes, considered the main ones of the so-called "*Adriatic Flyway*" for birds of prey, the Tremiti Islands and the Gargano promontory are located. Several studies have been conducted on the role of Capo d'Otranto as a migratory bridge between Italy and the Balkan peninsula (Premuda, 2005; Premuda et al., 2004; La Gioia, 2009; Mellone et al., 2011). According to the authors, from the point of view of migratory movement, the site represents, at least for some species, a probable "bridge" for the crossing of the Adriatic towards the Balkan peninsula. So only a part of the contingents or species migrating to Capo d'Otranto would continue the migration through Puglia. As far as the site of the Tremiti Islands is concerned, the results of several studies of migration, birds of prey and large gliders, (Premuda, 2003 and 2005; Marrese et al., 2005 and 2006; Pandolfi et al., 2008) confirm the importance of this site and the whole promontory for the study of the spring migration of birds of prey in the Mediterranean. In the light of the data collected so far, the migration to the Tremiti Islands can be considered numerically comparable to some observation points further north, such as the area of Monte San Bartolo in the Marche region, especially for species such as the Honey Buzzard, the Marsh Harrier and the Cuckoo Harrier (*Falco vespertinus*), which in order make up the majority of the presences in the spring period.

Birds – monitoring migration flows

Between 2012 and 2019 and in 2022 and 2023, a bird monitoring activity was carried out in the area of the project wind farm.

In order to understand the migratory phenomenon, in the central-northern sector of the Apulian coast, the data of several strategic sites for the migration of birds available in the literature have been analyzed and several survey sites have been chosen in the area of the Gulf of Manfredonia and the Gargano Promontory, both in the spring and autumn periods. From the analysis of the available data, it seemed appropriate to concentrate the survey activities in two sites; the archipelago of the Tremiti Islands and the coastal site of the mouth of the Ofanto. The first site was selected as it represents the most important known migratory transit site in the vicinity of the offshore wind farm layout. The coastal survey site of Foce Ofanto was identified in order to understand whether the migratory routes in this area were at least partly attributable to a possible crossing of the Adriatic and therefore falling within the so-called Balkan bridge or following the coastline.



Localization of migration monitoring sites

In all the sites studied, monitoring was carried out from a fixed location, according to the methods reported in the international protocols for the verification of the migrations of gliders and birds of prey. Monitoring from a fixed location was carried out continuously from 9.30 a.m. to 5.30 p.m. for a total of 8 hours a day (for the period mid-October-November the times were as follows: from 9.00 a.m. to 5.00 p.m.). Before and after this standardized time slot, however, data were collected in "itinerant" mode, generally from shortly after sunrise until sunset. During the observation session of birds of prey and large gliders, information was collected on the day and time of sighting, sex, age, direction of flight (both direction of origin or approach and direction of disappearance or departure), the direction of passage with respect to the observer (whether east or west or if exactly above it) and any notes. The meteorological data were reported every day on the field card on an hourly basis.

As regards the monitoring activities carried out in the Tremiti archipelago, on the island of San Nicola, the monitoring was carried out from a fixed location on the island of San Nicola, in the central part of the Tremiti archipelago, adopting the same survey point both during the pre-reproductive monitoring period (spring

2022 and 2023) and in the post-reproductive period (autumn 2022). The choice of the observation point, located at a height of about 40 m above sea level, was made on the basis of the view available over the entire archipelago, as well as on the basis of the development of updrafts right at the cliffs on the sides of the post, a factor that has often favored the close observation of birds of prey in thermals.

Anno	Primavera	Autunno	Siti di rilevamento
2012	maggio	No-data	Lago Salso
2013	No-data	No-data	No-data
2014	No-data	Settembre-Ottobre	Lago Salso, M. Calvo
2015	aprile-maggio	Settembre-Ottobre	Lago Salso, M. Calvo, I. Tremiti
2016	aprile-maggio	No-data	I. Tremiti
2017	aprile-maggio	Settembre-Ottobre	M. Calvo, I. Tremiti, M. Aquilone
2018	maggio-giugno	Settembre-Ottobre	M. Calvo, I. Tremiti, T. Mileto
2019	maggio-giugno	Settembre-Ottobre	M. Calvo, I. Tremiti, T. Mileto
2020	No-data	No-data	No-data
2021	No-data	No-data	No-data
2022	maggio	Ottobre	I. Tremiti

Year and period of study for each of the sites investigated

Below are the results of the monitoring carried out and the timeline of the activities in the field.

SPECIE	2012 oasi lago salso	tot.prim. 2012	2015 oasi lago salso	2015 m.calvo	2015 tremiti	tot.prim. 2015	2016 tremiti	tot.prim. 2016	2017 m.calvo	2017 m.aquilone	2017 tremiti	tot.prim. 2017	2018 m.calvo	2018 t. sitesimileto	2018 tremiti	tot.prim. 2018	2019 m.calvo	2019 t.mileto	2019 tremiti	tot.prim. 2019	%	Tot. primavera 2012-2019
01-Albanella minore	49	49	2	59	1	62	10	10	5	21	21	47	1	3	2	6				0	1,98	174
02-Albanella pallida	4	4	0	15	0	15	5	5			4	4				0				0	0,31	28
03-Albanella reale	0	0	6	0	0	6	2	2	3		2	5				0				0	0,14	13
04-Albanella sp.	0	0	0	0	0	0	4	4				0				0				0	0,04	4
11-Biancone	1	1	0	16	0	16		0		1		1	2			2				0	0,76	20
12-Capovaccaio	0	0	0	0	0	0	1	1				0				0	1			1	0,28	2
13-Cicogna bianca	477	477	4	22	0	26	125	125	84	15		99	35			35				0	8,29	762
14-Cicogna nera	0	0	0	7	3	10	3	3	1		4	5	2		1	3			1	1	0,25	22
15-Falco cuculo	124	124	0	102	9	111	3	3	26	16	13	55				0			4	4	3,38	297
16-Falco della Regina	0	0	0	2	6	8	2	2	1		2	3				0				0	0,14	13
17-Falco di Palude	145	145	63	218	102	383	262	262	45	52	240	337	15	9	33	57	4	2	17	23	13,73	1207
18-Falco pescatore	2	2	1	6	0	7	6	6		1	5	6			2	2				0	0,26	23
19-Gheppio	0	0	7	4	3	14	1	1			19	19			5	5				0	0,44	39
20-Grillaio	563	563	13	34	2	49		0	5	31		36				0				0	7,37	648
21-Gheppio/Grillaio	0	0	0	10	3	13		0				0				0				0	0,148	13
22-Lanario	0	0	0	2	0	2		0				0				0				0	0,02	2
23-Lodolaio	1	1	0	24	6	30	6	6	4	2	13	19	1	1	1	3			1	1	0,68	60
25-Nibbio bruno	6	6	0	13	6	19	15	15	2	2	11	15			3	3	2		2	4	0,70	62
26-Nibbio reale	0	0	0	0	0	0		0	1			1				0				0	0,01	1
27-Pecchiaiolo	274	274	0	424	1430	1854	250	250	561	259	353	1173	141	57	1162	1360	36		205	241	58,63	5152
28-Pellegrino	13	13	3	0	0	3		0				0				0				0	0,18	16
29-Poiana	67	67	15	20	1	36	16	16			17	17		7	6	13				0	1,69	149
31-Poiana codabianca	0	0	0	0	0	0		0	1			1	1			1				0	0,02	2
33-Sacro	0	0	0	0	0	0	1	1			1	1				0				0	0,02	2
34-Smeriglio	0	0	2	1	0	3		0				0				0				0	0,03	3
35-Sparviere	0	0	5	4	1	10	19	19	1		21	22				0				0	0,58	51
39-Gru	0	0	0	1	0	1		0			19	19				0				0	0,22	20
53-Aquila imperiale	0	0	0	0	0	0		0				0				0	1			1	0,01	1
TOTALI GENERALI	1726	726	121	984	1573	2678	731	731	740	400	745	1885	198	77	1215	1490	44	2	230	276	100	8786

General summary of data 2012-2019 – spring period

SPECIE	2014 oasi lago salso	2014 m.calvo	tot.autunno 2014	2015 oasi lago salso	2015 m.calvo	tot.autunno 2015	2017 m.calvo	2017 m.aquilone	2017 tremiti	tot.autunno 2017	2018 m.calvo	2018 t.milero	2018 tremiti	tot.autunno 2018	2019 m.calvo	2019 t.milero	2019 tremiti	tot.autunno 2019	%	Tot. autunno 2012-2019
01-Albanella minore	15		15	7	4	11	1	5	7	13	6	2	2	10	2	1	1	4	1,19	53
02-Albanella pallida	0		0	0	1	1				0				0	1			1	0,04	2
03-Albanella reale	17	8	25	0		0	5	16	9	30				0			7	7	1,39	62
04-Albanella sp.	0		0	6		6				0				0			3	3	0,20	9
06-Aquila anatraia min.	0		0	0		0				0			1	1			1	1	0,04	2
08-Aquila minore	0		0	0		0			2	2				0				0	0,04	2
10-Astore	0		0	0		0				0				0	1			1	0,02	1
11-Biancone	2		2	0		0				0	1			1	4		1	5	0,18	8
13-Cicogna bianca	18		18	0		0			3	3			21	21				0	0,94	42
14-Cicogna nera	0		0	0		0			2	2			10	10			8	8	0,45	20
16-Falco della Regina	0		0	1	1	2			3	3			1	1	1		2	3	0,20	9
17-Falco di Palude	239	58	297	612	530	1142	43	124	213	380	50	23	124	197	58	28	157	243	50,95	2259
18-Falco pescatore	2	1	3	4	4	8			1	1			1	1	1	1	1	3	0,36	16
19-Gheppio	26	31	57	2	2	4	10	2	27	39	3	2		5	3		1	4	2,45	109
20-Grillaio	127		127	0		0		4	17	21			9	9	4			4	3,63	161
22-Lanario	0		0	0		0		1		1				0				0	0,02	1
23-Lodolaio	2		2	35	105	140			22	22	2		4	6	12		26	38	4,69	208
25-Nibbio bruno	0		0	4	4	8			6	6			10	10	1		1	2	0,58	26
26-Nibbio reale	0		0	0		0			2	2			2	2	1		6	7	0,24	11
27-Pecchiaiolo	6		6	55	112	167		12	157	169	8		46	54	21	4	95	120	11,64	516
28-Pellegrino	16	1	17	0		0	2	4		6	2	1	1	4	1		2	3	0,67	30
29-Poiana	51	161	212	4	4	8	63	33	49	145	49	13	10	72	7		15	22	10,3	459
31-Poiana codabianca	0		0	0		0				0				0	1			1	0,02	1
32-Poiana delle steppe	0		0	0		0			1	1				0				0	0,02	1
34-Smeriglio	2		2	0		0		3	6	9				0				0	0,24	11
35-Sparviere	8	15	23	34	57	91	7	14	92	113	15	2	39	56	13		64	77	8,11	360
39-Gru	0		0	0		0			40	40			7	7				0	1,06	47
49-Grifone	0		0	0		0			1	1				0				0	0,02	1
50-Sula	0		0	0		0			1	1				0				0	0,02	1
51-Airone b.magg.			0			0			5	5				0				0	0,11	5
52-Uccello delle t.			0			0			1	1				0				0	0,02	1
TOTALI GENERALI	531	275	806	764	824	1588	131	218	667	1016	136	43	288	467	132	34	391	557	100	4434

General summary of data 2012-2019 – autumn period

Specie	tot. ind.	%
Albanella minore	1	3,45
Albanella reale	1	3,45
Cicogna bianca	1	3,45
Falco di Palude	13	44,83
Gheppio	2	6,90
Grillaio	6	20,68
Pellegrino	1	3,45
Poiana	4	13,79
TOTALI GENERALI	29	100

Percentages for the most representative species (percentages greater than 1%) – Mouth of the Ofanto River, spring 2022

Specie	Numero	%
Albanella minore	2	0,54
Albanella sp.	4	1,07
Falco di Palude	252	67,92
Gheppio	2	0,54
Lodolaio	25	6,74
Pecchiaiolo	51	13,75
Poiana	4	1,07
Sparviere	27	7,27
Totale	371	

Percentages for the most representative species (percentages greater than 1%) – Mouth of the Ofanto River, Autumn 2022

#	SPECIE	Tot ind	%
1	Airone cenerino	17	0,50%
2	Airone rosso	26	0,77%
	Albanella indet.	4	0,12%
3	Albanella minore	22	0,65%
4	Albanella pallida	1	0,03%
5	Albanella reale	2	0,06%
6	**Cicogna nera**	**8**	**0,24%**
7	Cormorano	44	1,30%
8	**Falco cuculo**	**73**	**2,15%**
9	**Falco della Regina**	**11**	**0,32%**
10	**Falco di palude**	**1156**	**34,10%**
11	**Falco pecchiaiolo**	**1491**	**43,98%**
12	Falco pellegrino	7	0,21%
	Falco pellegrino siberiano (ssp.)	1	0,03%
13	Falco pescatore	9	0,27%
	Falco sp.	15	0,44%
14	Garzetta	1	0,03%
15	**Gheppio**	**161**	**4,75%**
	Gheppio/Grillaio	72	2,12%
16	Grillaio	9	0,27%
17	Gru	1	0,03%
18	Gufo di palude	1	0,03%
19	Lodolaio	37	1,09%
20	Nibbio bruno	13	0,38%
21	Nitticora	21	0,62%
22	Poiana	10	0,29%
	Poiana delle steppe (ssp.)	1	0,03%
	Poiana indet.	3	0,09%
	Rapace indet.	5	0,15%
23	**Smeriglio**	**3**	**0,09%**
24	**Sparviere**	**165**	**4,87%**
	TOTALE	**3390**	**100,00%**

SPECIE	Tot individui	%
Accipiter sp.	1	0,05%
Airone bianco maggiore	11	0,57%
Airone cenerino	**173**	**8,95%**
Airone guardabuoi	1	0,05%
Airone rosso	1	0,05%
Albanella indet.	1	0,05%
Albanella minore	1	0,05%
Albanella minore/pallida	1	0,05%
Albanella pallida	1	0,05%
Albanella reale	**17**	**0,88%**
Astore	5	0,26%
Cicogna nera	1	0,05%
Circus sp.	1	0,05%
Cormorano	**306**	**15,82%**
Falco cuculo	2	0,10%
Falco della Regina	**18**	**0,93%**
Falco di palude	**145**	**7,50%**
Falco pecchiaiolo	27	1,40%
Falco pellegrino	3	0,16%
Falco pellegrino siberiano (*ssp.calidus*)	**10**	**0,52%**
Falco pescatore	4	0,21%
Falco sp.	9	0,47%
Gheppio	150	7,76%
Gheppio/Grillaio	7	0,36%
Grillaio	3	0,16%
Gru	1	0,05%
Lodolaio	33	1,71%
Nibbio bruno	3	0,16%
Nibbio reale	4	0,21%
Nitticora	1	0,05%
Poiana	25	1,29%
Rapace indet.	4	0,21%
Smeriglio	**47**	**2,43%**
Sparviere	**917**	**47,41%**
TOT	1934	100,00%

Total number of individuals (only birds of prey and gliders) detected during the spring (left) and autumn (right) monitoring period in the Tremiti Islands. In bold are the species that have contributed the most in percentage terms or whose totals are numerically interesting. The subspecies are shown in italics, while the indeterminate species are highlighted in gray

The data collected, in over ten years of observation, have on the one hand confirmed what is known in the literature about the importance of the Tremiti Islands in the so-called "Adriatic Flyway" for birds of prey and large gliders. The Tremiti represent an important bottleneck site along the so-called Balkan bridge that connects the migration front of the Italian peninsula with that of the Balkans.

On the other hand, the data collected show, as expected, that the crossing of the Adriatic by birds of prey and gliders takes place almost exclusively north of the Gargano along the route that connects the Tremiti to the Pelagosa islands, while no migration fronts have been recorded on E-W routes in the sites studied south of the Gargano.

The width of the Adriatic south of the Gargano Promontory exceeds 200 km without any island capable of providing the fundamental thermals necessary for birds of prey and you have gliders to make flights over long distances.

Spring migration routes for each site investigated; in red the main approach routes and in light blue the departure routes

Autumn migration routes for each site investigated; in red the main approach routes and in light blue the departure routes

Birdlife – site-specific monitoring

Between 2023 and 2024, a bird monitoring activity was carried out in the area of the project's wind farm. This survey mainly examined seabirds, i.e. species linked to the pelagic and coastal environment, focusing on those that can be regularly observed in the central and southern Adriatic and that are included in the main conservation lists: Directives 147/2009/EC; 56/2008 EC and IUCN Red List (EN, VU). However, most of the migratory species present in central-eastern Europe are potentially found in the area, as already extensively described in the previous paragraph, but the area of investigation does not represent an "obligatory passage" for migratory birds and therefore both from a qualitative and quantitative point of view it is rather complex to hypothesize the regular species in the stretch of sea under consideration.

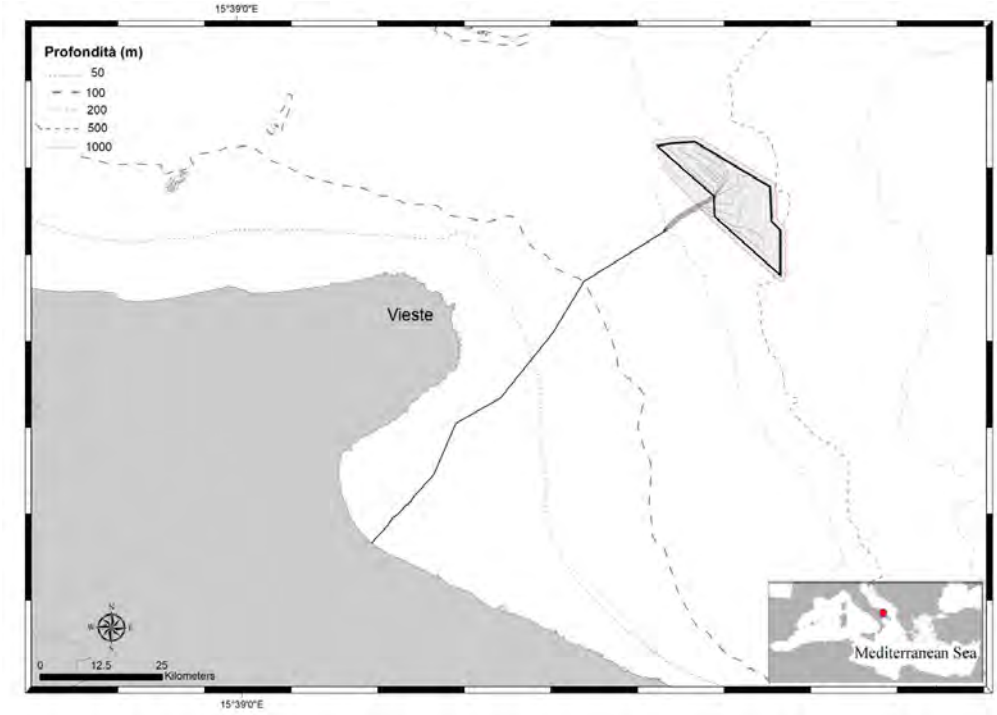
The complete list of marine species potentially observable in the study area is shown in the following table:

Species		Dir. Birds	Marine Strategy	IUCN	Phenology	Target Study area
Eider	*Very soft somateria*		X	NT	Mi, Wi	X
Sea Ogre	*Melanitta fusca*		X	VU	Mi, Wi	X
Scoter	*Melanitta nigra*		X	LC	Mi, Wi	X
Red-breasted merganser	*Mergus serrator*		X	LC	M, W	X
Great crested grebe	*Podiceps cristatus*			LC	M, W, SB	
Black-necked grebe	*Podiceps nigricollis*		X	LC	M, W, Bi	X
Black-throated diver	*Gavia arctica*	The	X	LC	W, Mi	X
Red-throated diver	*Starry Gavia*	The	X	LC	Wi	X
Storm bird	*Hydrobates pelagicus*	The	X	LC	Me	X
Cory's Shearwater*	*Calonectris diomedea*	The	X	LC	B, M	X
Manx shearwater*	*Puffinus yelkouan*	The	X	VU	B, M, W	X
Gannet	*Morus bassanus*			LC	M, W	
Cormorant	*Gulosus aristotelis*	The	X	LC	SB, M	X
Cormorant	*Phalacrocorax carbo*			LC	M, W, B	
Little gull	*Hydrocoloeus minutus*	The		LC	M, W	
Kittiwake*	*Tridactyla brawl*			VU	M, W	
Rosy gull	*Larus genei*	The		LC	M, B, W	X
Black-headed Gull*	*Larus ridibundus*			LC	M, W, Bi	
Mediterranean gull*	*Larus melanocephalus*	The		LC	M, W, Bi	X
Audouin's Gull	*Larus audouinii*	The	X	VU	SB, M	X
Common gull	*Larus canus*			LC	M, W	
Saffron	*Larus fuscus*			LC	M, W	
Northern herring gull	*Larus argentatus*			LC	W, M	
Herring gull*	*Larus michahellis*			LC	M, W, SB	
Pontic herring gull	*Larus cachinnans*			LC	M, W	
Little tern	*Sternula albifrons*	The		LC	M, B, Wi	X
Gull-billed tern	*Gelochelidon nilotica*	The		LC	M, B, Wi	X
Greater tern	*Hydroprogne caspia*	The		LC	M	
Leaded mignattino	*Chlidonias hybrida-*	The		LC	M	X
White-winged tern	*Chlidonias leucopterus*			LC	M	

Common Tern*	*Chlidonias niger*	**The**		**LC**	**M**	**X**
Common Tern	*Tern hirundo*	**The**		**LC**	**M, Bi**	**X**
Sandwich tern*	*Thalasseus sandvicensis*	**The**	**X**	**LC**	**M, W, Bi**	**X**
Labbo	*Stercorarius parasiticus*			**LC**	**M, W**	
Long-tailed lip	*Stercorarius longicaudus*			**LC**	**At**	
Middle skua	*Stercorarius pomarinus*			**LC**	**At**	

In column 3 the species included in annex. I of the Birds Directive (147/2009 EC); in column 4 the target species pursuant to the Marine Strategy in Italy (56/2008 EC); in column 5 the species considered vulnerable (VU), near threatened (NT) or of least concern (LC) globally according to the IUCN Red List; in column 6 the phenological status at the regional level (study area) according to the most recent update of the check-list (Liuzzi et al., 2013): A = accidental; B = nesting; M = migratory, W = wintering; i=irregular. In column 7 the target species of the present study. * Species observed during monitoring activities

The monitoring activities of the Nemetun Island wind farm area were carried out in the four seasons between 2023 and 2024. All the activities were carried out by means of a dinghy with a length of 8 m, equipped with 2 Yamaha engines of 150 hp each owned by Bio-Consulting S.r.l. The activities were carried out by professional ornithologists, in possession of specific qualifications (ISPRA_IWC qualification) and many years of experience on aquatic and marine birds. Monitoring was carried out only in Douglas ≤ 3 and Beaufort ≤ 3 scale conditions and in good visibility conditions.



Identification of the study area

The monitoring is mainly dedicated to the seabirds nesting in the Mediterranean (Cory's shearwater, Mediterranean shearwater, storm bird), and to the main species of wintering seabirds (sternids, deep-sea larids, dungs), in order to estimate their densities (number of individuals/km^2) on standardized linear transects (line transects), based on the principles of distance sampling. Only birds, in flight or perched in the water, that are within an imaginary strip 300 m wide and perpendicular to the direction of navigation are taken into account and counted, all other observations have however been noted on the field cards as (extra-transect). The counting of birds in the transect was carried out in time intervals (poskeys) lasting 5',

with a constant speed of the boat of 6 knots. The sighting of the birds was done with the naked eye and the recognition thanks to binoculars (8-10x32 or 42), dedicated digital applications, camera with 300-400mm telephoto lens, bird field guides. General transect data (day, start time, end time, course, speed) are entered in the Weather tab. At the time of a sighting, the appropriate "Data collection sheet: birds" is filled in which the following are noted: the code of the GPS point, the solar time, the GPS coordinates of the sighting point, the observation side (SIDE), the value of the band in which the contact is located (Strip sector, A/B/C/D/E; in the movement flight F is used), and other contact specifics (species, n individuals, age, directions of flight, etc.).

The behaviour of some species that forage (seabirds) or perch in the sea (seabirds, ducks) is indicated in the corresponding cell of the card with Water or Flight. If you observe birds perching on board, the time spent on the ship is marked, indicating the event with Ship in the cell of the card. The time of arrival coincides with the time of sighting and to estimate the time of departure, the place where the bird has landed should be checked every 5-10 minutes.

Gender and any other notes are indicated in the Behavior column.

Data collection sheet: Birds

Cod. transect n **Date** **Observer** **Ship name**

COD GPS	TIME	Ship position		SIDE	WATER/ FLYING/ SHIP	SPECIES	N	N juv	Strip sector	DISTANCE		ANGLE	BEHAVIOUR
		Y	X							eye	telemeter		

Excerpt from the field survey form of the birdlife

The direction of flight of migratory birds encountered along the transect are also recorded. The flight direction of the individual or flock is recorded by placing itself in a line parallel to their direction and using the on-board instrumentation (if possible) or the GPS compass crossed with the direction of the ship to correct the compass reading error due to the magnetism of the ship. This is especially true for migratory birds that fly in beaten or mixed flight (beaten with glides). In the case of migratory gliders (ciconids, accipitrids) using thermal soaring birds, the direction of flight is taken before the thermal vaulting begins or after it ends, i.e. as soon as the direction of movement towards the horizon (direction of vanishing) is evident.

However, they are noted on the card, in full and indicating in the footnote: OB (Off band), if they are out-of-band observations, or OS (Off sampling) if they are random or paused observations:

- the birds accompanying the ship (with the estimated accompanying time);
- observations of rare and/or particular species (e.g. shears, dung) outside the 300 m lateral strip,
- generally all observations judged interesting by the observer.

The monitoring activity was conducted over 20 days between December 2023 and July 2024, divided into the different seasons:

- Autumn: 8-9-10-11-12 December;
- Winter: 22-23 January and 16-17-18 February;
- Primavera: -5-12-13-14; 18 May;

- Summer: 11-12-13-14-15 July.

The overall sampling effort was 411.6 NM. The total sightings were 125 and involved 356 individuals of 8 different marine species. The species with the highest number of contacts is the Herring Gull (n=36); which is also the most abundant (34.3% of total individuals). Among the target species of this survey, the presence of the Cory's Shearwater (24.7% of individuals) and the Black-headed Gull (19.38%) is highlighted.

The observations made would seem to confirm the unrepresentativeness of the area with regard to the main migratory routes; in fact, in the face of the overall sampling effort, no evidence to this effect has emerged; however, the numerous variables must be considered in order to fully understand the real migratory flow and continuous monitoring is essential for the entire period both during spring and autumn.

The season with the highest number of contacts and individuals observed was autumn, mainly thanks to the presence of numerous shearwaters and Laridae.

79.2% of the observations concerned individuals in flight and of these as many as 92.9% at heights between sea level and 50 m.

Species observed in different seasons in the study area

	Autumn	Winter	Spring	Summer
Procellariiformes				
Procellariidae				
Calonectris diomedea			X	X
Puffinus yelkouan	X	X	X	X
Charadriiformes				
Laridae				
Tridactyla brawl	X			
Larus ridibundus	X	X		
Larus melanocephalus	X	X	X	
Larus michahellis	X	X	X	X
Thalasseus sandvicensis		X		
Chlidonias niger				X

Please refer to the *ES.9.1_01_Avifauna - Monitoring of migratory routes* and *ES.9.2_02_Avifauna - marine area monitoring* for the necessary insights.

4.1.5.2 Marine fauna – bibliographic data and monitoring

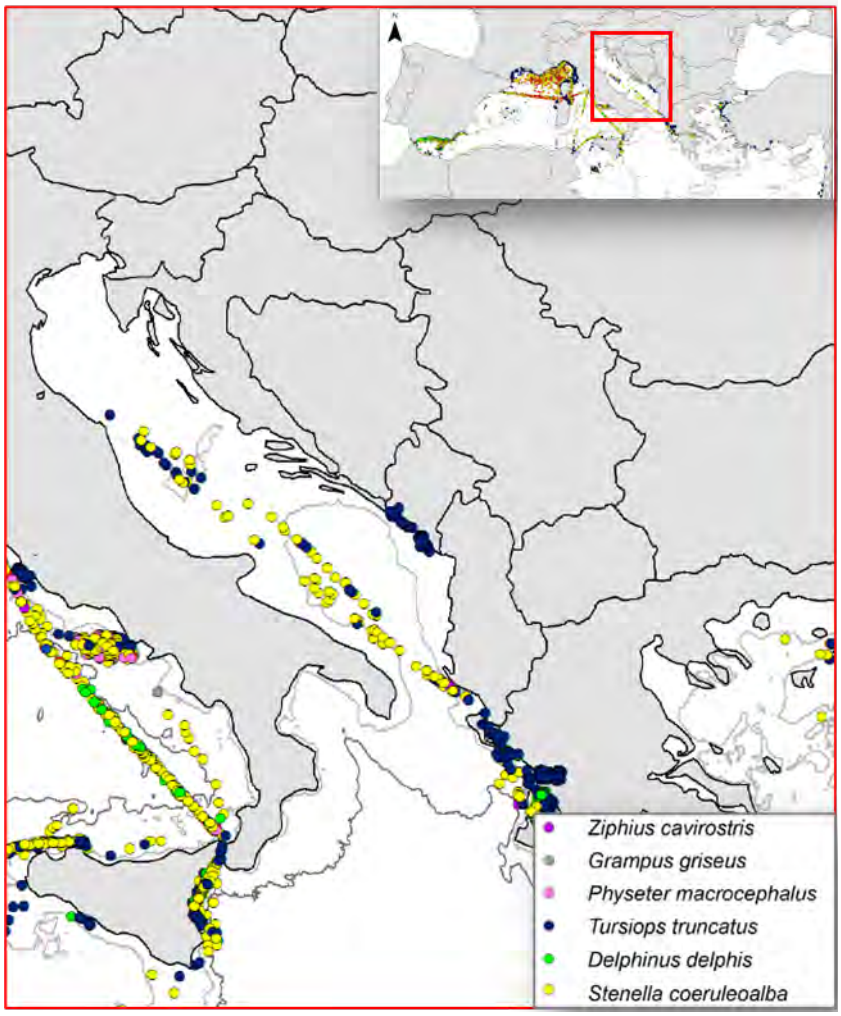
Marine fauna – bibliographic data and references

According to scientific literature, the Adriatic Sea is home to the bottlenose dolphin (*Tursiops truncatus*), the striped dolphin (*Coeruleoalba dolphin*), the common dolphin (*Delphinus delphis*), the Risso's dolphin (*Grampus griseus*), the Cuvier's beaked whale (*Ziphius cavirostris*), pilot whale (*Globicephala melas*), sperm whale (*Physeter macrocephalus*) and fin whales (*Balaenoptera physalus*), presenting, albeit with different distribution, frequency and abundance, 8 of the 21 species of cetaceans present in the Mediterranean Sea (Mo, 2010; Notarbartolo di Sciara and Birkun, 2010; Notarbartolo di Sciara, 2016). Their conservation status updated to the latest assessment prepared under ACCOBAMS (Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic Area)

(ACCOBAMS, 2021a) and published in the Red List of Threatened Species by the International Union for Conservation of Nature (IUCN) is shown in the following table:

Common name	Scientific name	State of conservation
Bottlenose dolphin	*Tursiops truncatus*	Least Concern
Striped dolphin	*Coeruleoalba dolphin*	Least Concern
Common dolphin	*Delphinus delphis*	Endangered under criteria A2cde C1
Risso's dolphin	*Grampus griseus*	Endangered under criteria C2a(ii)
Cuvier's beaked whale	*Ziphius cavirostris*	Endangered under criteria C2a(ii)
Pilot whale	*Globicephala melas*	Endangered under criteria C2a(ii)
Sperm whale	*Physeter macrocephalus*	Endangered under criteria C2a(ii)
Fin whale	*Balaenoptera physalus*	Endangered under criteria C2a(ii)

In particular, according to the latest report on the conservation status of cetaceans in the Adriatic Sea (UNEP-MAP-RAC/SPA, 2014) and according to the study recently published by Gnone et al. (2023) (figure below) on data collected from 2004 to 2018, the bottlenose dolphin is regularly present throughout the basin, while the striped dolphin, the Cuvier's beaked whale and the Risso's dolphin are mainly present in the central and southern portion of the Adriatic. The common dolphin, pilot whale and sperm whale appear to be rare visitors, while fin whale is present in the Adriatic seasonally especially in the central and southern region of the basin (UNEP-MAP-RAC/SPA, 2014). Further details on the distribution and ecological characteristics of the species regularly present in the Adriatic are reported in the following paragraphs.

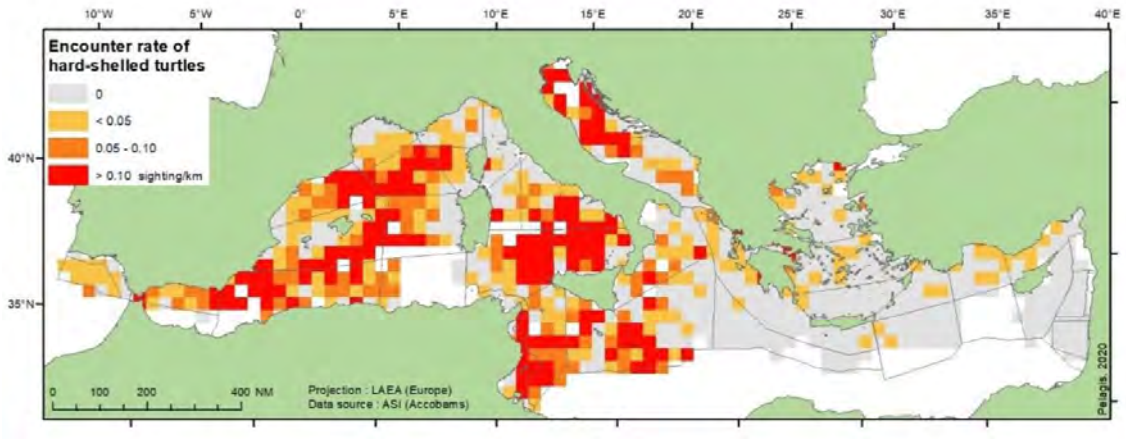


Sightings of the different species of cetaceans regularly present in the Adriatic Sea in the period 2004-2018 Gnone et al., 2023)

Please refer to the *ES.9.3_02* for the necessary insights on the individual species of cetaceans.

The presence of sea turtles in the Adriatic basin is linked to the distribution of *Caretta caretta* and *Chelonia mydas*, belonging to the family Cheloniidae, and *Dermochelys coriacea*, belonging to the family Dermochelyidae. Their state of conservation and their updated distribution are shown in the table and figure below.

Common name	Scientific name	State of conservation
Common turtle	*Caretta caretta*	Least Concern
Green turtle	*Chelonia mydas*	Endangered
Turtle Leatherback	*Dermochelys coriacea*	Vulnerable



*Encounter rates (sightings per km, on a 50*50 km grid) of sea turtles, detected during the ASI-ACCOBAMS aerial survey (ACCOBAMS, 2021b). There are no distinctions between species, but most sightings are attributable to C. caretta, followed by D. coriacea*

Most marine reptiles are considered threatened. All species are endangered due to the destruction of coastal nesting habitats, anthropization and fishing.

Please refer to the *ES.9.3_02* for the necessary insights on the individual species of sea turtles.

Marine fauna – anthropogenic threats

Considered a hotspot of marine biodiversity, the Mediterranean Sea, with its sub-basins, is exposed to multiple threats of anthropogenic origin, including the fishing industry associated with the phenomenon of overfishing and bycatch (accidental catches of species not of commercial value, including vulnerable species such as cetaceans and sea turtles), degradation and consequent disappearance of habitats, chemical and noise pollution, eutrophication, climate change and the invasion of alien species (Coll et al., 2010).

Focusing on the Adriatic Sea, both in its northern and southern parts, it is immediately evident that this sub-basin is heavily exploited, as it represents a source of resources (from fish stocks to natural gas reserves and other fossil hydrocarbons) to draw on.

Marine communities and the ecosystem itself are affected by the impact of the above-mentioned anthropogenic threats, the effect of which in the medium to long term is manifested in a decline in the abundance of species, both of commercial interest and of community interest, in a simplification and compromise of ecosystems and therefore, in a loss of biodiversity and functionality of marine ecosystems.

The Adriatic Sea is classified among the Mediterranean ecoregions as a basin characterized by a high cumulative anthropogenic impact (UNEP-MAP-RAC/SPA, 2014). The greatest contribution, excluding climatic factors, is given by the fishing activity of demersal resources and the load of nutrients of river origin, followed by the arrival of alien species and intense maritime traffic (Micheli et al., 2013). The contribution deriving from offshore gas exploration and exploration activities (even if incompatible with the decarbonisation objectives set at European level) and the potential contribution deriving from the construction of wind farms (MIMS, 2022) are also not negligible.

In the study " *ES.9.3_02_Marine Fauna – monitoring"* A summary of those aspects that threaten the conservation status of species that must be the subject of greater attention from a conservation point of view is reported, with specific reference to: fishing activities, chemical pollution and marine litter, maritime traffic, coastal development, research and exploration of hydrocarbons and wind farms.

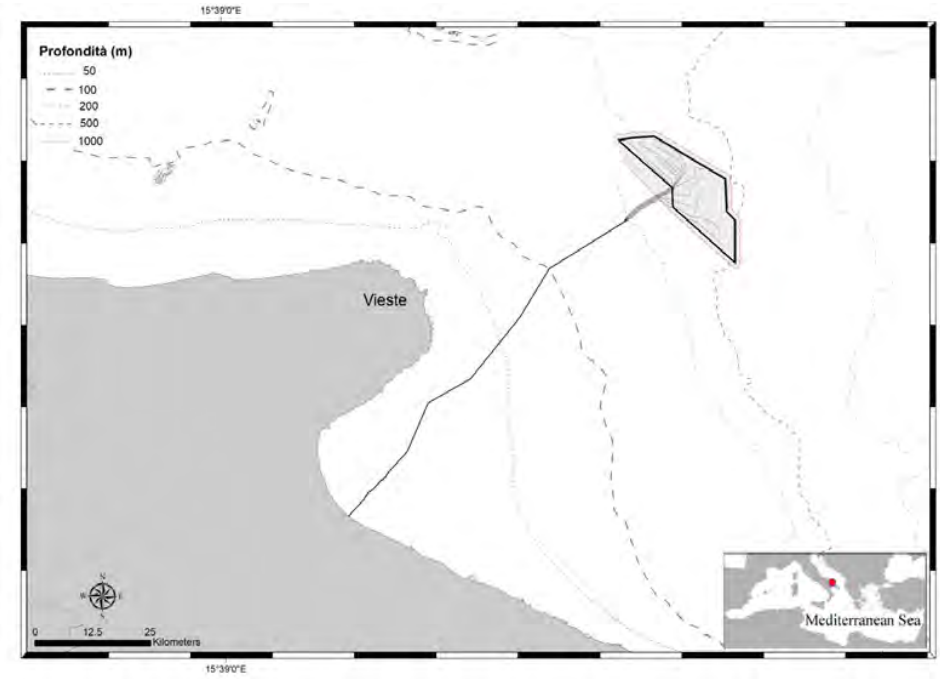
Marine Wildlife – Site-Specific Monitoring

The assessment of the potential pressures and impacts on marine megafauna and their elective habitats deriving from the construction of an offshore wind farm requires a preventive bibliographic study as well as an ante-operam monitoring plan aimed at documenting the presence of any target species.

The monitoring plan for the "Nemetun Island" project consists of the realization of visual and acoustic surveys aimed at collecting data on the presence of megafauna, and includes the monitoring of floating litter.

The monitoring plan includes 20 days divided into four sessions, one for each season to cover the entire year.

The sea area covered by the survey was greater than that included in the perimeter of the wind farm concession (about 257 km^2) and was extended, further by a buffer of 1 km, for a total area of 376 km^2 (figure below). The need to extend the area to be investigated, especially in the SW portion of the perimeter provided by the client, is to be found in the need to obtain a more regular sampling area on which the sampling design of the Line transect sampling can be applied (as specified below).



Map of the investigated study area. In black the boundary of the concession, in red the boundary of the buffer area. The cable duct route is also shown in the figure

All the activities were carried out by means of an 8 m long inflatable boat, equipped with 2 Yamaha engines of 150 hp each and by a team composed of two operators Marine Mammal Observer (MMO) and Passive Acoustic Monitoring (PAM) certified ACCOBAMS, for the visual and acoustic monitoring of cetaceans and turtles, and by an operator trained to monitor floating macro-litter.

The **Monitoring of cetaceans and sea turtles** It is mainly carried out through visual sampling (visual census), assisted for the cetfauna only, by acoustic monitoring by means of acoustic modules or hydrophones. The approach adopted is that of Conventional Distance sampling (Buckland et al., 2001, 2004), which allows to estimate the abundance of wild animal populations through the creation of linear or point transects in which the perpendicular distances from the group of animals (pods) sighted during the transect, the number of individuals and the research effort sustained (km) are recorded. In particular, the zig-zag line transect sampling method has been ubiquitously applied for the monitoring of cetaceans and for the estimation of their populations (e.g., Panigada et al., 2009; Lauriano et al., 2010; Carlucci et al.,

2018), as well as to collect data on the presence, density and possibly abundance of sea turtles (e.g., Vandeperre et al., 2019; DiMatteo et al., 2022).

This method consists in the creation of random zig-zag transects (equally spaced zig-zag) to investigate the wind farm area. The choice of this specific sampling design allows to optimize the time and costs of the monitoring activity, allowing a balanced coverage of the study area. In particular, by introducing the extension of the spatial buffer around the perimeter of the concession, whenever the generated transect intersects the perimeter of the area to be investigated, the possibility of observing beyond it was envisaged. The observation limit is in fact dictated, net of the experience of the observers, by the weather and sea conditions and the height above sea level of the observation platform. In the specific case treated, this limit has been estimated at 1 km since it is associated with the field of vision of the experts on board in weather and sea conditions on average suitable for monitoring (Beaufort scale ≤ 3).

Visual monitoring was carried out through the use of three operators certified by ACCOBAMS as Marine Mammal Observers (MMO) and Passive Acoustic Monitoring (PAM). Two operators were employed in the visual search of the animals on the surface, equipped with binoculars with 8X42 magnification equipped with rangefinder and compass, Nikon D3300 reflex camera with Nikon AF-P Nikkor 70-300 mm lens, f4.5-6.3G ED and a GoPro Hero 10 black underwater camera for the acquisition of images and videos useful for the photo-identification of individuals. An operator was employed in the acoustic survey through the use of a drag module. Specifically, the acoustic detection activity was carried out by lowering into the sea a 5 m long streamer containing 4 hydrophones, two set for the detection of high-frequency sounds, and two that detected low-frequency sounds, as well as a depth sensor. The acoustic detection system used (MER Acoustic Monitoring System - Acoustic Channels: 2x High Frequency Magrec HP03 units, with spherical ceramic and HP02 preamp. Near flat sensitivity 2KHz - 150 KHz - 2x LF Magrec HP03 with spherrical ceramic and preamplifier) acquires the acoustic recording, making it available on a remote PC installed on the support boat, allowing the PAM operator to constantly carry out acoustic monitoring with the joint help of headphones (for the audio band) and spectrographic representation, allowing the acoustic detection of cetaceans even in the absence of sighting. The acoustic signals are made visible through the use of Pamguard software.

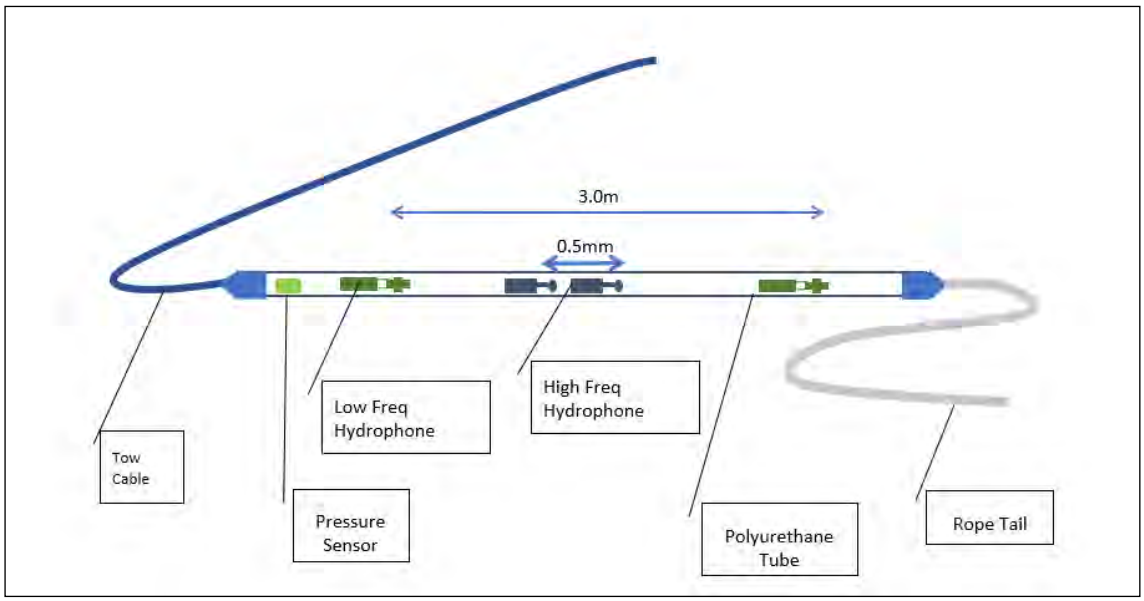
All the information relating to the monitoring activity carried out such as dates, start and end times of the transect, weather and sea conditions, sighting coordinates, species sighted, number of groups encountered, recorded behavioural activity (for cetus fauna only) and number of recordings made were reported in a special detailed register. The photo and video documentation and the acoustic recordings were saved and downloaded to a special database for subsequent analysis.

Specifically, the images acquired during the activities are useful for the photo-identification (photo-ID) of the individuals sighted, i.e. for the unique identification of each individual animal. The photo-ID technique is a non-invasive technique aimed at the unambiguous recognition of the individual through the observation of distinctive characters present on the body of the animal, and in particular on the dorsal fins for small and medium-sized cetaceans, and on the caudal fins for large cetaceans (e.g., Würsig and Würsig, 1977). Such features may include distinctive features such as scars, notches, smudges, or particular pigmentation. The potential of this technique lies in the possibility of recognizing individuals individually, allowing an analysis of the population structure in terms of sex, age, number of individuals present in an area as well as an analysis of the pattern of loyalty and site-specific residence.

The potential of the acoustic recordings acquired during the monitoring activities is to be found in the possibility of analyzing the vocalizations emitted by the different species in the different contexts in which we encounter them. Cetaceans orient themselves, communicate, prey through sound. The analysis of acoustic vocalizations, therefore, can provide valuable information on the acoustic patterns of the different species in the different contexts in which they live (socialization, reproduction, hunting, rest, group

dynamics) and, consequently, on their modifications in the presence of underwater noise produced by human activities. And today it has become an essential component in research on cetacean biology and ecology and for impact management and species conservation strategies.

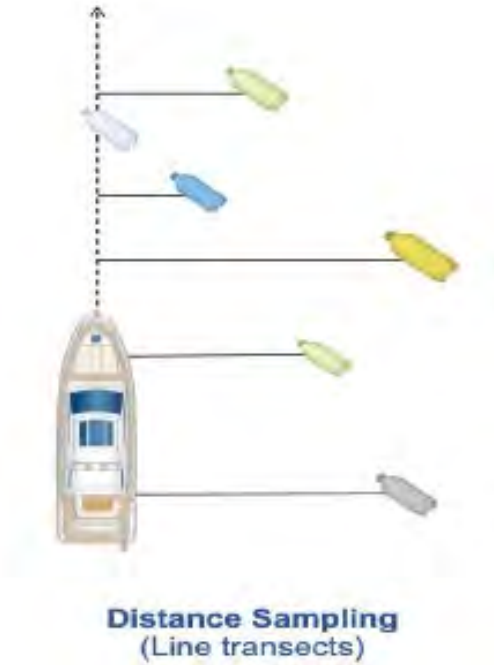
Monitoring activities. Visual survey; cSighting card andAcoustic system implementation



Representative diagram of the acoustic module used during the monitoring activity

For the **Macro-litter monitoring float** the Line Transect Distance Sampling method was adopted according to the protocol detailed in the Technical Report of the Joint Research Center for small and medium-sized boats (Vighi et al., 2022). It consists of the observation and identification by sight, without the aid of binoculars, by an operator placed at the bow of the observation platform, of floating waste larger than 2.5 cm (Galgani et al., 2013; Vighi et al., 2022). This protocol is applied only in optimal weather and sea conditions and with wave heights of less than 2 m.

The information recorded is related to the sighting coordinates, weather and sea conditions, perpendicular distance (measured through the use of a rangefinder) of the objects observed, type of waste, size as well as notes of any interactions with animal species (birdlife, cetaceans, turtles) and any presence of other boats.



Sampling scheme of floating marine litter according to the Distance Sampling approach

The monitoring activity of the "Nemetun Island" wind farm was conducted over 5 seasonal surveys for a total of 20 days carried out from December 2023 to July 2024.

The sampling effort applied during the entire campaign was 432.6 NM and made it possible to achieve **5 sightings of different groups of striped dolphins**, **1 Bottlenose dolphin sightings**, the sighting of **2 groups of Risa** and **3 sightings of *C. caretta***. During the activity, acoustic detection was also carried out for a total of 63 hours and 42 minutes which made it possible to obtain information relating to the different vocalizations produced during the sightings made. Whistles, clicks and click trains were the main vocalizations heard and observed in real-time as spectrograms during the sightings of all the species of toothed whales encountered followed by burst pulses recorded only during the sighting of Risso's dolphins.

From the analysis of the photographic images taken during the entire campaign, it was possible to photo-identify the 5 individuals of bottlenose dolphins encountered in the autumn campaign and 22 of the 45 individuals of Risso's dolphin sighted in the winter and spring campaigns. None of the dolphin individuals encountered have been photo-identified. This result is expected because dolphins generally have little or no marked dorsal fin, making the application of this technique useless. On the contrary, bottlenose dolphins and Risso's dolphins are among the species with a very high number of visible and persistent markers and therefore allows an effective application of this technique.

Neither the photo-identified bottlenose dolphins nor the photo-identified Risso's dolphins were re-encountered during the entire annual campaign, however, future investigations to be carried out in the area will benefit from the existence of photo-identification catalogues already developed which may represent the preliminary knowledge base to refer to.

Stagione	Sforzo (NM)	Detezione acustica (hh:mm:ss)	Data	Specie	N. individui	Profondità (m)
Autunno	105,2	02:29:00	08/12/2023	*S. coeruleoalba*	30	250
		03:15:12	09/12/2023	-	-	-
		03:07:20	10/12/2023	-	-	-
		03:32:53	11/12/2023	*T. truncatus*	5	210
		02:58:22	12/12/2023	-		-
Inverno	129,4	03:21:19	22.01.2024	-	-	-
		03:24:42	23.01.2024	-	-	-
		03:19:48	16.02.2024	*S. coeruleoalba*	35	470
				C. caretta	1	-
		03:33:18	17.02.2024	*G. griseus*	25	530
		03:20:21	18/02/2024	-	-	-
Primavera	92,8	03:24:33	05.05.2024	-	-	-
		03:29:48	12.05.2024	*S. coeruleoalba*	30	290
		03:07:39	13.05.2024	*G. griseus*	20	435
				C. caretta	1	208
		03:32:21	14.05.2024	-	-	-
		02:48:18	18.05.2024	-	-	-
Estate	105,2	03:10:30	11.07.2024	-	-	-
		02:56:48	12.07.2024	-	-	-
		03:13:42	13.07.2024	*S. coeruleoalba*	40	527
				C. caretta	1	313
		03:20:21	14.07.2024	-	-	-
		03:08:18	15/07/2024	*S. coeruleoalba*	15	350

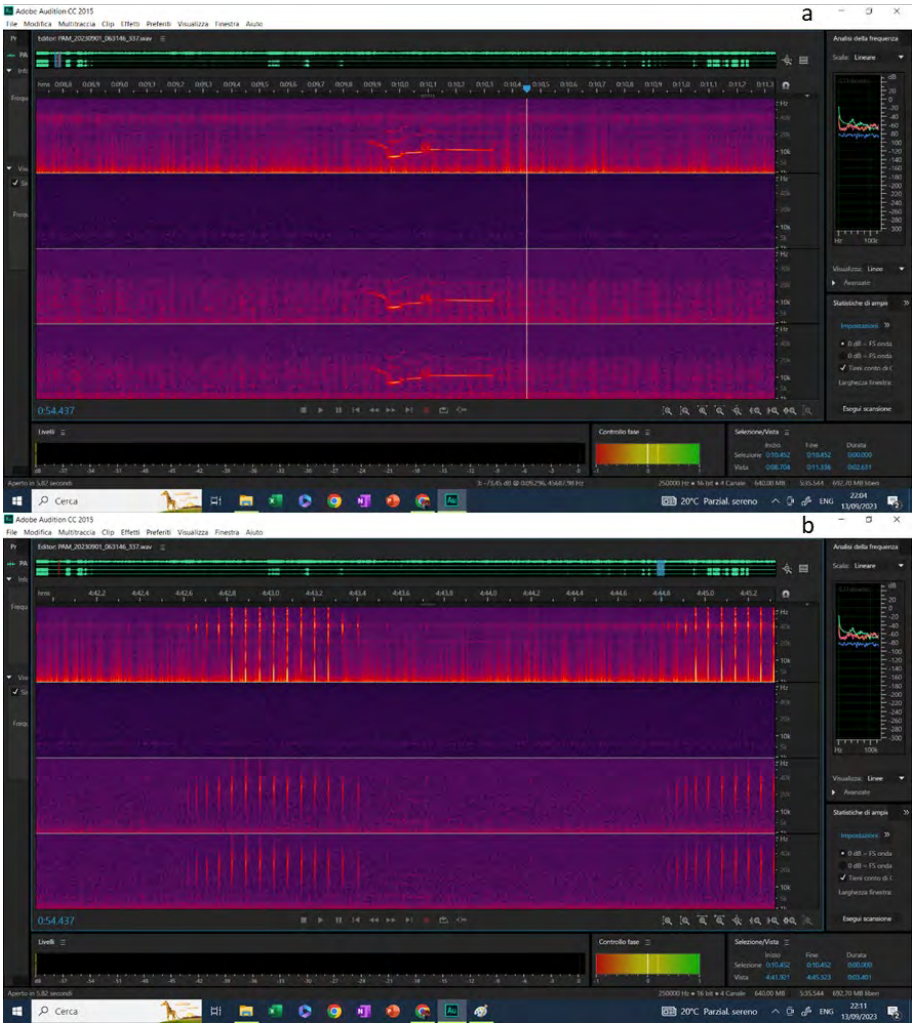
Summary table of the monitoring activity of "Nemetun Island", with an indication of the sampling effort, in terms of nautical miles traveled and hours recorded, as well as the sampling dates for each season, the species sighted and the information relating to the number of individuals and depths in which the animals were observed

Example images of the warning of a group of dolphins sighted on 8/12/2023 (left) and a group of bottlenose dolphins, in dduring autumn monitoring

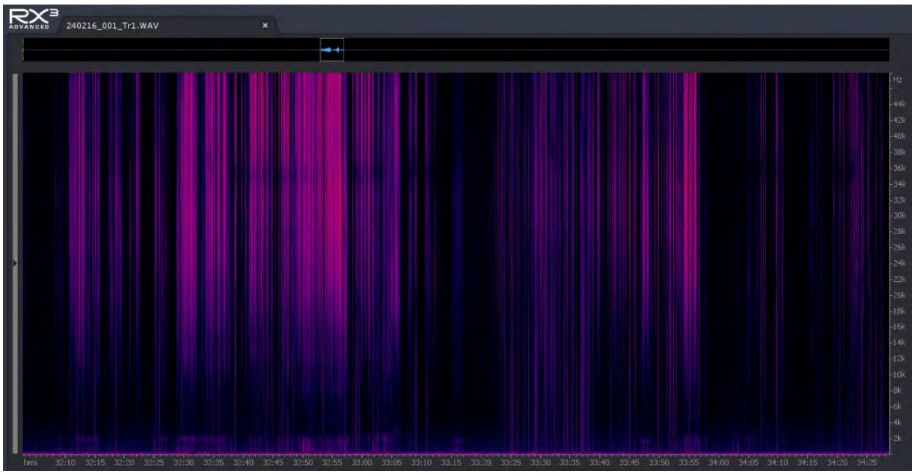
Example images of the sightings of G. griseus (left) and C. caretta (right) made during the winter monitoring campaign

Example images of the sighting of S. coeruleoalba carried out during the spring monitoring campaign

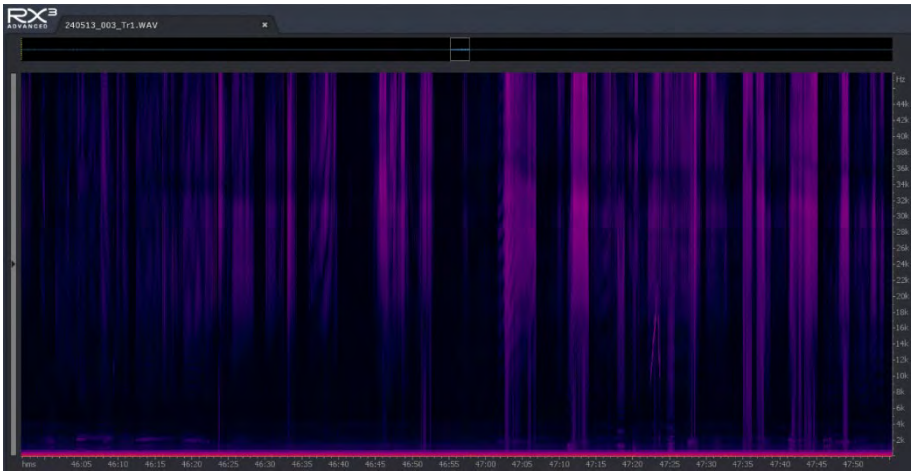
Example images of the sightings of S. coeruleoalba (left) and C. caretta (right) made during the summer monitoring campaign



Exemplary spectrograms of T. truncatus vocalizations recorded during the sighting of 11.12.2023. In a) whistles and in b) click trains



Sample spectrogram of click trains recorded during the sighting of S. coeruleoalba on 16.02.2024



Sample spectrogram of click trains and burst pulses recorded during the sighting of G. griseus on 17.02.2024

Synoptic table of the autumn monitoring activity of the floating macro-litter, with indication of the date, total number, type and size of the objects detected

Date	No. of objects detected	Typology							Dimension (cm)					
		APM	Rubber	Metals	Textile clothing	Wood	Paper	Other	At	B	C	D	And	F
08/12/2023	6	4	-	-	-	1	1	-	-	2	1	-	2	1
09/12/2023	9	9	-	-	1	-	-	-	3	3	1	-	1	1
10/12/2023	3	3	-	-	-	1	-	-	1	1	1	-	-	-
11/12/2023	6	4	-	-	-	-	1	1	-	1	2	1	2	-
12/12/2023	6	5	-	-	-	1	-	-	1	4	-	-	-	1
Total	**30**	**25**	**-**	**-**	**1**	**3**	**1**	**1**	**5**	**11**	**5**	**1**	**5**	**3**

Synoptic table of the winter monitoring activity of floating macro-litter, with indication of the date, total no., type of waste and size observed

Date	No. of objects detected	Typology							Dimension (cm)					
		APM	Rubber	Metals	Textile clothing	Wood	Paper	Other	At	B	C	D	And	F
22.01.2024	3	3	-	-	-	-	-	-	2	-	-	1	-	-

23.01.2024	6	5	-	-	-	1	-	-	2	1	3	-	-	-
16.02.2024	3	2	-	-	-	-	1	-	-	2	-	1	-	-
17.02.2024	2	2	-	-	-	-	-	-	1	-	-	1	-	-
18.02.2024	1	1	-	-	-	-	-	-	-	1	-	-	-	-
Total	**15**	**13**	**-**	**-**	**-**	**1**	**1**	**-**	**5**	**4**	**3**	**3**	**-**	**-**

Synoptic table of the spring monitoring activity of the floating macro-litter, with indication of the date, total no., type of waste and size observed

Date	No. of objects detected	Typology							Dimension (cm)					
		APM	Rubber	Metals	Textile clothing	Wood	Paper	Other	At	B	C	D	And	F
05.05.2024	6	6	-	-	-	-	-	-	1	2	1	1	-	1
12.05.2024	4	3	1	-	-	-	-	-	2		1	1	-	-
13.05.2024	4	2	-	-	1	-	1	-	-	1	1	1	1	-
14.05.2024	7	7	-	-	-	-	-	-	3	2	-	-	2	-
18.05.2024	2	2	-	-	-	-	-	-	-	1	1	-	-	-
Total	**23**	**20**	**1**	**-**	**1**	**-**	**1**	**-**	**6**	**6**	**4**	**3**	**3**	**1**

Synoptic table of the summer monitoring activity of floating macro-litter, with indication of the date, total no., type of waste and size observed

Date	No. of objects detected	Typology							Dimension (cm)					
		APM	Rubber	Metals	Textile clothing	Wood	Paper	Other	At	B	C	D	And	F
11.07.2024	2	2	-	-	-	-	-	-	1	1	-	-	-	-
12.07.2024	4	4	-	-	-	-	-	-	2	1	1	-	-	-
13.07.2024	2	1	-	-	-	1	-	-	1	-	1	-	-	-
14.07.2024	1	1	-	-	-	-	-	-	-	1	-	-	-	-
15.07.2024	3	2	-	-	-	1	-	-	-	1	2	-	-	-
Total	**12**	**10**	**-**	**-**	**-**	**2**	**-**	**-**	**4**	**4**	**4**	-	-	-

On the basis of the information reported in this study, deriving from bibliography and field monitoring, potential interferences and short- and long-term impacts on local megafauna (especially cetaceans) are evident. In addition, the impacts in general can be considered mitigated both during the installation and commissioning of the plant and subsequently, through containment and monitoring activities aimed at the fundamental application of the precautionary principle, as enshrined in art. 301, second paragraph, of Legislative Decree 152/2006, regarding the monitoring of noise pollution understood as "the introduction of noise into the living environment or into the external environment such as to cause annoyance or disturbance to rest and human activities, danger to human health, deterioration of ecosystems, (...)" (art. 2 L. 447/1995).

Finally, as emerges from the study, there is floating waste in the area attributable to both fishing and other marine and terrestrial human activities. During the construction and decommissioning phases of the plant, all the regulations relating to the dispersion of waste at sea will be implemented to contain the potential impact that this phase could have on the marine environment. In addition, during the operation phase, the area will be forbidden to fishing activities and maritime traffic, which, it is hoped, will reduce the amount of waste found in the area of the camp.

Please refer to the *ES.9.3_02_Marine Fauna - Monitoring* for the necessary further information.

4.1.6 NOISE AND VIBRATION

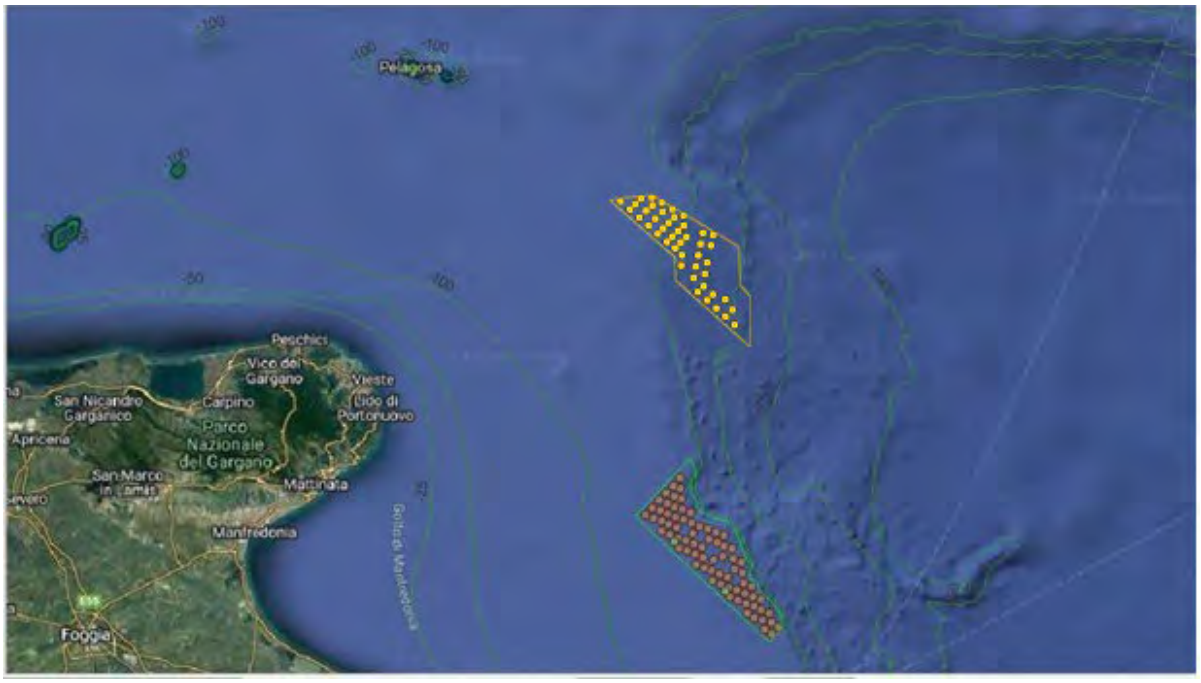
4.1.6.1 Acoustic characterization of the marine environment

Most industrial installations at sea, and more generally activities that involve the use of marine areas by humans including simple navigation, lead to an increase in the noise levels present in the environment. Acoustic comfort, which is determined by noise levels (intensity), frequency distribution and temporal distribution of the noise itself, is one of the characteristics that significantly influence the quality of life in a given environment, even more so for animals that use sounds to perform some fundamental tasks such as hunting, socialising and orientation.

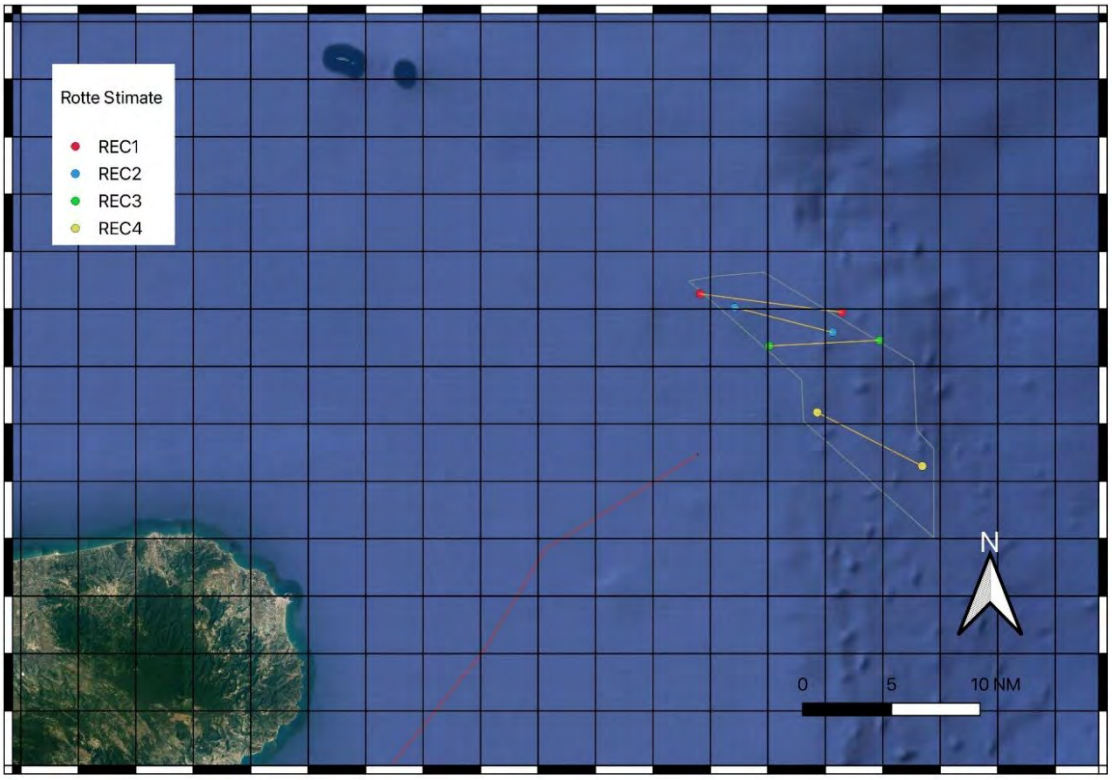
The study and measurements carried out on the basic marine environment were also conducted taking into account the provisions of the ISPRA 2011 guidelines - Higher Institute for Environmental Protection and Research.

For the acoustic detection campaign (held in December 2023) it was decided to use autonomous acoustic recorders that exploit the current. Each recorder was equipped with a float with flag, light and radar reflector in accordance with the law, as well as a satellite transmitter. The latter, fixed to the flag, watertight and equipped with a battery, periodically transmits its position (time interval of about 50 minutes) relying on the Globalstar network. It is received and displayed by a special satellite receiver that does not require other connections (e.g. cellular network) and is therefore able to operate anywhere. Through the data received, the recorders were recovered at the end of the period. The deposition took place along the northwest side of the area to be monitored and the subsequent recovery, after 24 hours, to the southeast of it.

The program included the collection of a 24-hour recording session covering, with 4 recorders, the entire study area.



Study area and location of sound recorders. The planned facility is the one in yellow



Recording and retrieval points. The current/wind combination determined their movement in the area, ensuring effective coverage

All recordings were collected using the same method and subsequently analyzed. The instrumentation used and the protocols have been standardized in order to make the analysis work and the consequent results homogeneous and comparable with each other.

Specifically, the recording sessions were performed via uRec384k 22D recorders:

Adatto a registrare i segnali acustici subacquei in una grande varietà di situazioni, dal monitoraggio delle interazioni con le reti e le gabbie da acquacoltura, da parte dei cetacei, al monitoraggio e survey ambientale in genere, al monitoraggio di Aree Marine Protette, al monitoraggio del rispetto dei protocolli di operazione durante le opere di costruzione in mare, in profondità e lungo la costa.

I RASP, e i bottom recorder in genere, sono strumenti di grande flessibilità, adatti ad essere utilizzati anche da gommoni e piccole imbarcazioni.

I modelli in produzione

uRec384k 22D

Basati sulla scheda di registrazione della Dodotronic, campionano segnali fino a 192kHz e usano l'idrofono SQ26-05, che però sopra i 90kHz perde molta sensibilità.
Alimentato con tre batterie "torcia" (dimensione D) può essere programmato per campionamenti di settimane o mesi.

Possiamo realizzare versioni custom con idrofoni diversi, dagli AS-1 con i loro preamplificatori, agli H2d, più economici.

uRec AM1.2

Basati sulla scheda di registrazione AudioMoth 1.2, campionano segnali fino a 192kHz e usano l'idrofono SQ26-05, che però sopra i 90kHz perde molta sensibilità.
Le schede AudioMoth sono, in questo momento, uno standard per gli studi di bioacustica in ambiente naturale.
Alimentato con tre batterie "torcia" (dimensione D) può essere programmato per campionamenti molto lunghi.

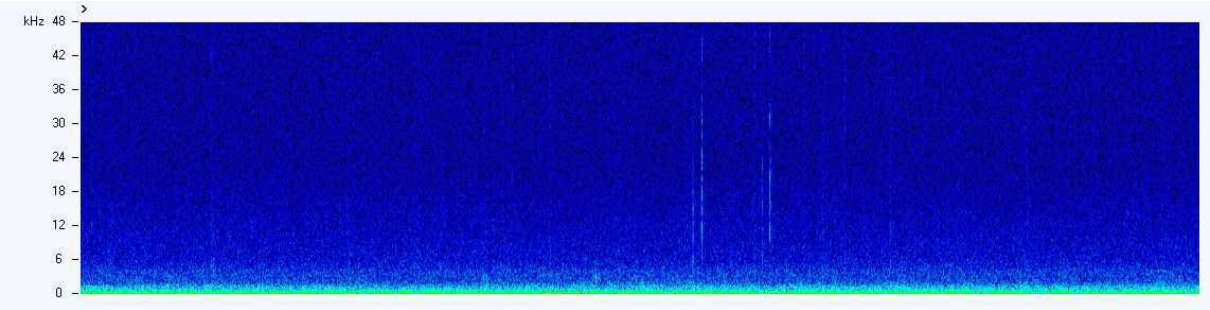
At the end of each recording session, the recorders were retrieved and the data immediately downloaded. The resulting files, in uncompressed linear .wav format, were subsequently analyzed in the laboratory. A total of about 100 hours was analyzed in the laboratory.

The acoustic analysis of the recordings was focused on two aspects: noise measurements with parameter measurement (quantitative description) and identification of biological and anthropogenic signals (qualitative description).

The first feature What emerges from the recordings is the constant and significant presence, over 24 hours, of clicks attributable to the presence of alpheids (snapping shrimps). They are small decapod crustaceans, a few millimeters long, with the peculiar characteristic of emitting very intense clicks, despite the small size of the individuals, and broadband, through the snap of a hypertrophic claw. The species most present in the Adriatic, on seabeds such as those of the area examined in the first hundred meters of depth, is *Alpheus glaber*. Their presence in the Adriatic, in waters up to about three hundred meters deep, is almost ubiquitous. In these areas, however, they are always part of the natural soundscape with which the other species present have co-evolved. Most of these signals were detected in the western area, where the depth of the water is lower, less than 200 meters. These crustaceans, in fact, prefer waters with depths of up to about three hundred meters.

Alpheus glaber

The following figure illustrates what alpheids clicks look like recorded on-site:



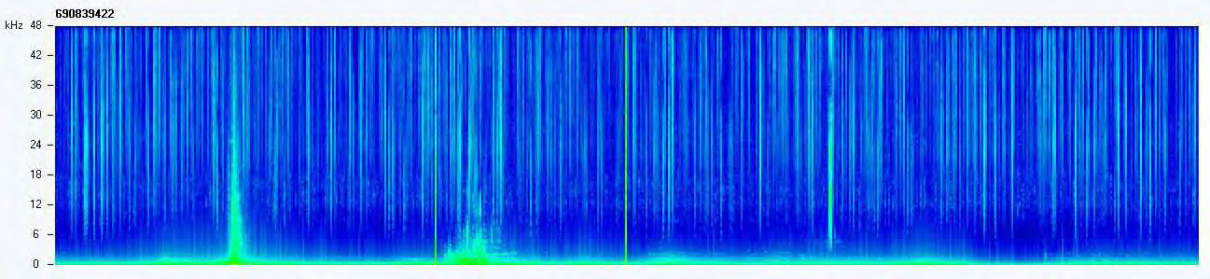
Click by Alpheus glaber (vertical light lines), in which you can see the reflection from the surface

You can sell it as in the screenshot above is shown the detail of two clicks of alfeids registered in the West area of the area. Notice how often the direct click is accompanied by the echo reflected from the surface.

The "noise" generated by these small crustaceans constitutes a non-negligible component of the underwater acoustic landscape in Italian coastal waters, especially at the frequencies medium-high, making it very difficult to highlight the dolphins' distinctive echolocation clicks when not well defined or intense.

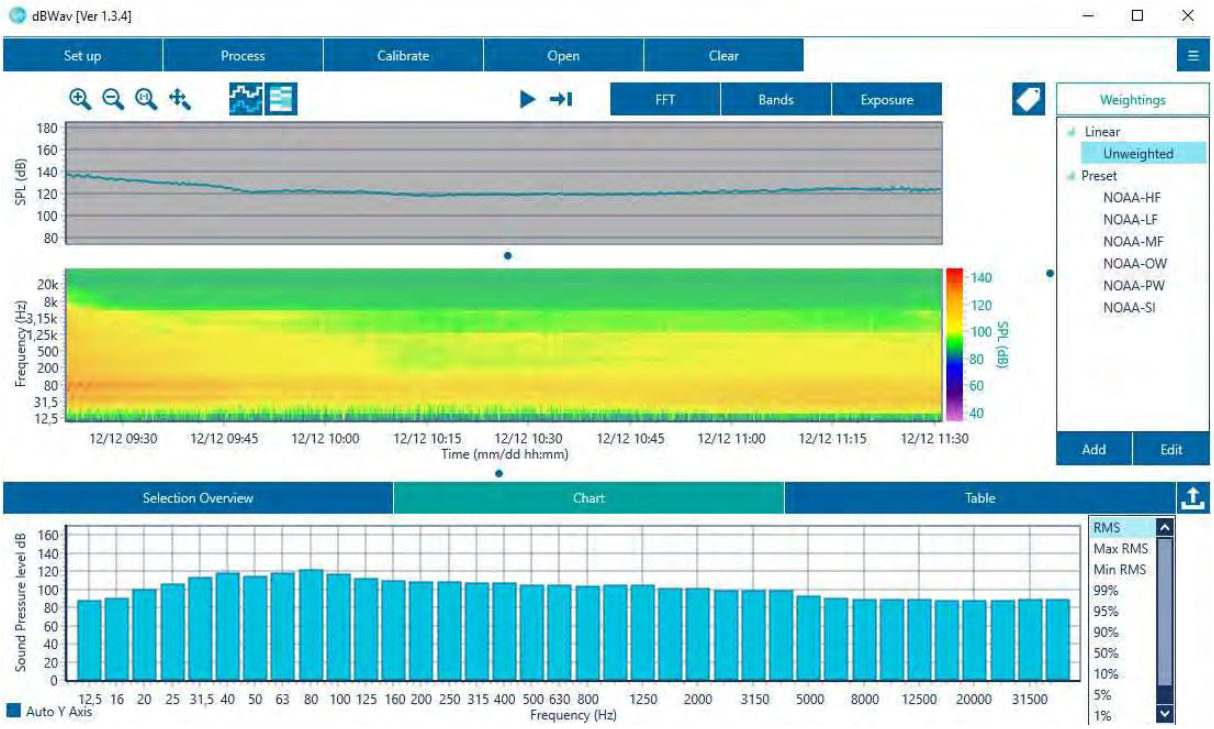
During the transfer operations to and from the area, dolphins belonging to the species were encountered *Tursiops truncatus* (bottlenose dolphins) in the presence of fishing boats, as is very frequently observed. In fact, these animals exploit the fishing activity to feed themselves and consequently are often seen following fishing boats. Despite visual contact, no acoustic signals (clicks or whistles) were detected. It is reiterated that in order to detect the signals of these animals, given the acoustic context (almost constant presence

of alpheid clicks), the signal-to-noise ratio must be more than favorable, and the animals must therefore pass in the immediate vicinity of the recorder. In the following figure it is possible to note, as in the other characterized areas, the massive presence of alpheids. In this context, the dolphin signal, to be appreciable, and as explained above, must be very intense. Therefore, the presence of their signals, albeit weak, is not excluded. The following figure shows the detail of six hours of recording extracted from the total and representative of the general trend of the area; There are only two major acoustic events, but you can see an almost constant fluctuation of the clear band at the foot of the figure. That means low-frequency energy.



Compressed spectrum lasting 6 hours. The two peaks in the first half of the image are related to the passage of boats. The second, of longer duration, is probably due to a fishing boat towing the net

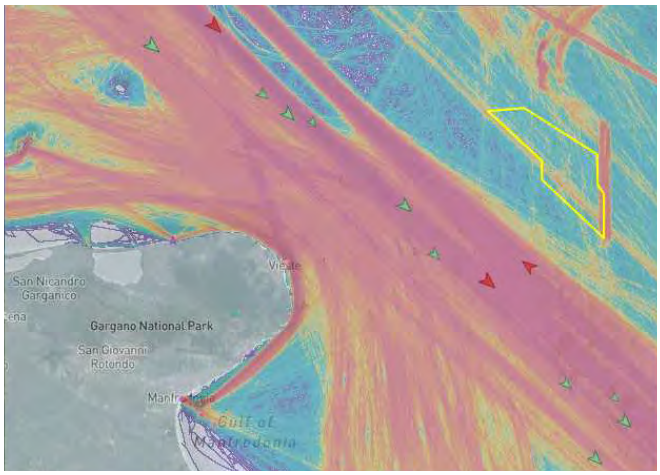
To better appreciate it, the next figure shows in detail a graph, lasting 2.5 hours, with an event (fishing boat) and a situation of relative silence, which well represent the general trend of the 24 hours. The frequency scale is in thirds of an octave. This allows you to zoom in on the low frequencies.



Passage of a fishing boat (beginning of the row on the right) and relative silence. Frequency scale in thirds of an octave

It can be clearly seen that in this different representation the energy is much more evident and that it is concentrated at low frequencies, but also has a component up to higher frequencies. This is due to the fact that, in addition to the anthropogenic noise component that will be described later, there is also weather noise. The weather conditions during the recordings, in fact, were not optimal. The foot band graph of the figure, however, helps to discriminate the different components. We see the increase in energy in the 40 –

100 Hz zone (distant ship traffic) and a maintenance of the same up to about 1 kHz (weather component). This noise trend, to summarize, is distributed as follows: low-frequency band (40-120Hz), due to the contribution of anthropogenic noise, linked to ship traffic, coming from the "corridor" located a few miles away. Noise at a higher frequency (about 1 kHz) due to the contribution of the weather (wind and related waves). As represented in the *ES.4.1_01_ Assessment of the Impact on Navigational Conditions* and as can be seen from the following figure, it is evident that the plant, and therefore the area of investigation of this study, is located a few miles away from an important transit area.

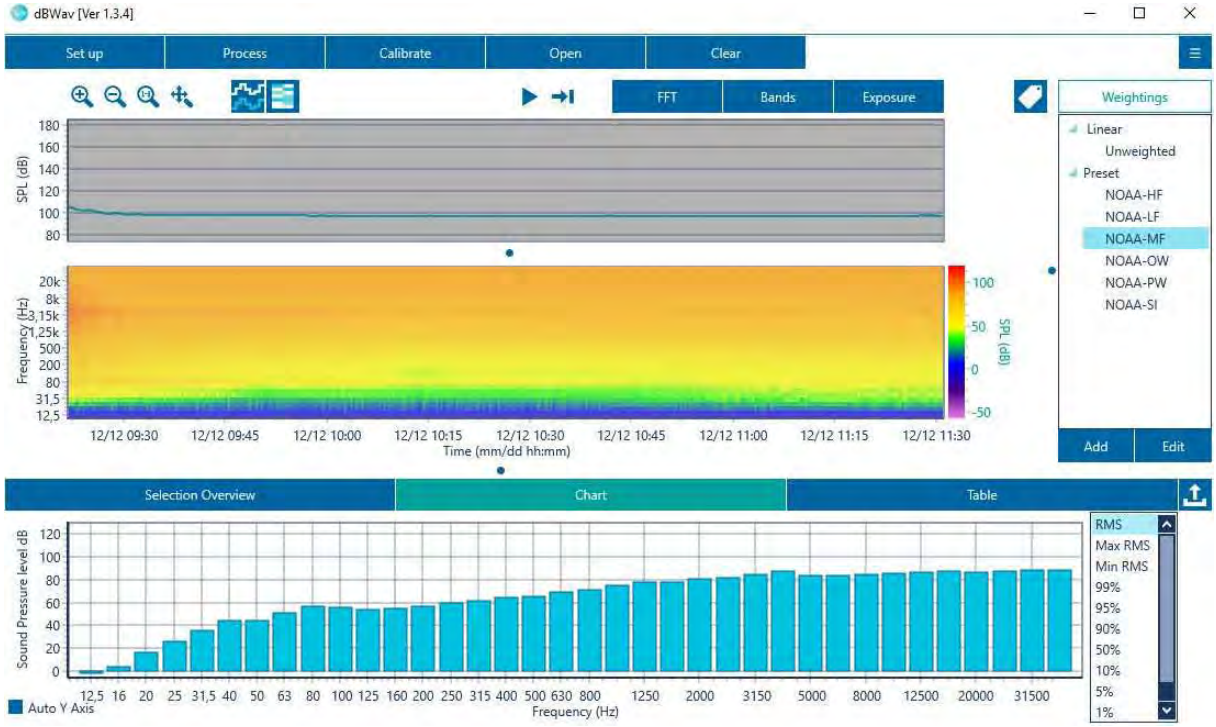


Cumulative traffic map of 2023. In red the busiest areas, in yellow the area of project (anddrawn from Marinetraffic.com.)

The studied area receives an LF (Low Frequency) component from the nearby traffic corridor, even if it is not directly crossed by it. Low-frequency noise, in fact, is transmitted over long distances and is exactly concentrated in the band highlighted in the previous figures.

The qualitative analysis described here was also conducted with the compact spectrogram technique. Thanks to a function of the software used, it is possible to "package" time intervals even several hours long on a single spectrogram, depending on the parameters set. This makes it possible to quickly highlight "macro-events" such as the passage of a ship in the vicinity, but also to bring out, when the appropriate conditions occur (e.g. signal-to-noise ratio) series of dolphin clicks in the acoustically complex context that characterizes these recordings.

The characterization of noise in terms of "amount of exposure in 24 hours", better known by the English acronym SEL (Sound Exposure Level), is shown in the figure below of which the most frequent species in the area, bottlenose dolphins, are part. In practice, the Mid Frequency (MF) weighing of the NOAA (National Oceans and Atmosphere Administration, USA) takes greater account of the frequencies perceived by the animals in question.



Acoustic characterization of the same representative file as in figure 6 but with MF weighing

From a quantitative point of view, the area was much more homogeneous in the time window analyzed. The values, in fact, did not see significant variations, except in conjunction with the passage of boats near the recorder, such as the one visible in one of the previous figures. The representative values are therefore as follows:

RMS	RMS max	RMS min	SEL MF
126.3	148.6	117.5	136.6

The following table shows the values corresponding to the analysis of blocks of recordings of six hours each, for further information. The periods represented are from 12 to 18 and from 00 to 06. The number of the recorder indicates its position: 1 the northernmost one, 4 the southernmost one. The differences, minimal between the recorders, depend mainly on the ship passages recorded in the period reported and not on substantial differences.

RMS dB	RMS dB max	RMS dB min
Rec 1		
126,7	148,6	124,3
123,2	126,6	121,2
Rec 2		
121,3	123	120,7
119,2	120,7	117,5
Rec 3		
126,4	130,3	118,5
121,5	126,9	118,5
Rec 4		

125,2	125,4	121,5
125,2	134,1	117,7
MEDIAN		
124,2	126,7	119,6

Conclusions of the study

Anthropogenic noise, coming from **Ship traffic**, is in fact **heavily present**. The difference is that, **in the monitored period**, showed a **constant trend**, as there were no ships passing near the recorders. Also in this case, it is reiterated that particular attention will be paid to the detection and study of any noises associated with mooring systems still in the description phase.

Again, it is reiterated that, in this context largely compromised from an acoustic point of view, **The contribution of the wind farm in the operational phase is likely to be negligible**. This statement is based on what is reported in the bibliography and in particular in Tougaard, 2020.

The model for predicting the acoustic impact of the work has entailed, in terms of setting, some difficulties. The knowledge and measurements associated with floating wind farms and the related measurements in the field are in fact still incomplete, given the relatively young age of this type of installation with these power values for the Mediterranean. Technology in the sector is advancing rapidly, and the turbines planned for implementation in this project are currently only in the prototype phase. The reference data for the execution of the model are therefore derived from measurements carried out in similar installations and scaled in terms of power and number of towers. This assumption, the only way forward at the moment, may not entirely correspond to reality.

In order to promote a more accurate assessment of future installations, it is planned to conduct an extensive noise monitoring campaign in the area of the future wind farm. Measurements will be carried out according to a sampling scheme covering 24 hours, with representative sampling, in all phases of construction and operation of the plant. The surveys will therefore take place in

correspondence with the pile driving phase for the foundations of the anchors, the installation phases of the same, the positioning of the towers and their operational phase for a period of at least 12 months of normal operation.

In this largely compromised context, where noise levels are much higher than in other areas of the Adriatic Sea, the contribution of the wind farm in the operational phase is likely to be negligible. The aim of this study will be multiple:

- on-site verification of the provisions of the model;
- creation of an acoustic baseline of all construction and operational phases, which will be promptly published in order to provide future installations with a real reference of this type of plant. In particular, some "transient" noises that could be related to the different anchoring systems and on which the bibliography is still incomplete will be verified;
- monitor the noise trend in the area, since ship traffic will be partially diverted;
- pay particular attention to a possible enrichment of the biodiversity present, following the "artificial barrier" effect and a consequent use of the area by marine mammals for food.

4.1.7 ARCHAEOLOGY

4.1.7.1 Onshore archaeology

In order to assess the consistency of a possible "archaeological risk" in the areas affected by the interventions, a careful analysis and a risk assessment study were carried out, contained in the section *SIA. ES.10* attached to this Study.

The works planned in the landing areas and the onshore infrastructures of the wind farm are divided into User Works and Network Works.

- **User works**

Near the planned landing point in the municipality of Zapponeta, an underground joint hole will be built to transition from marine cable to land cable and from there on the cable will continue with underground laying following the existing public road network. The energy produced will then be conveyed to the user's Electrical Substation where the power factor correction system is housed and connected, again by means of an underground power line, to the National Transmission Grid (NTG).
In In these hypotheses, the user works for the connection consist of:

- **An Underground Transition Joint Bay**, located near the landing point in the municipality of Zapponeta, which will allow the transition from the submarine cable to the cable intended for underground laying in the onshore section;
- **An underground power line consisting of two three 380 kV cables**, extended for about 18 km, mainly located along the public road network in the territories of the municipalities of Zapponeta, Trinitapoli and Cerignola, with short transits on agricultural land. The installation will take place mainly through excavations with a fixed section, but to manage interference along the way, **11 sections laid using the excavation-free technique called "Horizontal Directional Drilling" (HDD).** The 11 sections will have variable lengths, as represented in the project documents;
- **A set of 22 tubs intermediate joints,** located along the route of the underground cable duct with a variable distance between 700 and 950 meters. The intermediate joints will be made as part of the excavation with a fixed section planned for the laying of the power line;
- **An electrical utility substation, isolated in GIS, for sharing the stall and equipped with a power factor correction unit, dedicated to the Nemetun Island plant**, with a maximum capacity of 600 MVAr, consisting of two Shunt type reactors. The GIS Substation will be located in an industrial building located in the municipality of Cerignola, near the connection point to the NTG indicated by TERNA and represented by a new Switching Station to be built as an extension to the Cerignola Electrical Substation;
- **An underground power line consisting of a trio of 380 kV cables,** approximately 200 m long, for the connection of the electrical substation to the nearby new Switching Station to be built as an extension to the Cerignola Electrical Substation

- **Network Works**

In order to allow the connection of the offshore wind farm, some interventions are necessary to expand the NTG identified by TERNA in the connection estimate and which consist of:

A 380 kV Switching Station - in extension to the Cerignola Electrical Substation of the TERNA unified type with air insulation and having the following configuration:

- N. 1 double busbar system
- N. 2 cable line stalls for SE RTN 380 kV "Cerignola 380" connection
- N. 2 parallel busbar stalls
- No. 1 TIP stall

- N. 2 stalls fully equipped for the entrance – exits on the existing 380 kV power line "Manfredonia 380 – Andria"
- N. 6 line stalls available for future network needs

Two 380 kV Overhead connections, for the incoming connection – exits in a simple circuit of the new Switching Station to the existing line of the 380 kV "Manfredonia-Andria" NTG. The connections will be supported by 4 new pylons after the decommissioning of 2 existing pylons;

Two underground AT connections, consisting of a total of 4 triads of 380 kV cables, approximately 2.70 km long, for the connection of the new Switching Station to the SE RTN 380 kV "Cerignola 380" under construction connected in and out to the 380 kV RTN "Foggia-Palo del Colle" line.

In the report on Subjection to the VPIA, drawn up in accordance with the regulatory plan in force (Prime Ministerial Decree of 14 February 2022; DGABAP Circular No. 53/2022; Art.41, c. 4 and All.I.8 of Legislative Decree 36/2023,), the phases of the study were organised as follows.

- Bibliographic research: retrieval of archaeological finds published in specialized literature at libraries (university, provincial and municipal), also making use of telematic resources and online databases.
- Photointerpretations: identification of anomalies that can be highlighted by reading the available or specially made aerial photographs and available satellite images that can help to hypothesize the extension and, sometimes, the planimetric articulation of archaeological evidence.
- Surface reconnaissance: systematic control of the territory, aimed at identifying and locating the traces of ancient frequentation.
- Evaluation of archaeological potential: the analysis and study of historical data-The final result of the archaeological and territorial studies is the drafting of a map, on an adequate scale, in which the degree of archaeological potential of the archaeological area must be highlighted.'area affected by the project.
- At the end of the analysis carried out by cross-referencing all the data listed above, the degree of archaeological risk (null-low-medium-high) of the project was determined.

With reference to the study carried out and the technical documents drawn up, the following considerations and evaluations can be made for the area under consideration:

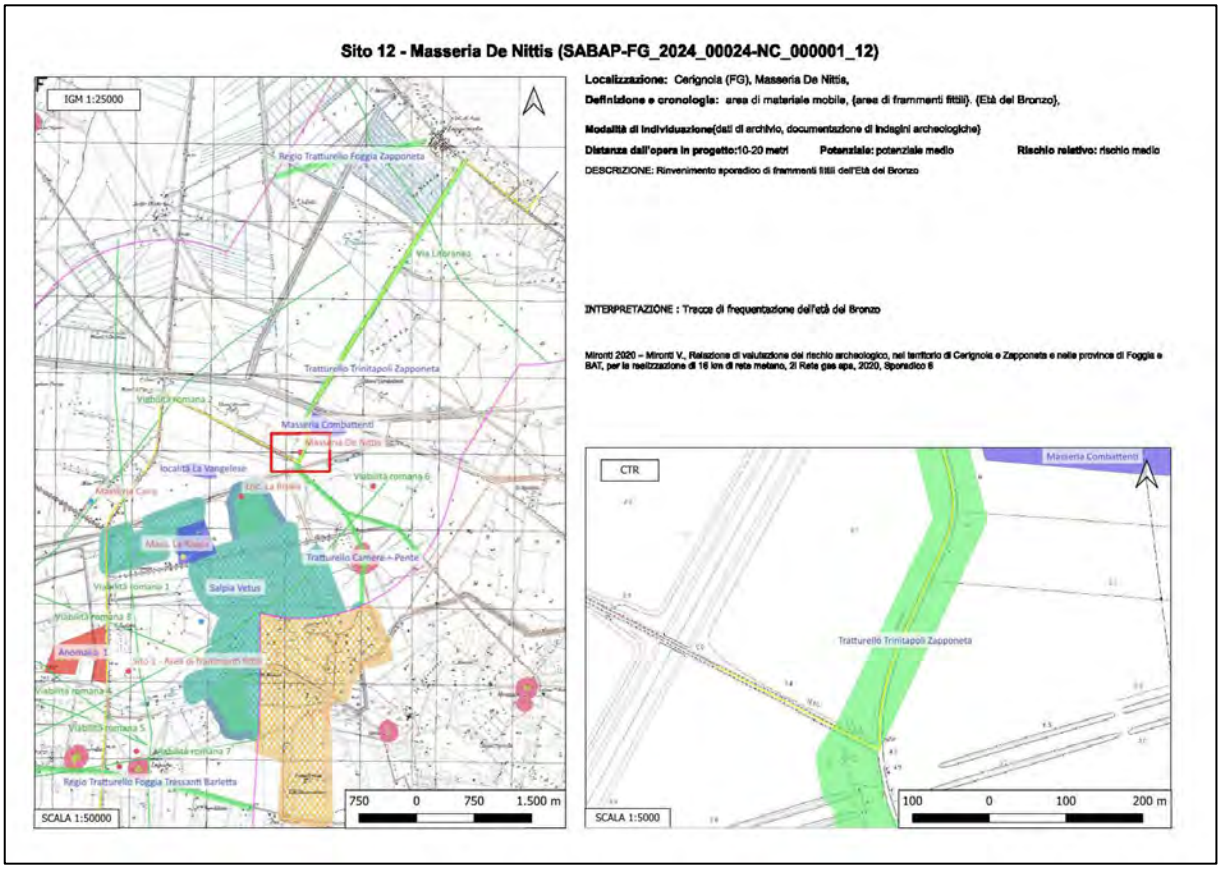
- Bibliographic and archival analysis has shown that in the study area there are numerous archaeological testimonies of various types, referable to different historical periods (ES.10.2_01_CATALOGO MOSI, ES.10.3_01_CARTA ARCHEOLOGICA).

  In particular, the well-known sites of Masseria Combattenti (Mosi Multipolygon Sheet No. 26); Masseria De Nittis (Mosi Multipoint Sheet n. 12); Geographical unit T2 (Mosi Multipolygon Sheet No. 13) and the area subject to direct archaeological constraints of *Salpia Vetus* (Mosi Multipolygon Sheet No. 17).

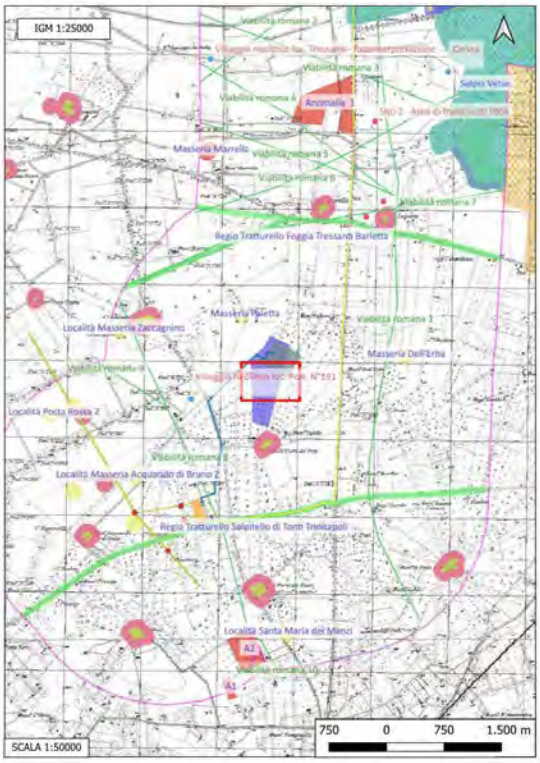
  The power line intersects the Via Litoranea (Mosi Multiline Sheet No. 28) and ten secondary Roman road layouts reconstructed by Alvisi (Mosi Multiline Cards nos. 29- 37), it follows the Trinitapoli-Zapponeta Tratturello in the section on the SP 66 (Mosi Multipolygon Sheet No. 21) and the Regio Tratturello Salpitello di Tonti Trinitapoli (Mosi Multipolygon n. 50) on the SP 68 and crosses the Regio Tratturello Foggia Tressanti Barletta (Mosi Multipolygon Sheet No. 23) at the intersection of the SP 77 and the SS 544.

In addition, the SE Rifasamento and the SE Enlargement fall within the buffer area of the Regio Tratturello Salpitello di Tonti Trinitapoli (Mosi Multipolygon n. 50).

Finally, it is worth mentioning the site Località Masseria Acquarulo di Grillo (Mosi Multipolygon Sheet No. 42) interfering with one of the pylons in the project.



Sito 13 - Unità geografica T2 (SABAP-FG_2024_00024-NC_000001_13)



Localizzazione: Cerignola (FG), Mass. Paletta, S 545

Definizione e cronologia: area di materiale mobile, (). (non determinabile),

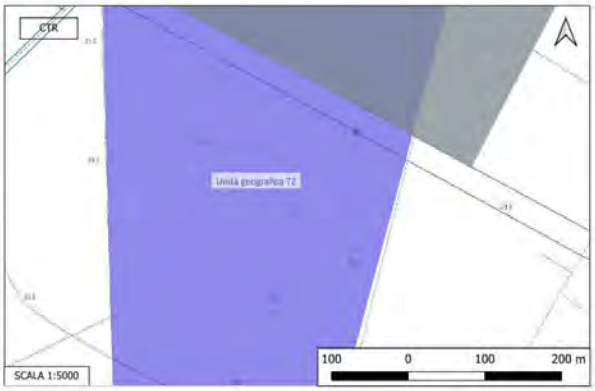
Modalità di individuazione(dati bibliografici, dati di archivio, fotointerpretazione/foto restituzione, resti materiali visibili nell'area, ricognizione archeologica/survey)

Distanza dall'opera in progetto0-10 metri **Potenziale:** potenziale medio **Rischio relativo:** rischio medio

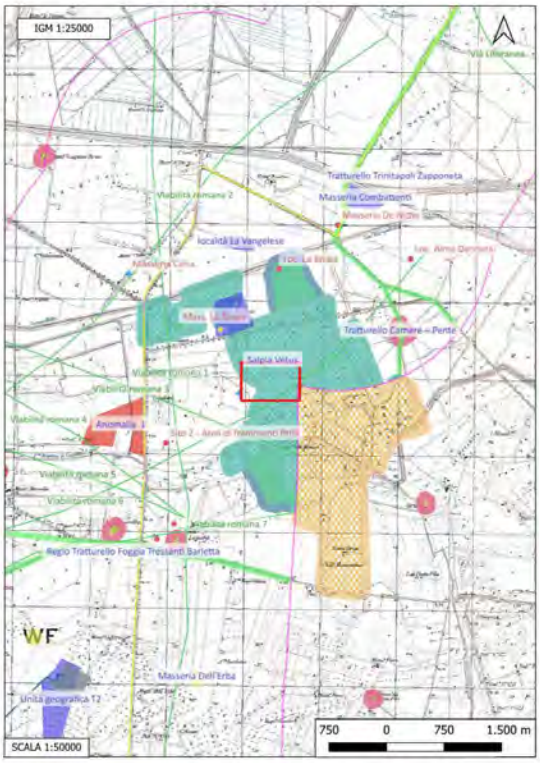
DESCRIZIONE: Nell'area indagata non è stata rilevata la presenza di evidenze archeologiche, solo presenza sporadica di frammenti fittili e laterizi

INTERPRETAZIONE : l'esigua quantità di materiale mobile non consente di ipotizzare una frequentazione antica, ma l'area risulta interessata dall'analisi aerofotografica da tracce riconducibili ad assi viari antichi

GNA (Mosi Multipolygon)



Sito 17 - Salpia Vetus (SABAP-FG_2024_00024-NC_000001_17)



Localizzazione: Cerignola (FG), contrada Lupara-Giardino,

Definizione e cronologia: sito pluristratificato, (). (Età del Bronzo, Età del Ferro, Età Romano repubblicana),

Modalità di individuazione(dati bibliografici)

Distanza dall'opera in progetto0-10 metri **Potenziale:** potenziale alto **Rischio relativo:** rischio alto

DESCRIZIONE: L'abitato si organizzava su un modestissimo rilievo pianeggiante con andamento molto articolato orientato in senso N-S. Le ricerche condotte nella zona hanno restituito testimonianze di frequentazione dell'abitato dall'Età del Bronzo all'Età Repubblicana. Durante la prima età del Ferro l'abitato era in capanne, in parte esplorate tra il 1958 e il 1978, a pianta rettangolare e a pianta absidata; le tombe erano a fossa. Durante la seconda Età del Ferro, Salapia conobbe una significativa crescita: probabilmente in questo periodo l'abitato dovette riorganizzarsi topograficamente. Il centro abitato sorgeva all'interno di un ampia depressione con acque stagnanti. L'interrimento e impaludamento di quest'ultime costituiscono la causa principale dell'abbandono dell'abitato daunio e il suo trasferimento a Monte di Salpi, 6 km ad est. Questo avvenne a seguito della richiesta di trasferimento dei Salapini fatta dal senato romano attraverso il patronus M. Hostilius. Vincolo Archeologico Diretto Istituito ai sensi della L. 1089/1939

INTERPRETAZIONE : Insediamento daunio (testimonianze archeologiche dell'età del Bronzo all'Età romano- repubblicana)

Da Venuto G., Goffredo R., Tottan D. M., De Mitri C., Ciminale M., Valenzano V., Salapia. Storia e archeologia di una città tra mare e laguna, in Mélanges de l'Ecole française de Rome. Antiquité, Vol. 127, n. 1, 2015
Lippolis E., Giammetteo T., Salpia vetus. Archeologia di una città lagunare, Venosa, 2008

PPTR (BP Zone di interesse Archeologico, UCP Aree di rispetto- zone di interesse archeologico; UCP Stratificazione insediative- siti storico-culturali; UCP Aree di rispetto- Siti storico culturali)
Carta dei Beni Culturali della Regione Puglia (Codice FGBIS003782)
Aree non idonee Fer (Beni Culturali con buffer di 100 m, Segnalazioni Carta beni con buffer di 100 m)

Sito 21 - Tratturello Trinitapoli Zapponeta (SABAP-FG_2024_00024-NC_000001_21)

Localizzazione: Cerignola (BT), .

Definizione e cronologia: infrastruttura viaria, (tracciato viario). (Età Medievale, Età Moderna, Età Contemporanea),

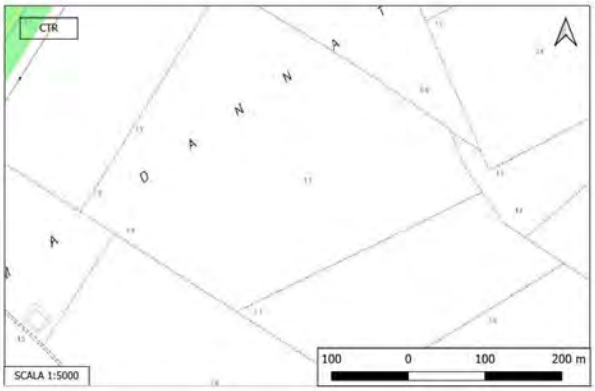
Modalità di individuazione(dati bibliografici)

Distanza dall'opera in progetto0-10 metri **Potenziale:** potenziale medio **Rischio relativo:** rischio medio

DESCRIZIONE: Tratturo e area di rispetto

INTERPRETAZIONE : Tratturo

PPTR (UCP- stratificazione insediativa- rete tratturi; UCP- area di rispetto- rete tratturi)
Quadro assetto tratturi n. 43



Sito 28 - Via Litoranea (SABAP-FG_2024_00024-NC_000001_28)

Localizzazione: Zapponeta (FG), .

Definizione e cronologia: infrastruttura viaria, (tracciato viario). (Età Romana),

Modalità di individuazione(dati bibliografici)

Distanza dall'opera in progetto0-10 metri **Potenziale:** potenziale medio **Rischio relativo:** rischio medio

DESCRIZIONE: Secondo Alvisi dopo la città di Siponto, la via Litoranea riprendeva il suo percorso lungo la riva del mare. "Dalla la foce del Cervaro, la sua traccia sembra continuare fino a Zapponeta, mentre più a sud, in contrada Alma Dannata, non rimane più alcun elemento utile all'individuazione del tracciato stradale. Si giunge così all'altezza delle Saline di Margherita di Savoia, che ei identificano, in parte con l'antica laguna di Salapia prima e con il lago di Salpi successivamente".

INTERPRETAZIONE : Via Litoranea (Viabilità principale)

ALVISI G., La viabilità romana della Daunia, Bari, 1970, pp. 66-69.

Sito 26 - Masseria Combattenti (SABAP-FG_2024_00024-NC_000001_26)

Localizzazione: Cerignola (FG), Masseria Combattenti,

Definizione e cronologia: area di materiale mobile, (area di frammenti fittili, industria litica, resti paleontologici). (Età del Bronzo),

Modalità di individuazione(dati di archivio, documentazione di indagini archeologiche)

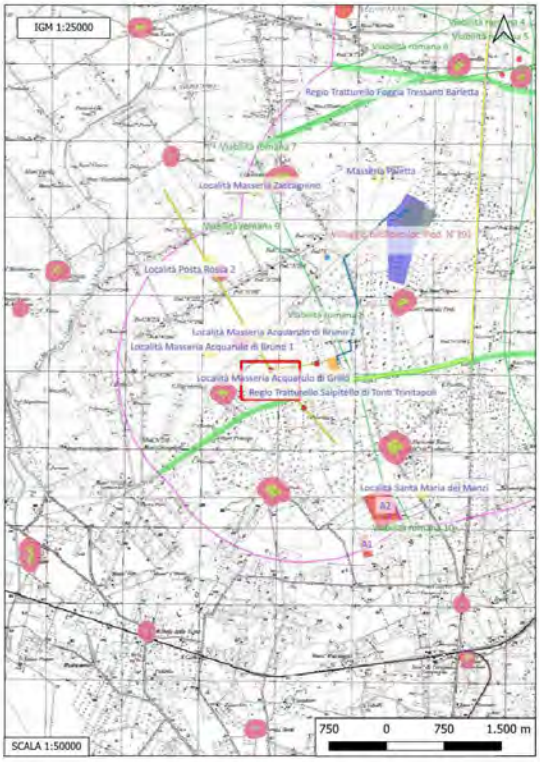
Distanza dall'opera in progetto0-10 metri **Potenziale:** potenziale alto **Rischio relativo:** rischio alto

DESCRIZIONE: Rinvenimento di frammenti fittili, industria litica, un frammento di fornello e malacofauna databili all'Età del Bronzo

INTERPRETAZIONE : Frequentazione dell'Età del Bronzo

Mironti V., Relazione di valutazione del rischio archeologico, nel territorio di Cerignola e Zapponeta e nelle province di Foggia e BAT, per la realizzazione di 16 km di rete metano, 2i Rete gas spa, 2020, UT 3

Sito 42 - Località Masseria Acquarulo di Grillo (SABAP-FG_2024_00024-NC_000001_42)



Localizzazione: Cerignola (FG), ,

Definizione e cronologia: insediamento, (villaggio). (Neolitico),

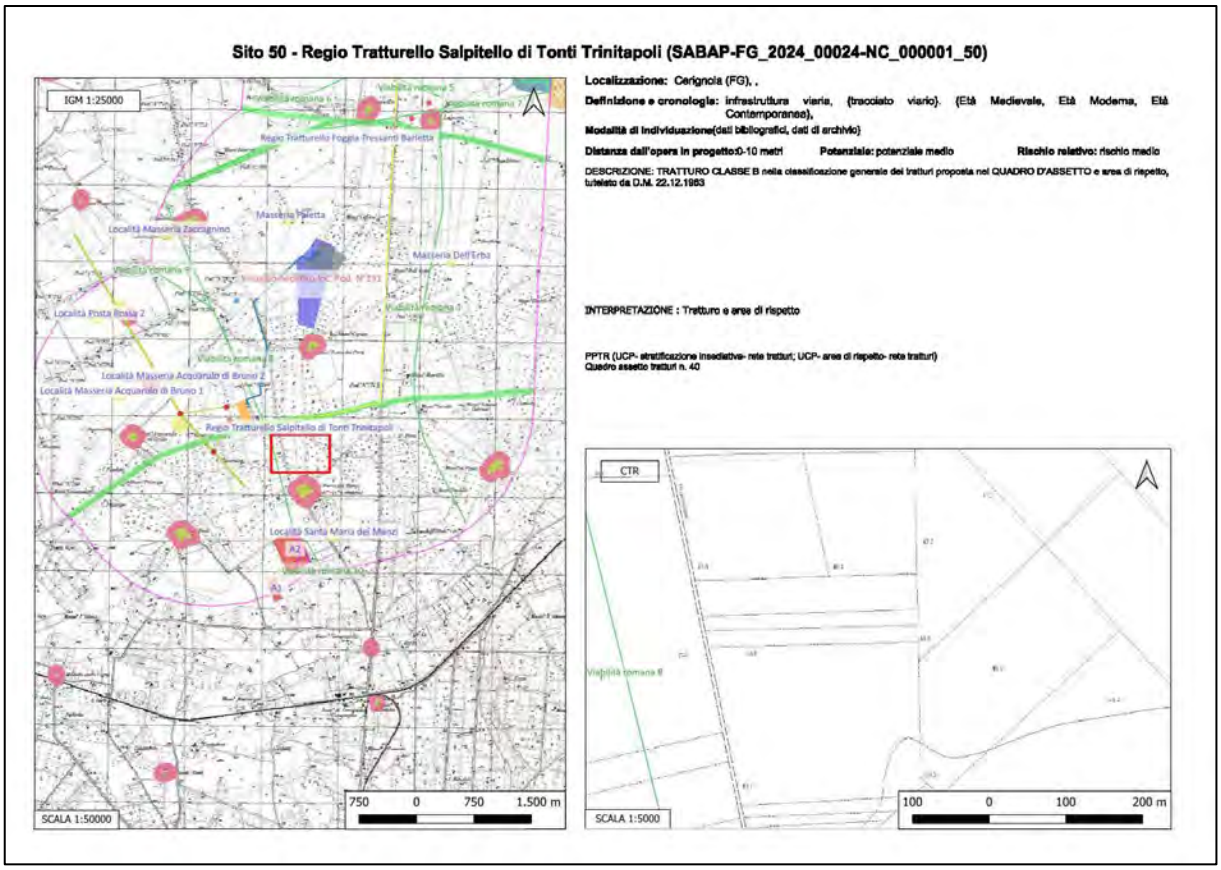
Modalità di individuazione(dati bibliografici, fotointerpretazione/foto restituzione)

Distanza dall'opera in progetto20-50 metri **Potenziale:** potenziale alto **Rischio relativo:** rischio alto

DESCRIZIONE: Villaggio trincerato individuato tramite fotointerpretazione. La traccia da fotografia aerea non consente di procedere alla definizione del numero e articolazione delle componenti interne.

INTERPRETAZIONE : villaggio neolitico

Carta dei Beni Culturali della Regione Puglia (Codice FGBS5003734)
Area non idonee Fer (Segnalazioni Carta beni con buffer di 100 m)



Some Mosi cards extracted from the ES. 10.2 (Mosi Catalogue) –archaeology

- From the observation of orthophotos Analyzed (Ortofoto 2019, 2016, 2015, 2013, 2011, B/W 1997; Google Satellite) Along the project route and in the surrounding areas, the following anomaly was identified:

  MOSI MULTIPOLYGON SHEET NO. 27 Anomaly 1: Anomaly from traces of damp of rectilinear shape and circular spots, close to the power line along the SP 77 identified on Ortofoto 2013, doubtfully interpretable as non-id structuresentified.

Anomaly from aerial photointerpretation Behind of the power line along the SP 77

- The reconnaissance was carried out on January 14, 2024, on a sunny and sometimes cloudy day, without wind.

  The operations started from the northern end of the planned cable duct, at the outlet into the sea on the southern outskirts of Zapponeta (Marchesa locality).
  After a short stretch on a gravel road, the planned cable duct joins the SP 5 and proceeds for about 1.3 km northwards. Entering the municipality of Zapponeta, the route deviates west on the SP 66 and continues south for 6.5 km, enters a gravel road to the west and runs along it for about 1.8 km. The cable duct then leads to the SP 77 and after about 9.5 km southbound, it joins another dirt road that leads to the Terna electrical station in Cerignola.
  Overall, the area was characterized by the presence of agricultural land (olive groves, vineyards, orchards and cereals); covered with spontaneous covering vegetation or uncultivated land with zero visibility.
  Some ploughed fields were also reconnaissance, within which no ceramic fragments or other archaeological evidence were found.
  Some peculiar aspects of the reconnaissance areas are underlined: on the southern outskirts of Zapponeta, near the sea, the soils were sandy in consistency and numerous fields were occupied by greenhouses, as well as buildings.
  The area in question is located in a very depressed area whose altitude is often lower than that of sea level and subject to constant swamping. This has made it necessary to carry out numerous

reclamation and canalization interventions. Many project roads were therefore elevated above the surrounding land and the presence of numerous bridges and canals is noted.
The changes to the project layout made it necessary to carry out a new reconnaissance, which took place on 22 May 2025 on a warm day with moderate wind.
The land where the 4 pylons will be built was first inspected: the two to the west are located in arable land with zero visibility, the rest in olive groves and vineyards with good or low visibility.
The "SE extension" station is designed in a land partly cultivated with arable land, partly with vineyards: in both cases the visibility to the ground was optimal.
The "SE power factor correction" station is located in a field currently occupied by an olive grove that was ploughed.
The cable duct runs along the SP 77, along an unnamed asphalt road, along the SP 69 and dirt roads between the fields.
The land surveyed in the 50 m around the project areas was mostly olive groves and a few vineyards, arable land with zero visibility and a few uncultivated fields.
Both reconnaissances were negative, as no evidence of archaeological interest was found.
Please refer to the *ES.10.4_01_Map of soil visibility*, *ES.10.5_01_Map of land cover* and the photographs taken contained within the RCG Layer and RCG Attachments-Images folder of the archive *ES.10.8_01_Template GIC ICA onshore archaeology* for further information.

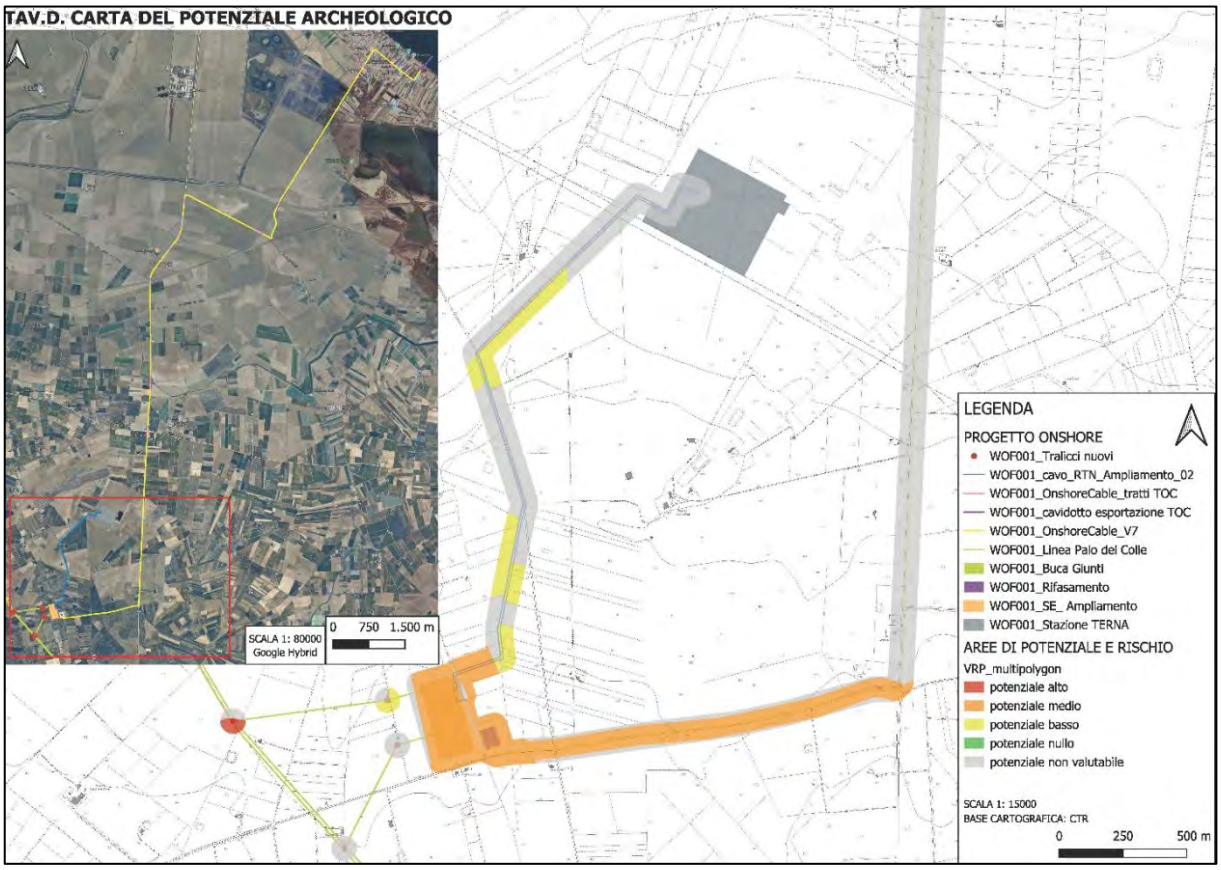
- For the definition of the Archaeological Potential and Risk, the following factors were considered: the attestations of archaeological finds known from archives and bibliography, the discoveries possibly made during the surface reconnaissance phase, the analysis of the available aerial photographic documentation, the known paleo-environmental situation, the presence of significant toponyms, the operational specifications for the project activity. The estimate was made on the basis of the indications provided in Annex 1 of Circular no. 53/2022 DGABAP "Preventive verification of archaeological interest. Regulatory and procedural updates and technical indications". For the evaluation, we relied on the "Table of degrees of archaeological potential" contained in Annex 3_ Circular no. 1/2016 DG-AR "Discipline of the procedure referred to in Article 28, paragraph 4 of Legislative Decree No. 42 of 22 January 2004, and Arts. 95 and 96 of Legislative Decree no. 163 of 14 April 2006, for the preventive verification of the archaeological interest, both in the preliminary design and in the final and executive design, of the areas chosen for the location of public works or works of public interest".

  The archaeological potential was assessed on an area of 50 m per side with respect to the project areas and, as illustrated in Annex.*ES.10.6_01_CARTA OF ARCHAEOLOGICAL POTENTIAL*, the following potential grades have been established:

  - **Potential not assessable:** outline of the project in an underwater environment; areas that are not accessible or covered by arable or uncultivated vegetation that has made visibility on the ground null; paved, gravel or dirt roads.
  - **Low potential:** areas with good or medium visibility on the ground, characterized by the absence of archaeological traces, located at a sufficient distance from the known archaeological evidence.
  - **Average potential:** areas located less than 100 m from the ancient road layouts (Mosi Multiline Cards); areas interfering with the route of the sheep tracks and the related buffer areas; area interfering with the anomaly from aerial photointerpretation 1 (Mosi Multipolygon Sheet no. 27).
    A degree of archaeological potential has been assigned **Medium** also to the SE of Enlargement because, although the reconnaissance was negative, it is located a short

distance from an ancient road layout and a sheep track, as well as being in a vast area dense with known archaeological evidence.

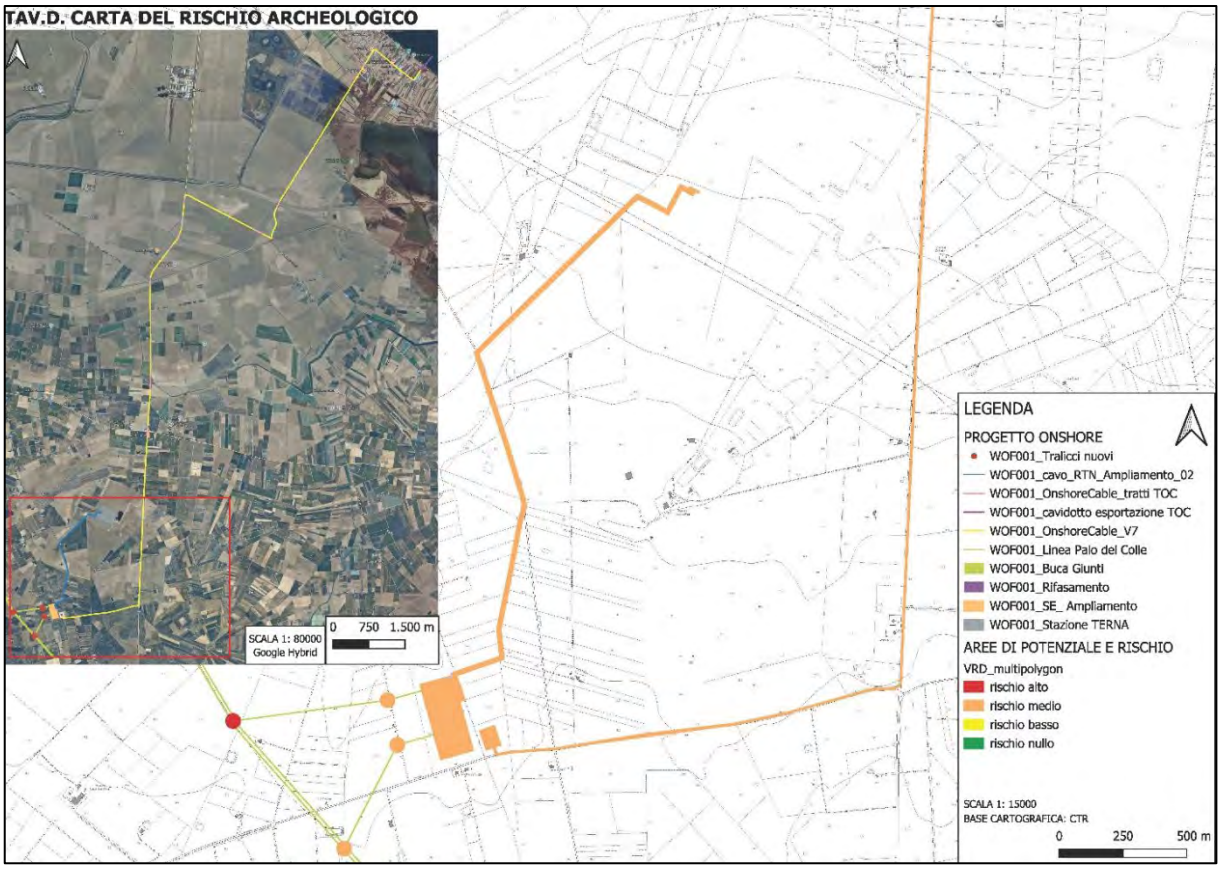
- **High Potential**: areas located less than 100 m from the punctual archaeological evidence (Mosi Multipoint Cards) and less than 50 m from the polygonal archaeological evidence (Mosi Multipolygon Boards)



Map of archaeological potential – excerpt

At the end of the analysis carried out, the following degrees of Archaeological Risk were established, illustrated in Annex. *ES.10.7_01_Map of archaeological risk*:

- **Archaeological risk High** for the pylon close to the site known as "Località Masseria Acquarulo di Grillo";
- **Low archaeological risk** for sections of cable ducts built on elevated roads or with HDD technique;
- **Medium archaeological risk** for all other project areas.



Archaeological risk map – excerpt

4.1.7.2 Offshore archaeology

In order to assess the consistency of a possible "archaeological risk" in the offshore areas affected by the interventions, a careful analysis and a risk assessment study were carried out, contained in the section *SIA.ES.11* attached to this Study.

The purpose of the investigation carried out was to determine the critical underwater and coastal areas in order to constitute a reference to detect the inherent problems caused by the interference between any archaeological presences and the planned works, as established by the Article 41, paragraph 4 and Annex I.8 of Legislative Decree no. 36 of 31 March 2023.

A reading of the coastal geomorphological characteristics was carried out as a function of the reconstruction of the settlement evolution of the coast, integrating these data with those obtained from the published bibliography and cartography. The data obtained from the instrumental investigations were also subjected to analysis aimed at making known the nature, extent and consistency of any archaeological deposits or declaring a negative outcome by assessing their compatibility with the works in the project and with the protection of the environmental component and the archaeological heritage itself. This first phase of the Preventive Verification of Archaeological Interest has as its purpose the evaluation of the impact of the works to be carried out on the archaeological heritage and/or on the context of archaeological interest, the collection of data, the method of transmission of the documentation that will make it possible to define the terms for the activation of the procedure of preventive verification of archaeological interest which in turn will have the purpose of preserving the archaeological deposits located in the along the coast and also preserved underwater, which constitute to all intents and purposes a portion of the cultural heritage.

The purpose of the investigation carried out is to determine the critical underwater and coastal areas in order to constitute a reference for detecting the inherent problems caused by the interference between any archaeological presence and the planned works.

The preliminary phases of the study included:

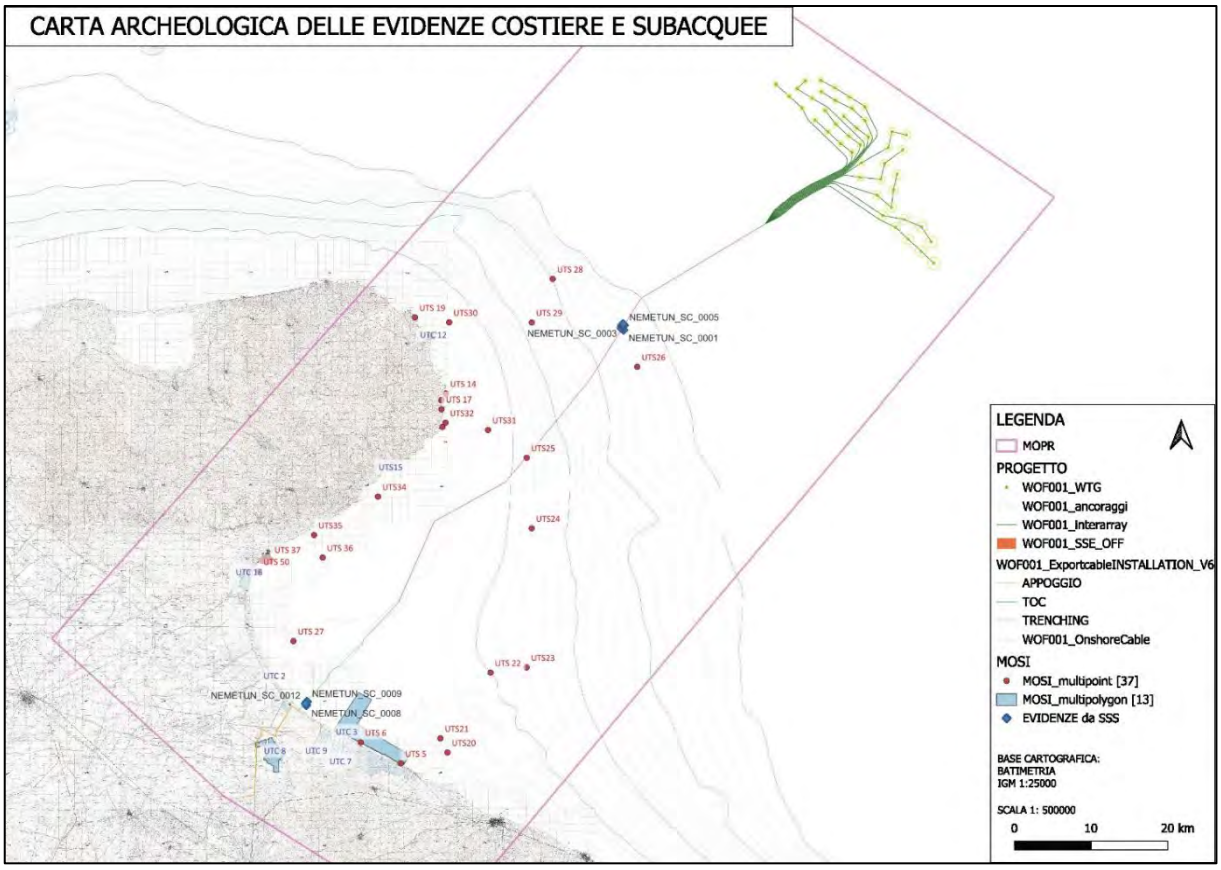
- bibliographic research with retrieval of coastal and underwater archaeological finds published in the specialized literature at libraries (university, provincial and municipal), also making use of telematic resources and databases *Online*;
- Cataloguing of sites merged into the *MOSI Catalogue*;
- QGIS application called "*Template mare_GNA Version 1.4.1*" updated on February 14, 2024;
- first preliminary assessment of the underwater archaeological evidence with respect to the area of implementation of the project, contained within the MOSI sheets;
- creation of a topographic reference map with georeferencing of the sites reported in relation to the project;
- creation of reference topographic maps with assessment of the underwater archaeological risk deduced on the basis of published data and instrumental investigations.

Please refer to the series "S*IA. ES.11_Archaeology"*, for more information.

- **Preliminary assessment of areas of underwater archaeological interest**

Following the search for bibliographic and archival sources concerning an area approximately within a radius of 40 km with respect to the project area, the analysis of the overlap between the plan of the wind farm and the marine cable duct with the identified underwater topographic units revealed a general absence of archaeological interference. The only exception is represented by a generic "wreck" of contemporary times (**UTS 25**), located about 110 m east of the cable duct. The greatest concentration of underwater finds is found along the coastal strip and in the stretch of sea to the south-east from the junction of the submarine cable in the locality of la Marchesa (Zapponeta-FG). About 6 km to the south-east is the site of Torre Pietra (**UTS 4**), while among the coastal sites closest to the grafting area are the **UTC 8-9**, corresponding to *Salpia vetus*/Salapia/Salpi, located about 6 km to the south, and the villa of San Vito (**UTC 7**), 8 km south.

With reference to the topographic positioning of these coastal and underwater elements with respect to the development envisaged by the project *Nemetun Island* An archaeological assessment was carried out that leans towards an assessment of medium potential and low risk. Despite the scarce presence of archaeological information, a hypothetical anthropic presence of the area in ancient times cannot be ruled out at a potential level, given the relative proximity to the main centers of *Salapia* and Siponto. On the other hand, the characteristics of the work and the absence of a certain archaeological presence allow us to assess a low risk, in the absence of further prospecting and cognitive archaeological investigations.



Map of archaeological evidence (Coastal Topographic Units and Underwater Topographic Units)

- **Instrumental investigations**

In November-December 2023 and January 2024, the area affected by the planned works was subjected to instrumental investigations in order to obtain geoacoustic surveys. The operations were planned along the connections and cable ducts planned for the plant, carried out along a corridor about 1000 m long and centered on the theoretical route of each cable duct. In the areas where the connection cable conduit is located, in the landing areas and in the areas approaching the coast, visual inspections of the seabed were carried out on 11 and 12 January 2024 using a wire-guided robotic vehicle ROV.

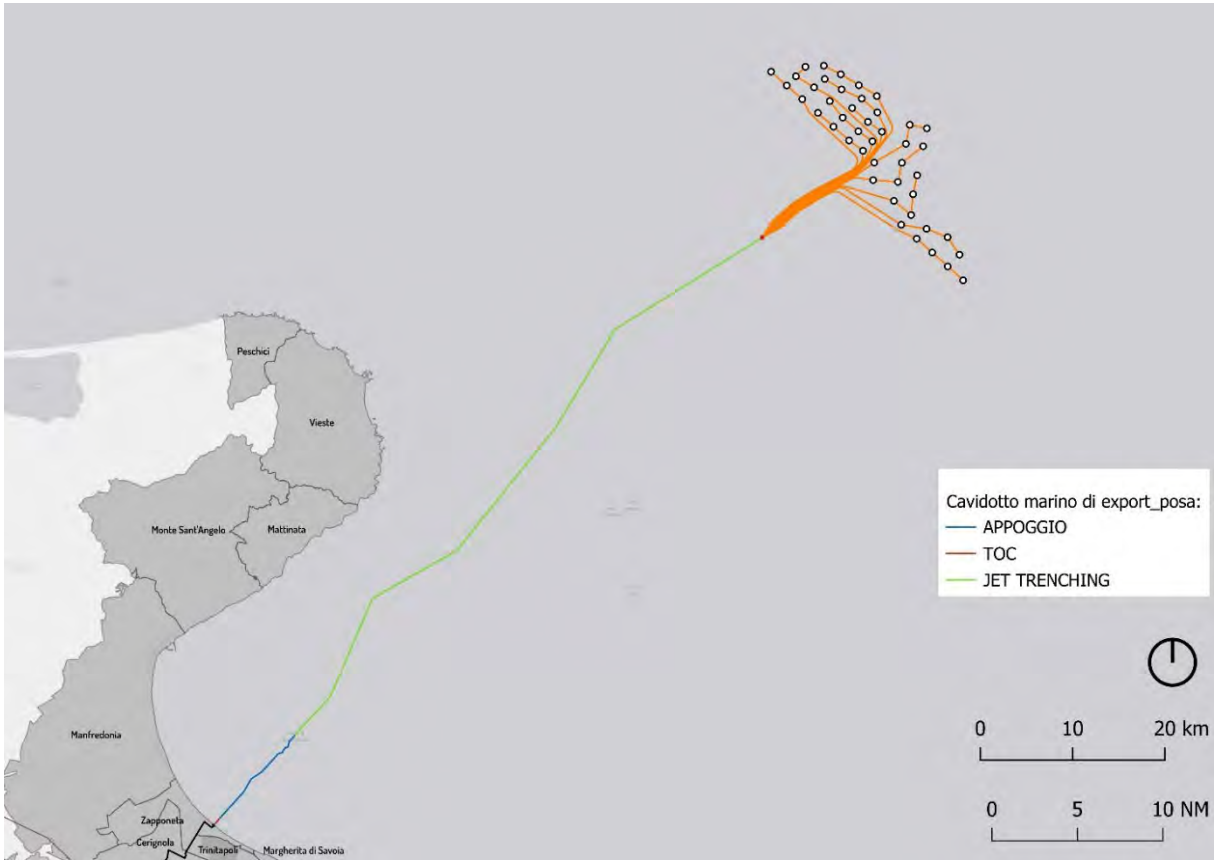
The activities carried out were as follows:

- bathymetric survey with multibeam echosounder
- morphological survey by side scan sonar, *Side Scan Sonar* (SSS)
- stratigraphic survey by means of *Sub Bottom Profiler* (SBP)
- Video inspection by wire-guided underwater vehicle *Remote Operated Vehicle* (ROV).

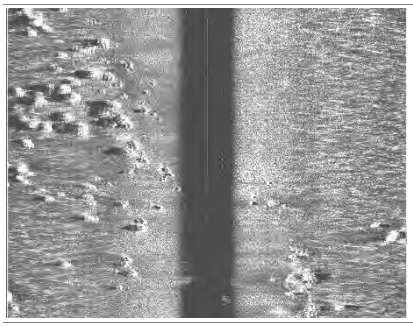
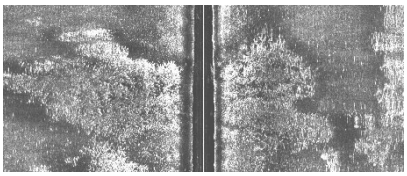
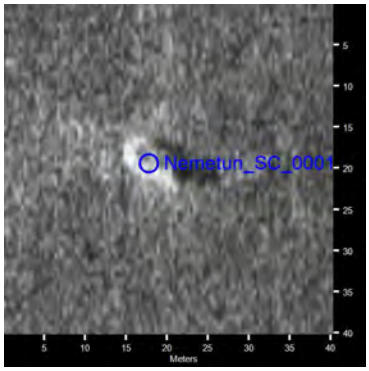
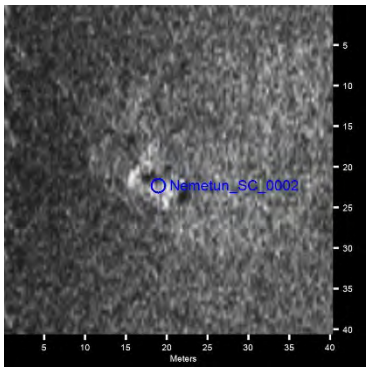
- **Archaeological Risk Assessment in relation to the data of instrumental investigations**

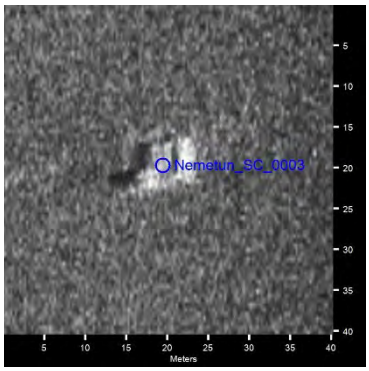
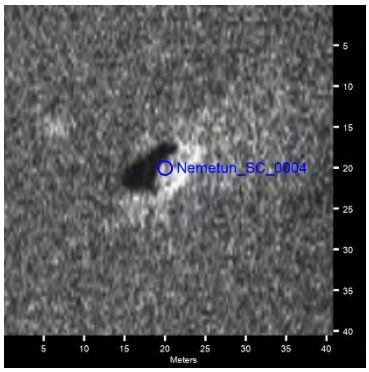
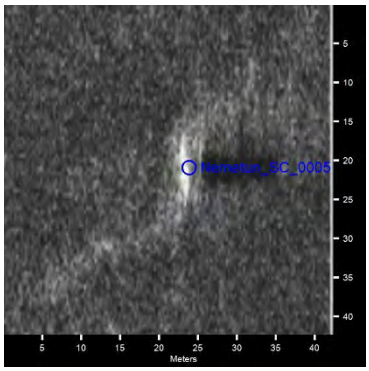
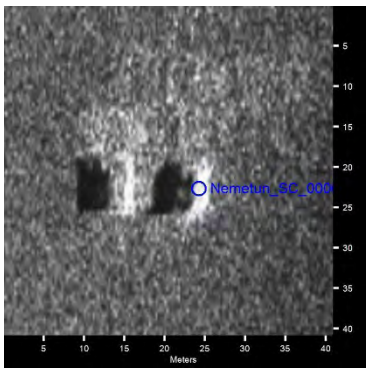
The data collected will make it possible to define in greater detail the design choices with reference to the procedures for laying and burying the marine cable duct, through different techniques including HDD, *jet trenching* and laying of cables resting on the seabed with high-precision methods with low impact on areas characterized by the presence of *Cymodocea nodosa* and coralligenous and laying in trenches on the seabed characterized by loose sediments, to the sizing of the foundation structures for the Substation *Offshore* on a fixed platform and the design of the anchoring and mooring works for the floating foundation substructures of the wind turbines, in addition to the impact assessment on the archaeological evidence,

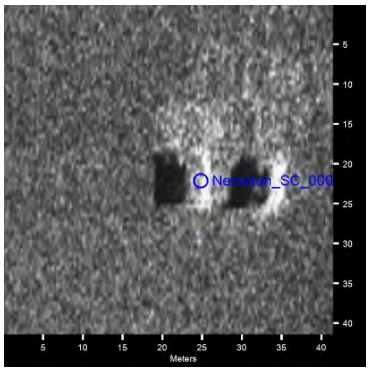
mainly concentrated in the area below the coast but absolutely not falling within the design areas, and in correspondence with the anomalies found (**SC_01 – SC_12**).



General overview map with installation systems of the export cable duct

Image *Side Scan Sonar*	Image ROV	Info
	GLDS0216_121224737.mp4 	**Coralligenous** ● Position 41.5269735 16.0651768 (WGS84) (X) 588866.34 (Y) 4597806.49 (Projected Coordinates) Depth: 17 m
	GLDS0216_133156238.mp4 	***Cymodocea nodosa*** ● Position 41.4527100 15.9799915 (WGS84) (X) 581852.781 (Y) 4589477.579 (Projected Coordinates) Depth: 5 m
	NO IMAGE	**SC_01** ● Position 41.8913869606 16.4775201587 (WGS84) (X) 622574.07 (Y) 4638772.58 (Projected Coordinates) **Dimensions and attributes** ● Target Width: 3.98 Meters ● Target Height: 2.32 Meters ● Target Length: 8.19 Meters Depth: 95 m ● Description: Probable container
	NO IMAGE	**SC_02** ● Position 41.8935246080 16.4737501713 (WGS84) (X) 622257.23 (Y) 4639004.54 (Projected Coordinates) **Dimensions and attributes** ● Target Width: 3.24 Meters ● Target Height: 0.97 Meters ● Target Length: 6.39 Meters Depth: 95 m ● Description: Probable container

	NO IMAGE	**SC_03** ● Position 41.8966765179 16.4750567966 (WGS84) (X) 622359.60 (Y) 4639356.37 (Projected Coordinates) **Dimensions and attributes** ● Target Width: 6.76 Meters ● Target Height: 2.11 Meters ● Target Length: 8.42 Meters Depth: 96 m ● Description: Probable container
	NO IMAGE	**SC_04** ● Position 41.8976677767 16.4758446720 (WGS84) (X) 622423.07 (Y) 4639467.55 (Projected Coordinates) **Dimensions and attributes** ● Target Width: 4.21 Meters ● Target Height: 2.53 Meters ● Target Length: 7.94 Meters Depth: 97 m ● Description: Probable container
	NO IMAGE	**SC_05** ● Position 41.8967807789 16.4783875543 (WGS84) (X) 622635.71 (Y) 4639372.70 (Projected Coordinates) **Dimensions and attributes** ● Target Width: 2.26 Meters ● Target Height: 2.38 Meters ● Target Length: 8.69 Meters Depth: 97 m ● Description: Probable container
	NO IMAGE	**SC_06** ● Position 41.8983044165 16.4765456946 (WGS84) (X) 622480.00 (Y) 4639539.24 (Projected Coordinates) **Dimensions and attributes** ● Target Width: 2.37 Meters ● Target Height: 3.36 Meters ● Target Length: 7.34 Meters Depth: 97 m ● Description: Probable container



NO IMAGE

SC_07

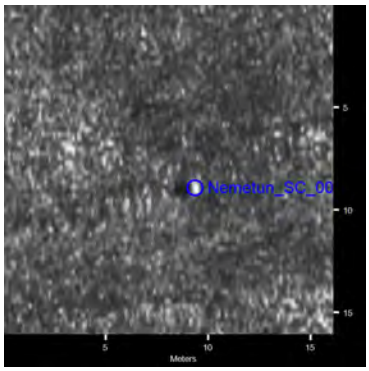
- Position 41.8983439825 16.4764469870 (WGS84) (X) 622471.74 (Y) 4639543.49 (Projected Coordinates)

Dimensions and attributes

- Target Width: 3.78 Meters
- Target Height: 2.25 Meters
- Target Length: 6.68 Meters

Depth: 97 m

- Description: Probable container

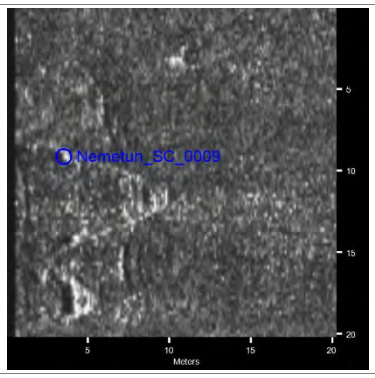


SC_08

- Click Position 41.4547169920 15.9828860608 (WGS84) (X) 582092.02 (Y) 4589703.14 (Projected Coordinates)
- Map Projection: UTM84-33N
- Line Name: 0003_1312

Dimensions and attributes

- Target Width: 0.47 Meters
- Target Height: 0.17 Meters
- Target Length: 1.05 Meters
- Description: Debris



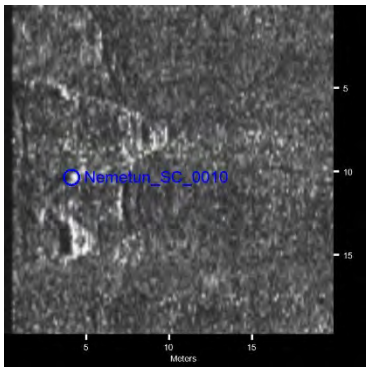
GLDS0216_133156238.mp4

SC_09

- Position 41.4589596658 15.9838561679 (WGS84) (X) 582167.69 (Y) 4590175.08 (Projected Coordinates)

Depth: 9 m

- Description: Fishing net; detritus

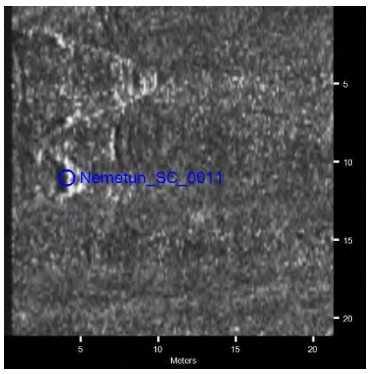


SC_10

- Click Position 41.4589365108 15.9838122894 (WGS84) (X) 582164.05 (Y) 4590172.47 (Projected Coordinates)
- Map Projection: UTM84-33N
- Line Name: CL

Dimensions and attributes

- Target Width: 0.37 Meters
- Target Height: 0.07 Meters
- Target Length: 0.78 Meters
- Description: Fishing net; detritus

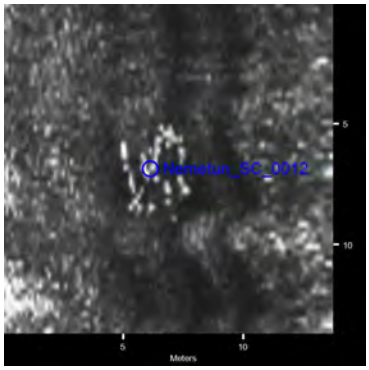


SC_11

- Click Position 41.4589173195 15.9837863683 (WGS84) (X) 582161.91 (Y) 4590170.31 (Projected Coordinates)
- Map Projection: UTM84-33N
- Line Name: CL

Dimensions and attributes

- Target Width: 0.63 Meters
- Target Height: 0.09 Meters
- Target Length: 2.46 Meters
- Description: Fishing net; detritus



GLDS0216_130013588.mp4

SC_12

- Position 41.4565807642 15.9817566212 (WGS84) (X) 581995.34 (Y) 4589908.98 (Projected Coordinates)

Dimensions and attributes

- Target Width: 3.51 Meters
- Target Height: 0.00 Meters
- Target Length: 3.88 Meters
- Description: Debris accumulation

Depth: 9 m

The underwater archaeological evaluation of the data obtained from the instrumental reconnaissance made it possible to assess the absence of evidence of a historical/archaeological nature or inherent to the submerged cultural heritage. However, the presence of coastal evidence, port sites with important commercial roles, the discovery of finds (amphorae, anchors, etc.) decontextualized and isolated, rarer ancient wrecks and more frequent contemporary shipwrecks, which occurred in previous decades, in correspondence with the reference area of the coastal municipalities involved in the Project *Nemetun Island*, which have been affected in the past by frequentations, stationing, navigation and anchoring and stopover activities – especially in correspondence with the *Guillemot*/Vieste, Siponto and *Salapia*/Salpi – suggest that specific checks will be necessary during the processing and implementation phases of the project precisely in correspondence with the latter area and in those specifically indicated in the "Underwater Archaeological Risk Maps" (***ES. 11.1_01***).

In the latter, the thematic contents have been expressed in relation to the values of HIGH, MEDIUM AND ZERO RISK with respect to the "interference of the planned works" and with respect to the "relationship with the value of archaeological potential", as contemplated in the ministerial table. The cartographic settings were made by assigning a *buffer* of 50 m around the areas that will be affected by the laying of the cable ducts – which will take place with different techniques also based on the specificities of the seabed, such as HDD (Horizontal Directional Drilling),*Trenching* and the laying of cables resting on the seabed – and 30 m around the areas designed for the anchoring of the wind turbines within the wind farm *off shore*.

The value of HIGH RISK (***ES. 11.1_01***), at the first stretch of sea where it is planned, near the landing point, that the cable will be laid in the seabed for about 880 m and up to a minimum bathymetry of 8 m by means of the Horizontal Directional Drilling (HDD) technique. This technique will make it possible to cross the

defence works on the coast and to reach the transition joints without excavating the coastline. The same value as HIGH RISK has been assigned to the segment where geophysical surveys have revealed the presence of a pseudo prairie of *Cymodocea nodosa* which extends to a depth of 7 m and, again, to cover bathymetry between -9 m and -10 m due to the presence of anomalies **SC_08 - SC_12**. Adopting a precautionary criterion, the High risk section was extended by a further 300 m after the anomaly SC_09.

The landing solution with TOC is aimed at reducing the impact of the works at the current coastline characterized by transversal breakwaters to the shoreline and to overcome the stretch where the Cymodocea nodosa is present. This operation will involve surveillance by the archaeologist during the execution phases. The sea-side end of the section to be carried out with remote-controlled drilling within which an excavation will be carried out to bring out the aforementioned ends while avoiding contact with water, in order to facilitate the laying of the pipes inside the holes and the subsequent laying of the cables.

The technique called "simple support" guarantees the mechanical protection of the cable conduit using coupled metal tubular elements, often made of cast iron. This laying method offers a certain flexibility to the cable even after the application of the protection and prevents contact with the bioconstructions present or with any archaeological evidence, guaranteeing the best protection.

The HIGH RISK has also been assigned exclusively in a preventive manner in this phase, referring in any case to what has been reported and georeferenced from the point of view of the cataloguing of the sites that have been documented in this area and to the evaluation of the instrumental investigations which, however, did not show potential from an archaeological point of view, in the intermediate section, at bathymetry between -30 m and -31 m (***ES. 11.1_01***) and **UTS 25**, whose position falls approximately 100 m east of the range of the route and the range between the bathymetry of -95 m and -97 m (***ES. 11.1_01***) where instrumental investigations have highlighted the concentration of anomalies **SC_01 – SC_07** that gravitate around the cable duct laying area.

On the other hand, the value of MEDIUM RISK has been assigned, mainly with reference to the instrumental investigations carried out, i.e. an "area in which the planned work will directly affect the altitudes at which the presence of archaeological stratification is considered possible or its proximity" with respect to areas "with high or medium archaeological potential" even if it cannot be fully assessed on the basis of instrumental investigations, most of the section where the cable duct is planned to be laid starting from the area below the coast with bathymetry between -9 m and -17 m (***ES. 11.1_01***), between -17 m and -60 m (***ES. 11.1_01***), between -60 m and -94 m and then resumed between -98 m and -130 m (***ES. 11.1_01***) and between -130 and -176 m (***ES. 11.1_01***).

The marine cable will be positioned by silting at a depth of about 2 m using a water jet machine, where possible based on the characteristics of the seabed. The width of the trench in which the cable is laid and therefore protected is slightly greater than the diameter of the cable itself, minimizing the impact of operations on the seabed and the dispersion of sediment in the surrounding environment. The excavation in the areas where silting is planned will be carried out with a water jet machine (*jet trenching*) which allows a modest impact on the environment but on average critical towards any objects or deposits of an archaeological nature, even if the latter, compared to the sections reconstructed thanks to the investigations *Sub Bottom Profiler*, do not seem to be present in the sampled area which is characterized on average by the presence of a muddy layer at least one meter thick along the entire route of the cable duct. For the stretch from the bathymetric height of -17 m to the electrical substation *Offshore*, along a route of 77 km (equivalent to about 41.5 NM), the characterization of the seabed has detected a substrate of loose sedimentary deposits and in correspondence with these portions the cable duct will be installed in the trench using the technique of *Jet Trenching*. These drag-driven trenching systems employ a plough specially designed to adapt to different types of soil and laying depths. The excavation takes place thanks to the pulling action exerted on the plough by a tow boat, which provides the necessary traction force while the

plough is equipped with water jets that liquefy the seabed, as described above, creating the trench, laying the cable duct and at the same time closing the trench.

The processing does not require any movement of the cable on the bottom. The operation can be interrupted at any point and possibly resumed at a later point.

The MEDIUM RISK has also been assigned for the wind farm area, where 45 wind turbines are planned to be installed on tubular steel towers and the related floating foundations, divided into 12 subfields. In addition to these, there are 12 submarine cable power lines connecting the wind turbines, an electrical collection and transformation station *Offshore* wind turbines installed on tubular steel towers moved by three-bladed rotors and their floating foundations anchored to the seabed and connected by cables to an electrical substation *Offshore* on a fixed platform. The MEDIUM RISK value also includes the foundation areas of the substation structures *Offshore* which will be of a fixed type and composed of substructures (*Jacket*), foundation piles and superstructures (*Topsides*). The wind farm of *Nemetun Island* has designed a *Jacket* that will make up the aforementioned substations has been designed as a truncated pyramid-shaped welded truncated tubular steel 4-legged truncated steel structure, which extends from the seabed to elevation +15 m above sea level. The structure of the *Jacket* it is anchored to the seabed by means of foundation piles of type '*skirt piles*', positioned at the four corners. In this phase of the project, 8 *skirt piles*, two per corner. The piles are driven into the seabed by hammering, using an underwater hydraulic pile driver, through appropriate guides (*fleece sleeves*) firmly connected to the base of the *Jacket*. Once the design driving has been reached, the piles will be connected to the *Jacket* by pumping cement mortar into the cavity between the pole and the guide with a special injection system. These design characteristics constitute the reference for the assignment of the AVERAGE RISK value with respect to this area, also in consideration of the zero value of the visibility of any archaeological site.

The project foresees, before the start of the installation operations of the Jacket, a thorough inspection of the seabed in the installation area in order to identify any obstacles to be removed and verify that the seabed is regular and, considering the bathymetric values, the inspection will be carried out by ROV (*Remote Operated Vehicle*). Transport from the construction site to the installation site will be done by loading the *Jacket* on transport barges of adequate capacity, equipped with runways and launching sling bar (*launching barge*). The *Jacket* will be built and transported horizontally and close to the installation site, the *Jacket* it will be, after adequate ballasting, made to slide into the water and through the use of a crane and at the same time flooding some compartments in the lower part of the *Jacket*, the verticality of the structure will be obtained until it submerges and reaches the bottom, where it will assume a balanced position thanks to the temporary foundation plates. These operations could cause hydrodynamic movements of the water and displacements of the sedimentary layers of the bottom, causing possible risks for the submerged cultural evidence, should they be highlighted precisely as a result of these interventions, since at the moment the instrumental investigations do not allow us to define entities of this nature. The foundations of the platform will consist of eight or twelve piles ranging in diameter from 2 m to 2.5 m, and the eight piles will be driven into the seabed layers up to about 100 m. The poles will be prefabricated in a single piece and transported to the installation site on a special barge, or on the same barge on which the *Jacket*. The installation of the pile can be carried out by pile driver or drilling of the housing hole, depending on the results of direct investigations

In the same way, the MEDIUM RISK value has been assigned to the circular areas within which the anchorages of the wind turbines will be planned.

The construction of the wind farm is planned *Offshore* it will take place mainly on the quay in dedicated port areas specially set up; The floating foundations consisting of a substructure stabilized by a buoyancy figure, semi-submersible or barge type with internal damping body of water, will be assembled and then launched

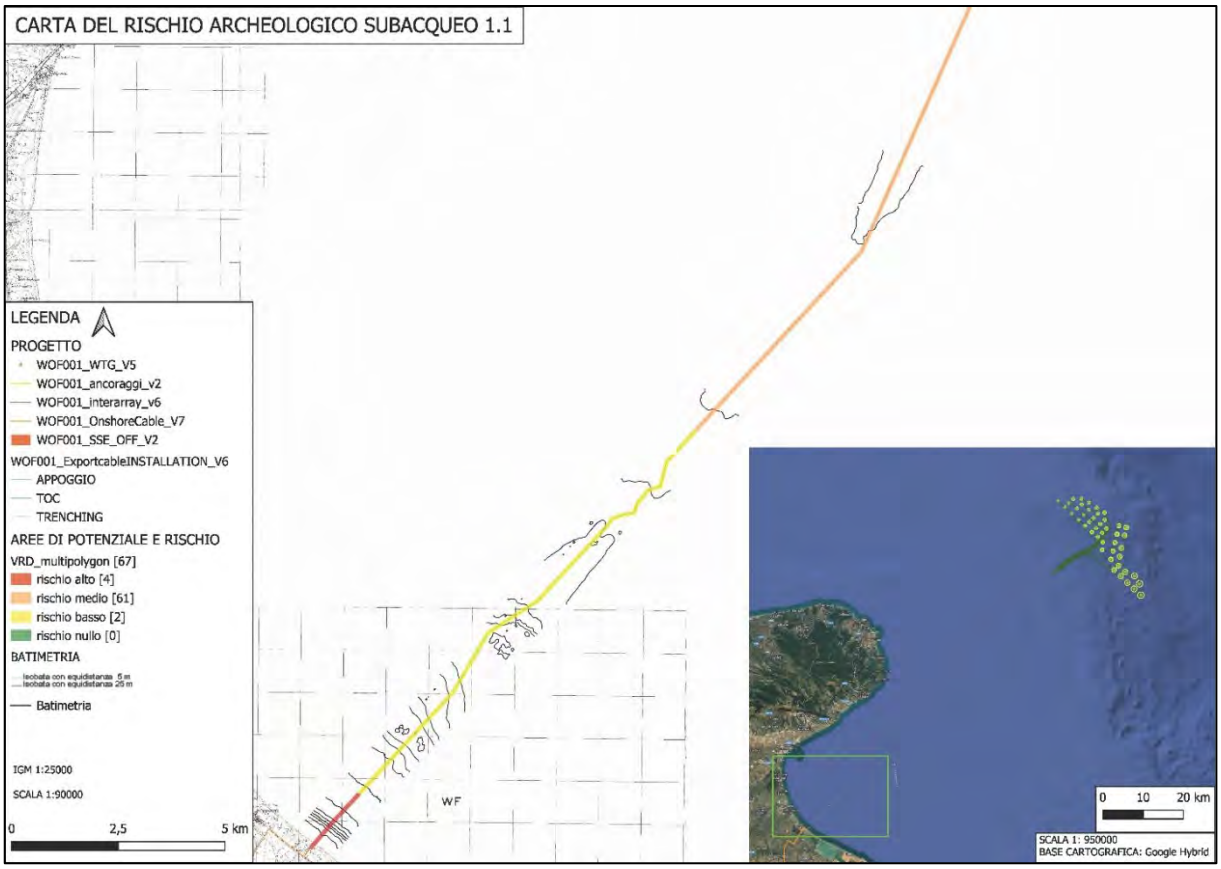
into the sea. The turbines will then be fixed to the seabed by means of special anchoring systems for each wind turbine falling within an area about 210 m away from the floating foundation.

Specifically, the presence of areas characterized by soft bottoms makes these areas compatible with the presence of the anchors of the floating foundations, made by means of fixed poles and semi-tensioned moorings, but the visibility with respect to any evidence of archaeological interest could be reduced or non-existent, also caused by the suspensions that these operations may cause and by the possible position of the evidence in a possible state of lying below the surface sediments of the fund. The soil conditions in the plant area of the wind farm *Nemetun Island* consist of a thin layer of very soft sandy/soft clay extending at least up to 3 m below the seafloor, probably thicker, overlying thick depositional sequences of highly stratified Quaternary deposits; the chances of finding parent rock layers within the range of interest for FOWT anchors is very low according to the analysis of data obtained from geophysical surveys. The same possibility is also projected for any archaeological evidence (***ES. 11.1_01***).

A further section of the project, also assessed with MEDIUM RISK, is the one identified with the area that will provide for the housing of dynamic 66 kV AC marine cables connecting the turbines and the Electrical Substation *Offshore*Cables *inter-array* (***ES. 11.1_01***). For the routing of dynamic cables in the sections between the platform and the point of arrival on the seabed (*touchdown point*) the lazy wave configuration ("*lazy wave*") through the installation of floating modules along specific sections of the cable since the performance is superior to that of the more classic catenary shape in compensating for the movement of the floating foundation and thus reducing the maximum damage cycles due to tension and fatigue. The sections distinct from the branch of cables *inter-array*, identifiable with a real "bundle of cable ducts", will be laid in the trench by the project, a technical element of installation that conditions the attribution of a MEDIUM RISK in this section. It is also specified that in order to ensure the level of stabilization or mechanical protection required of the *touchdown point* or along the route, the cables may also be covered with cementitious aggregates (e.g. concrete mattresses) or boulders (*Rockdumping*).

With sufficient confidence we will be able to define the archaeological risk of offshore works as a medium-low risk, to be investigated more by means of the supervision of the works.

For correct archaeological monitoring during the execution phase, archaeological surveillance is carried out by an archaeologist in possession of the legal requirements, during the cable laying operations using the HDD technique, laying the cable in support and in *Trenching*, laying of the substation jaket *Offshore* and laying of the anchors of the floating foundations.


CARTA DEL RISCHIO ARCHEOLOGICO SUBACQUEO 1.1
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PROGETTO
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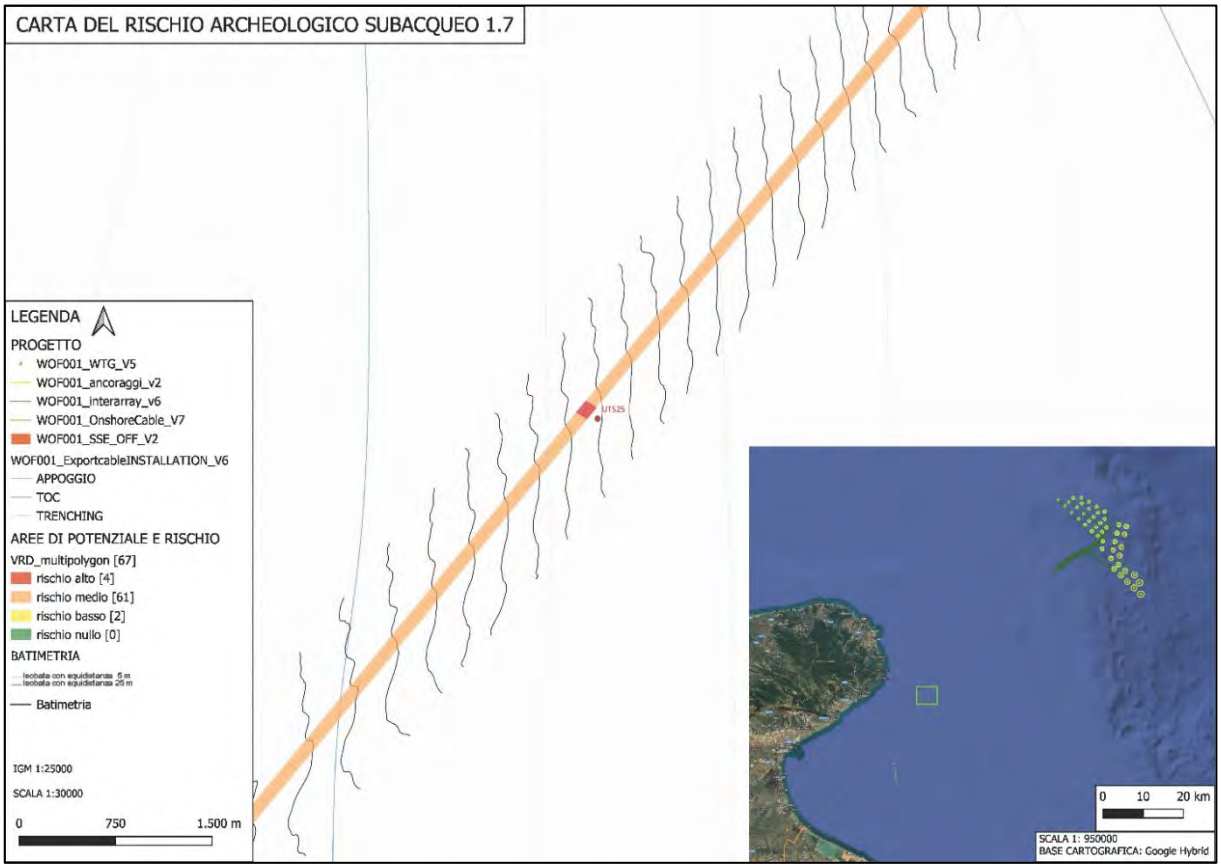
WOF001_ancoraggi_v2
WOF001_interarray_v6
WOF001_OnshoreCable_V7
WOF001_SSE_OFF_V2
WOF001_ExportcableINSTALLATION_V6
APPOGGIO
TOC
TRENCHING
AREE DI POTENZIALE E RISCHIO
VRD_multipolygon [67]
rischio alto [4]
rischio medio [61]
rischio basso [2]
rischio nullo [0]
BATIMETRIA
Batimetria
IGM 1:25000
SCALA 1:90000
0 2,5 5 km
WF
0 10 20 km
SCALA 1: 950000
BASE CARTOGRAFICA: Google Hybrid


CARTA DEL RISCHIO ARCHEOLOGICO SUBACQUEO 1.7
LEGENDA
PROGETTO
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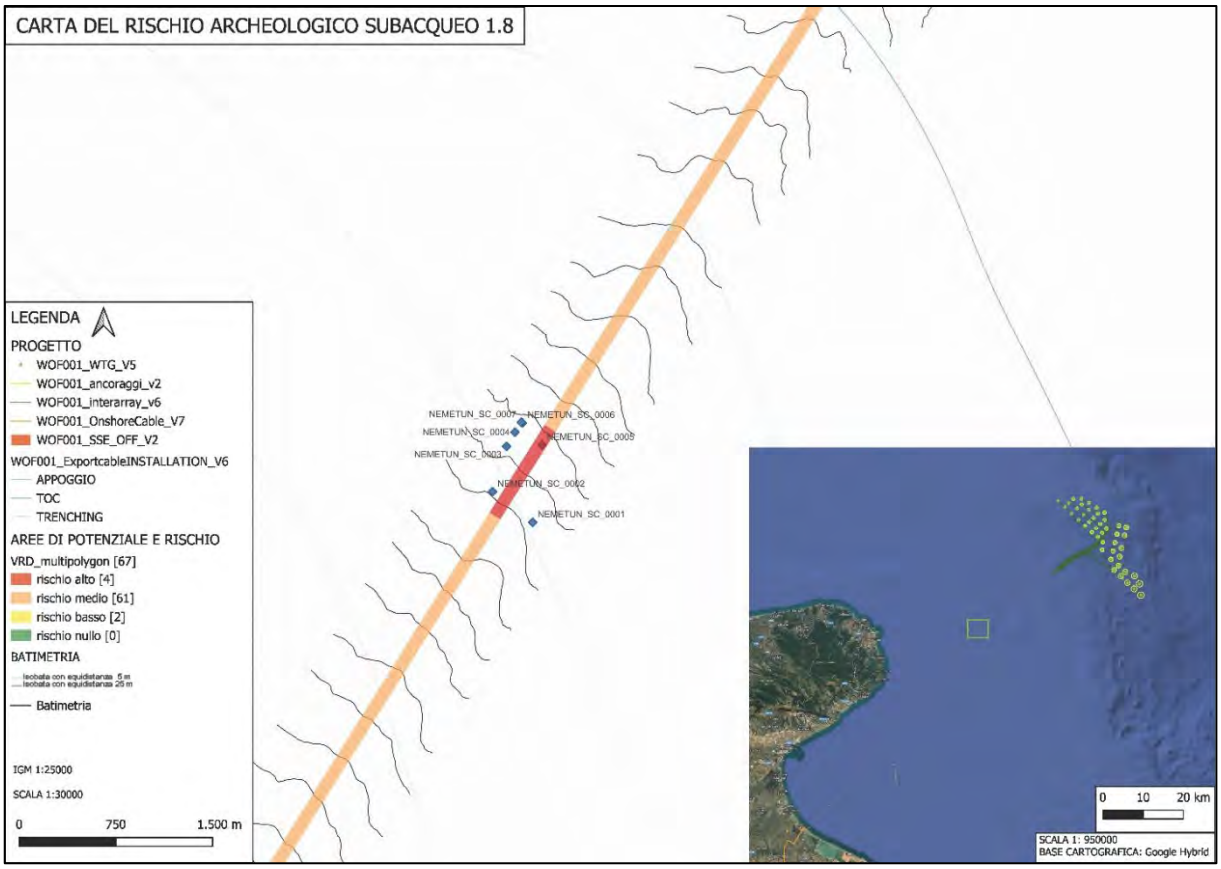
WOF001_interarray_v6
WOF001_OnshoreCable_V7
WOF001_SSE_OFF_V2
WOF001_ExportcableINSTALLATION_V6
APPOGGIO
TOC
TRENCHING
AREE DI POTENZIALE E RISCHIO
VRD_multipolygon [67]
rischio alto [4]
rischio medio [61]
rischio basso [2]
rischio nullo [0]
BATIMETRIA
Batimetria
IGM 1:25000
SCALA 1:30000
0 750 1.500 m
UTS25
0 10 20 km
SCALA 1: 950000
BASE CARTOGRAFICA: Google Hybrid



ES. 11.1_01 - Archaeological Risk Maps

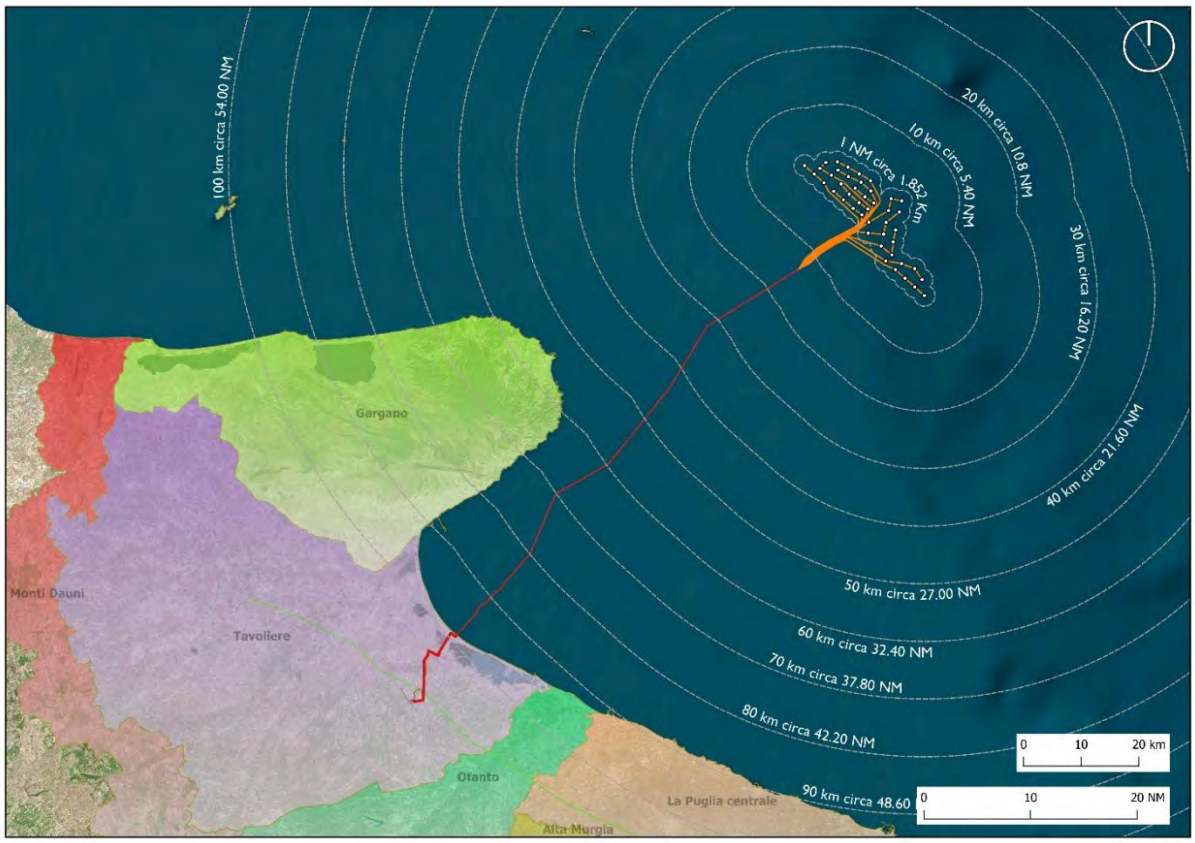
4.1.8 LANDSCAPE AND CULTURAL HERITAGE

4.1.8.1 Analysis of the landscape system

The project area is located in front of the stretch of Apulian coast between Peschici and Mola di Bari. As far as the landscape framework is concerned, reference can be made to the following areas:

- "Gargano", for the stretch of coast to the north;
- "Tavoliere", from Manfredonia to Margherita di Savoia;
- "Ofanto", between Margherita and Barletta;
- "Central Puglia" between Barletta and Mola di Bari;

The following paragraphs provide a summary description of the structural characteristics of the areas of interest, based on sections A of the Area Sheets attached to the PPTR and divided by hydro-geo-morphological, ecosystemic-environmental and anthropic and historical-cultural structure.



Landscape areas of the PPTR with identification of the layout of the wind farm

Hydro-geo-morphological structure

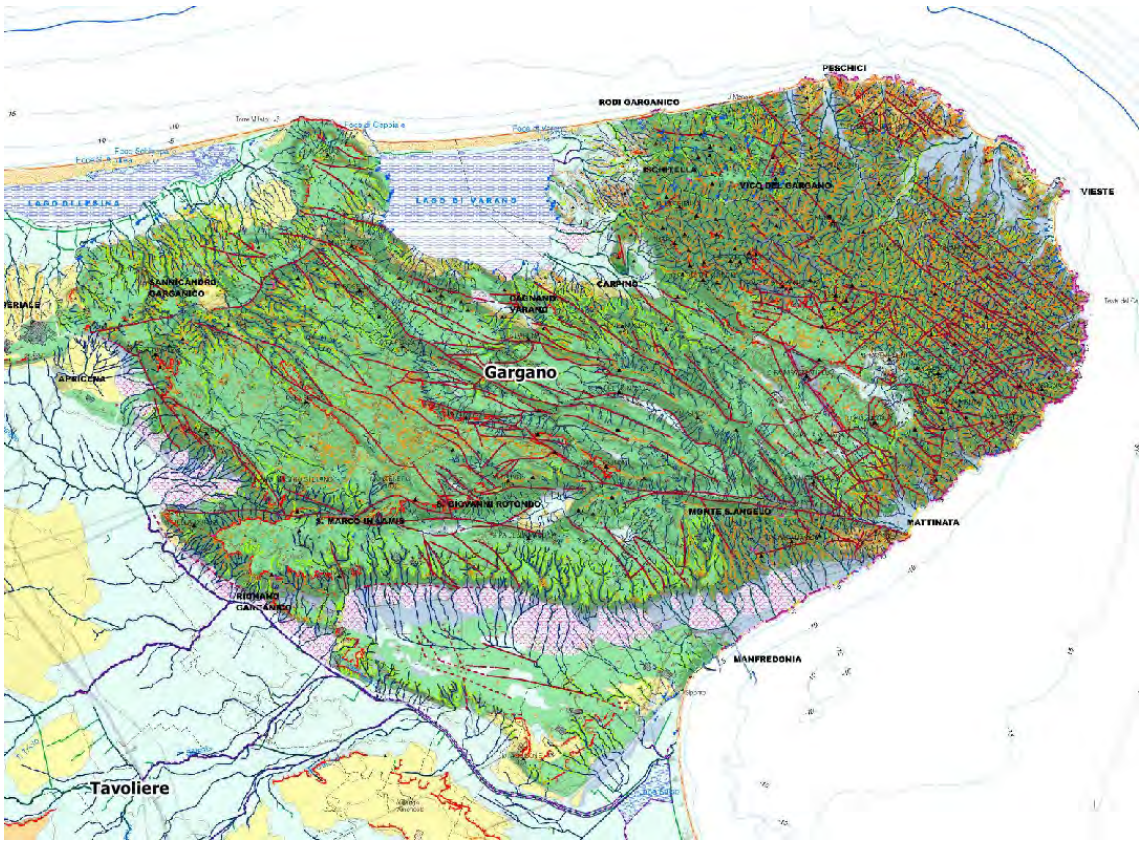
The scope of the **Gargano Promontory** it consists of a vast isolated carbonate mountain block, with a maximum altitude of just over a thousand meters in height (the highest points are M. Calvo 1,055 m and M. Nero 1,024 m), consisting of a peculiar alternation of mountains and wide karst plateaus that tend to slope down towards the Adriatic Sea, both with steep and steep slopes, either with slopes that gently connect or with morphological escarpments to the coastal plains.

Internally there are systems of endorheic depressions modeled by processes of karst origin, while in the eastern sector the erosive forms of the fluvial or fluvio-karst type prevail. In fact, the karst morphology is remarkably widespread, particularly marked in correspondence with the extensive summit surfaces of the promontory, with epigean and hypogeal forms, among which the sinkholes, organized in real fields, are by far the most representative.

The Gargano Promontory, together with the Daunian sub-Apennines, represents the only mountain system of some importance in Puglia, distinguishing itself for the particularity of the landscape consisting of the presence of thousand-year-old woods, such as the Umbra Forest, which among all the Apulian ones is the largest and oldest.

The steep slopes (in particular in the northern and southern sectors) are cut transversely by deep karst-erosive furrows with a torrential regime, showing a typical stepped conformation, locally enlivened by the outcropping of the typical stratum "ribs" along the same rocky slopes. The torrential hydraulic regime is characterized by reduced concentration times, such that, in relation to the local rainfall regime, it gives rise to long periods of low flow interspersed with short but intense flood events, which are also accompanied by abundant solid transport.

From a geological point of view, the area of the promontory is characterized by a system of numerous rigid blocks of Jurassic-Cretaceous limestone-dolomite rocks that constitute the backbone of the Apulian subsoil, strongly raised with respect to the external areas, locally covered by more or less extensive strips of more recent deposits, to constitute a body isolated from both the rest of the Region and the Peninsula by powerful tectonic dislocations that are still active.



Geological and hydrogeological structure of the Gargano

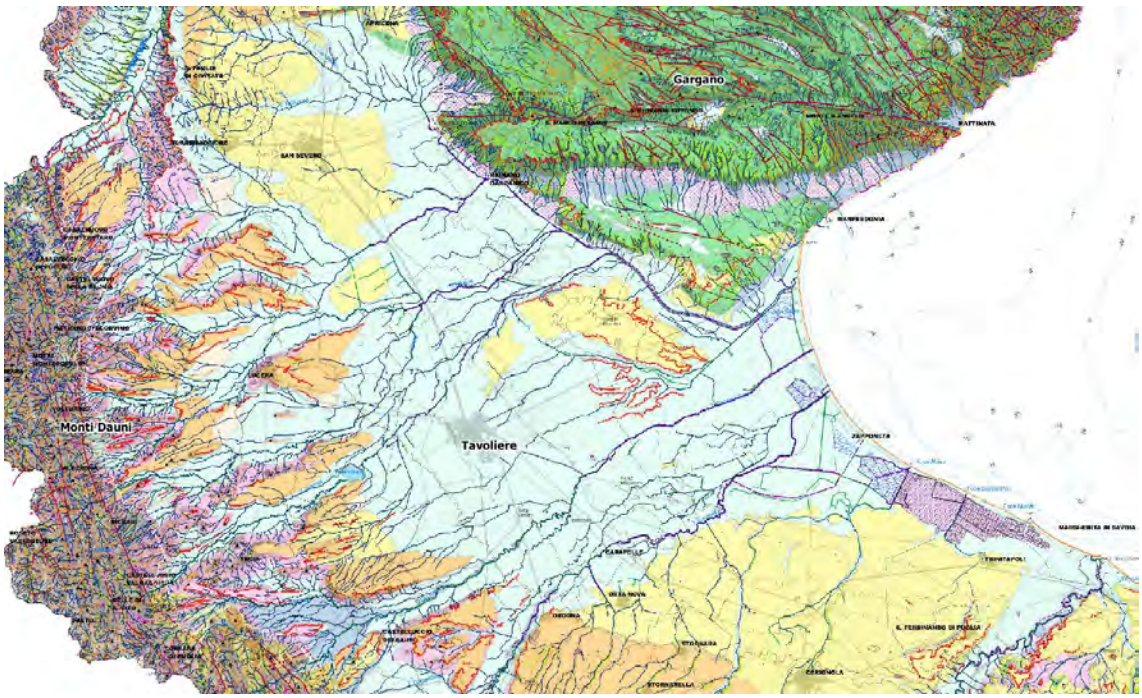
Among the critical elements of the landscape characteristic of the Gargano area, the various types of anthropogenic occupation of karst forms, surface hydrography and slope hydrography must be considered. These are houses, road infrastructures, plants, service areas, areas for tourist use, etc., which determine a fragmentation of the natural morphological continuity, and worsen the conditions of both hydraulic risk and morphological impact in the complex landscape system. One of the most impactful forms of human occupation is that of the opening of quarries, which create real wounds to the natural continuity of the territory.

Further critical elements concern the transformations of coastal areas, especially for tourism purposes, these often take place in the absence of adequate assessments of the effects induced on the meteorological and marine balances (e.g. the construction of ports and piers, with significant alteration of coastal solid transport).

A further critical aspect is linked to the alteration in the balance relationships between surface and underground hydrology, precisely because of the peculiar presence of karst forms that constitute a preferential route for the recharge of the underground aquifer.

Continuing southwards, you will find the **Board**, a plain originating from a seabed, gradually filled with Pliocene and Quaternary sandy and clayey sediments, subsequently emerged. Currently it is configured as a set of various alluvial plains variously extended and divided into terraced shelves sloping down towards the sea, with an average altitude not exceeding 100 m above sea level, separated from each other by

modest slopes. These are the basis of landscape forms represented by a series of variously extended shelves sloping towards the Adriatic, connected by gradually lower escarpments and oriented sub-parallel to the current coastline. The continuity of shelves and escarpments is interrupted by vast incisions crossed by watercourses, of Apennine origin, among the most important in Puglia (Carapelle, Candelaro, Cervaro and Fortore), characterized by hydrographic basins of significant extensions of the order of a few thousand km^2, which have contributed significantly, with their detrital contributions, to the formation of the Tavoliere. The aforementioned watercourses, with a torrential hydrological regime characterized by prolonged periods of low flow associated with short but intense flood events, especially in the autumn-winter period, flow into extensive alluvial plains which, converging, give rise, near the coast, to extensive marshy areas, reclaimed since the 40s. Important and numerous have been the hydraulic and reclamation works that have taken place over time, often with contrasting effects, in the waterways of the Tavoliere. Extensive sections of the grids involved have a high degree of artificiality, both in the routes and in the geometry of the sections, which in many cases are contained.



Geological and hydrogeological structure of the Tavoliere

The entire eastern coastal sector, which was once characterized by the massive presence of coastal wetlands and marshy areas, is currently intensively cultivated, following a process of widespread reclamation that is not always coherent and organized.

Among the detractors of the landscape are to be considered, by analogy with other neighbouring areas, the different forms of occupation and anthropogenic transformation of the riverbeds of watercourses, especially where they are not affected by regulation and/or arrangement works. The disorderly construction of houses, road infrastructures, plants, service areas, etc., contribute to fragmenting the natural constitution and morphological continuity of the forms, and to increasing the conditions of hydraulic risk. In the same way, agricultural occupations for the production of large areas, even in close proximity to watercourses, have contributed to further reducing the albeit limited naturalness of the areas pertaining to the river. In this context, agricultural crops established, in some cases, within floodplain areas appear to be particularly serious.

The coastal balance also appears to be significantly subject to disturbance, with intense coastal erosion phenomena that have already caused the destruction of the original dune cordons and produced significant

damage to public and private assets and infrastructures, and could further contribute, if not adequately regimented, to the compromise of the delicate balance existing between the coastal strips and the wetlands immediately behind.

Although the entire Murge plateau represents a geologically defined unit and clearly distinct from those bordering it, the altimetric variability that it presents as well as the different level of anthropogenic occupation and the consequent state of alteration of the naturalness of the landscape, lead to differentiate, within the same plateau, the area of the upper Murgia from that of the lower Murgia.

The scope of the **Central Puglia** it is morphologically characterized by the Murgia carbonate plateau and the so-called Plain of Bari. While in the Alta Murgia the denuded forms of Cretaceous limestone rock are prevalent, giving rise to barren rocky expanses furrowed by depressions, sinkholes and blind valleys with a predominantly flat bottom and gently connected slopes, in that of the lower Murgia the tilled and regularized areas of calcareous rocky outcrops but also calcarenitic and sandy-clayey are widespread. almost always cultivated, furrowed by fluvio-karst incisions with delivery to the sea (the so-called Lame) more or less regularly spaced.

The physical limit between the upper and lower Murgia is never clearly circumscribed, as the specific characteristics of each area are often strongly interpenetrated. As a first approximation, it is possible to make it coincide with the altitude of 300 meters above sea level.

From a geomorphological point of view, this area identifies a vast rocky plateau, uniformly sloping towards the sea by means of a series of terraces connected by more or less evident escarpments, having an elongation parallel to that of the coastline.

From a hydrographic point of view, the basins on the Adriatic side of the Murge, with "Lame" type watercourses, are characterized by the presence of a surface hydrography of a fluvio-karst nature, consisting of a series of incisions and valleys developed on the predominantly calcareous or calcarenitic rocky substrate, and characterized by an episodic hydrological regime. The envelope of the catchment basins of the Lame forms a "fan-like" surface with an apex roughly in correspondence with the town of Bari.

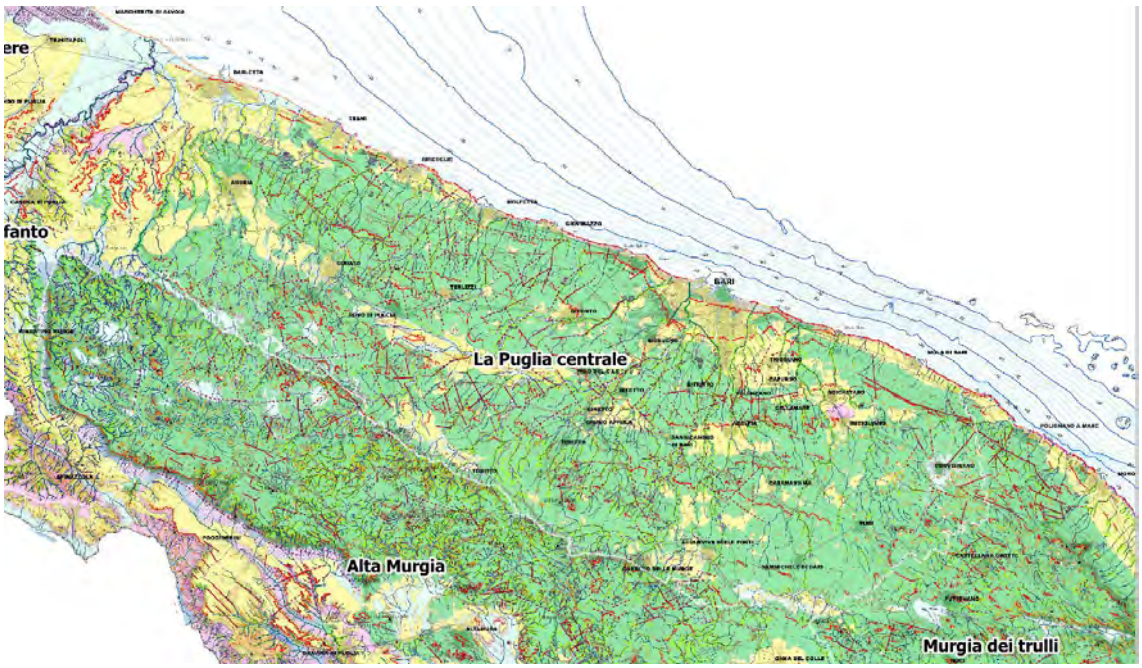
The peculiarities of the Murgia landscape, from a hydrogeomorphological point of view, are closely linked to the orographic and hydrographic characteristics of the reliefs, and to a lesser extent, to the diffusion of karst processes. The specific hydrogeomorphological typologies that characterize the area are essentially those originating from the processes of river and slope modeling, and subordinate to the karst ones. Closely connected to these forms of surface hydrography are the "river erosion rips" present in several orders at the edges of the same incisions, and which constitute the clear discontinuities in the morphological articulation of the territory that contribute to variegating the exposure of the slopes and their perceptive and ecosystem value.

Equally important are the forms linked to phenomena of slope modeling of a regional character, such as the edges of terraces of marine or structural origin, such as to create more or less evident "balconies" on the areas below, a source of suggestive perceptions of the morphology of the places.

To a lesser extent, especially in the context of the upper Murge, it is worth noting the presence of forms originating from karst processes, such as the "doline", typical depressed forms originating from the karst dissolution of the outcropping limestone rocks, such as to significantly shape the original tabular surface of the relief, often rich within them and near further natural singularities. ecosystem and landscape (rare flora and fauna, hypogea, exhibition of geological structures, traces of historical settlements, examples of hydraulic engineering works, etc.).

Among the critical elements of the landscape characteristic of the lower Murgia area are to be considered the different types of anthropogenic occupation of the karst forms, surface hydrography and slope hydrography. Houses, road infrastructures, plants, service areas, areas for tourist use, contribute to

fragmenting the natural morphological continuity of the forms, and to increasing the conditions both of hydraulic risk, when the same forms play a primary role in the regulation of surface hydrography (valleys, sinkholes, chasms), and of morphological impact in the complex landscape system. Among the most impactful forms of human occupation are certainly the quarries, which create real wounds to the natural continuity of the territory.

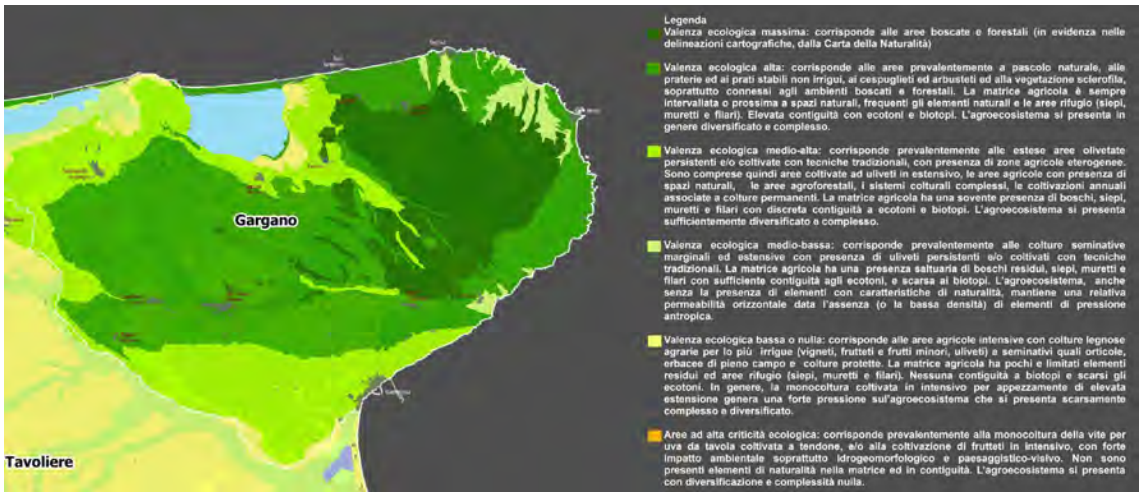


Geological and hydrogeological structure of Central Puglia

Ecosystem – environmental structure

As part of the **Gargano** a maximum Ecological Value is found for the wooded and forest areas of the Umbra Forest, as well as for the entire stretch of coast that runs from Vieste to Mattinata, while it is high for the natural pasture areas, the prairies and the permanent non-irrigated meadows of the karst plateau. In these areas, in fact, the agricultural matrix is always interspersed or close to natural spaces, natural elements and refuge areas (hedges, walls and rows) are frequent. There is a high contiguity with ecotones and biotopes. The agroecosystem, therefore, is generally diversified and complex. The hilly areas of the eastern, northern and southern Gargano, mostly cultivated with olive groves, still have a medium-high ecological value due to the significant presence of woods, hedges, walls and rows and the discreet contiguity to ecotones and biotopes. The agroecosystem is sufficiently diversified and complex.

On the other hand, the values of ecological value associated with the intensive agricultural areas immediately south of the Gargano massif, in correspondence with the Manfredonia plain, cultivated with irrigated arable land such as horticultural, open field herbaceous and protected crops, are low. In these areas, the agricultural matrix generates a strong pressure on the agroecosystem, which is also scarcely complex and diversified.



Map of the ecological value of the Gargano

The following protected areas of naturalistic value fall within the Gargano affected by the planned plant:

CODE	DENOMINATION	TYPE
IT9110011	Tremiti Islands	SAC
IT9110040	Tremiti Islands	SPAS
IT9110037	Lakes of Lesina and Varano	SPAS
IT9110016	Pineta Marzini	SAC
IT9110025	Manacore of the Gargano	SAC
IT9110004	Umbra Forest	SAC
IT9110008	Foothills and steppes	SAC
IT9110009	Valloni di Mattinata - Monte Sacro	SAC
IT9110012	Head of the Gargano	SAC
IT9110014	Monte Saraceno	SAC
IT9110039	Gargano Promontory	SPAS
IT9110030	Bosco Quarto – Monte Spigno	SAC
IT9110001	Island and Lake Varano	SAC
-	Tremiti Islands	Marine Protected Area
-	Varano Island	Nature Protection Reserve
-	Ischitella and Carpino Forest	Biogenetic Nature Reserve
-	Falascone	Oriented Nature Reserve
-	Umbra Forest	Biogenetic State Nature Reserve
-	Gargano National Park	National park
-	Mount Barone	Biogenetic State Nature Reserve

As regards the **Board**, the ecological value is medium-low in the innermost part of the plain, where marginal and extensive arable crops prevail. The agricultural matrix has a scarce presence of residual woods, hedges and rows with sufficient contiguity to the ecotones of the greenhouses and the hydrographic network.

The ecological value is low or zero in the lower tableland between Apricena and Cerignola, due to the presence of intensive agricultural agricultural areas with mostly irrigated agricultural woody crops

(vineyards, orchards and minor fruits, olive groves) and irrigated and non-irrigated arable land, and then increases (medium-low to medium-high ecological value) near the main watercourses represented by the Carapelle, of Cervaro and above all from Ofanto.

The agricultural matrix has decidedly few and limited residual elements of naturalness, mostly near the hydrographic network. The anthropogenic pressure on the agroecosystems of the lower tableland is considerable, so much so that they are scarcely complex and diversified.

On the other hand, the numerous and diversified coastal wetlands, listed in the following table, are worthy of consideration and environmental protection, both for the fundamental role of hydraulic regulation of the outflows of the main watercourses they play, and for the ecosystem characterization that favor the development of faunal and floristic associations of very significant value. To be taken into due consideration, although counted among the industrial production plants, are the extensive areas of the Savoy Daisy Salt Pans, which constitute important areas for avian species passing through during migratory routes. The mouth of the Ofanto River Regional Park is also worth mentioning, although it is part of the Ofanto area.

Map of the ecological value of the Tavoliere and Ofanto

The following protected areas of naturalistic value fall within the Tavoliere affected by the planned plant:

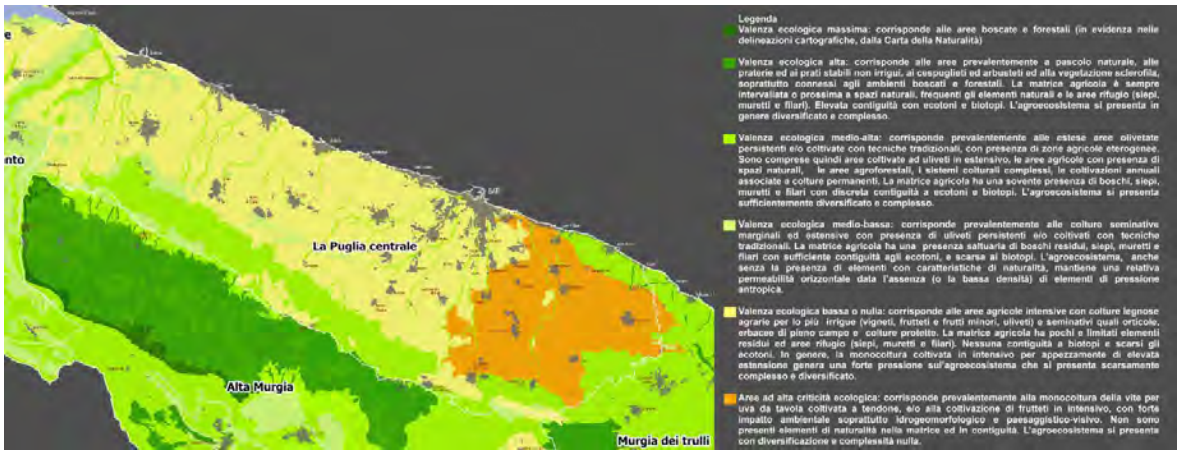
CODE	DENOMINATION	TYPE
IT9110005 - IT9110038	Wetlands of the Capitanata - Marshes near the Gulf of Manfredonia	SAC SPA
IT9110041	Aloisa - Carapelle	SPAS
IT9120011	Ofanto Valley - Lake Capaciotti	SAC
-	Ofanto River	Regional Natural Park
-	Frattarolo Marsh	Popol State Nature Reserve. Animal
-	Masseria Combattenti	Popol State Nature Reserve. Animal
-	The Mount	Popol State Nature Reserve. Animal
-	Saline Margherita di S.	Popol State Nature Reserve. Animal
-	Ofanto River	Regional Natural Park

The intermediate zone up to the coast of the **Central Puglia** It is characterized by a vast platform of marine abrasion with a substantially flat morphology with a vegetation cover prevalent in the olive grove in the

northern part and a vineyard for table grapes further south. The area covered with olive groves, cultivated intensively, has a low ecological value. The presence of natural elements and areas with a refuge function immersed in the agricultural matrix (rows, hedges, dry stone walls and wooded patches) is reduced to a minimum. The agricultural matrix also generates a strong pressure on the agroecosystem which is consequently scarcely complex and diversified. The area south of Bari is highly critical due to its strong environmental and landscape-visual impact, as it is characterized by monoculture of the vine for table grapes cultivated in a canopy. There are no elements of naturalness both in the agricultural matrix and in contiguity.

The shelves of the low, flat or slightly inclined Murge at the base of the Murgian escarpments, cultivated with olive groves with wooded areas and frequent karst forms, have a medium-high ecological value. The agricultural matrix has a significant presence of woods, hedges, walls and rows with discreet contiguity to ecotones and biotopes. The agroecosystem is sufficiently diversified and complex.

The innermost and highest area of the area, roughly corresponding to the Alta Murgia National Park, is characterized by a high ecological value, with the presence of natural grazing areas, non-irrigated prairies and permanent meadows, bushes and shrubs and sclerophyll vegetation, often in direct connection with wooded and forest environments. The agricultural matrix is interspersed or close to natural spaces, natural elements and refuge areas (hedges, walls, and rows) are frequent. High contiguity with ecotones and biotopes. The agroecosystem is generally diversified and complex.



Map of the ecological value of Central Puglia

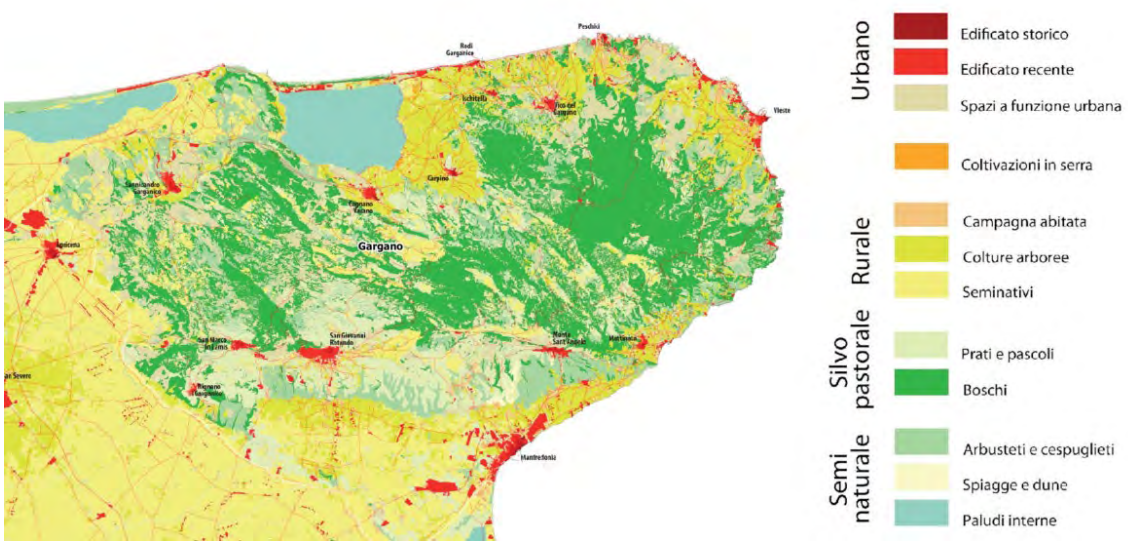
The following protected areas of naturalistic value fall within the Central Puglia affected by the planned plant:

CODE	DENOMINATION	TYPE
IT9120009	Posidonieto San Vito - Barletta	SAC SEA
IT9120012	Hermit Rock	SPAS
-	Lama Balice	Regional Natural Park
-	Costa Ripagnola	Regional Natural Park

Anthropic and historical cultural structure

The scope of the **Gargano Promontory** It has an important variety of landscapes, due to its articulated morphology and pedology: around a vast wooded area that includes, in the central and eastern part, the Spigno, Manfredonia, Quarto, Sfilzi, Iacotenente woods and the Umbrian State Forest, with a series of pine forests that reach the sea, the distinctive feature of the interior of the promontory are historically the wooded pastures. The coastal strip is characterized by the presence of olive groves which, in the southern areas,

is frequently organized on artificial terraces, which also host, near Monte Sant'Angelo, discreet horticultural crops.



Articulation of the territory in the landscape of the Gargano

The major critical issues, in addition to the widespread illegal construction and building expansion largely linked to the tourist phenomenon, especially in the coastal strip (the urbanized area here has multiplied by 10 in the last fifty years), are linked to the aging of the rural population, the widespread abandonment of crops, and an uncontrolled expansion of the forest especially in hilly and mountainous areas.

The rural landscape of the olive grove prevailing in the Gargano valleys

Effective measures should be implemented to safeguard the rural building heritage, also with incentives and rewards. In particular, in rural areas located within areas of great tourist attraction, measures in favor of the recovery of rural building complexes for accommodation purposes should be encouraged, with the promotion of agritourism companies, farms and educational farms, the development of soft roads (cycle tourism, hiking, walking).

It is intended to implement appropriate compensation measures, which are described in more detail in the relevant specialist report of the & series. Compensation and enhancement interventions, which support the above.

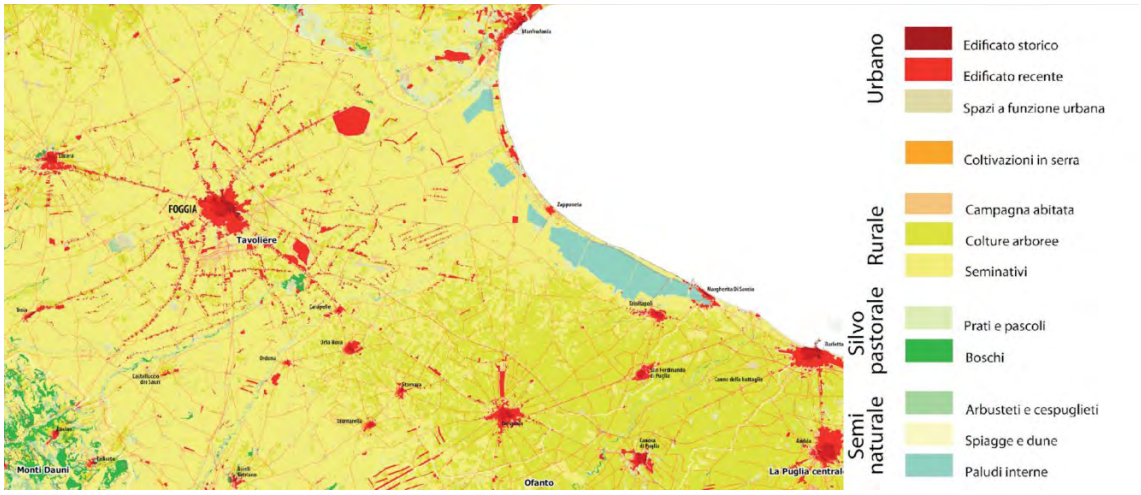
The scope of the **Board** It is characterized by the presence of a basically flat landscape whose great morphological unity places the type of cultivation as the first determining element of the rural landscape. The second element is the agricultural plot, which occurs in various geometries and textures, sometimes deriving from hydraulic regulation works rather than from crop fields, but in general it always presents itself as a plot that is not very marked and not very characterized.

The agricultural landscape, although deeply affected by rampant urbanization and radical changes in cultivation systems, retains elements of great interest. The prevailing characteristic is that of large crop masses, whose production is market-oriented, with a limited organization of rural space with extensive

crops that besiege the degraded urban suburbs. Furthermore, the share of the population scattered is irrelevant, except in peri-urban areas, but in this case it is almost never peasant families.

The rural landscape of the Tavoliere characterized by extensive arable crops and olive groves

The landscapes of the Tavoliere plain are also affected by the land consumption that characterizes the southern territory, both for the spread of urban residential construction and for the construction of infrastructures, logistics platforms, industrial areas and even buildings at the direct service of the farm. Much of the rural building heritage of the Tavoliere is abandoned, from the farms, to the post office, to the rural taverns, to the churches, to the farms. Only in a few cases is a process of recovery or reuse for other purposes of part of this huge heritage underway, the full enhancement of which is also prevented by renovation costs, poor security in the countryside, and frequent theft of building materials.



Articulation of the territory in the landscape of the Tavoliere and Ofanto

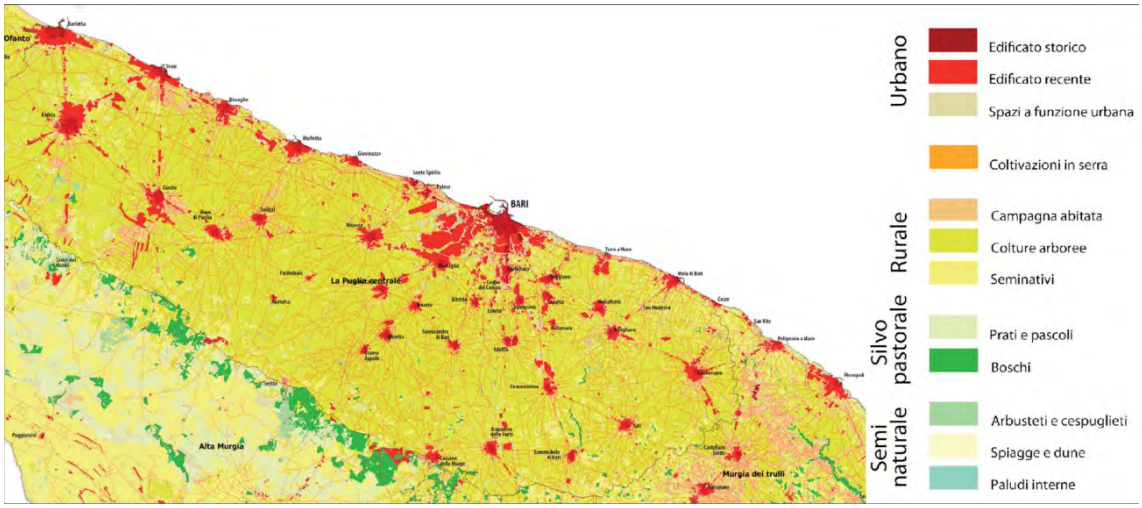
As part of the **Central Puglia** the rural landscapes are still clearly legible according to three bands that in a roughly parallel direction to the coastline go from the sea towards the Murgia. First of all, there is the system of coastal and pericoastal gardens, which currently only partially overlook the sea, but which represent coastal passages of great value. The second belt is that of the olive grove countryside of the hinterland, currently also affected by dynamics of intensification to vineyards and orchards, always present in this strip of territory. Of great importance is the rural landscape that is interposed between the blades and that characterizes the large strip of tree crops of Central Puglia through a transversal rhythmic scanning.

The third belt is the foothills, here we find a rural landscape that gradually tends towards the forestry-pastoral system, and it is possible to read this transition through the agro-environmental matrix that is rich in walls, hedges, trees and rows.

The rural landscape of the Bari basin is made up of a peri-urban agricultural mosaic that is characterized by a series of structured penetrations along the blades, which are interspersed with the vaguely radial development of the Bari suburbs.

Tightly woven olive grove monoculture

The northern coast, overlooked by Bisceglie and Trani, is characterized by a rural landscape behind where the presence of rural houses insisting on large expanses of olive groves is significant, which towards Trani are associated with vineyards and secondarily with arable crops. The coastal rural landscape south of Bari is characterized by fruit and vegetable crops, which gradually, in the south-eastern part of the area, give way to extensive vineyards, vineyards associated with olive groves and orchards.



Articulation of the territory in the landscape of central Puglia

4.1.8.2 The Coastal Landscape – Photographic Survey

The

The stretch of Adriatic coast affected by the plant consists of about 300 km, and falls within the following coastal landscapes:

- Area 1 – Gargano - UC 1.2 "The Gargano coast"
- Area 3 – Tavoliere - UC 3.1 "The system of coastal wetlands of the Capitanata"
- Area 4 – Ofanto - UC 4.1 "At the mouth of the Ofanto"
- Area 5 – Central Puglia - UC 5.1 "The festoon of the coastal cities of Central Puglia"

Area 1 – Gargano - UC 1.2 "The Gargano coast"

The portion of this coastal landscape affected by the plant extends from the town of Peschici to Manfredonia and falls within the administrative boundaries of the municipalities of Peschici, Vieste, Mattinata, Monte Sant'Angelo and Manfredonia.

From a morphological point of view, the Gargano promontory, with its rather steep platform and high and rocky cliff coasts, represents an area of discontinuity between the two alluvial plains of Lesina and Varano and the Tavoliere.

The coast is characterized by a continuous series of peaks or promontories with jagged and steep banks that alternate with bays with beaches located in the final stretch of small variously extensive alluvial plains (pocket beaches), afferent to streams and valleys descending from the surrounding reliefs, frequently affected by the presence of active dunes. The beaches that are found locally consist mostly of narrow sandy tongues, often limited upstream by steep and high cliffs, which rise sheer over the variously extensive and receding inlets.

UC 1.2 "The Gargano coast"

The town of Vieste overlooks a coastal stretch characterized by the presence of caves and stacks linked to the erosive action of the sea. Famous is the white and majestic monolithic stack of Castello. The beaches along the stretch of coast after Vieste are pebbly and sandy-silty and are mainly made up of the decay of limestone and limestone-siliceous rocks from the nearby hills of the hinterland. Their formation, like that of the dozens of small beaches scattered along the entire Gargano coast, is linked to the torrential contributions of the watercourses that descend from the top of the promontory towards the coast.

Between Testa del Gargano and the olive grove plain of Mattinata, the coastal morphotype is that of the high cliff overlooking the sea, interrupted by coves and sandy bays fed by the solid contribution of torrential watercourses descending along the valleys. Proceeding south-westwards, in the stretches near Mattinata, the coast develops with a rather jagged course, becoming almost straight near Manfredonia. Here the coastal morphotype is the high and rocky one, marked by limestone cliff walls. Of considerable interest are the vertical walls engraved in the conglomerate deposits of the fans produced by the alluvial deposits, near Manfredonia.

The numerous streams that descend towards the coast from the heights of the promontory show the typical stepped conformation (particularly in the northern and southern sectors). These watercourses are characterized by long periods of low flow interspersed with short, but intense flood events, accompanied by an abundant transport of solid material to the coast.

The corresponding fluvio-karst valleys, locally called "valloni", end on the coast with small alluvial plains barred by dunes that once closed the outlet to the sea of the waters, producing wetlands, now fully reclaimed.

The historic center of Vieste

The town of Mattinata

The Gargano suffers from a very intense tourist development, essentially by the seaside, characterized by an extreme seasonality that sees hundreds of thousands of visitors concentrated on the coasts in the summer season, compared to a rapid and vertical drop in presences in the other periods of the year. It is a tourism essentially aimed at the exploitation of the sea resource and poorly integrated with the considerable tourist resources of the inland areas of the park. Another serious critical factor along the coast, also motivated by tourism, is represented by the building expansion concentrated above all in the most accessible areas of the coastal strip.

Tourist settlements, consisting of second homes but also imposing tourist-accommodation platforms, are also present in morphologically inaccessible places such as the tourist-accommodation platform of Pugnochiuso. Another critical situation is found in the Baia delle Zagare, accessible by land only from the hotel of the same name.

The coast of Mattinata is characterized above all by an anomalous congestion of the territories close to the beach, many still for agricultural use or used as campsites or occupied by single homes or in the form of residences. This form of occupation of the coastline eliminates the public character of the coast, even causing free access to the sea.

Another critical element is represented by the transformation of the coastal strip for the construction of ports and piers for tourist purposes, or defense works, often with the effect of a significant alteration of the coastal solid transport due to the absence of an adequate assessment of the impacts on the meteorological and marine balances of the interventions.

Further risks are the geological ones along the coasts of the Gargano promontory, represented by the detachment of rock and collapse of blocks, collapse of cavities and coastal caves and flooding of the final stretches of the valleys.

The problem of fires is serious and frequent, also connected to the fraudulent attempt to gain territories for new expansions for tourist purposes in protected areas where any construction is inhibited. The spontaneous pine forests along the coast are a type of vegetation with a high risk of fire both for reasons related to the high flammability of conifers, and for speculative reasons related to tourist settlements.

The coast of Manfredonia, declared together with Taranto and Brindisi an area of high environmental risk, presents a completely different criticality. The port industrial center, on the border between Manfredonia and Monte Sant'Angelo and which came into operation in 1971, has long produced fertilizers, anhydrous ammonia, urea, caprolactam and ammonium sulphate. Today the hub has been decommissioned and replaced by other types of industries and even shopping centers, certainly with a lower environmental impact but still inadequate to occupy a coastal area of such importance.

Area 3 – Tavoliere - UC 3.1 "The system of coastal wetlands of the Capitanata"

UC 3.1 "The system of coastal wetlands of the Capitanata"

This coastal unit extends from the south-eastern outskirts of Manfredonia to the locality "Il Focione di Cannapesca" of Margherita di Savoia and falls within the territory of the municipalities of Manfredonia, Zapponeta, Trinitapoli and Margherita di Savoia, also including parts of the municipalities of Trinitapoli and Cerignola.

In the form of an open arch towards the Adriatic, the coastline is marked at both ends by the mouths of two watercourses – the Candelaro stream to the north and the Ofanto river to the south – and is characterized by low and sandy beaches, sometimes pebbly, limited inland by wetlands. These beaches, extensive and with a uniform profile, are mainly fed by the coastal redistribution of solid transport, especially from the Ofanto and, to a lesser extent, from the Carapelle and Cervaro streams, of Apennine origin, as well as from the Candelaro stream, which also drains part of the southern Gargano territory.

The waters of these watercourses, in the past unable to flow into the sea due to the presence of an imposing system of dune cordons, arranged in various orders along the coast, gave rise to an uninterrupted succession of ponds and marshes, then subject to progressive and intense reclamation. Before these interventions, watercourses and marshes stagnated throughout the plain, creating 30,000 hectares of permanent marshes, 40,000 hectares of seasonal marshes (autumn-spring) and 15,000 hectares of lakes, for a total of 85,000 hectares.

Despite the impressive reclamation operations of the twentieth century, which led to a reduction of wetlands from the initial 85,000 (1930) to about 17,570 ha (1990), the wrecks of existing marshy areas still have a high naturalistic and ecological value, both for the fundamental role of hydraulic regulation of the outflows of the watercourses that arrive here from the Apennines, and for their ecosystem connotations that see the development of valuable fauna and floristic associations.

In the past, the coast was bordered by Lake Salpi, a single vast environment behind the dunes, separated from the sea by a substantial dune cord, not very different from the lagoon environment of Lesina and Varano. The vast basin was subsequently naturally filled by the detrital contributions of the watercourses, giving rise to separate wetlands that still characterize this stretch of the Apulian coast, despite their extension has been greatly reduced by reclamation interventions.

Today the landscape of the "coastal wetlands of the Tavoliere" looks like a dense and multi-layered palimpsest of water signs, where among the dense canalization systems, even substantial residues of ancient marshy areas survive, as well as numerous signs of the hydraulic economy that once animated the area.

The wetland area of Lake Salty near Manfredonia

Proceeding along the coast, from Siponto towards Margherita di Savoia, you will come across in sequence: the Sipontine reclamation area, the Frattarolo marsh, the mouth of the Candelaro river, the Daunia Risi wetland, the Scalo dei Saraceni and Ippocampo marshes, the mouth of the Cervaro, the Berardi and S. Floriano basins, the mouth of the Carapelle stream, and the system of lake mirrors of Alma Dannata which is part of the complex of the Margherita di Savoia Salt Pans, the largest salt pans in Europe (3,871 ha), obtained from the reclamation of the pre-existing Lake Salpi.

Currently, the salt production plant is still active and produces 5-6 million quintals of salt per year, which is arranged in large heaps clearly visible from the road. From a landscape point of view, the scenery is of strong impact, dominated by a wide range of colors generated by water, salt and the reflections of the sun at different times of the day.

The tanks of the salt pans of Margherita di Savoia

As early as 1979, the salt pans area was recognized as a wetland of international importance for the protection of birdlife and its habitat according to the Ramsar Convention. Currently, the biotope is

ecologically similar to a vast lagoon, with waters of different salinity, characterized by low herbaceous vegetation and numerous bodies of water of reduced depth. The entire complex of the Margherita di Savoia Salt Pans, together with the historic center, the spa and the landscape of the coastal gardens, constitutes a territorial unicum of great historical-cultural value, as well as landscape and naturalistic. Also of great interest is the Historical Museum of the Salt Pan, located in the ancient Torre delle Saline, currently incorporated into the town of Margherita, from which it is possible to grasp the system of relations of the town with the surrounding area: in favorable climatic conditions it is possible to spot the castle of Barletta and the Gargano sites of Monte Saraceno, Mattinatella, Mattinata and Torre del Barone.

In the stretches of water, among vast reeds, five species of herons and eight species of ducks nest. Beyond the banks of the Daunia Risi, there is another strip of the ancient Salpi lake. This is the Frattarolo Nature Reserve, to which the numerous buffaloes introduced still give an archaic and evocative appearance.

The marsh of San Floriano is an expanse of fresh water rich in reeds and islets, whose enormous potential is limited by the poaching activities widespread along the coast. Of the mighty dune cordons that once hindered the flow of water to the sea, little remains, with the exception of the dune system of Siponto.

The landscape of the coastal gardens between Zapponeta and Margherita di Savoia

The entire narrow coastal strip that extends from the mouth of the Carapelle to Barletta has historically been characterized by the seriality and rhythmic cadence of irrigated vegetable gardens, in narrow and elongated lots, called "beaches". From a pedological point of view, these are sandy, gray and easy-to-work soils, which have a low water retention capacity and are poor in nutrients.

Specific building forms belong to the rural landscape described such as the casini and rural dwellings between Barletta and the mouth of the Ofanto river, the single-sided and double-pitched dwellings between Margherita and Zapponeta, the enclosures of the sciali (rural housing structures between Zapponeta and the mouth of the Candelaro), as well as the farmhouses of Siponto. In addition to rural buildings, the coastal landscape was once marked by the defensive system of coastal towers (Torre dell'Ofanto, Torre delle Saline, Torre Pietra and Torre Rivoli), the only visual bulwarks on a territorial scale in a morphologically flat territory.

At present, the coastal landscape is marked by the alternation of open and built spaces. In the stretch of coast between Zapponeta and Manfredonia, several tourist-accommodation platforms, nuclei of mainly seasonal residences and bathing facilities have sprung up. Often the new settlement fabrics have

developed around the ancient sciali, incorporating them (Sciale degli Zingari, Sciale di Lauro) and/or in close contact with the wetlands (as is the case of the tourist villages of Ippocampo or Foggiamare).

The mouths of the rivers also represent an important potential for the development of nature tourism, capable of connecting and synergistically enhancing the resources of the coast with those of the hinterland. Most of the mouths, however, are highly artificial, with the exception of the mouth of the Carapelle and (in part) that of the Candelaro.

Along the entire coastal arc, the joint action of coastal erosion and anthropogenic action has caused the destruction of the original dune cordons, which once separated the beaches from the marshy and lagoon areas behind, also producing significant damage to existing assets and infrastructures. The intense erosion phenomena could further contribute to the compromise of the delicate balance existing between the coastal strips and the wetlands immediately behind, if not adequately regimented. The numerous and varied defence works (adherent and detached longitudinal works, transversal works, mixed works, embankments) erected to counter the erosive action of the sea, practically along the entire coastal stretch, effectively testify to the seriousness of the situation.

Area 4 – Ofanto - UC 4.1 "At the mouth of the Ofanto"

UC 4.1 "At the mouth of the Ofanto"

This coastal unit develops from the locality "Il Focione di Cannapesca" on the north-western outskirts of Barletta and is included in the administrative territory of the coastal municipalities of Margherita di Savoia and Barletta, also including part of the municipality of Trinitapoli.

In the final stretch, the main course of the Ofanto river is characterized by a meandering pattern, with regular bends. Once in the territory between Margherita di Savoia and Barletta, the river flows into the Adriatic Sea, creating a modest cusped delta, currently in regression, which juts out into the sea for about 1 km.

On the sides of the mouth, sandy beaches extend for a few kilometers, once bordered by dune cordons that over time have been partly flattened to obtain cultivable areas or, as in the case of the area adjacent to the town of Margherita di Savoia, artificialized to protect the wetlands behind the dunes which in turn have been transformed into tanks for the production of salt.

The entire narrow coastal strip that extends from the mouth of the Carapelle to Barletta has historically been characterized by the seriality and rhythmic cadence of irrigated vegetable gardens, in narrow and elongated lots, called "beaches", which have already been mentioned in the previous Coastal Unit of the Tavoliere.

The naturalistic, landscape, hydrogeological and historical-cultural values of the Ofanto river have been sanctioned by numerous planning tools, despite this, the relics of nature existing in the final stretches of the river survive with great difficulty by creeping between the narrow meshes of the agricultural landscape. The banks of the final stretch are bordered by discontinuous residues of tree and shrub formations, as well as herbaceous plants. These are fragments of the typical Ofantino river landscape located further upstream, marked by the presence of poplars, willows and some elms, as well as the alternating presence of tamarisks, sedges and marsh reeds in the shore area.

The area of the mouth also has considerable historical and cultural value. In addition to the most famous sites of archaeological and historical interest that arise along the lower valley of the river (Canne and Canosa, the hypogea of Trinitapoli and San Ferdinando a Ripalta, Cerignola), the remains of prehistoric settlements have also been found in the areas close to the mouth. In particular, in the locality of Fiumara, numerous Neolithic fragments (tools, ceramics and a stele) have been excavated under a base of huts.

Worthy of protection and enhancement is Torre Ofanto, part of the system of coastal defense towers, located near the mouth, in the territory of Barletta. Built in the second half of the sixteenth century, the building takes up on a smaller scale the model of the nearby Torre delle Saline, with which it is visually connected. The isolated tower formed an effective point defense system, also relating to the other coastal or internal towers (Torre Pietra, Torre Rivoli, Torre Alemanna) and with the castle of Barletta; it also had a signalling function for passing boats.

The estuary mouth of the Ofanto river with evident signs of erosion and coastal retreat

The hydrogeological risk at the mouth of the Ofanto is mainly represented by coastal erosion and flooding. The area of the mouth today is highly degraded both from a vegetation and geomorphological point of view due to the improper use of the river. The evolutionary dynamics affecting the coast have reduced the overall width of the coastal strip significantly, so much so that today the state-owned divide intersects the shore line, falling back into the sea, in several stretches (at the mouth, the village of Fiumara and in the locality of Pantanella). The delta area, once formed naturally by the river, is evolving into an estuary due to natural and especially anthropogenic causes. The retreat of the coastline is also partly linked to the distribution of the prevailing winds.

The causes of the very rapid retreat recorded in the post-war period are actually linked above all to the lack of sedimentary input from upstream caused by the construction of numerous artificial reservoirs and

crossbars in the upper part of the hydrographic basin, as well as by the direct withdrawal from the river bed of aggregates to be used in construction. In the area around the mouth of the Ofanto river, an average retreat rate of about 2 m/year has been estimated, which would result in a loss of beach sediments of more than 125,000 cubic meters of sand.

Even the marine waters in front of the mouth are not in good condition: near Barletta, there are phenomena of accumulation of both civil, industrial and agricultural pollutants, which generate a state of eutrophication along the coastal areas. The situation of the seabed overlooking Barletta and Margherita di Savoia, once colonized by the posidonia grove and currently completely denuded also as a result of fishing activities, is decidedly compromised.

Area 5 – Central Puglia - UC 5.1 "The festoon of the coastal cities of Central Puglia"

UC 5.1 The festoon of the coastal cities of Central Puglia

South of the mouth of the Ofanto river, the coast shows a completely different conformation from the other Adriatic coasts, no longer low and sandy, but rocky. In fact, it corresponds to the edge of the Apulian limestone platform, which overlooks the sea with an almost continuous terminal escarpment.

Consistent with the morphological and structural characteristics of the Murgia plateau, the coast has a rocky consistency of a calcareous or calcarenitic nature. The low rocky coasts form marine abrasion platforms that slope gently towards the sea or end in almost vertical walls, usually not exceeding 1.5 m in height. These surfaces, which have a variable width and generally do not exceed 10 m, are widely supported by forms of karst corrosion such as corrasion tanks, mufflers, grooves. The rare stretches of high rocky coast, on the other hand, are characterized by cliffs and cliffs that show variable slopes up to being almost vertical, but with differences in height that do not exceed 10 meters. The only exception to this condition is the stretch between Trani and Bisceglie, where the heights of the banks can exceed 20 meters.

The continuity of the rocky front is interrupted by stretches that are almost always not very extensive and not very wide characterized by sandy and/or pebbly beaches, locally very degraded, fed by materials eroded by meteomarine modeling agents or coming from the collapses that affect the coastal shores themselves. The only predominantly sandy stretch of large dimensions (about 9 km) is the beach that from the mouth of the Ofanto that goes as far as the wetland area of Ariscianne-Boccadoro, south of Barletta, representing the final part of a coastal plain where once there were frequent lagoon and marshy areas, today mostly reclaimed.

The rocky front along the entire coast of the area in question is punctuated by coves and inlets, in adherence to which the original nuclei of the seven large centers aligned along the coast have almost always arisen on small promontories: Barletta, Trani, Bisceglie, Molfetta, Giovinazzo, Bari and further south Mola. On the rocky coasts of central Puglia, starting from the Middle Ages, a unique settlement configuration took shape: a festoon of city-port, which from Barletta to Monopoli organized the relationship between the agricultural production areas of central Puglia and the Mediterranean.

Along the rocky walls of the coast of the Bari area there are several caves and cavities of karst-marine origin. A first group of caves is present south-east of Bisceglie, along the walls of the inlet of Punta Ripalta (Grotta della Spina, del Polpo, della Volpe, Grotte della Punta di Ripalta and Grotticelle del Compare

Girolamo). A second group of caves is present in the stretch of coast north-west of Torre a Mare (Scizza Caves, Punta Penne Caves, Queen's Cave) and a little further south-east, in Fontanaviva.

The local hydrographic network shows a "comb" configuration with a close series of almost rectilinear networks, parallel to each other and perpendicular to the coastline. Among the main blades that rhythmically mark the coast with their incisions with their mouths, forming small indentations, we have: the Ciapetta-Camaggi, Palumbariello, Paterno blades between Barletta and Trani; Lama di Bisceglie, Lama Macina, Lama Marcinase and Lama Le Sedelle between Trani and Molfetta; the Lama Martina, Lama Le Carrese, Lame di Giovinazzo, Lame di Castello, Lama Caldarese, Cala D'Oria, Lama Balice, Lamasinata canal between Molfetta and Bari; the Valenzano Canal, Lama Cutizza, Lama S. Giorgio, Lama Giotta, Rinaldi.

In the Bari area, the system of blades is of strategic importance from an ecological point of view because the beds of the blades are often characterized by the presence of spontaneous vegetation, in a context that has always been intensely cultivated.

Due to its rocky nature and high level of anthropization, the coast of Central Puglia is almost devoid of wetlands. The only exception is the residual marshy area of Ariscianne-Boccadoro, located between Barletta and Trani, generated by numerous karst resurgences and now drained by a network of reclamation canals. Other spring emergencies are present between Bari and Mola, in particular in the Torre a Mare area. Along the coast that extends from Mola to Bari, the system of blades formed until the beginning of the last century a series of marshy areas (Fesca, S. Francesco, Marisabella, San Giorgio).

The compact coastal historic nuclei are generally located on promontories and in adherence to natural inlets used as landing places. They are defended by a system of walls and castles from which the monumental cornerstones of the urban space clearly emerge: Romanesque cathedrals, matrix churches, municipal palaces and convents. A long sequence of defense towers rhythmically cadence the coast (Tower of Pilate and Torre Olivieri along the coast of Trani, Torre Calderino, Torre S. Giacomo, Torre Grillo, Torre Panunzio, Torre Ciciriello, Torre Palumbo in Molfetta, Torre Rotonda, Torre Pietre Rosse, Torre di San Matteo, Torre di S. Agostino in Giovinazzo, Torre D'Amelle, Torre Montrone and Torre a Mare in Bari).

On the ancient coastal settlement system composed of a theory of city-port of a certain size and devoid of hierarchies, the phenomenon of the growth of the capital city has been grafted. Today the metropolitan area develops along a "spider's web" road structure that organizes the relations between the center and the cities of the first and second crown, with some offshoots of penetration towards the slopes of the Murgia plateau.

Due to its historical uniqueness, the settlement system of Central Puglia represents a value and a structural character to which a strategy can be attached that attempts to counteract, through the active protection and safeguarding of the residual coastal passages, the ongoing trend of the formation of a continuous linear metropolis of one million inhabitants on the coast. In this vision, therefore, all the strips of olive grove countryside that from the hinterland reaches the coast, historically bordered by systems of coastal gardens that survive today, often incorporated into the coastal offshoots of the contemporary city, take on great value.

The entire coastal strip that goes from Barletta to Polignano, despite the strong degree of artificialization of the coast, is characterized by seabeds of great naturalistic importance. Generally, immediately after the biocoenosis with well-calibrated fine sands, the posidonia grove appears (*Posidonia oceanica*), followed almost everywhere by the Apulian coral belt. Both the posidonia and the coralligenous constitute biocoenoses of extreme interest for the maintenance of marine biodiversity, hosting hundreds of species, many of which are of high phytographic and zoogeographical interest.

The maritime cities of Central Puglia are equipped with valuable historical nuclei and historic ports, in various ways integrated into the economy and history of their respective urban centers, but they are little frequented by external visitors, with the exception of Trani and Bari. These are historic centers rich in historical and cultural heritage of great importance, united by history and urban structure, but each characterized by a personal imprint. The potential of these coastal urban centers is enormous, because all together they form a complex tourism system that is still undervalued.

The ancient village of Bari with its merchant and tourist port

In general, in the stretch of coast between Barletta and Mola, the hydrogeological risk consists of detachments and overturning from rock walls, collapses of caves and coastal cavities, erosion at the foot of the cliffs in soft rocks. From the point of view of coastal erosion, in consideration of the lithological characteristics of this coastal stretch, the area does not present particular problems, except for some local crisis situations. The rare sandy beaches present, already not very extensive and wide, are locally degraded and scarcely fed by the solid contributions coming from the interior also due to the artificialization of the blade bed.

From a hydrogeological point of view, the problems are mainly related to the risk of flooding of coastal areas due to the flooding of the blades, whose beds or mouth areas are often partially occluded by anthropogenic interventions. The numerous flooding events recorded since the beginning of the massive urbanizations of the last century have led to the implementation of various mitigation interventions (embankments, guard canals, diverter canals, weirs).

Another serious criticality of the coast of Central Puglia is represented by the degradation of the sea meadows present in the seabed overlooking the coast, also caused by the modifications of the coastline that occurred near all the large coastal municipalities, with the construction of port piers. These constructions may have caused variations in the sedimentation rate, altering the hydrodynamic regime of the area. No less important, especially along the coast of the city of Bari, but also of Trani, Bisceglie and Molfetta, are to be considered all the civil and industrial sewage discharges, which, for many years, have poured untreated wastewater into the sea, as well as the deleterious action of some fishing activities along the coast (trawling, clams).

The relative scarcity of rainfall, but above all the uncontrolled exploitation of the underground water resource for irrigation, drinking and industrial use, have in fact determined the gradual shift of the interface between fresh groundwater and salt water of the sea upwards and towards increasingly inland areas, with consequent progressive salinization of coastal karst aquifers (salt content greater than 0.5 g/l) to be now scarcely usable for uses. irrigation or drinking.

Uncontrolled urban development is leading to the construction of a single Adriatic coastal front, resulting in the welding of coastal centers and the obliteration of the great historical coastal voids. The areas closest to

the coast are undoubtedly those most characterized by transformative pressures, especially with regard to the agricultural margins between settlements, which are increasingly used as tourist-accommodation building areas or to locate industrial or craft activities.

In the last 10 years, the coastal front of the city of Bari has seen the implementation of numerous redevelopment and reconnection projects, aimed above all at developing leading collective functions (cultural, recreational, associative), although not yet integrated nor yet qualitatively capable of playing an effective role in tourist attractiveness. In the other coastal cities of central Puglia, the collective functions (recreational and bathing, sports, associations, cultural) of use of the sea as a public resource, which find their traditional scene on the coastline, still appear not to be integrated or adequately supported by quality interventions. The lack of an integrated and differentiated system of urban mobility by land and sea also seriously affects the enjoyment of the coastal landscape understood as a common good of the inhabitants of coastal cities.

4.1.9 POPULATION AND HUMAN HEALTH

The following data provide an excursus on the demographic data of the province of Foggia with the aim of describing the baseline scenario on which to evaluate any impacts or interactions of the Nemetun Island wind farm.

4.1.9.1 Demographic context

For the description of the demographic trend of the entire area, the demographic data of the province FG are analyzed below, considered a significant reference for its size and population.

According to ISTAT data and analyses, in the time frame between 2001 and 2021 the resident population of the province of FG suffered a progressive decrease, with a drastic decline between 2008 and 2009.

Trend of the resident population In FG Province

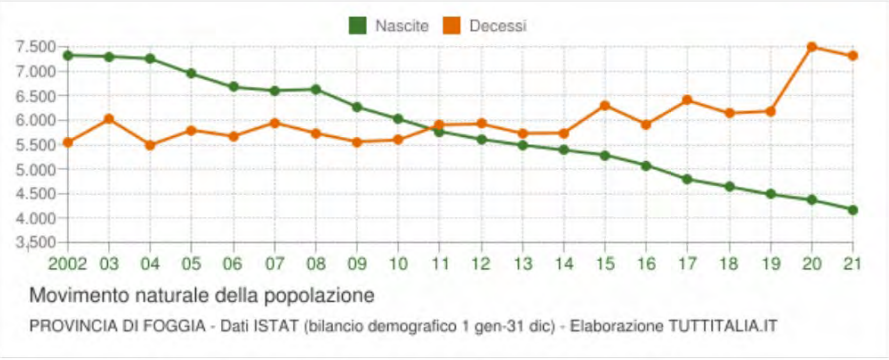
Below is the analytical table of the change in residents on an annual basis, also prepared by the National Institute of Statistics.

Anno	Data rilevamento	Popolazione residente	Variazione assoluta	Variazione percentuale	Numero Famiglie	Media componenti per famiglia
2001	31 dicembre	690.426	-	-	-	-
2002	31 dicembre	688.902	-1.524	-0,22%	-	-
2003	31 dicembre	688.001	-901	-0,13%	237.943	2,88
2004	31 dicembre	686.856	-1.145	-0,17%	239.339	2,85
2005	31 dicembre	684.273	-2.583	-0,38%	240.824	2,82
2006	31 dicembre	681.546	-2.727	-0,40%	241.535	2,81
2007	31 dicembre	682.456	+910	+0,13%	244.033	2,79
2008	31 dicembre	682.260	-196	-0,03%	246.252	2,76
2009	31 dicembre	640.891	-41.369	-6,06%	232.978	2,74
2010	31 dicembre	640.836	-55	-0,01%	234.858	2,72
2011 (1)	*8 ottobre*	*639.559*	*-1.277*	*-0,20%*	*235.733*	*2,71*
2011 (2)	*9 ottobre*	*626.072*	*-13.487*	*-2,11%*	-	-
2011 (3)	31 dicembre	625.657	-15.179	-2,37%	236.785	2,64
2012	31 dicembre	628.221	+2.564	+0,41%	249.984	2,51
2013	31 dicembre	635.344	+7.123	+1,13%	242.713	2,61
2014	31 dicembre	633.839	-1.505	-0,24%	242.824	2,60
2015	31 dicembre	630.851	-2.988	-0,47%	244.023	2,58
2016	31 dicembre	628.556	-2.295	-0,36%	242.829	2,58
2017	31 dicembre	625.311	-3.245	-0,52%	244.474	2,55
2018*	31 dicembre	611.518	-13.793	-2,21%	242.077,31	2,52
2019*	31 dicembre	606.904	-4.614	-0,75%	243.306,78	2,49
2020*	31 dicembre	602.394	-4.510	-0,74%	(v)	(v)
2021*	31 dicembre	599.028	-3.366	-0,56%	(v)	(v)

(1) popolazione anagrafica al 8 ottobre 2011, giorno prima del censimento 2011.
(2) popolazione censita il 9 ottobre 2011, data di riferimento del censimento 2011.
(3) la variazione assoluta e percentuale si riferiscono al confronto con i dati del 31 dicembre 2010.
(*) popolazione post-censimento
(v) dato in corso di validazione

Variation Demographic Percentage on an annual basis – province of Foggia

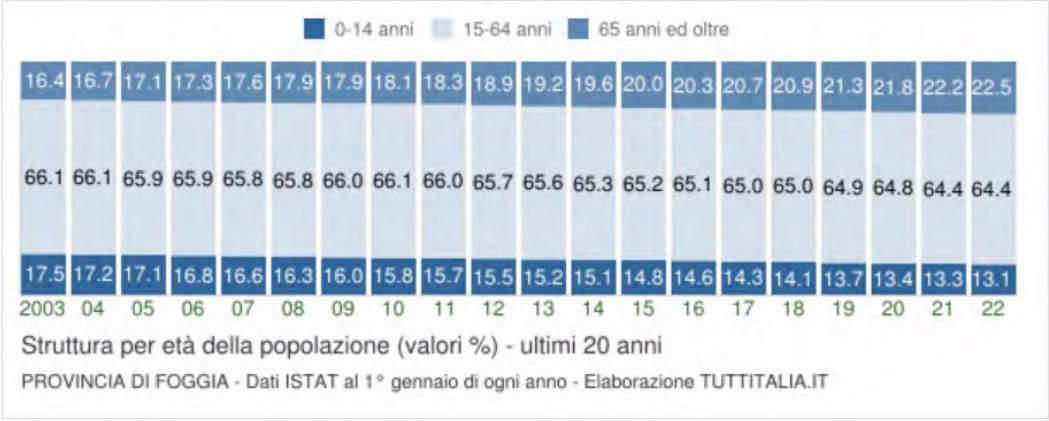
Another "sensitive" data on demographic trends is the ratio between births and deaths, also defined on a statistical basis and represented by the following representation.



Natural movement of the population – province of FG

The graph shows that the "natural balance", i.e., the area between the two curves, has undergone a drastic reduction over time until a total change in trend in recent years. The negative change confirms the data on the overall decrease in the population and provides a reference on the progressive aging of the resident population in this province, a trend comparable to other Apulian provinces and many centers in southern Italy.

By shifting the analysis to the data relating to the so-called "population structure", important data can be obtained to assess certain impacts (e.g. those of a project such as the Nemetun Island wind farm) on the social, labour or health systems.



Structure by age of the population – province of FG

Another fundamental fact for the definition of the impacts is certainly the structure of the so-called "demographic indicators", which are transcribed in the following table and which - especially for the "activity" indices - represent an important comparison of the impacts of a major work. A description of the indexes is inserted after the table for a better and more accurate reading.

Anno	Indice di **vecchiaia**	Indice di **dipendenza** strutturale	Indice di **ricambio** della popolazione attiva	Indice di **struttura** della popolazione attiva	Indice di **carico** di figli per donna feconda	Indice di **natalità** (x 1.000 ab.)	Indice di **mortalità** (x 1.000 ab.)
	1° gennaio	1° gennaio	1° gennaio	1° gennaio	1° gennaio	1 gen-31 dic	1 gen-31 dic
2002	90,4	51,0	76,0	77,6	0,0	10,6	8,0
2003	93,6	51,3	77,4	79,4	0,0	10,6	8,7
2004	96,9	51,4	76,7	81,3	0,0	10,6	8,0
2005	100,1	51,9	74,8	84,3	0,0	10,1	8,5
2006	103,1	51,8	74,6	87,0	0,0	9,8	8,3
2007	106,3	51,9	78,6	90,0	0,0	9,7	8,7
2008	110,1	51,9	81,7	92,4	0,0	9,7	8,4
2009	111,9	51,5	88,8	95,5	0,0	9,5	8,4
2010	114,0	51,4	94,8	98,6	0,0	9,4	8,7
2011	116,5	51,6	99,7	101,3	0,0	9,1	9,3
2012	122,2	52,3	101,0	104,1	0,0	8,9	9,4
2013	126,0	52,4	101,8	105,7	0,0	8,7	9,1
2014	129,7	53,1	99,4	107,9	0,0	8,5	9,0
2015	134,8	53,5	99,8	110,3	0,0	8,4	10,0
2016	139,4	53,7	100,8	112,8	0,0	8,1	9,4
2017	144,6	53,9	103,4	115,2	0,0	7,6	10,2
2018	148,9	53,8	106,2	117,8	0,0	7,5	9,9
2019	155,6	54,0	110,3	119,9	0,0	7,4	10,1
2020	162,6	54,4	113,7	122,0	0,0	7,2	12,4
2021	166,8	55,2	116,8	123,7	0,0	7,0	12,2
2022	172,5	55,3	121,0	125,2	0,0	-	-

Demographic indicators - province of Foggia

- **Old age index**

  It represents the degree of aging of a population. It is the percentage ratio between the number of over-sixty-fives and the number of young people up to 14 years of age. For example, in 2022 the old age index says that there are 172.5 elderly people for every 100 young people.

- **Structural dependency ratio**

  It represents the social and economic burden of the non-active population (0-14 years and 65 years and over) on the active population (15-64 years). For example, theoretically, in 2022 in the province of FG there are 55.3 dependents for every 100 who work.

- **Turnover index of the working population**

  It represents the percentage ratio between the segment of the population that is about to retire (60-64 years) and those that are about to enter the world of work (15-19 years). The younger the working population is, the lower the indicator is. For example, in 2022 in the province of FG the replacement index is 121.0, indicating that the working-age population is elderly.

- **Structure index of the working population**

  It represents the degree of ageing of the working-age population. It is the percentage ratio between the oldest (40-64 years) and the youngest (15-39 years) working-age population.

- **Burden of children per fertile woman**

  It is the percentage ratio between the number of children up to 4 years of age and the number of women of childbearing age (15-49 years). It estimates the burden of pre-school children for working mothers.

- **Birth rate**

  It represents the average number of births in a year per thousand inhabitants.

- **Mortality Index**

  It represents the average number of deaths in a year per thousand inhabitants.

4.1.9.2 Quality of life analysis

To describe the current state of the quality of life in the province of FG, the "2022 ranking of the quality of life" drawn up by the national economic newspaper "Il Sole 24 ore", which annually collects statistical data from authoritative sources such as those drawn up by Istat, Infocamere, Legambiente, INPS, etc., was taken as a reference.

The province of FG is ranked 104th out of 107 provinces surveyed.

Below is the summary table of the indicators analyzed to define this position in the ranking.

Classifica finale 2022		104°	+2			
Ricchezza e consumi		89°	+5	0	0	0
Affari e lavoro		100°	+2	0	0	0
Giustizia e sicurezza		100°	+7	0	0	0
Demografia e società		88°	+1	0	0	0
Ambiente e servizi		90°	+10	0	0	0
Cultura e tempo libero		103°	-9	0	0	0

Province of Score Table FG, source Sole 24 Ore website

https://lab24.ilsole24ore.com/qualita-della-vita/foggia

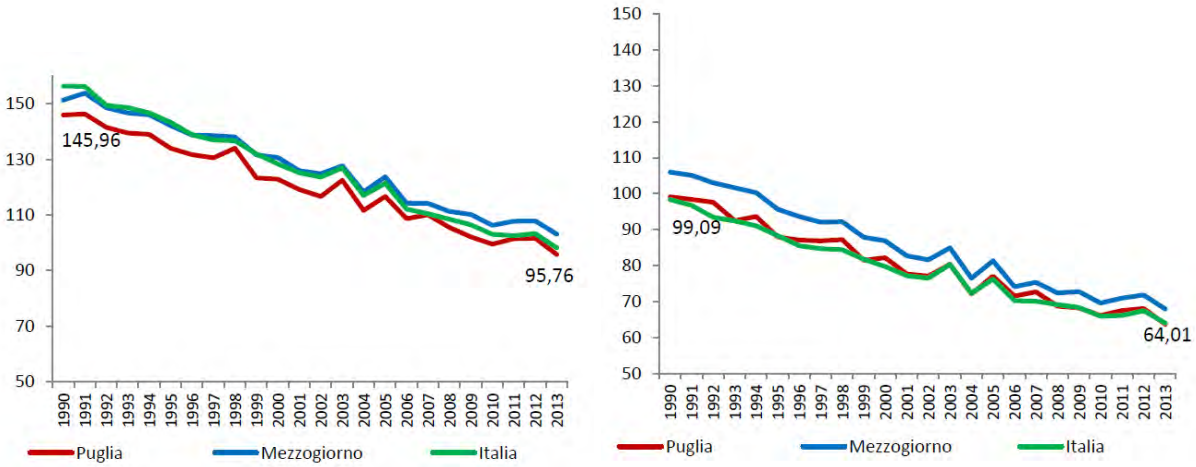
In particular, data relating to business and work, justice and security and culture and leisure are sensitive and have the greatest impact on the position in the ranking.

4.1.9.3 Analysis of mortality and morbidity

From the consultation of authoritative sites and portals such as Istat, Istituto Superiore di Sanità (ISS) and Arpa Puglia, an analysis of the data on morbidity and mortality relating to the population residing in the area affected by the project was carried out, accompanied by the identification of the main causes of death and disease characterizing the community in question.

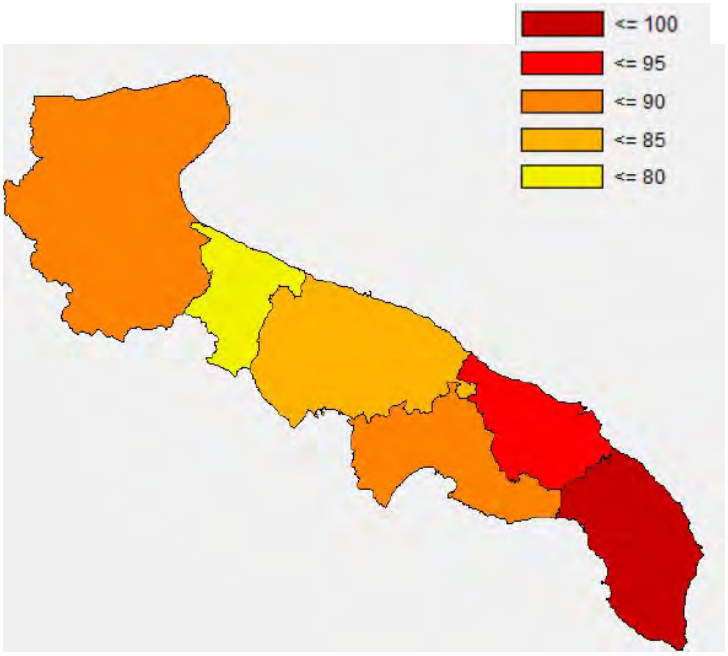
The following are some data collected from the report "PUGLIA, MAIN CAUSES OF DEATH: A REGIONAL AND PROVINCIAL COMPARISON" of the statistical service of the Puglia Region in 2016, drawn up on the basis of data from the European Information System "Health for all" (HFA).

Since 1990, in Puglia, Southern Italy and Italy, there has been a downward trend in standardised mortality rates, both for males and females, the former with higher values than the latter. The Apulian trend is below that of Italy and the South for males. For females it is below the Italian figure and in line with that of the South.



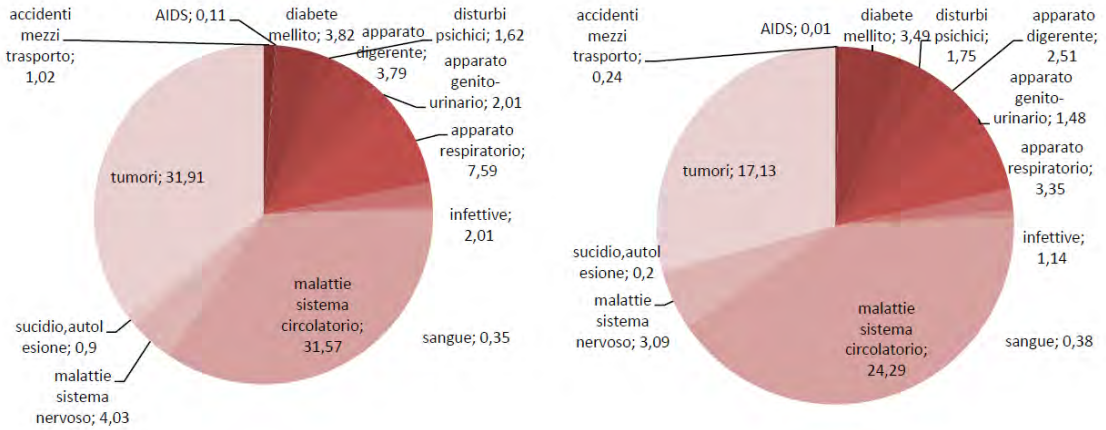
Standardized mortality rate - Years 1990-2013 - Males on the left and females on the right

The provincial analysis of the mortality rate for the year 2013 shows the highest values of the rates in the province of Lecce while the lowest are concentrated in the province of BAT.



Death rates in the Apulian provinces in 2013

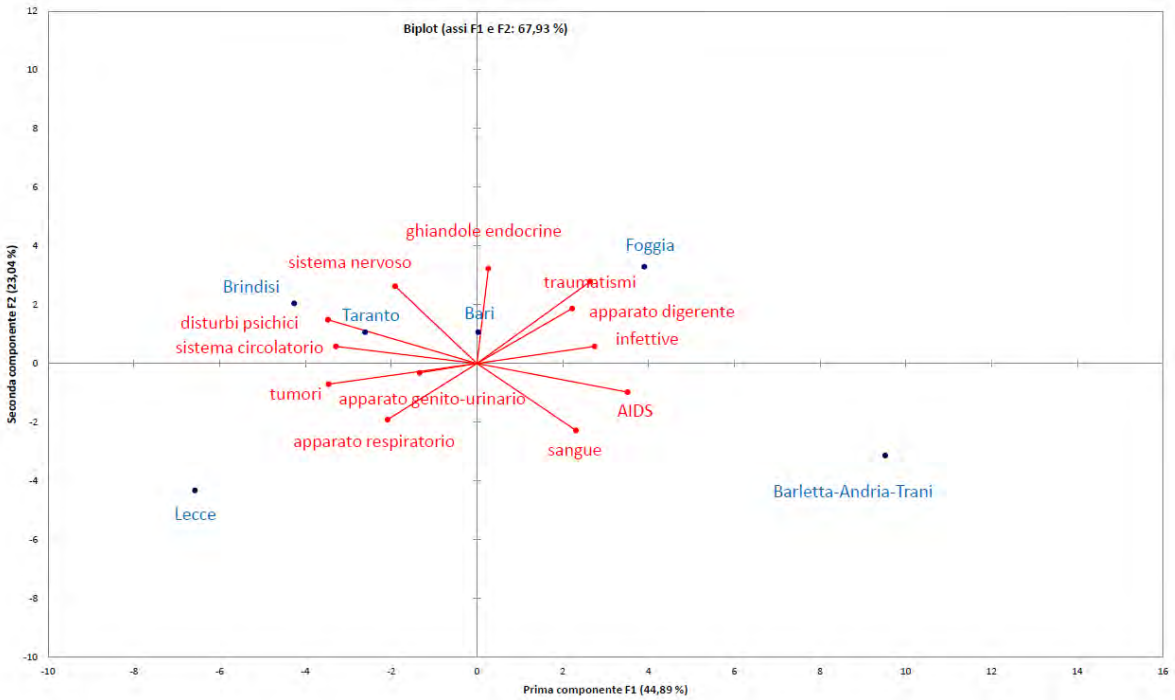
The most common causes of death in the Apulia region in 2013 were due to tumors and diseases of the circulatory system for both males and females.



Standardised mortality rates for some types of causes of death in Puglia in 2013: males on the left and females on the right

Focusing on the individual provinces of Puglia, for the year 2013, the province of BAT is the one in which people die the most from infectious diseases, AIDS, blood diseases, hematopoietic organs and immune disorders, while it is the one in which people die the least due to tumors, mental disorders, nervous system diseases, circulatory system diseases. The province of FG is the one in which people die the most from diseases of the digestive system and due to trauma and poisoning. In the province of BA, mortality from diseases of the nervous system and organs of the senses and mental illnesses is more recurrent. In addition, the PCA graph, used in order to carry out the graphic synthesis within two orthogonal axes, allows to explore the possible statistical relationships between mortality rates for different causes, in order to reduce them to only two components. The first two factors, F1 and F2, identified by the PCA summarize 67.93% of the total variability present in the variables "causes of death", expressed through rates. The origin of the axes represents the average situation and The origin of the axes represents the average situation. The province of Bari is the one closest to the center, so it can be said that the incidence of causes of mortality does not seem to show significant variations from what can be expressed on average by the

various provincial territories. While the greatest distance from the central midpoint is from the province of BAT, which is located on the quadrant characterized by deaths from AIDS and blood diseases. Finally, the province of Foggia is characterized by mortality due to causes such as trauma, infectious diseases and diseases of the digestive system.

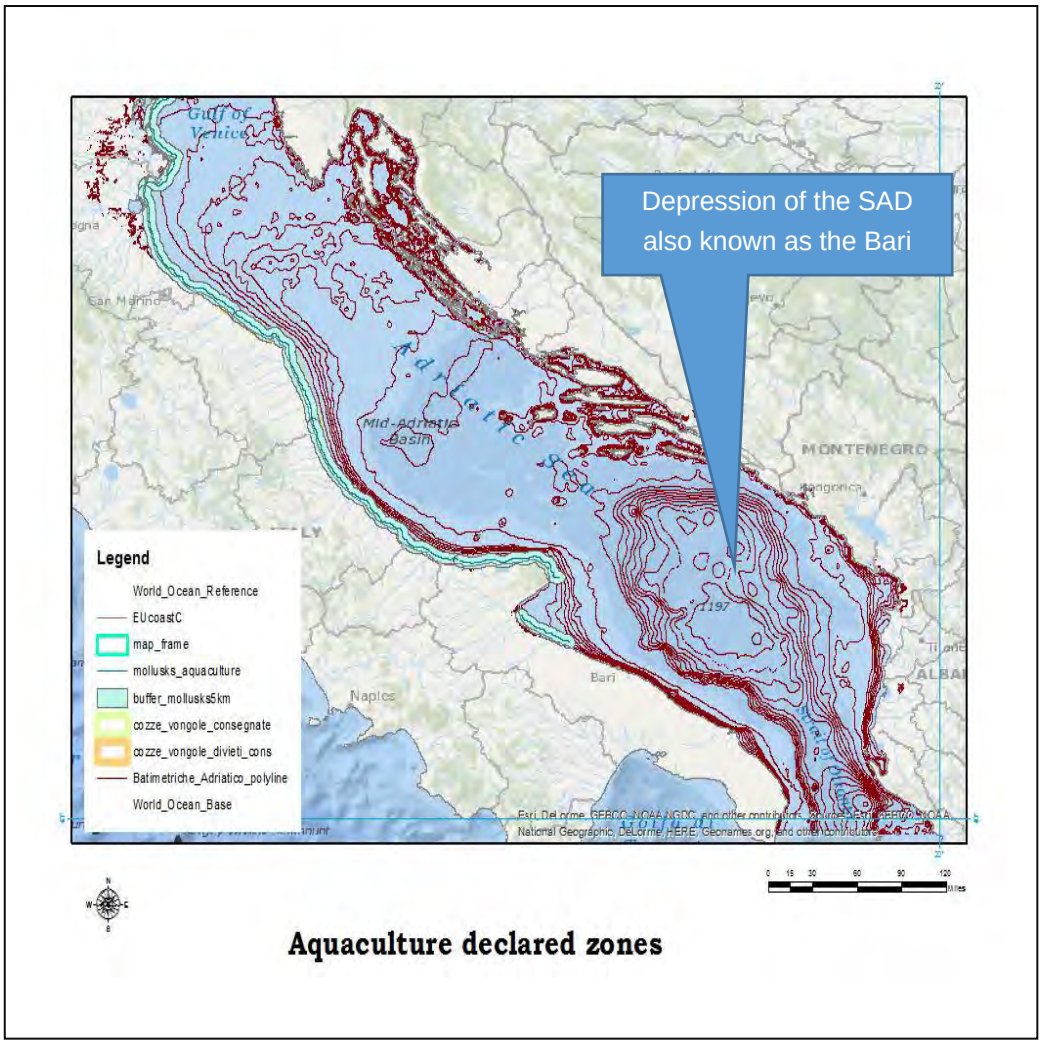


4.1.10 SOCIO-ECONOMIC ASPECTS

4.1.10.1 Fisheries – general data

Here are some excerpts from the publication of the book "The state of fishing and aquaculture in the Italian seas" edited by S. Cautadella and M. Spagnolo carried out as part of the project "Program for a publication on the state of fishing in Italy – code 6G24" containing a detailed description of the Apulian fishing system, also some analysis data derive from the study of the POWERED Project of Offshore Wind Energy: Research, Experimentation, Development, aimed at assessing the impacts of the installation of offshore plants on the fishing system of the Apulian coast.

The project area is part of geographical area 18 (GSA 18 - Lower Adriatic) which extends between the Italian coasts of the Puglia Region and those of Montenegro and Albania and is characterized by the presence of the large central depression called "SAD Depression" and also called "Bari Trench". In this area the seabed reaches a depth of 1.233 m.



Areas for aquaculture - Powered IPA Project – WP5 Final Report

The coast of the Lower Adriatic contributes substantially to national fish production with a contribution comparable to that of the Strait of Sicily and equal, in 2010, to about 13% (IREPA data, 2010). The Italian fleet of the Lower Adriatic is made up of about 1,100 boats: 44% of the boats use artisanal fishing gear, 43% trawl and 7% dredgers for bivalve mollusc fishing (IREPA data, 2009).

The main fishing ports of the Lower Adriatic are Manfredonia, Bisceglie, Molfetta, Mola di Bari and Monopoli.

Anchovies (*Engraulis encrasicolus*), in first place for contribution to the formation of the commercial performance of the Lower Adriatic, reached about 29% of the catch in 2010 (IREPA data, 2010). The Gulf of Manfredonia represents the area along the Italian coast with the highest concentration of juvenile forms of small pelagics. Anchovies and sardines in the adult stage are fished throughout the year in areas of the circalittoral parallel to the coast, mainly with purse seiners, "purse seines" or "lampare" nets and with pelagic "flying" type trawls. Albatto fishing (juvenile sardines, *Sardina pilchardus*), which is highly developed in Manfredonia, is now the subject of a profound revision and specific management plans following the entry into force of Reg. (EC) 1967/2006, also known as the "Mediterranean Regulation".

Fishing habits change between navies and are largely dependent on the capacity of the fleet. The main demersal resources of fishing in the Lower Adriatic are represented by the following species:

- hake (*Merluccius merluccius*),
- the cuttlefish (*Sepia officinalis*),

- the langoustine (*Nephrops norvegicus*),
- squid (*Illex sp. z o.o.*),
- the pink shrimp (*Parapenaeus longirostris*),
- the octopus (*Eledone spp.*),
- the mud mullet (*Mullus barbatus*).

In 2010, hake alone accounted for about 13.6% of the catches on the western side of the basin (IREPA data), while the other species just mentioned together reach about 21%. It is therefore a pool that stands at around 34% of the production of the western side of the southern Adriatic.

In the years from 1994 to 2010, the biomass of most of the faunal groups, estimated on the western slope of the Lower Adriatic, varied, but without any trend, with the exception of the cephalopod group which had a significant increase. There has also been an increase, particularly in the last year, in the biomass of selaci and crustaceans.

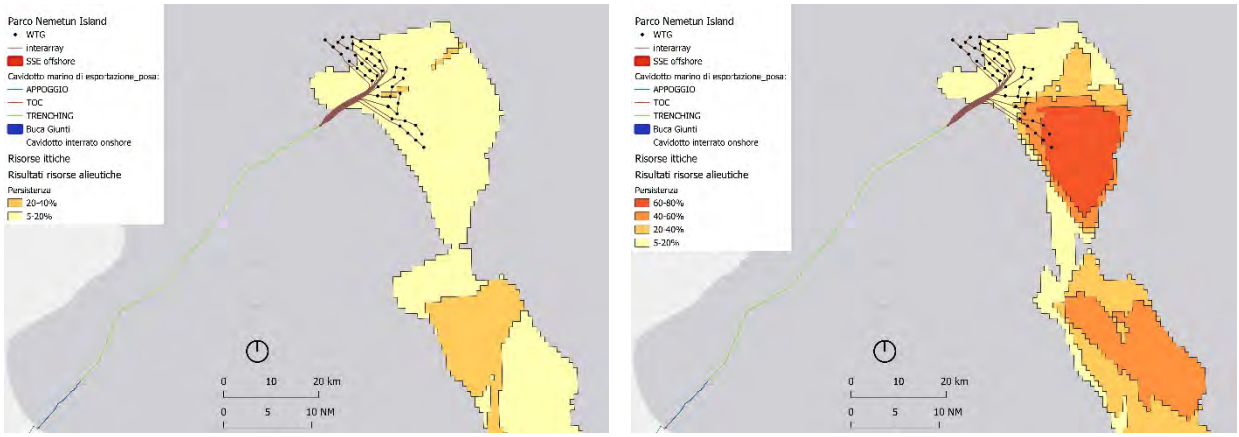
The reproduction period of the different species, estimated by combining both the data obtained from the experimental campaigns and the data from the commercial landing, shows a continuous deposition pattern for the hake, which reproduces all year round with a peak in the late autumn and winter months (December-March), for the pink shrimp and for the common squid, while the breeding season of the red mullet is concentrated in a few months, in the late-spring summer period. An intermediate condition is observed for octopus and langoustin.

An evaluation conducted in collaboration between Italian, Montenegro and Albanian researchers on the condition of exploitation of hake is an emblematic and representative case for GSA 18. As previously highlighted, hake is a sequential spawner that reproduces all year round, with a peak in the late autumn and winter months (December-March). It has high fecundity and the size of the first sexual maturity of females in the Lower Adriatic is about 33 cm in total length.

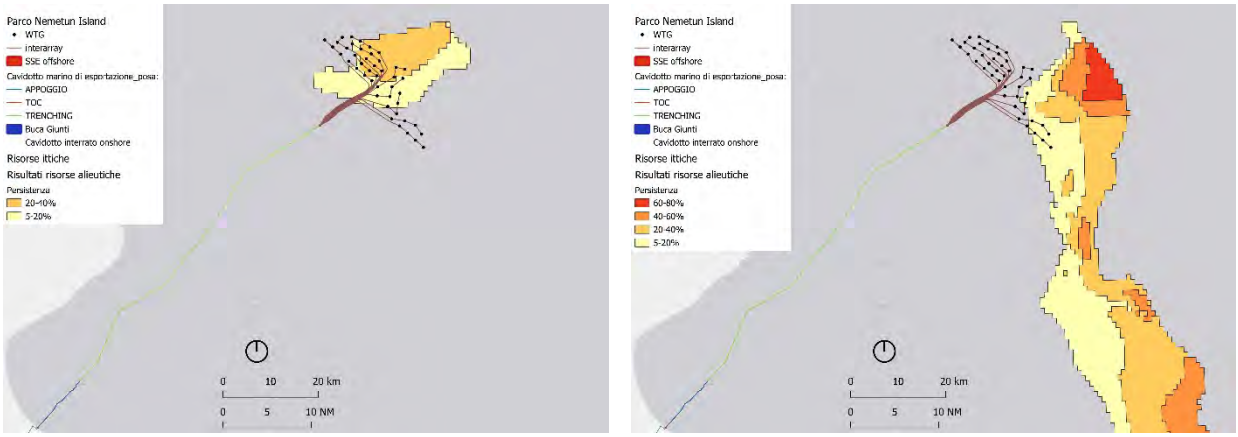
Recruitment has two seasonal peaks, one in late spring (June-July) and another in autumn. The fishing grounds are located on the continental shelf and on the upper part of the escarpment. Trawl catches come from depths between 50 and 500 m; Hake is fished with other important commercial species: *Illex coindetii*, *Mullus barbatus*, *Parapenaeus longirostris*, *Eledone spp.*, *Todaropsis eblanae*, *Lophius spp.*, *Pagellus spp.*, *Phycis blennoides*, *Nephrops norvegicus*.

The surveys conducted by COISPA Tecnologia & Ricerca, based on available literature data with checks carried out at the navies most involved through surveys among fishermen and more easily accessible tools such as the AIS (Automatic Identification System) automatic tracking system, confirm that the area chosen for the Nemetun Island wind farm falls within areas of recruitment and reproduction of commercial species identified as priorities for the GFCM (General Fisheries Commission for the Mediterranean): *Aristeus antennatus, Illex coindetii, Merluccius merluccius, Eledone cirrhosa, Aristaeomorpha foliacea, Galeus melastomus, Mullus barbatus, Pagellus erythrinus, Parapenaeus longirostris* and *Nephrops norvegicus*. Especially *N. norvegicus* it has a breeding hotspot in the N-W part of the wind farm with persistences from 5 to 100%, while *At. foliacea* It has both very large nursery and breeding areas that cover almost the entire area of the wind farm. *A. antennatus* has breeding areas in the S-E part of the wind farm, in the same area we also find breeding animals *G. melastomus*, while its nursery area is more concentrated in the central part of the wind farm. *P. longirostris* it has small breeding hot spots, one of which borders the central part of the wind farm towards N-E and recruitment instead that cover almost the entire N-W half of the wind farm. *E. cirrhosa* It has large recruitment and breeding areas that border the southern part of the wind farm. *I. Coindetii* it has a minimum persistence in the central area of the wind farm for both broodstock and

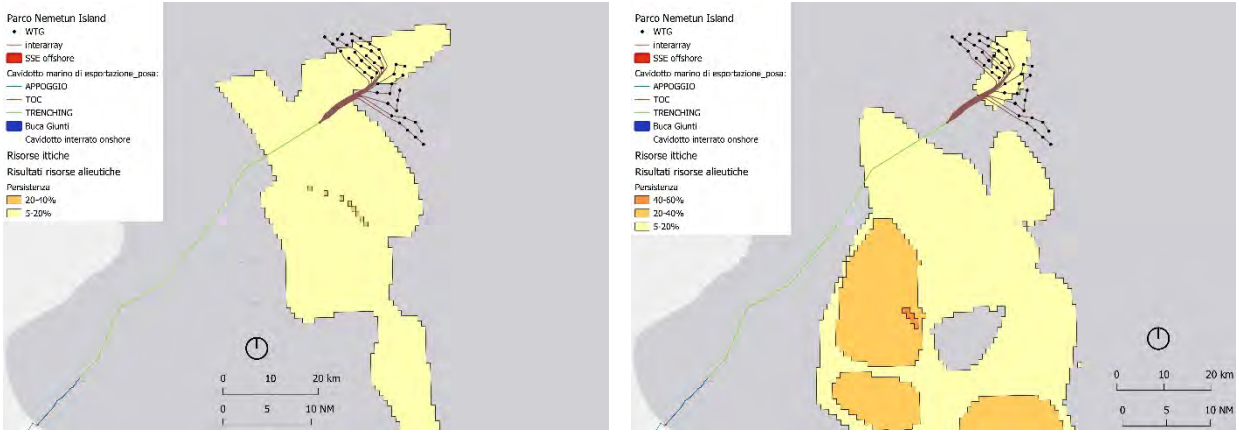
recruits. *M. merluccius* it has a greater persistence of recruits in the wind farm area than that of the reproducers. Finally, we find a minimal presence of breeding stock *M. barbatus* in the N-W part of the wind farm.



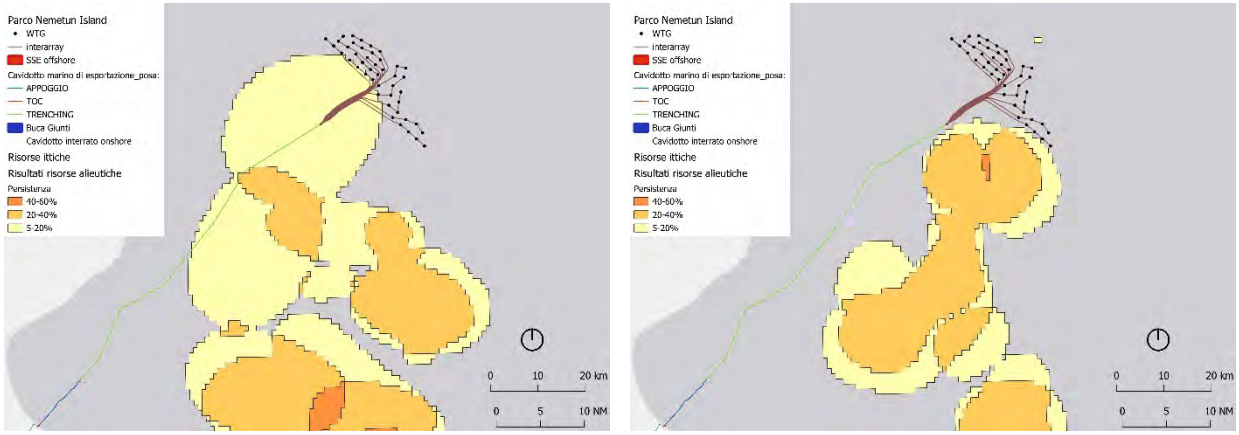
Persistence of Recruits (left) and Players (right) of Aristaeomorpha foliacea falling within the area of the wind farm



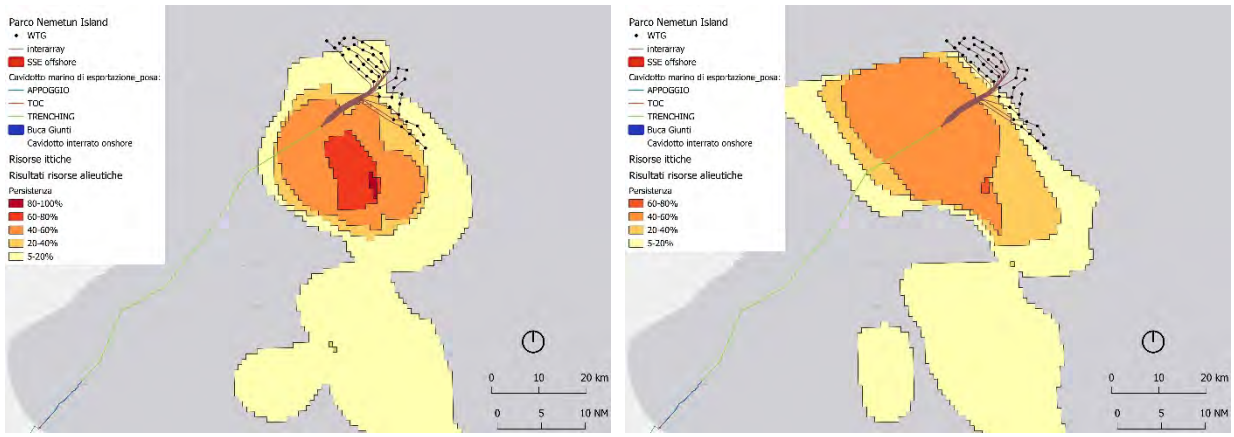
Persistence of Recruits (left) and Players (right) by Galeus melastomus falling within the area of the wind farm



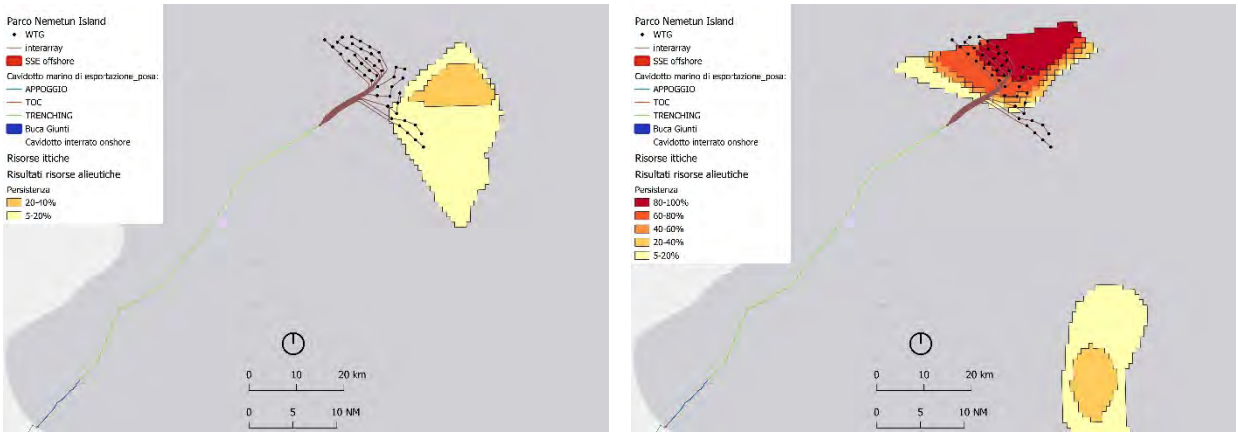
Persistence of recruits (left) and broodstock (right) of Illex coindetii falling within the area of the wind farm



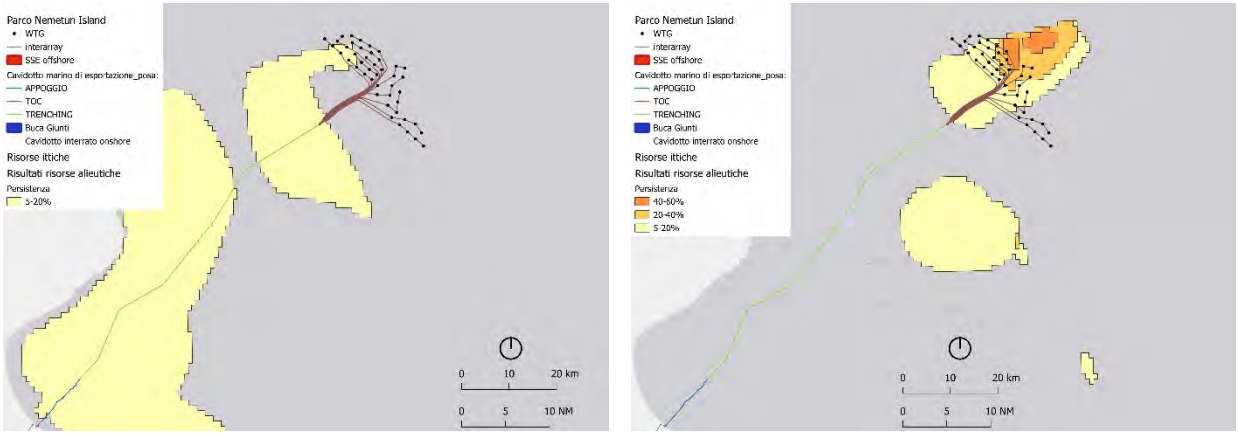
Persistence of recruits (left) and broodstock (right) of Eledone cirrhosa falling within the area of the wind farm



Persistence of recruits (left) and breeding (right) of Merluccius merluccius falling within the area of the wind farm



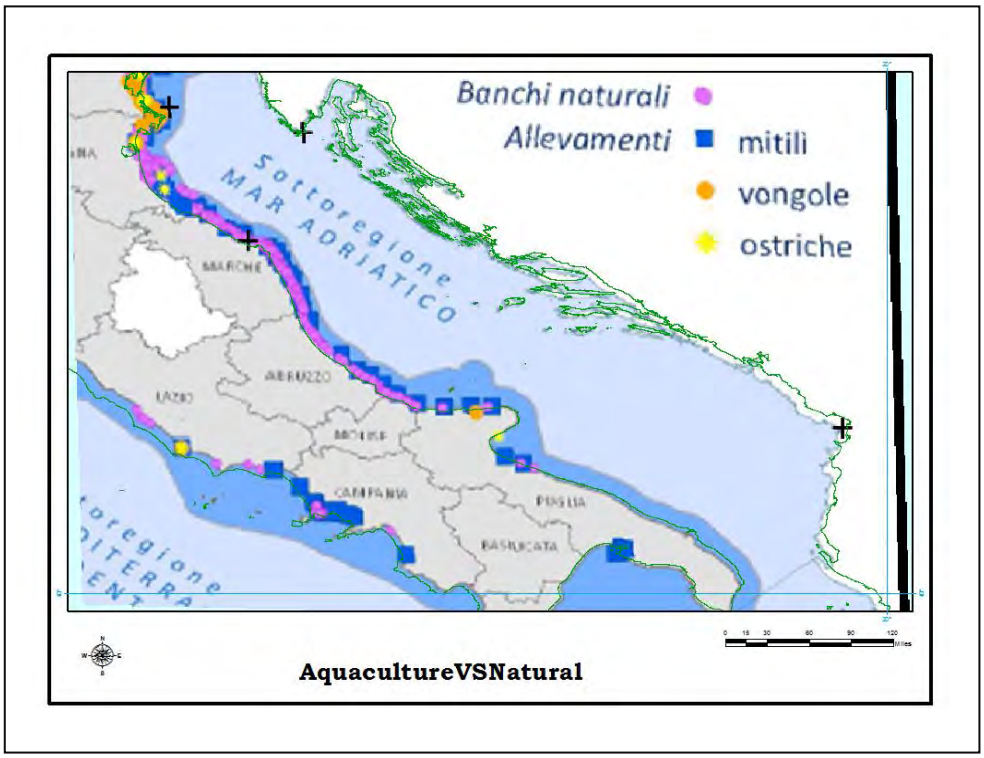
Persistence of breeding stock by Aristeus antennatus (left) and by Nephrops norvegicus (right) falling within the area of the wind farm



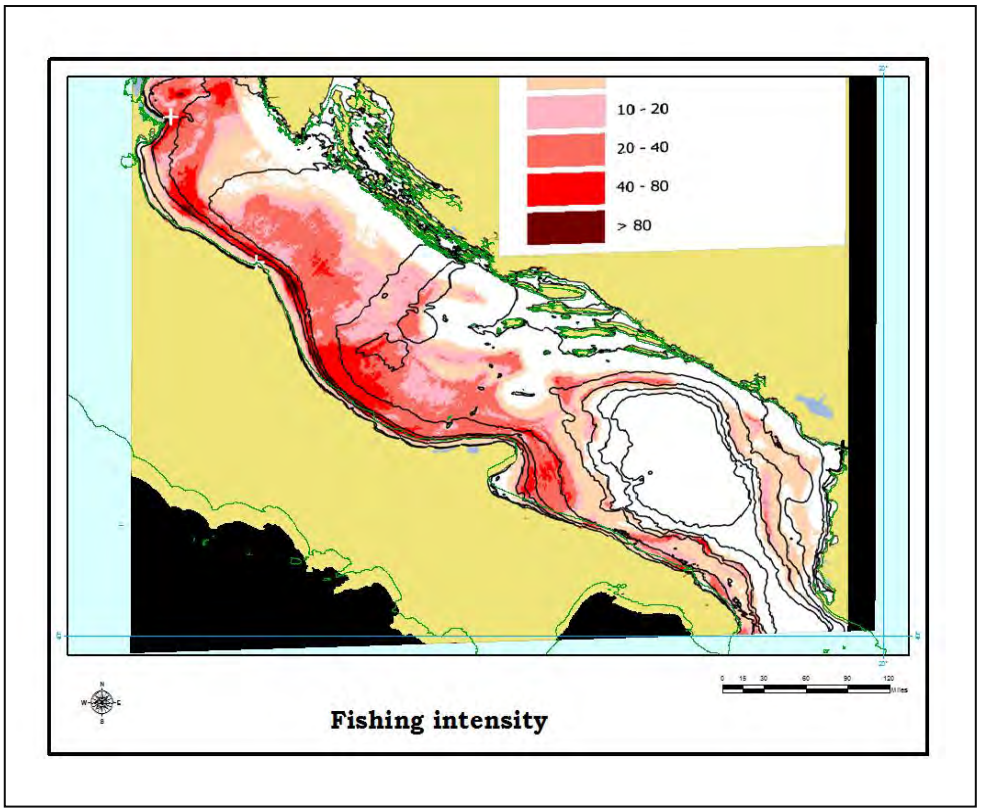
Persistence of Mullus barbatus broodstock (left) and Parapenaeus longirostris recruits (right) in the wind farm area

Below are some thematic maps extracted from the aforementioned final report of WP5 of the POWERED IPA project concerning aquaculture and fishing effort in the Adriatic Sea. Observing them, it is clear that the project areas partially overlap with the areas particularly dedicated to aquaculture; in fact, near the landing area there are mussel farms which, together with those of oysters, are located off the coast between Manfredonia and Bari; the fishing activity in the project area appears to be practiced at low intensity, as can be seen both from the information provided through the AIS system and from the field surveys with the Side Scan Sonar (SSS). Therefore, it is believed that the chosen stretch of sea is not among those most suitable for fishing.

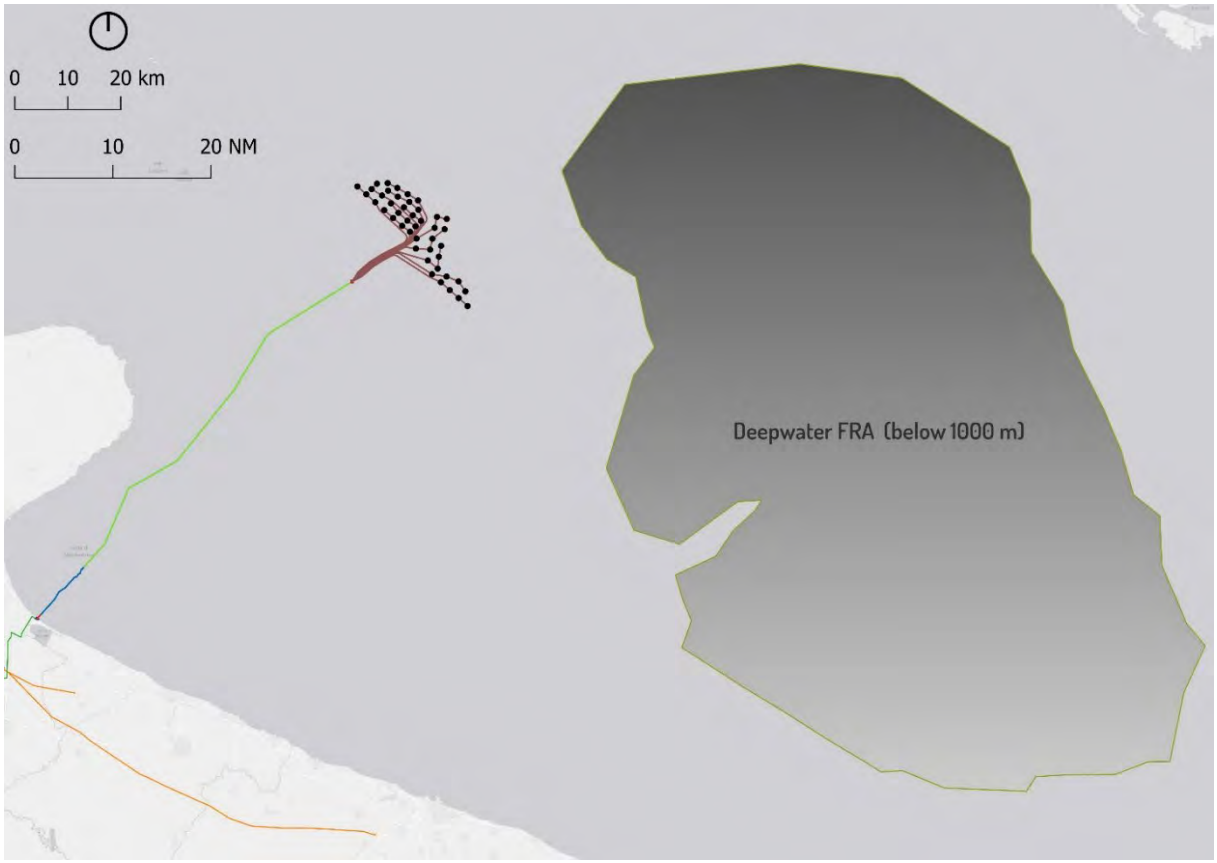
In addition, the examination of the vast area affected by the project shows the presence of the Fisheries Restricted Areas (FRAs), called Deepwater FRA (below 1000 m), in the vicinity (about 10 NM).



Aquaculture and natural beds of edible molluscs - Powered IPA Project – WP5 Final Report



Fishing intensity map in the Adriatic Sea - Powered IPA Project – WP5 Final Report

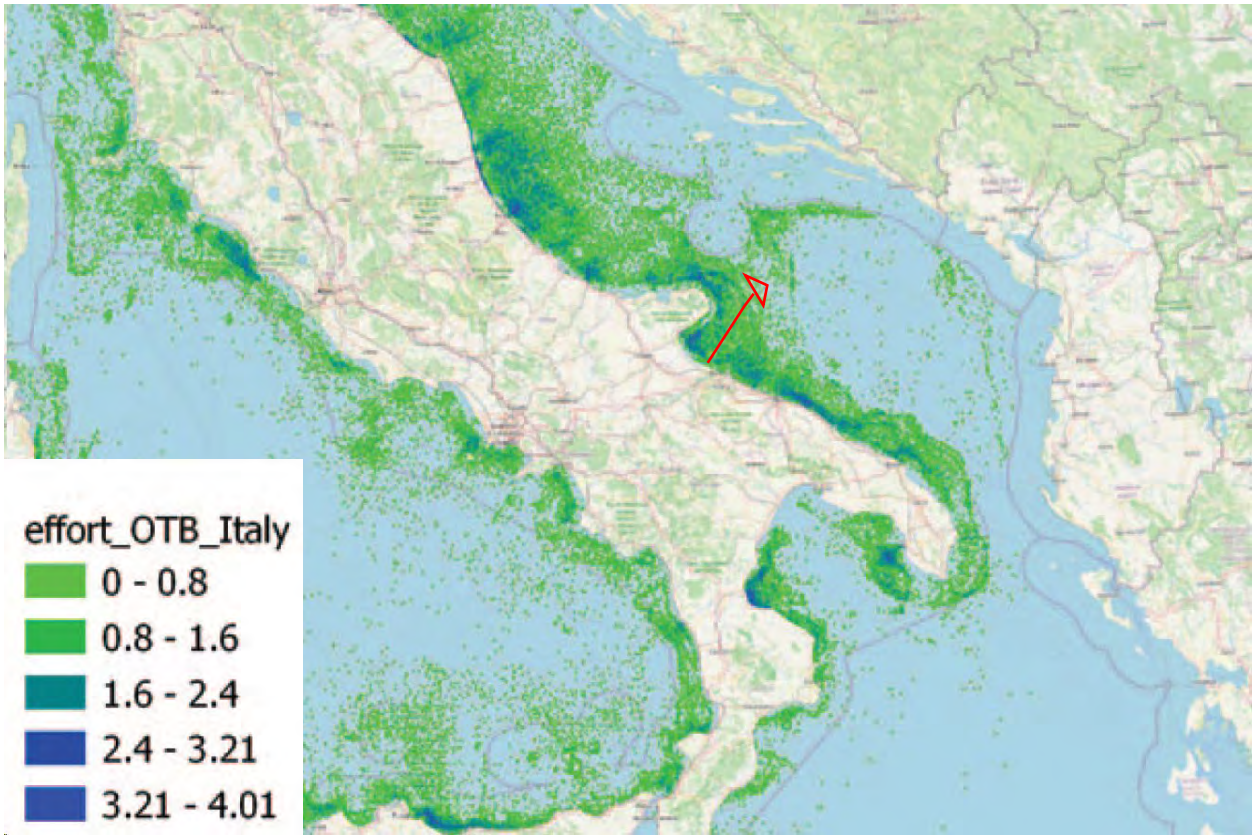


Restricted fishing area in the vicinity of the wind farm – Deepwater FRA (below 1000 m)

Main techniques used and frequency in fishing vessel maritime traffic in the area

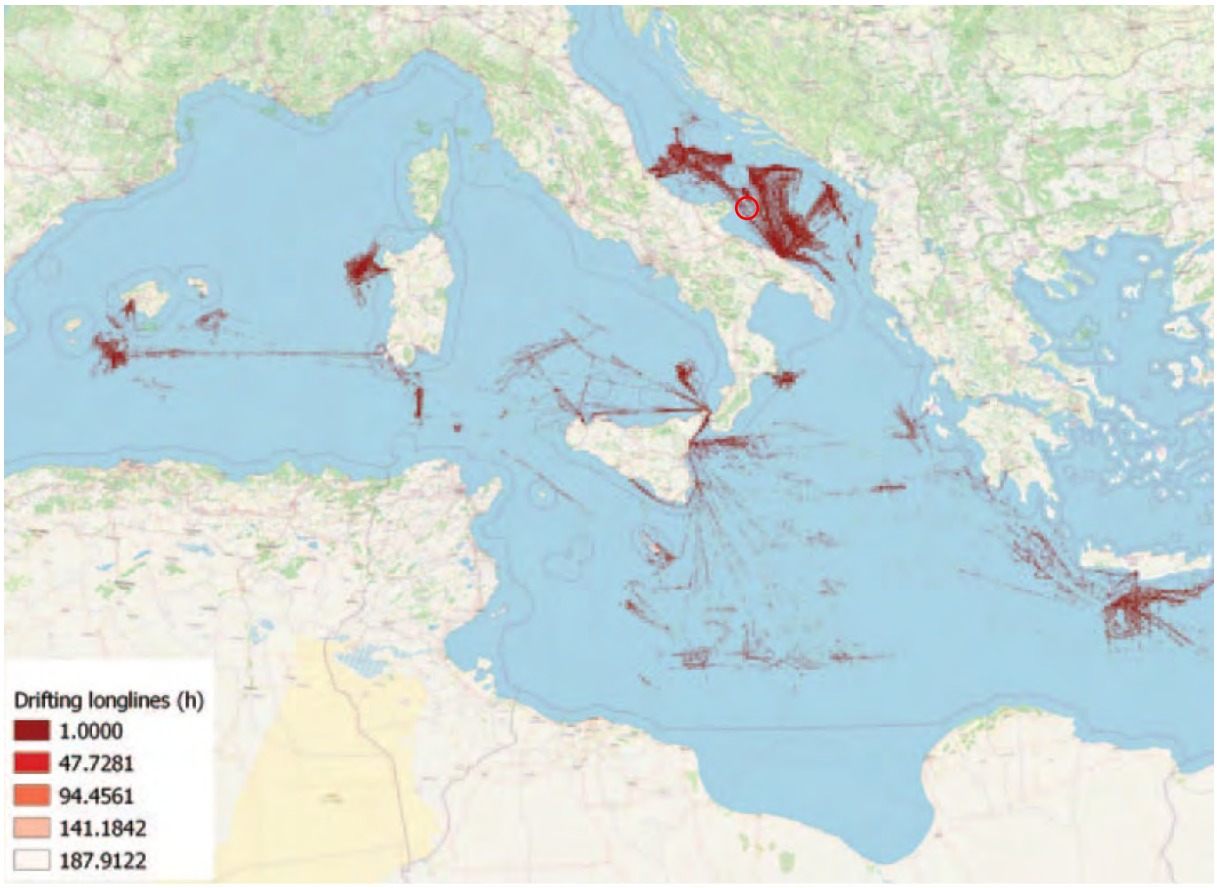
Trawling is the most important fishing activity in the entire area; in fact, the fishing effort is about 70% of the total effort (Irepa 2010 data). The area potentially exploited by trawling for the entire GSA 18 is about 15,000-17,000 km^2 (70% on the western side, 30% on the eastern side). The extent of the shuffle area increases, according to a latitudinal gradient, from south to north of the basin. The escarpment is difficult to drag due to the presence of "dirty" bottoms and possible war remnants.

It is worth mentioning the publication prepared as part of the fishing project by the FLAI CGIL, called "Italian fishing in the use of maritime space" edited by Franco Andraloro, the interesting graphs of this publication have been created by classifying the AIS data according to the type of boat used, they show us a lowering of the frequency of trawling in the areas of the Nemetun Island project, due to the reasons mentioned above, and the increase in the transit effort of trawling boats along the route of the cable duct.



Trawling activities logbook data 2021

Another interesting graph of the aforementioned publication concerns fishing with drifting longline, which instead identifies in the area of the wind farm an area more transited than that of the cable duct.



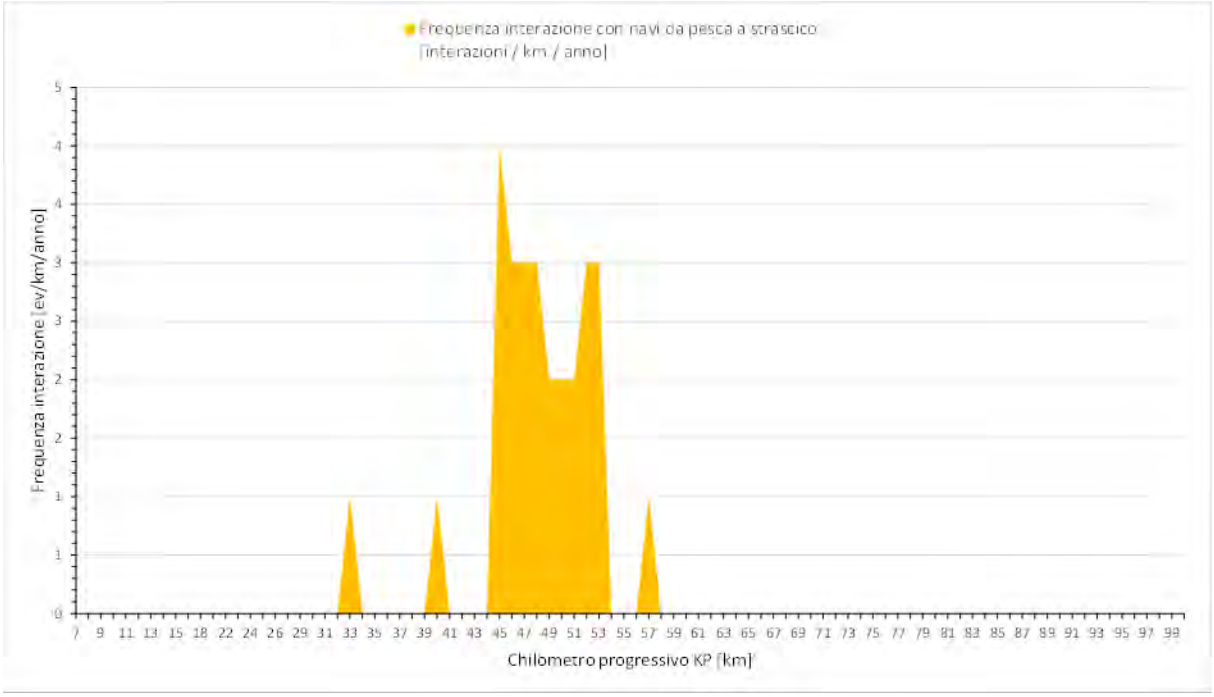
Fishing tracks for drifting longline vessels (AIS 2020 DATA)

On the basis of the analysis drawn up by RINA on the presence of vessels and the frequency of navigation in the project area, it is appropriate to make some considerations, in order to quantify the frequency and presence of fishing vessels in the area affected by the Nemetun Island project.

First of all, it should be noted that among fishing vessels, only trawling vessels can interfere with the presence of the underwater infrastructure of the wind farm. Therefore, for the purposes of the analysis of interaction frequencies, only the latter are considered in the RINA study.

The frequency of interaction between trawl nets and cable ducts/pipes was evaluated on the basis of the results of the analysis of maritime traffic in the area planned for the Nemetun Island wind farm by processing the ship traffic data detected by the AIS tracks and conducted over an area of about 15000 km^2 around the location of the wind farm. The nearby Barium Bay wind farm was also included in the area of interest in order to include, in the representation of traffic corridors, the potential impacts generated by the combined presence of both fields. Conservatively, any crossing event with the cable duct/pipes by fishing vessels equipped with trawl nets was considered as an interaction event.

In Italy, according to Reg. (EC) 1967/2006 art. 13, trawling is prohibited within a distance of 3 nautical miles from the coast or within the 50 m isobath when this depth is reached at a shorter distance from the coast. Therefore, any passage of trawling vessels in parts of the sea with a depth of less than 50 m or within 3 miles from the coast will not be considered as possible interactions between trawls and the cable duct.



Frequency of interaction with cable ducts for trawling boats

It is concluded that the KPs from 0 to 45 of the cable duct (land side) have a depth of less than 50 meters and therefore the interactions with bottom trawling are negligible (illegal bottom trawling); two interactions are recorded at KP 33 and 40 probably associated with the passage of vessels without trawling activity. For all the other KPs of the cable duct, trawling has a very limited number of passages (maximum 4 passages per year); In addition, it should be remembered that the results relating to trawling have been calculated by cautiously considering that:

- all fishing vessel passages belong to trawling vessels (information not specified in AIS data);
- all passages correspond to ongoing fishing activities.

It is therefore concluded that the route of the cable duct is not really affected by trawling activities and such a contribution can reasonably be excluded.

The stretch of coast involved in the presence of the Nemetun Island plant is affected by the presence of the marine SPA IT9110041 "Aloisa - Carapelle" characterized by the presence of a habitat suitable for wintering the species of community interest *Mergus serrator* as well as for the presence of other species of marine birdlife. Geophysical investigations show that in the landing area of the offshore cable duct there is a meadow of *Cymodocea Polyarteritis* (habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*) which falls within the same SPA and continuing along the stretch of cable duct there are several bioconstructions both of low morphological and biological relief (habitat MB1.51 - Mediterranean infralittoral rock with infralittoral algae) and of muddy coralligenous nuclei (habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*) at a depth of about 17 m.

The *Cymodocea nodosa* and bio-building is strongly threatened by bottom trawling activities, when they are carried out illegally within 3 MN of the coast and below 50 m depth.

Studies carried out during the geophysical surveys have shown the presence of evident traces left by trawling below the permitted limit. In particular, areas characterized by a high density of furrows are evident along the entire stretch of the future cable duct as well as in the area of the future wind farm.

In order to be able to encourage sustainable fishing activities, and therefore create deterrents to trawling (and in particular to that practiced illegally), specific preventive measures can be adopted, obviously to be agreed with the local communities.

The health of the stretch of sea strongly influences small-scale coastal fishing. As well as the *Posidonia oceanica* and other biocoenoses of conservation interest, even small-scale coastal fishing is damaged by the illegal practice of trawling, which, if carried out below the permitted bathymetry, subtracts resources and habitats from small-scale fishermen and the natural development of biocoenoses.

4.1.10.2 Marinas

With reference to the Regional Coastal Plan of the Puglia Region, the intervention area is part of the main physiographic units "UF1 Termoli - Testa del Gargano" which extends from Termoli (Molise) to the Testa del Gargano (Puglia) for a length of 147.53 km and "UF2 Testa del Gargano - Bari" which extends from the Testa del Gargano to the port of Bari for a length of 172.85 km.

The area affected by the intervention includes the following administrative limits of several municipalities falling within the provinces of Foggia and Barletta-Andria-Trani:

- Peschici (FG);
- Vieste (FG);
- Mattinata (FG);
- Monte S. Angelo (FG);
- Manfredonia (FG);
- Zapponeta (FG);
- Margherita di Savoia (BAT);
- Barletta (BAT).

In addition, the Regional Coastal Plan in the aforementioned stretch of coast identifies the following ports:

PROVINCE	COMMON	NAME
Foggia	Peschici	Peschici
Foggia	Vieste	Vieste
Foggia	Morning	Morning
Foggia	Manfredonia	Manfredonia
Barletta-Andria-Trani	Margaret of Savoy	Margaret of Savoy
Barletta-Andria-Trani	Barletta	Barletta

Ports identified by the PRC in the section affected by the intervention

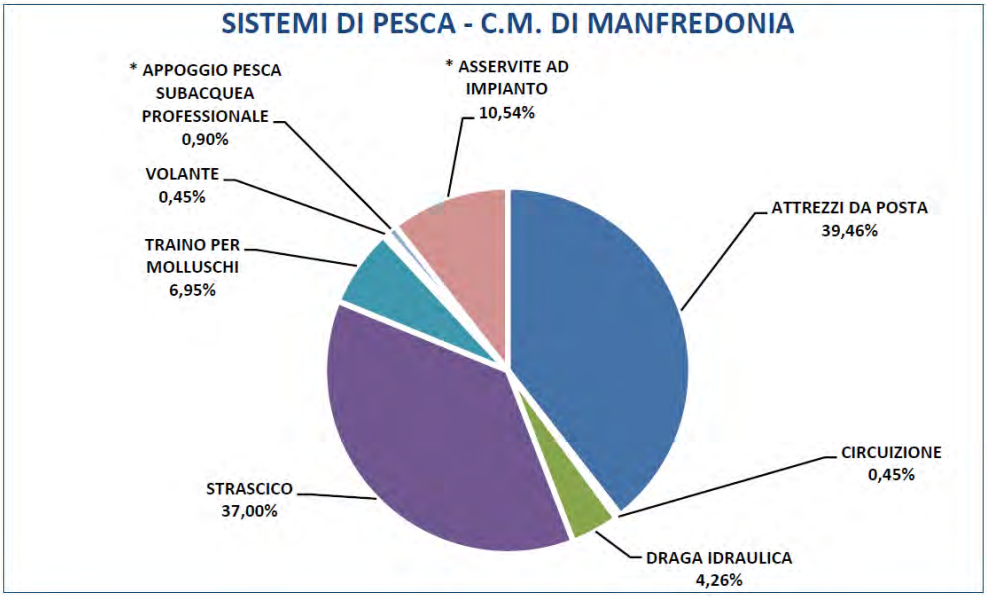
A recent study conducted by the ASSET Agency (Regional Strategic Agency for the Eco-sustainable Development of the Territory) of the Puglia Region as part of the APPESCA Project ("Analysis of the state of Apulian ports and adaptation and efficiency needs for professional fishing" EMFF PO 2014/2020 - Mis. 1.26 Innovation) collected data on the presence and state of Apulian ports.

In this project, in the area of interest, the following base ports used by professional fishing vessels are identified:

PROVINCE	COMMON	NAME
Foggia	Peschici	Peschici
Foggia	Vieste	Vieste
Foggia	Morning	Morning
Foggia	Manfredonia	Manfredonia
Barletta-Andria-Trani	Margaret of Savoy	Margaret of Savoy
Barletta-Andria-Trani	Barletta	Barletta

The Zapponeta landing is the most directly affected by the work (Nemetun Island plant), as the cable duct crosses the stretch of sea in front of this municipality, which does not have a fishing port nor is it part of the Maritime Compartment of Manfredonia. Therefore, the works related to the area affected by the landing of the submarine cable duct will not have an impact on fishing-related activities.

Given the extension of the area affected by the Nemetun Island wind farm, some information regarding the Manfredonia Maritime Compartment which will be most affected by the project. It includes 8 ports, all falling within the Province of Foggia: Marina di Lesina (Lesina), Capojale (Cagnano Varano), Foce Varano (Ischitella), Rodi Garganico, Peschici, Vieste, Mattinata and Manfredonia. In numerical terms, it is the Apulian Maritime Compartment with the largest number of permanent vessels, as well as with the greatest tonnage and total engine power. Among the various fishing systems used in this Maritime Compartment, the following figure clearly shows the prevalence of small-scale coastal fishing, characterized by the use of gillgear (176 boats, equal to 39.46% of the total fleet of the C.M. analyzed), followed immediately by trawling (165 boats, equal to 37.00% of the total fleet of the C.M. analyzed).



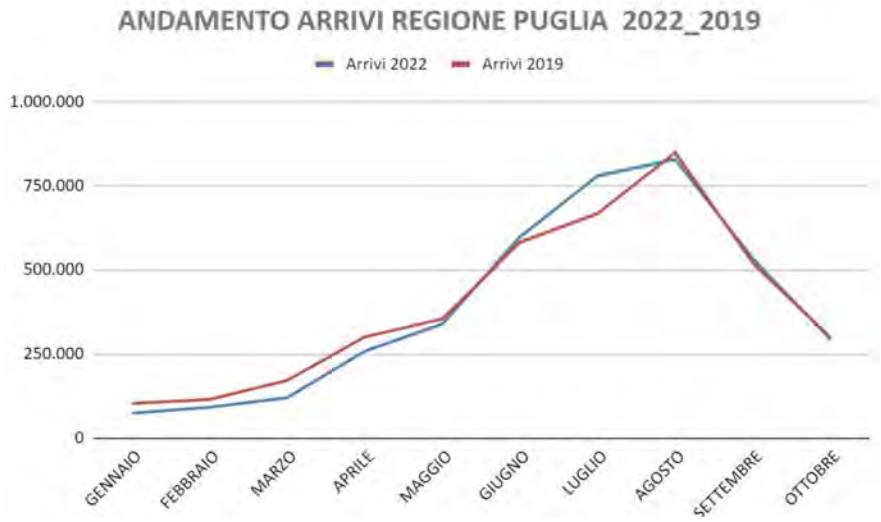
Fishing systems of the C.M. of Manfredonia

In this Maritime Compartment, the port with the largest fleet in terms of numbers is that of Manfredonia, where 188 boats are moored and which reports the largest amount of landings in the entire region to the year 2020. In this C.M. the fishing of bivalve molluscs is mainly practiced (*Chamelea hen*), hake (*Merluccius merluccius*), white prawns (*Parapenaeus longirostris*) and mullet (*Mullus barbatus*).

4.1.10.3 Tourism – general information

The strong tourist vocation of the Apulian territories and the coast, in particular, is well known, tourist presences in recent years have been negatively affected by the Covid - 19 pandemic, however according to the report drawn up by the Puglia Observatory Office-promotion on Istat / Puglia Region data - Spot Puglia System for the tourism observatory, the strong recovery of the summer months of 2022 has made it possible to recover the losses of the years 2020 - 2021.

This paragraph briefly describes the data reported in the report of the Puglia Promotion Observatory. After the first months of 2022, still strongly influenced by the pandemic, tourist movements in Puglia have resumed growing rapidly, thanks above all to the foreign market (+7% arrivals and +11% presences). The flows from June onwards made it possible to compensate for the losses of the first months, allowing the first 10 months of 2022 to close with a value of both arrivals (-1%) and presences (+1%) almost stationary compared to 2019.



Apulia Region Arrivals Report - Apulia Promotion Observatory

Presences, i.e. the number of nights spent in Puglia, have reached and exceeded the flows of 2019 starting from June 2022. Except for the stationary value in August, from June onwards presences in Puglia have recorded continuous increases. There are strong increases compared to 2021, arrivals and overnight stays grew by +26% and +12% respectively. The foreign component has almost doubled in the space of a year: +110% arrivals and +89% overnight stays.

Diagram of tourist presences on a provincial basis year 2022

Three provinces are most affected by the 2022 tourist increase: Bari is in first place, Lecce second and Brindisi is third, with significant increases, up to exceeding the pre-covid threshold, despite the persistence of the pandemic and the presence of the economic crisis. Particularly interesting is the increase in foreign tourism, whose increase is around 30%.

The territorial tourist vocation is a very important and sensitive factor to be taken into due consideration when designing a large project such as the Nemetun Island offshore wind farm.

4.1.10.4 The tourist vocation of the project area, sustainable tourism

The coast overlooking the maritime area where the Nemetun Island wind farm is planned is characterized by a strong tourist vocation. Without going into details on the peculiarities of tourism in Puglia and its considerable attractiveness, this paragraph refers to one of the new forms of sustainable tourism, widely practiced and widespread.

Cycle tourism It is a form of sustainable tourism that consists of traveling by bicycle, discovering the territory, culture and nature of the places visited. Puglia is a region that offers many opportunities for cycling tourism, thanks to its variety of landscapes, from the sea to the hills, from cities of art to historic villages, from protected natural areas to archaeological sites.

Among the most interesting areas for cycling in Puglia is the Gargano, the promontory overlooking the Adriatic Sea and which is characterized by wild nature and rich in biodiversity. The Gargano offers numerous cycle paths, both along the coast and inland, which allow you to admire the natural and cultural beauty of this land. Some examples are:

- The Gargano ring: an itinerary of 233 kilometers and 3,870 meters of elevation gain, which starts and finishes in Manfredonia and touches the main towns of the Gargano, such as Mattinata, Vieste, Peschici, Cagnano Varano, San Nicandro Garganico, San Marco in Lamis, San Giovanni Rotondo and Monte Sant'Angelo. Along the way you can admire the stacks of the Baia delle Zagare, the monolith of Pizzomunno, the Tremiti Islands, Lake Varano, the Umbra Forest and the Sanctuary of San Michele Arcangelo.
- The variant of the Umbra Forest: an itinerary of 58 kilometers and 1,490 meters of elevation gain, which detaches from the Gargano ring in Vieste and enters the Umbra Forest, the green lung of the Gargano and a UNESCO World Heritage Site. Here you can observe the ancient beech forests and the typical fauna of the Gargano National Park.

- The orchid route: an itinerary of 40 kilometers and 600 meters in altitude, which starts from Monte Sant'Angelo and arrives in Mattinata. Along the way you can admire the wild orchids that bloom between April and May, as well as beautiful views of the sea and hills.

The development of cycle tourism in Puglia has been favored by various projects and initiatives promoted by the Puglia Region, the Strategic Agency for the Eco-sustainable Development of the Territory (ASSET), Puglia Promozione, the Polytechnic of Bari, ANCI Puglia and the Italian Cycling Federation. These projects include:

- The "Puglia Bike Destination" guide, which contains 56 cycle routes divided into four areas: Gargano, Daunia, Bari and Murgia, South of Puglia. The guide can be consulted online through QR codes and is also available in English.
- The Regional Cycling Mobility Plan, which provides for a network of cycle paths and cycle paths throughout the region, connecting the main urban, naturalistic and cultural poles of Puglia.
- The National System of Tourist Cycle Routes (SNCT), a national project involving Puglia with three cycle paths: the Adriatic Cycle Route (Bari - Santa Maria di Leuca), the Cycle Route of the Villages (Bari - Matera) and the Cycle Route of the Trulli (Bari - Taranto).

In this context, the project Nemetun Island, It is proposed to be integrated with a series of compensation interventions aimed at further promoting this form of tourism considered eco-sustainable and in line with the decarbonization objectives of the project. For further details, please refer to the contents of this SIA and to the section *6_TheCompensation and valorisation interventions* of the final project.

4.1.10.5 Navigation

The project areas at sea have been the subject of a study drawn up by RINA to verify the interference with the main shipping routes and assess the risk associated with the navigation activity. The results of this study are contained in the "*ES.4.1_01_ Assessment of the Impact on Navigational Conditions"* and are part of the specialist studies attached to this SIA.

Maritime traffic in the area of interest is obtained from the processing of AIS data. The AIS (Automatic Identification System) is an automatic tracking system used by ships and VTS (Vessel Tracking Services) services for the identification and detection of the position of ships based on the continuous exchange of information between neighboring ships and between ships and AIS bases (both terrestrial and satellite). The information exchanged by AIS systems includes the unique identification of the vessel, its position, course, speed, direction and type of vessel. For the analysis in question, AIS data for the calendar year 2021-2022 were acquired. The data are provided in tables in CSV (Comma Separated Value) format; each row of the AIS database provides the data of a ship at the time of registration and transmission to other AIS systems. The AIS database provides a precise description of the successive positions occupied by each ship within the area of interest and for the selected period of time; the purpose of data processing is to identify the routes of ships recorded by the AIS system on the basis of the successive positions provided by the database. The data samples that are purchased usually contain millions of records, thus making it necessary to use an automatic routine to process the amount of information available. This routine carries out, automatically and continuously, the following steps:

1. reading and interpretation of the database in CSV (Comma Separated Value) format; The data is read and filtered to remove ships at anchor or ashore. This filter makes it possible to reduce the number of recordings to be analyzed, lightening the calculation time, without impacting the resolution obtained in the definition of the maritime traffic routes;

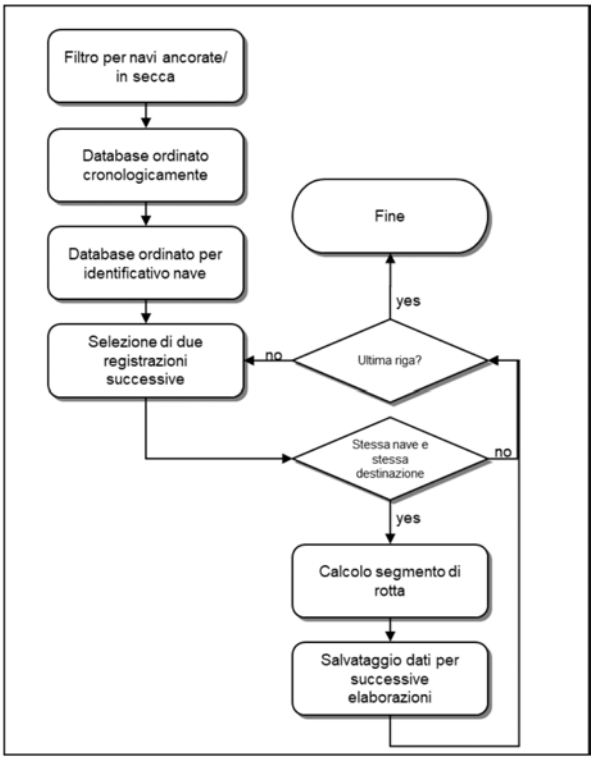
2. reordering of the database in ascending chronological order (from the oldest registration to the newest registration);

3. reorganization of the database for unique identification of the ship;

4. Selection of the first two records in the database: if the two records describe successive positions of the same ship and the time distance between the two records is sufficiently small, the route is calculated and stored as a straight line segment that joins the two subsequent positions. The maximum time distance is defined as 10 hours; beyond this interval, the recordings are interpreted as belonging to two separate routes of the same ship;

5. The route segment is stored for subsequent processing and for the graphical representation of the sea routes;

6. The routine selects the next recording and proceeds with the application of steps 3, 4 and 5 until the end of the database.



Flow Diagram of AIS data processing procedure

The results of the basic analysis

The analysis of maritime traffic in the area planned for the Nemetun Island wind farm was carried out on the basis of the processing of ship traffic data detected by the AIS tracks and conducted over an area of about 15000 km^2 around the location of the wind farm. The nearby wind farm of the company Barium Bay S.r.l. has also been included in the area of interest in order to include, in the representation of traffic corridors, the potential impacts generated by the combined presence of both fields. The analysis also took into account the presence of the Seanergy wind farm to assess the possible impact on traffic corridors; this wind farm (located further along the coast in front of Manfredonia) does not seem to cause significant impacts on the direction and position of the traffic corridors of interest for the risk assessment of the Nemetun Island field.

Identifying the area of interest (in white Nemetun Island, in blue Barium Bay and in green Seanergy)

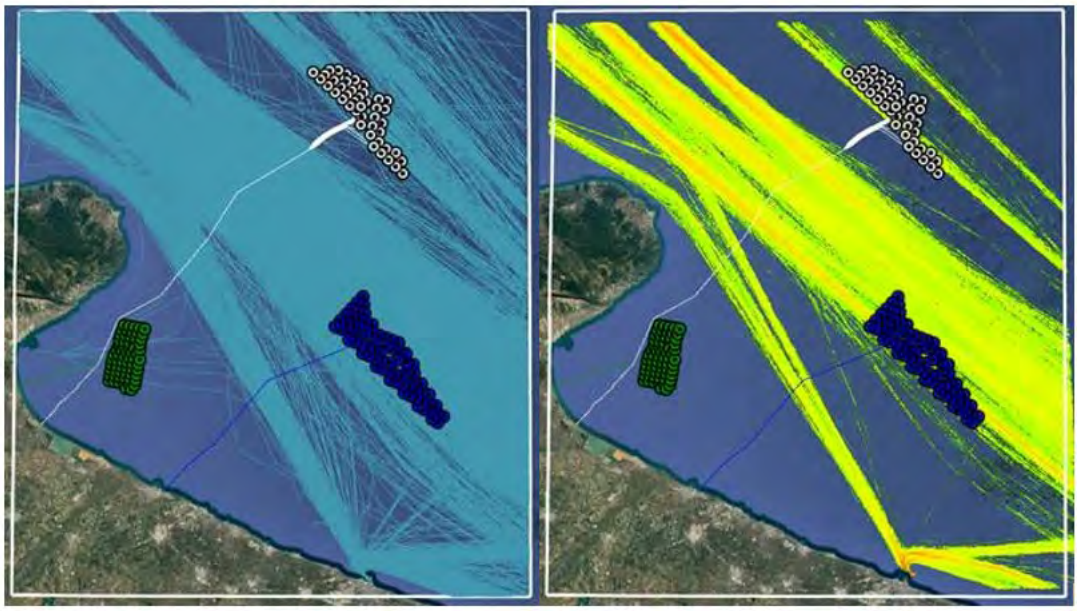
The following table details the tonnage classes used to divide maritime traffic:

GRT (tonn)	Classe GRT
< 1500	1
1500-5000	2
5000-10000	3
10000-30000	4
30000-60000	5
> 60000	6

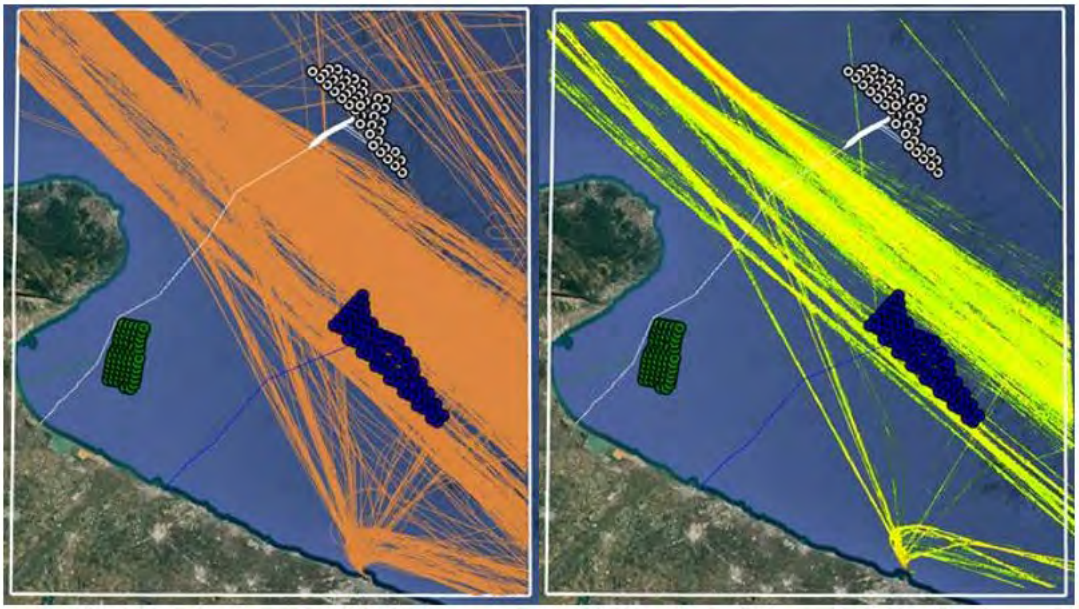
Tonnage of the ships analyzed and consequent GTR assigned

It is important to note that there is a link between ship length and GRT tonnage; using the data of the ships for which both length and tonnage GRT are available, a functional relationship was derived; on the basis of this relationship it was therefore possible to define the GRT tonnage of those ships for which only the length was known. In this way, it was possible to make a greater number of recordings usable.

In the specialist study drawn up by RINA, the different GRT classes have been graphed with different colours, which identify the route followed by boats of different sizes. By way of example, some graphs of the study drawn up for the larger vessels are transcribed below: for each GRT class, the plot of the individual routes is shown on the left of the figure, the semi-quantitative representation of the density of passages (maximum in correspondence with the red dots, minimum in correspondence with the green dots, negligible in the absence of color coding).



Maritime traffic 2021 – GRT 5 – in white Nemetun Island, in blue Barium Bay and in green Seanergy



Maritime traffic 2021 – GRT 6 – in white Nemetun Island, in blue Barium Bay and in green Seanergy

4.1.10.6 Agriculture

Agriculture is a leading sector of the Apulian economy. There are 352,510 farms in the Puglia region, equal to 13.59% of the farms present throughout Italy. The region is the second nationally in terms of the number of farms (preceded only by Sicily). The total agricultural area of the region is 1,379,278 hectares (7.04% of the national total) and the utilised agricultural area (UAA) is 1,249,645 hectares (9.46% nationally).

The region excels in Europe for the production of olive oil and table grapes, as well as for the production of durum wheat and tomatoes. The production of artichoke (especially in the Brindisi area, but not only), lettuce, fennel, celery and cabbage also stand out. Until a handful of years ago, the Puglia region also excelled in the production of almonds, before the market was totally conquered by Californian competitors. In general, however, the agricultural sector has to contend annually with drought, a problem that in some years has not failed to halve yields and profits, putting many producers in difficulty.

4.1.10.7 Tertiary sector

Within the tertiary sector, various companies and services operate, including: commercial distribution companies; transport companies; brokerage and advisory services in the insurance and financial field; health and social care services; training and teaching activities; scientific and technological professional activities that include management and specialist consultancy (administrative, IT, legal, etc.); information and communication services; accommodation and catering services; rental services and travel agencies; cultural, entertainment, leisure and other activities.

The credit branch, the most modern sector of the tertiary sector, has a larger size in the region than the situation in Sicily and the south in general.

4.2 ASSESSMENT OF THE POTENTIAL IMPACTS DUE TO THE CONSTRUCTION OF THE WORK

After conducting an in-depth examination of the state of the environment, it is necessary to define for each component and criterion an assessment of the impacts observed through the definition of an approach that allows the effects of the project actions to be evaluated in a rational and synthetic way.

In this regard, an evaluation method has been used, which, following the precise description "component by component" made in the following paragraphs, allows the evaluation of the ***Environmental pressures*** of any impact.

The method used is a synthetic matrix approach that first defines a ***Impact Ranking*** Defined ***positive, negative, or null*** depending on the advantages or disadvantages that the inclusion of the Nemetun Island wind farm causes on the environment. The second currency subdivision ***the magnitude of the impact*** according to a scale of four values: ***high, medium, low or negligible.*** Finally, the changes due to the insertion of the production plant have been described according to their ***persistence on the environmental context*** with the values of ***reversibility or non-reversibility.***

The following tables have been developed on each paragraph and sub-paragraph depending on whether the impact is classified as positive, negative, or non-existent:

Negative impact

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

The entity column, colored in the colors of the red scale, provides a degree of negative modification of the environmental or social alteration due to the work. The environmental mitigations and compensations envisaged by the project are designed to reduce, mitigate or "repay" the inevitable negative effects of the inclusion of a major work, following the principle and the desire to "transform a disadvantage into a resource".

Positive impact

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

The entity column, colored in the colors of the green scale, provides a degree of positive and advantageous modification of the environmental or social alteration due to the work.

Zero impact

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

Zero impacts, by definition, have no effect on the environment because they simply do not change it. Environmental or social alterations defined as zero do not require a degree of magnitude or reversibility.

4.2.1 ESTIMATION OF IMPACTS ON THE ATMOSPHERE

As is now unanimously recognized by the scientific community, carbon dioxide emissions, one of the main culprits of global warming of the planet, derive largely from the exploitation of fossil fuels; these emissions can be avoided by preferring the production of electricity from renewable sources. The environmental benefits deriving from the operation of the plant are therefore connected to the avoidance of "greenhouse effect" gases (CO_2), as well as gases harmful to health, such as NO_X and SO_X.

In this specific case, the order of magnitude of the emissions and the "payback indices" of the plant can be effectively deduced from the LCA study carried out by the Politecnico di Milano for a case study of a floating offshore wind farm ("*Life cycle assessment of offshore wind farms - Life cycle analysis of an offshore wind farm with 15 MW wind turbines on floating foundations, located off the coast of Brindisi" - Gaia Brussa, Mario Grosso, Lucia Rigamonti - Politecnico di Milano, Department of Civil and Environmental Engineering DICA*) taken as a reference for its similarities with the planned plant (see paragraph 4.2.19). In particular, as effectively reported in the abstract of the cited article "*With a view to decarbonisation, it should be noted that the estimated impact on global warming is 30 t CO_{2eq}/GWh; This carbon intensity is competitive with other low-emission technologies for electricity generation. The wind farm also shows a good performance in terms of payback time of greenhouse gas emissions and energy invested in the construction of the plant, estimated at 2 and 3 years respectively, compared to an expected life of 30 years*." If we consider that a power plant producing electricity from natural gas to a combined cycle has an impact of about 456 t CO_{2eq}/GWh, an offshore wind farm has an impact of an order of magnitude lower than the cleanest of traditional energy sources.

The only expected impacts are essentially due to ***Atmospheric emissions of dust*** and pollutant emissions due to ***vehicular and naval traffic*** during the construction phase. In the operating phase, there are no significant impacts, except for those related to the vehicles used for operation and maintenance operations.

The works in the project do not involve the use of combustion and/or heating systems or activities involving thermal variations, water vapour emissions and other releases that may modify all or part of the local microclimate.

The Nemetun Island wind farm has no effect on the rainfall component, or on the thermometry of the site for the impact on the wind, please refer to the specialized studies contained in the SIA section. ES.7 on the meteomarine climate and what is described in the paragraph relating to the operating phase.

It is important to note that, compared to what is described in the baseline scenario on **Air quality** In the project area, the offshore wind farm described here has a ***strong positive impact*** and represents at least a valid alternative for its estimated clean energy production of 2570 GWh/year, equivalent to annual energy consumption of approximately 817.000 families.

4.2.1.1 Construction phase

The main impact on the atmosphere of the planned plant is associated with the transport of components and raw materials for the construction of wind turbines and offshore and onshore project structures.

The impact is mainly due to carbon monoxide and particulate emissions, it is inevitably classifiable as a negative impact. As reported in the *R.7.1_01* the main criticality of the construction phase is related to supplies: the preliminary analyses conducted showed that the former ILVA plant in Taranto could be able to meet the production demand, estimated at about 300,000 tons of steel. In any case, the components of the floater, as well as of the wind turbines, are of such dimensions that they require only transport by sea: as far as floaters are concerned, if the production capacity of the former ILVA in Taranto is confirmed, the transport distance is small, otherwise the only countries able to cope with significant steel demands are

Turkey, China, South Korea and Japan. For this reason, it is essential to activate local production chains in order to make them suitable for the demand for offshore wind production.

The assembly of semi-submersible foundations and wind turbines can be deployed on a regional basis in the ports for which the compatibility conditions have been detected: Bari, Brindisi and Taranto will be able to host (subject to the implementation of adaptation and completion interventions) the assembly of floaters, while in the port of Manfredonia it will be possible to provide for the integration of the wind turbine on the floater. While airport constraints limit the operation of the ports of Bari and Brindisi for the installation phase of the wind turbines.

In conclusion, the most important impact in terms of emissions into the atmosphere derives from the transport of floater and wind turbine components, which is substantially limited by resorting to the local supplies that Puglia is able to offer. Advantageous conditions in this sense also derive from having identified four port infrastructures suitable for the installation of floaters, a condition that is very difficult to find in other territorial areas, even at an international level.

As regards the construction of onshore works, for the analysis of the impact on air pollution generated by the presence of vehicular flow during the construction phase, the difference between short-range and long-range pollutants must be highlighted. Technically, short-range pollutants are defined as those compounds and elements that, when released from engine exhausts, cause limited effects in space and time; They include, mainly carbon monoxide, lead compounds, hydrocarbons and dust. Long-range pollutants, on the other hand, are those whose harmful effect is achieved thanks to large-scale atmospheric diffusion and a series of complex chemical-physical phenomena that alter their initial characteristics; they include, among other things, sulphur dioxide and sulphur dioxide, nitrogen oxides and greenhouse gases (primarily carbon dioxide).

During the construction phases, pollution due to vehicular traffic is typical of short-range pollutants, previously described, since the speed of vehicles within the area is limited and therefore the emission is also substantially limited to the area under consideration. The impacts on the air component due to vehicular traffic concern the following emissions: NO_X, PM, NMVOC, CO, SO_2. These substances, although harmful, will not be emitted in such quantity and for a time as to significantly compromise air quality. The intervention, therefore, will not directly determine permanent alterations in the "air" component in the areas pertaining to the construction sites. It should also be specified that even the effect caused by particular types of pollutants (such as lead) will presumably occur along small strips of territory or close to the existing road network (marginal strip 150 m) where dispersion will be minimal.

The increase in vehicular traffic induced by the construction of the project works cannot be considered significant for the environmental effects induced as it is objectively not significant in terms of number of vehicles/hour and very limited in time.

The estimated impact at this stage is therefore **negative, medium and reversible**, because it is limited to the construction phase only.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

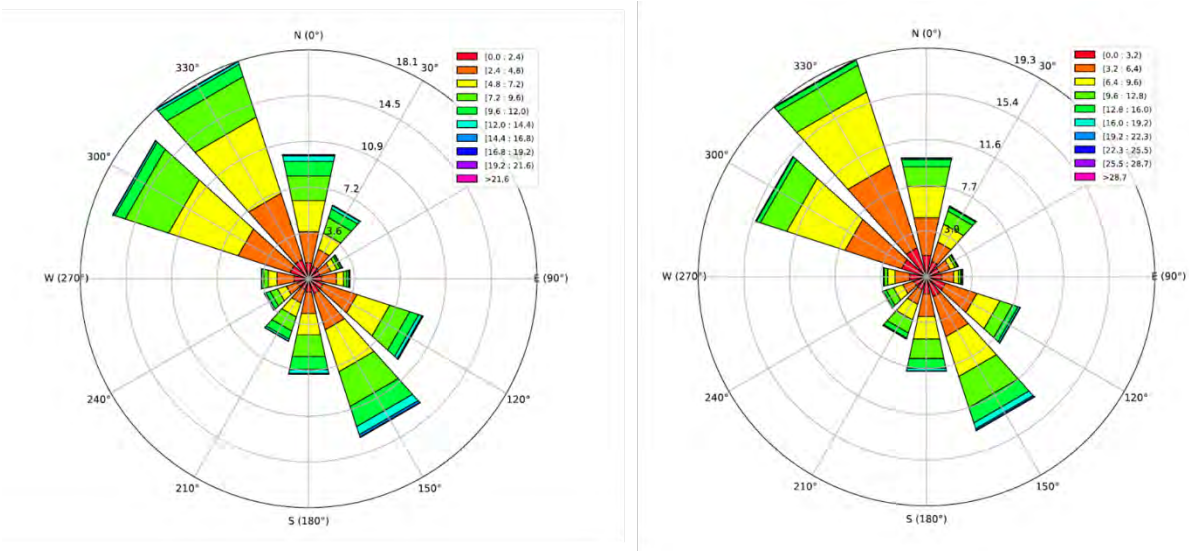
4.2.1.2 Operation phase

As mentioned in the introduction, the impact on air quality of the Nemetun Island wind farm is certainly positive due to the production of clean energy and the triggering of a strong decarbonization process of energy production in the area concerned. In particular, as reported at the beginning, the estimated impact on global warming is 30 t CO_{2eq}/GWh compared to about 456 t CO_{2eq}/GWh of a combined cycle natural gas

power plant: **An offshore wind farm has an impact of an order of magnitude lower than the cleanest of traditional energy sources**.

With respect to a potential impact on the atmospheric component, it is appropriate to include in this section the studies carried out on the meteorological climate and in particular on the expected impact on the wind, contained in the specialized reports of the series "*SIA.ES.7- Meteomarine climate".*

The wind in the wind farm area was extracted from the ERA5 database (https://www.ecmwf.int) at node 42.0 N 17.0 E, at the altitude of 10 m and 100 m and in the period from 01/01/1983 to 28/02/2025. Representative roses of the anemometric regime are extracted from the Meteomarine Report in Scientific Engineering Limited (2023).



Wind rose at 10 m (left) and 100 m (right) extracted from ERA5 at node 42.0 N 17.0 E

There is a distribution concentrated on two opposite directions, at both altitudes considered, with a strong dominance of winds coming from NNW (i.e. 330°) and WNW (300°), from which come (cumulatively) about 34.5% of the winds, at both altitudes, followed by winds coming from SSE (180°) and ESE (150°), from which come (cumulatively) about 21-22% of the winds, at both altitudes. The most intense winds tend to come from the N (0º) and from the SSE (150º) for the altitude of 10 m a.s.l., and from the SSE for the altitude of 100m a.s.l. About 99% of the total events are characterized by a speed less than or equal to 16 m/s, with an average annual speed at the height of the wind field rotor of about 6-8 m/s.

Effects on the local microclimate

In 2004, research by Keith, et al., concluded that microclimates were present within large-scale onshore wind farms (Keith, et al., 2004). These areas are created by mixing layers of air, often displacing warmer air or moisture, which leads to localized warming in the trails within wind farms, generally at night. This research has been misinterpreted by journalists and the general public to imply that wind farms cause temperatures to warm. In reality, in the case of localized heating, the turbines extract the warmer air from where it rises during the night and mix the warm air with the cooler air on the ground surface, causing a downwind wake of warmer air.

This warmer wake is a redistribution of existing warm air, not a net warming of the atmosphere (Stromberg, 2014).

Research has been conducted to investigate the influence of downwind wind speed reduction, or wake effect, on the arrangement of turbines in wind farms. The first row of turbines slows down the wind through the movement of the turbine blades, reducing wind speed and increasing turbulence behind the turbine. The successive rows of turbines are then arranged to avoid the trails of the turbines positioned against the

wind inside the wind farm. Similarly, studies have been conducted within onshore and offshore wind farms to observe and model the mixing of air masses occurring above, under, or inside wind farms. Factors such as temperature, wind speed, humidity, atmospheric pressure and airflow are measured with instruments inside wind farms, on aircraft or from satellite data. Other components such as drag, surface friction, turbulence and wind direction are also taken into account. The data collected is then applied to create models to assess how wind farms may affect the local climate. (Frandsen, et al., 2004; Platis, et al., 2018; Musial, 2018; Meyers & Meneveau, 2012; Deutsche Windguard, 2018).

Two very visible but atypical manifestations of the wake effect occurred in the North Sea off the coast of Denmark. These cases are often cited as troubling examples of microclimates that could occur along the Atlantic coast. Notably, these offshore wind farms are located off the west coast of Denmark, where wind generally moves across the sea to land (Hasager, et al., 2017).

The Horns Rev 1 offshore wind farm in the North Sea was photographed on February 12, 2008, at 10:10 Coordinated Universal Time (UTC), showing fog trails following the main row of moving turbines. This has sparked scientists' curiosity to understand what were the climatological factors at the origin of the condensation behind the rotating blades. In this case, a unique phenomenon of cold, moist air was located over a warm sea layer. As the turbines rotated, cold, moist air was dragged downward, over warmer air near the sea, creating condensation in a swirling trail of fog drifting downwind, in the wake of the rotating blades. The following figure shows the fog event at Horns Rev 1 (Hasager, Rasmussen, Pena, Jensen, and Rethore, 2013; Hasager, et al., 2017; Emeis, 2010).

Fog trails at Horns Rev 1 (Hasager, Rasmussen, Pena, Jensen, & and Rethore, 2013)

Eight years later, another fog trail phenomenon occurred at Horns Rev 2, located less than 20 km from Horns Rev 1. However, the weather conditions at the origin of this event were different. To simplify, warm, moist air was dragged to cooler air near sea level, which mixed and created fog in the wake of the main rows of turbines. Although windward turbines exhibit fog trails, mixing of the top warm air layer by leeward turbines causes a drying condition within those trails. This situation is often measured in onshore wind

farms. The following figure shows the fog and dry trails of Horns Rev 2 on January 25, 2016, at 12:45 UTC (Hasager, et al., 2017).

Trails at Horns Rev 2 (Hasager, et al., 2017)

In both cases, numerous additional factors such as the presence of cloud or foggy layers, prevailing winds and atmospheric instability led to the formation of the fog trail. These events are known from photographs taken by helicopters en route to offshore locations, the duration of the events is uncertain. Due to the many factors that contribute to these rare events, the persistence of visible trails is likely to last only for minutes to possibly hours. Research has established that, if even one factor of trail formation were to change, there would be no visible contrails (Joulin, et al., 2020; Hasager, et al., 2017; Hasager, Rasmussen, Pena, Jensen and Rethore, 2013).

The prevailing winds on the Atlantic coast are generally directed away from the coast, depending on the season (National Oceanic and Atmospheric Administration (NOAA), ND,a; NOAA, ND, b). Under normal circumstances, wakes from offshore wind farms will extend far from the coast and into the Atlantic Ocean. If the wind blows towards the shore and the turbines are running, in most cases the distance from the shore is large enough to dissipate most of the wake turbulence before it reaches the shore. The fog trail event reaching the ground is extremely unlikely given the unique weather conditions required to create this phenomenon (Hasager, Rasmussen, Pena, Jensen, & and Rethore, 2013; Hasager, et al., 2017).

These two visible examples show that localized microclimates are present in wind farms. Studies and research on onshore and offshore wind farms, in combination with complex models, also provide evidence that microclimates are created within wind farms (Hasager, Rasmussen, Pena, Jensen, & and Rethore, 2013; Hasager, et al., 2017; Wang & Prinn, 2010).

Apart from very rare events, microclimates do not translate into the only visible trails seen at Horns Rev 1 or 2. When turbines spin, they create downwind trails and, in some cases, mixing of atmospheric layers. Research argues that although temperature or humidity is redistributed in the turbine wakes, this is not a

net change in temperature or water vapor due to turbines. The surface of the ocean is smoother than land, creating less resistance to slow downwind wakes, therefore allowing the trails to reach a greater extent than on land. Contrails tend to be shorter in stable wind conditions, with constant wind speed and direction (Wang & Prinn, 2010; Hasager, et al., 2017; Siedersleben, et al., 2018; Vautard, et al., 2014; Platis, et al., 2018).

On the basis of the results presented in the literature analyzed, it can be likely that **wind intensities can be reduced by up to about 20% inside the** wind farm**, with values of up to 50% at the turbine nacelle, and up to 10% downwind of the turbines outside the wind farm**, with a recovery within a distance of 30/40 km downwind.

As regards the expected effects on the anemometric regime under the Gargano coast, located at a distance of more than 60 km from the center of the wind farm, it can probably be considered that:

- in the case of Mistral / Tramontana winds, coming from the North North - West, frequent and quite intense, the area under the wake of the turbines would propagate longitudinally to the coast until it attenuates within a length of 30/40 km, causing effects on land that are difficult to appreciate;
- in the case of Sirocco winds, coming from the South-South-East, frequent and more intense, the area under the wake of the turbines would propagate offshore, in the opposite direction to the coast, causing effects on land that are difficult to appreciate.
- In the case of Bora winds, coming from the North-East, which is also the wind with the strongest intensity with typical gusts of gale level wind (72 km/h) speed, but which can also exceed 180 km/h. However, the direction of this wind causes the length of *Fetch* is relatively short, preventing the generation of substantial wind waves; therefore, no appreciable effects should be caused on the ground.

In addition, for floating turbines, it has been estimated that their oscillatory motion in response to incident waves causes increased vortex mixing induced by the dynamic response of the structures, which potentially reduces the recovery length of the downwind wake to the turbine.

As regards ground works, The only possible impacts are those related to the vehicles used for management and maintenance operations, but which should not generate a greater impact than the vehicular traffic already present in the area.

On the basis of the studies carried out and considering the negligible effects on wind, rainfall regime and thermography, we can classify the impact on the atmosphere during operation as follows:

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

The impact is considered non-reversible, because the benefits on the atmosphere, analyzed throughout the life cycle of the entire plant, are very long-lasting.

4.2.1.3 Decommissioning phase

The decommissioning phase causes effects similar to those estimated during operation, to slightly mitigate their magnitude we can consider the shorter duration expected for the interventions and the recycling of most of the raw materials used.

We will have the following evaluation:

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.2 ESTIMATION OF IMPACTS ON THE WEATHER AND SEA CLIMATE

The estimation of the impacts on the meteomarine climate due to the presence of the Nemetun Island offshore wind farm was developed by the Department of Civil, Chemical and Materials Engineering of the Alma Mater Studiorum – University of Bologna, on the basis of the basic data on the meteomarine climate developed by the company Scientific Engineering ltd and summarized in paragraph 4.1.2 of this SIA.

The data modelling and case study collection is contained in the report called "*ES.7.2_01_Oceanografia fisica_modellazione*" is part of the documentary and investigation annexes to the Environmental Impact Study, please refer to the specialist report for the necessary further information. In this paragraph we intend to summarize the results of the study and compare them with the 3 temporal phases of the presence of the work in the project area.

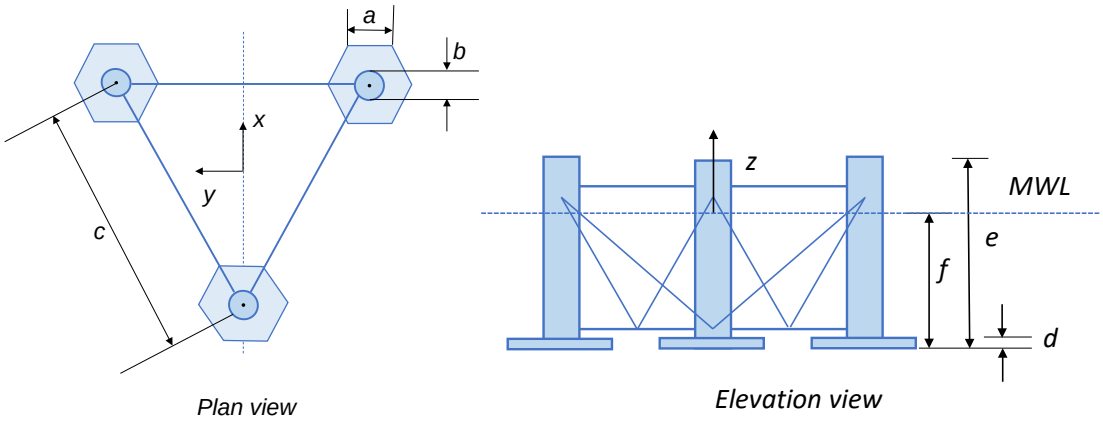
The study was drawn up specifically considering three different types of impacts:

- The **Impacts on the anemological regime** due to the presence of wind turbines, discussed in the paragraph on impacts on the atmosphere,
- The **Impacts of sediment dispersion** and possible re-suspension linked to the excavation of the trench of the cable duct, the discussion of which is referred to the paragraph relating to the impacts on nature and biodiversity,
- the **Local impacts on wave motion and hydrodynamics**, in the area where the wind farm is installed and along the coast.

The impacts are analyzed by numerical modeling with the Mike 21 calculation software developed by DHI Water & Environment, as described in the specialist study.

The floating structure selected for the wind farm and modeled in the analyses will be of the WindFloat type by Principle Power or UMaine VolturnUS-S Reference, a stabilized semi-submersible.

The semi-submersible foundation has been modeled as shown in the following diagram: it is composed of 3 large columns with a diameter of 16 m and a relative distance of 80 m and the dimensions and characteristics of dynamic response to the waves are shown in the following table.



Main dimensional parameters of a WindFloat

Parametri	Unità	Valore
a. lunghezza lato "water entrapment plate"	m	17.0
b. diametro colonna	m	16.0
c. distanza da centro a centro della colonna	m	85.0
d. altezza della "water entrapment plate"	m	1.4
e. altezza totale della colonna	m	30.0
f. draft	m	20.0
Dislocamento (volumetrico)	m^3	~15 200
Massa di acciaio (compresi torre e RNA)	t	~3.400
Angolo di inclinazione statico alla velocità nominale del vento	gradi	4.5

Schematization and model data of the semi-submersible foundation

Expected impact on the state of the sea

The potential effect on the sea state of a floating offshore wind farm such as the one under consideration concerns the interaction between the incident wave and the semi-submersible floating structure supporting the turbine. This interaction depends on the weather and sea climate and the construction characteristics of the floating structure which can determine a local variation in height, length and direction of the wave.

The processes of alteration of the characteristics of the waves can be summarized as follows:

- energy dissipation;
- the processes of reflection, transmission and diffraction;
- processes due to the effect on the sea of the reduction in wind intensity;
- the variation of the wave field due to the characteristics of the structure and the anchoring system.

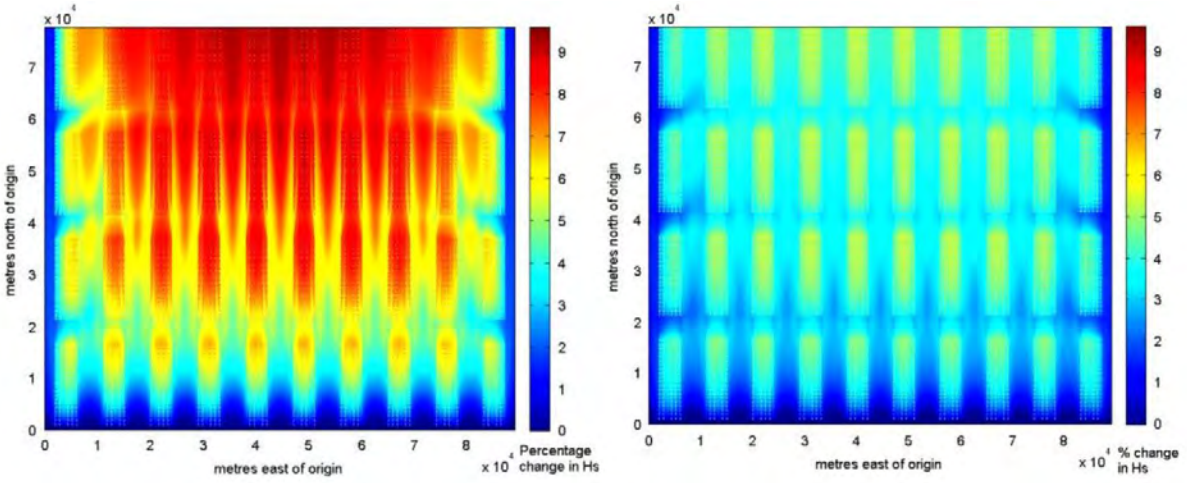


Diagram of the percentage reduction of the significant wave height coming from the south due to a large offshore wind farm in the absence (left) or presence (right) of wind from the south

At the level of the floating foundations of the turbines, there is a significant increase in wave height of 5-8% of H_s in the area immediately in front of the piles, due to the phenomenon of reflection, while, in the area behind the pile, there is a significant reduction in the wave height of 15-30% of H_s.

On a large scale, both for Bora and Sirocco waves, there is a significant reduction in wave heights H_s within the wind farm and in the wake of the wind farm of the order of 5-20% H_s.

The presence of the wind farm locally produces a very limited reduction or increase in the wave height values (of the order of 5% of H_s) and a negligible variation of the mean directions of a few degrees (<5°N). These minimal variations do not have appreciable effects on coastal transport. The reduction of H_s below

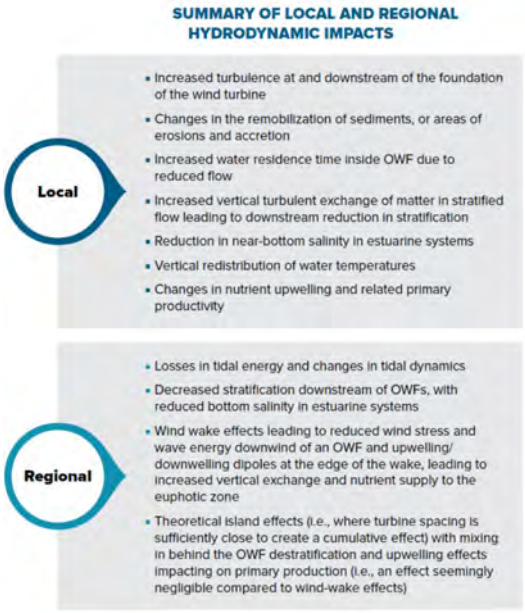
the coast can lead to a modest reduction in the wave energy incident on the coast in the southern area of the study area, with a consequent advantage for the protection of the same.

The effect of mooring lines on waves can probably be considered negligible due to their size compared to the wavelength. Furthermore, for the case of Nemetun Island it is estimated that the spacing between the poles of the semi-submersible structure can allow an almost total transmission of the incident wave.

Expected impact on hydrodynamics

The main impacts of an offshore wind farm on the hydrodynamic regime essentially concern:

- the effect of dragging currents induced by the presence of the structure, with consequent turbulence and local mixing of the stratification of the water column;
- the effect on hydrodynamics of reducing wind intensity in the leeward area of the turbines



Effects on hydrodynamics at local and regional scale of an offshore wind farm

With regard to the Nemetun Island wind farm, the offshore current regime in the vicinity of the offshore wind farm was presented in the Meteorological Marine Report of Scientific Engineering Limited (2023), - attached to this EIA and named *ES.7.1_01_Metheorology* - with values below 0.3 m/s 91% of the time. It can be seen that the directionality of the surface velocity of the current is dominated by the residual component, with an average intensity value between 0.1 and 0.2 m/s and maximum values between 0.6 and 1.2 m/s, and with a prevailing direction from the North and North-North-East.

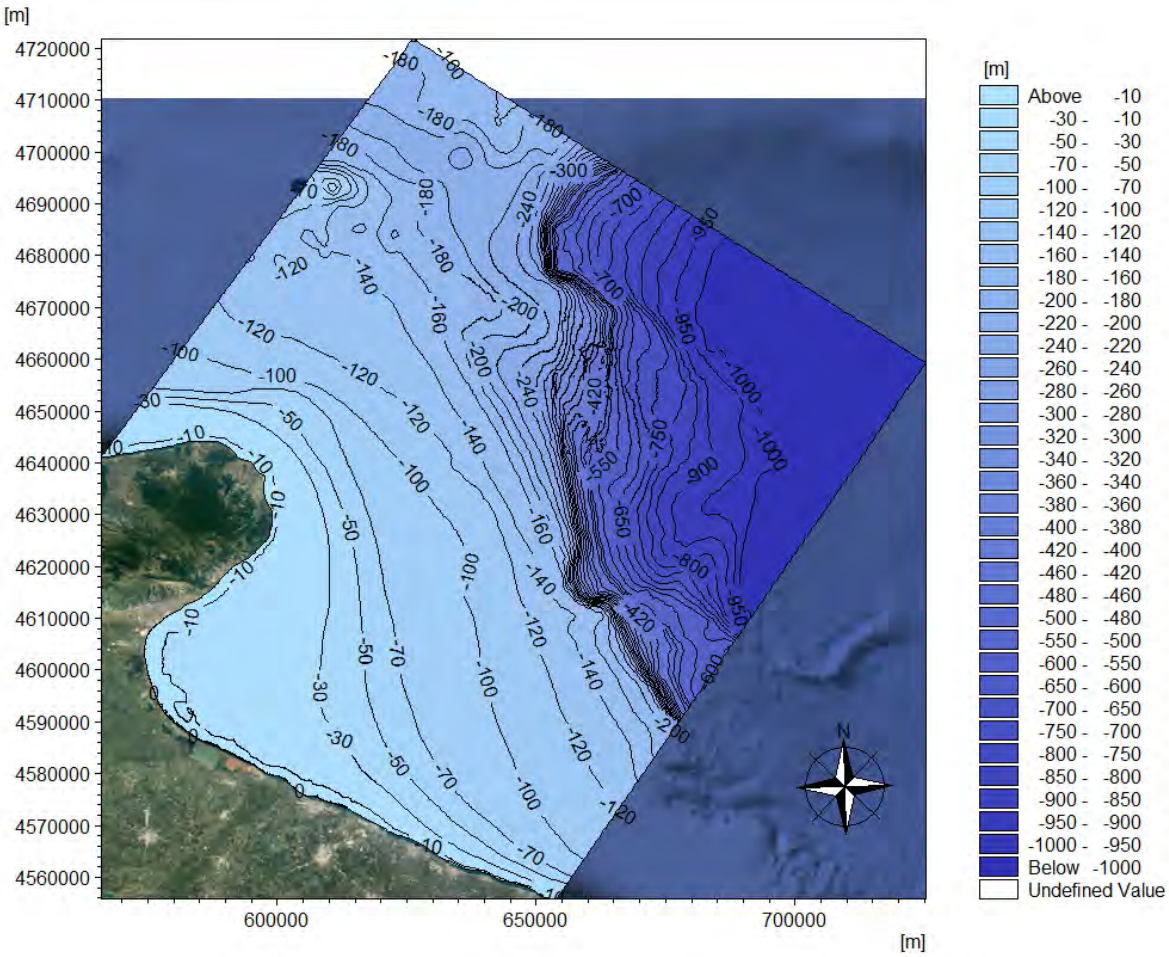
The expected impact of the turbines on hydrodynamics will likely be limited to the immediate vicinity of the floating structure, in the water column of 20-30 m and, based on the results of the literature, it is expected that it may lead to minimal/moderate changes to the circulation in the area.

In addition, since the floating structure occupies about 10-15% of the seabed and the size of mooring cables and anchoring systems to the seabed will presumably be reduced compared to the current at the bottom, the expected impact on currents near the seabed should be reduced and possibly very localized.

The following subparagraphs include the results of the modelling carried out and the reasoned and temporal subdivision of the potential impacts described above, in relation to the life cycle of the Nemetun Island plant.

4.2.2.1 Construction phase

The study conducted by the University of Bologna and the modeling with software, concern the vast area, represented in the figure:



Bathymetry of the study area reconstructed by interpolation of the available data

A reasoned consideration of the impact on currents and wave motion of the presence of the offshore wind farm can be made considering that the assembly of turbines and semi-submersible structures takes place in port facilities and that their transport to the installation site is carried out by tugs or trawlers. By eliminating the phase of driving the anchors - however short-lived - **No operations at sea are expected to cause significant impacts on the weather and sea climate during the construction phase.**

The estimated impact at this stage is therefore of the **null**.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.2.2 Operation phase

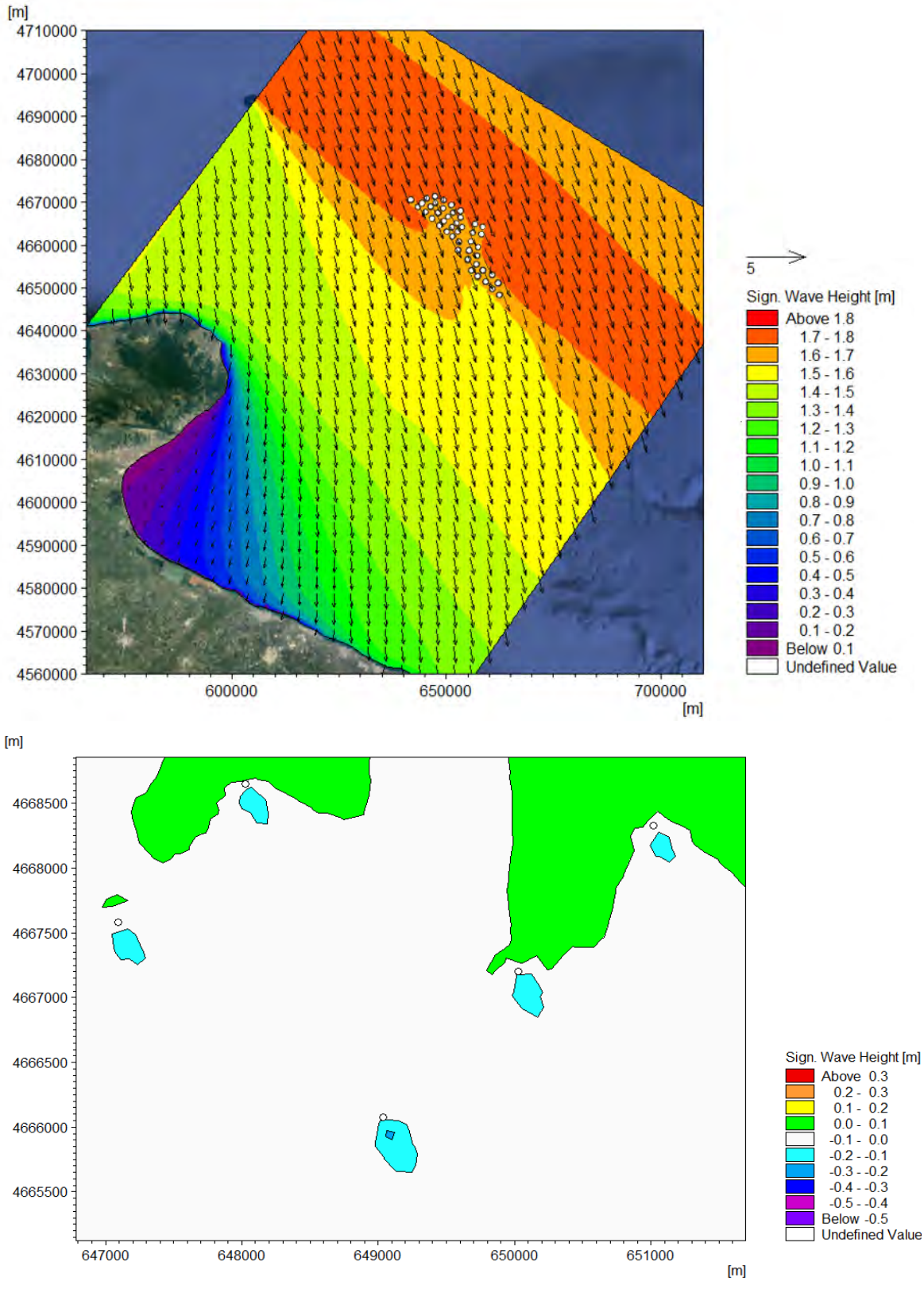
The University of Bologna study models in detail the behavior of wave motion and hydrodynamics in the presence of the installed and functioning Nemetun Island wind farm.

The analyses are carried out on the basis of the prevailing winds (Sirocco and Bora), both for the offshore area where the turbines are installed and for the coastline of influence.

The modeling results and graphs are particularly significant and representative of the expected impacts.

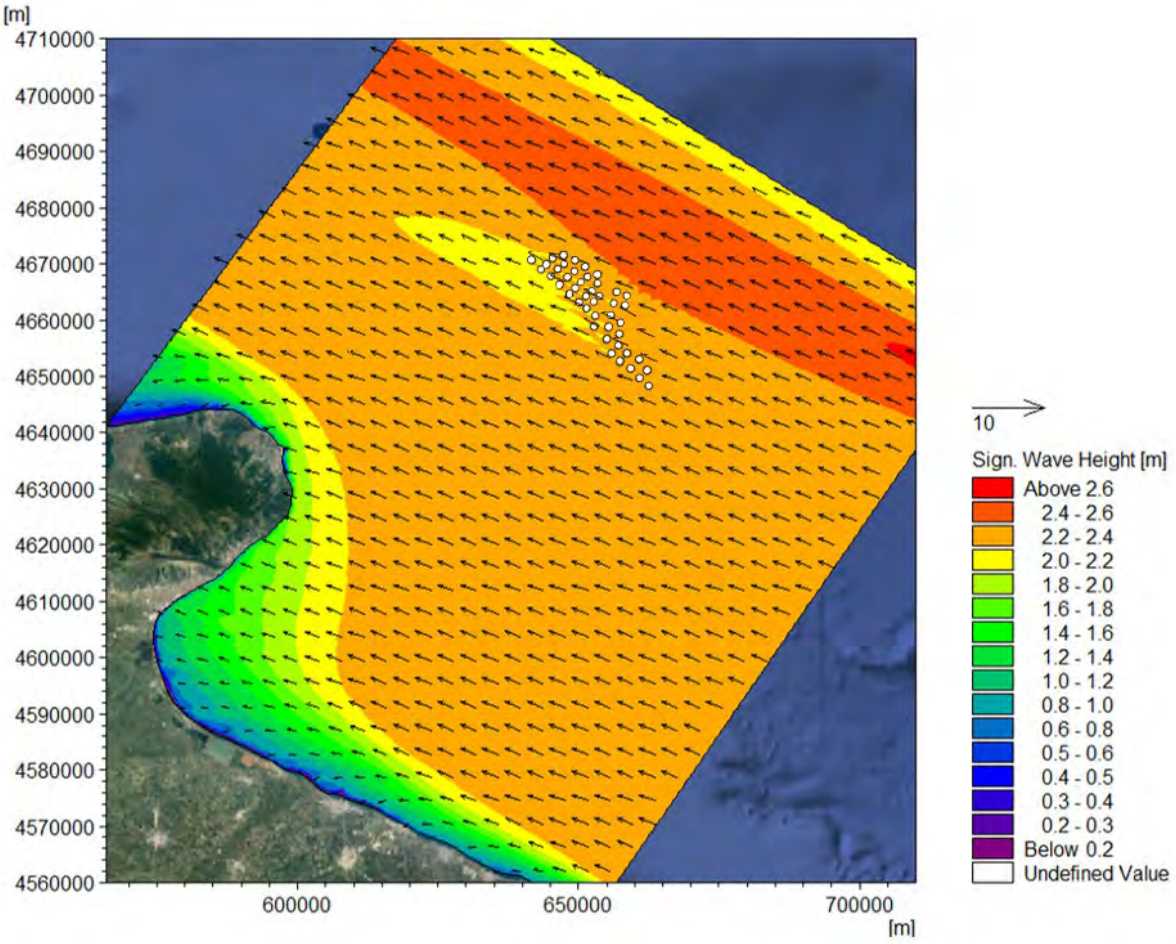
Considering the most unfavorable situation R = 50%, the alterations on wave motion are represented as follows for the two dominant winds:

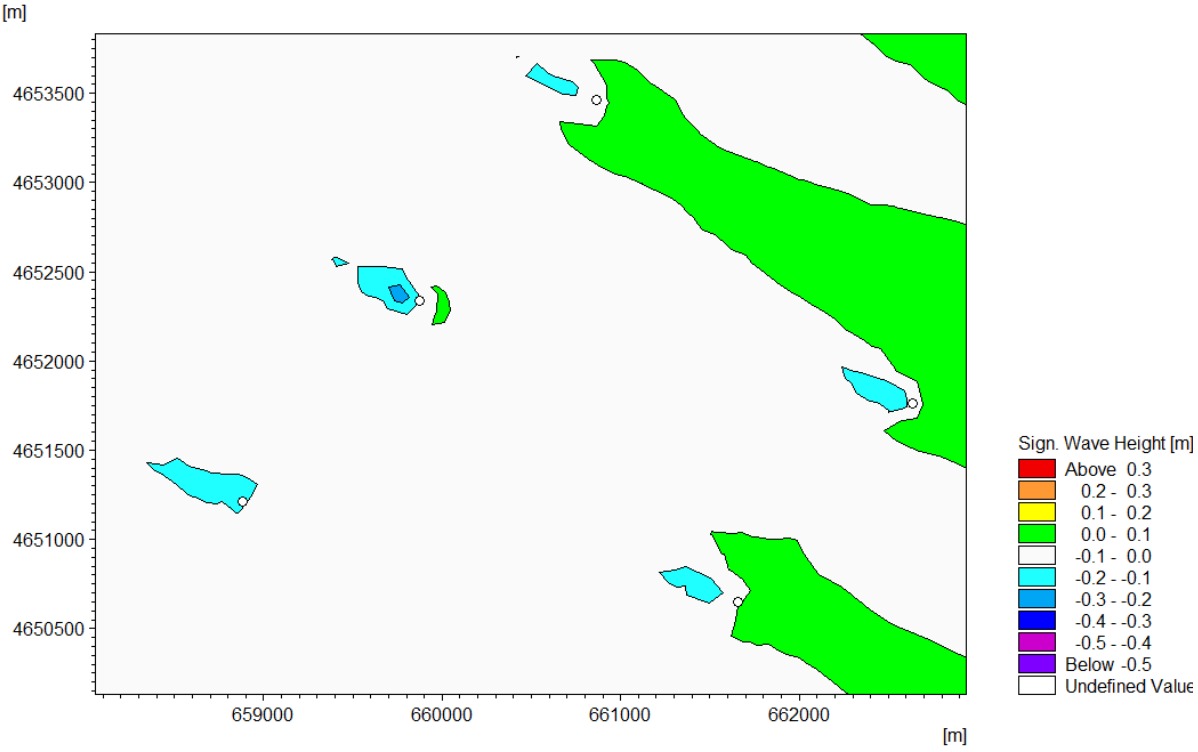
Bora wind



Wave state 1, wind turbines R=50%, full view and detail

Sirocco Wind





Wave state 2, wind turbines R=50%, full view and detail

From an initial qualitative analysis of the results, it emerges that the wind field does not determine an appreciable influence on wave motion. Due to the typical directions of the most frequent waves, which in fact hit the wind farm "shear", i.e. in a direction parallel to the axis of the wind farm along the coast in a south-east or north-west direction, a wake area with a modest reduction in the significant wave heights can be observed that develops along the axis of the wind farm. Analyzing the detailed wave field around the structures, there is a minimal effect of significant local increase in the wave height in the area immediately in front of the structure itself, due to the phenomenon of reflection. Conversely, in the area behind the pile, there is a modest local reduction in the wave height due to the blocking effect of the piles.

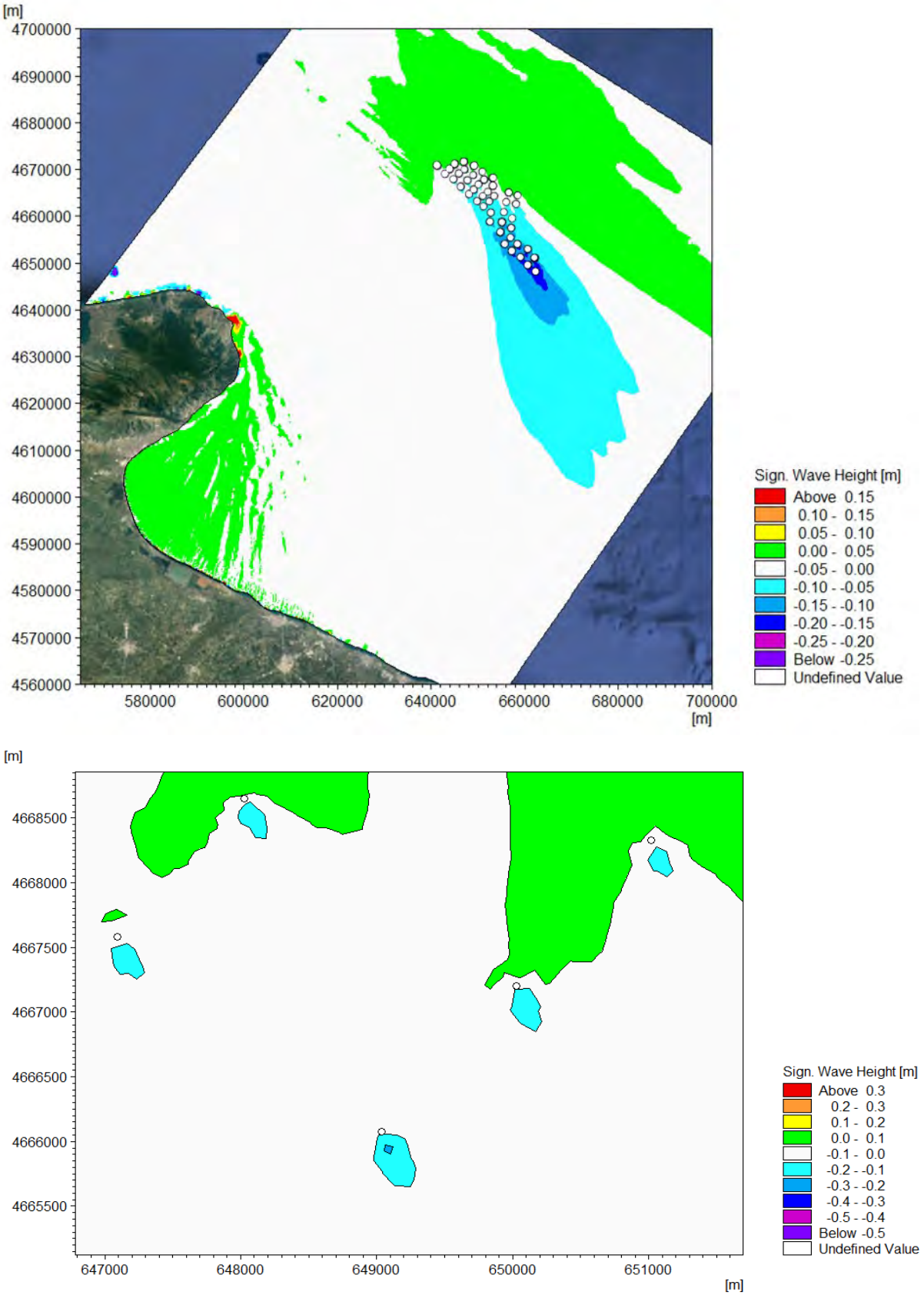
The global effect of the wind farm, i.e. the wake effect, propagates from the area where the wind farm is installed along the axis of the wind farm itself, towards the north-west for the Sirocco wave state and towards the south-east for the Bora wave state. The wake effect remains localized on deep seabeds (h>50 m even in the case of Bora) without affecting the coastal area.

The quantitative effects of the wind farm are very modest, as demonstrated by the conservation of the wave directions (by observing the vectors) and by the significant reduction of the wave heights Hs in the wake (on average by 0.1 m or 2-3%· Hs). The reduction of H_s in the wake is a **Advantage of the safety of maritime routes**.

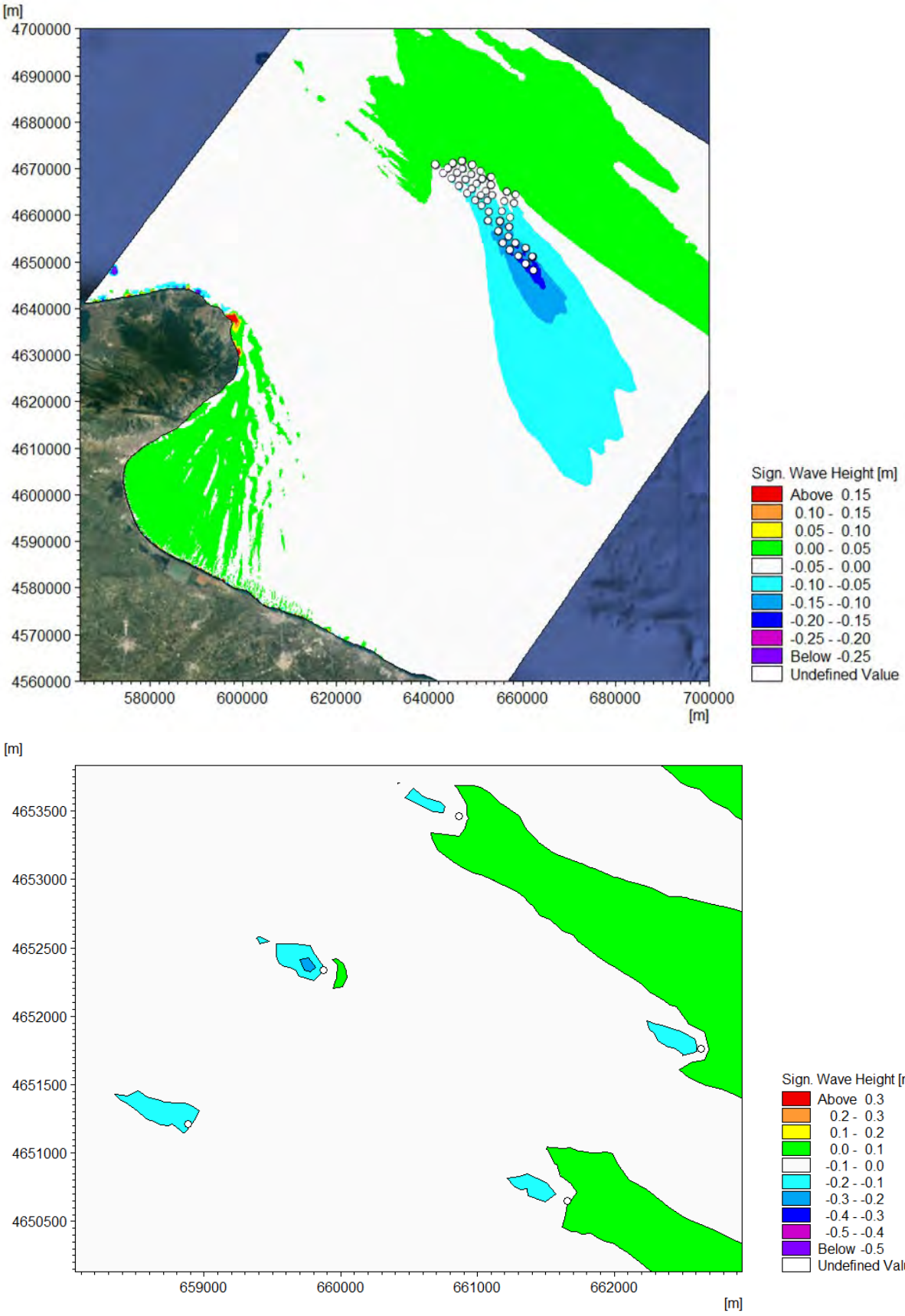
Locally to the stacks, the effects in front of the stacks are very modest and similar in both the Bora and Sirocco bear states, with a modest increase of 3% in H_s and 10% reduction in H_s.

The study conducted on the interaction effects between the batteries ("wake" effects) is also significant. The wake effect of the wind farm affects the area where the wind farm is installed, remaining in fact along the wind farm and propagating towards the northwest in the case of sirocco, propagating instead along the escarpment and in the direction below the coast for the Bora; in the case of sirocco, there is a local increase in wave height (up to a maximum of +6% of H_s) immediately downstream of the wind farm, which propagates towards the north-west and remains confined to the strip of deep seabed of installation and in the wake of the wind farm itself. This wake is due to the interaction between the foundations, whose reflectivity is represented in a precautionary way, combined with the high obliquity of the wave conditions that practically affect the wind farm with a shear. There is a widespread, insignificant increase in wave height along the coast in the case of sirocco while this effect is confined immediately downstream of the Gargano promontory in the case of Bora. In both cases of Bora and sirocco, there are no significant variations in wave height locally to the piles. In both the case of Bora and sirocco, the wave heights and directions follow the same trend in the presence of turbines as they do today without turbines. As far as heights are concerned, very modest increases in values are observed in the presence of turbines (deviations <±0.04 m). The directions do not show significant variations for both Bora and sirocco (deviations <±2°).

The distribution of the wave field suggests that local effects do not produce significant changes for maritime traffic or other activities within the wind farm, since the increase in H_s local and limited. The modest reduction in H-wave height$_s$ in most of the wind farm installation area, it suggests that the maintenance operations of the wind farm can be carried out both in the presence of Bora and in the presence of Sirocco. In addition, the co-installation of aquaculture facilities, which would benefit from the reduction of H_s in the wind farm area.



Wave state interaction between stacks - Bora wind



Wave state interaction between the wind piles of sirocco

The reduction of H_s below the coast can lead to a modest reduction in the wave energy incident on the coast in the southern area of the study area, with a consequent advantage for the protection of the same. The map of wave field differences for the typical annual climate shows that the expected significant wave height variations are of the order of ±0.05 m at most.

Near the coast, point extractions of wave heights and directions show a maximum local increase or decrease in wave height values of 3% and 5% of H respectively$_s$. **The increase in directions of a few degrees (<4°N) for both Bora and sirocco does not have appreciable effects on coastal transport and does not cause appreciable disturbances on the biocoenoses and habitats present in the area.**

We will therefore estimate **a medium-sized and non-reversible positive impact,** because it is long-lasting.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.2.3 Decommissioning phase

The impacts during the decommissioning phase are comparable to those described during the construction phase. The only appreciable difference is given by the possibility that the timing of operations at sea is reduced compared to implementation, but this factor can be considered a positive and advantageous effect in terms of the significance of the environmental impact.

In this case as well, the assessment is negligible.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.3 ESTIMATION OF IMPACTS ON THE SEABED

The impact assessment on the seabed is defined with reference to the technologies used and the analyses conducted on biocoenoses and on the presence of NATURA 2000 NETWORK sites identified and described in the *S.3_02_ Appropriate Assessment* and in the relevant section of the baseline scenario.

Please refer to the contents of the specialist studies conducted contained in the Sections *SIA.ES.6* for further information.

In the following paragraphs, the impacts on the various phases of the life cycle of the Nemetun Island wind farm are estimated.

4.2.3.1 Construction phase

The possible interference of the works with the seabed during the construction phase is essentially linked to excavation operations.

In the case in question, given that the foundations of the wind turbines are planned to be floating to minimize the impact on the seabed, **The excavation activities potentially interfering with marine biocoenoses are related to the construction of offshore substations and the laying of interconnection cable ducts** (66 kV) **and connection** (380 kV).

In order to verify the presence of priority habitats in the area of the wind farm, offshore substations and along the route of the cable duct, a specific Environmental Impact Assessment was carried out as part of the Environmental Impact Assessment **investigation aimed at developing a biocenotic cartography**,

moreover, with the Truth at Sea method, the biocenotic presences were visualized through the analysis of the video frames produced by the use of an ROV vehicle.

The geophysical survey of the seabed with Side Scan Sonar and Sub Bottom Profiler has highlighted, along the route of the future cable duct, at stations from NEM 1 to NEM 11, the presence of loose sediments with medium grain size and rocky sub-outcrops covered by sediments about 30 cm of muddy sand sediments (habitat UNEP(DEPI)/MED IG.23/23: MB5.5 - Mediterranean infralittoral sand and MC5.5 - Mediterranean circalittoral sand). This type of sediment is associated with particular acoustic signals in some areas that highlight the presence of meadows with *Cymodocea nodosa* (habitat UNEP(DEPI)/MED IG.23/23: MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*) between NEM 1 and NEM 3 stations as well as rocky cores in the vicinity of NEM 10 station (habitat UNEP(DEPI)/MED IG.23/23: MB1.51 - Mediterranean infralittoral rock with Infralittoral algae) and bioconstructions (habitat UNEP(DEPI)/MED IG.23/23: MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*) near the NEM 11 station.

In conclusion, the geomorphological analysis (surveys with Side Scan Sonar, Sub Bottom Profiler and sea truths with ROV and ARA diving) combined with the analysis of sediments and benthic communities showed that the area affected by the future implementation of the off-shore wind farm as well as the cable duct connecting the plant and the onshore station does not have areas of significant naturalistic interest, with the exception of the *Cymodocea nodosa* (habitat MB5.534 Superficial muddy sands in sheltered waters with *Cymodocea nodosa*), present in the landing area of the cable duct and for the coralligenous nuclei (habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp*) taken along the cable duct at a depth of 17-18 m.

In order to preserve these areas, a cable installation plan has been prepared that provides for minimizing interference and impacts between the cable and marine habitats. The presence of the MB5.534 habitat below the coast determined the decision to proceed with a burial of the HDD cable in the last part of its journey starting from a depth of 7 m up to the landing and the Joint Bay (total length of about 1 km, 880 m on the sea side). In the next portion of the cable duct from about 7 m up to about 1 km beyond the habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*), the design choice sees the laying of the cable duct in support with the covering of cast iron shells for about 12.5 km of cable duct for the following reasons:

- presence of the SPA Aloisa – Carapelle,
- presence of rocky sub-outcrops covered by sediment (habitat identified as MB5.5 - Mediterranean infralittoral sand),
- presence of habitat MB1.51 Mediterranean infralittoral rock with infralittoral algae,
- presence of habitat MC1.5 - - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*

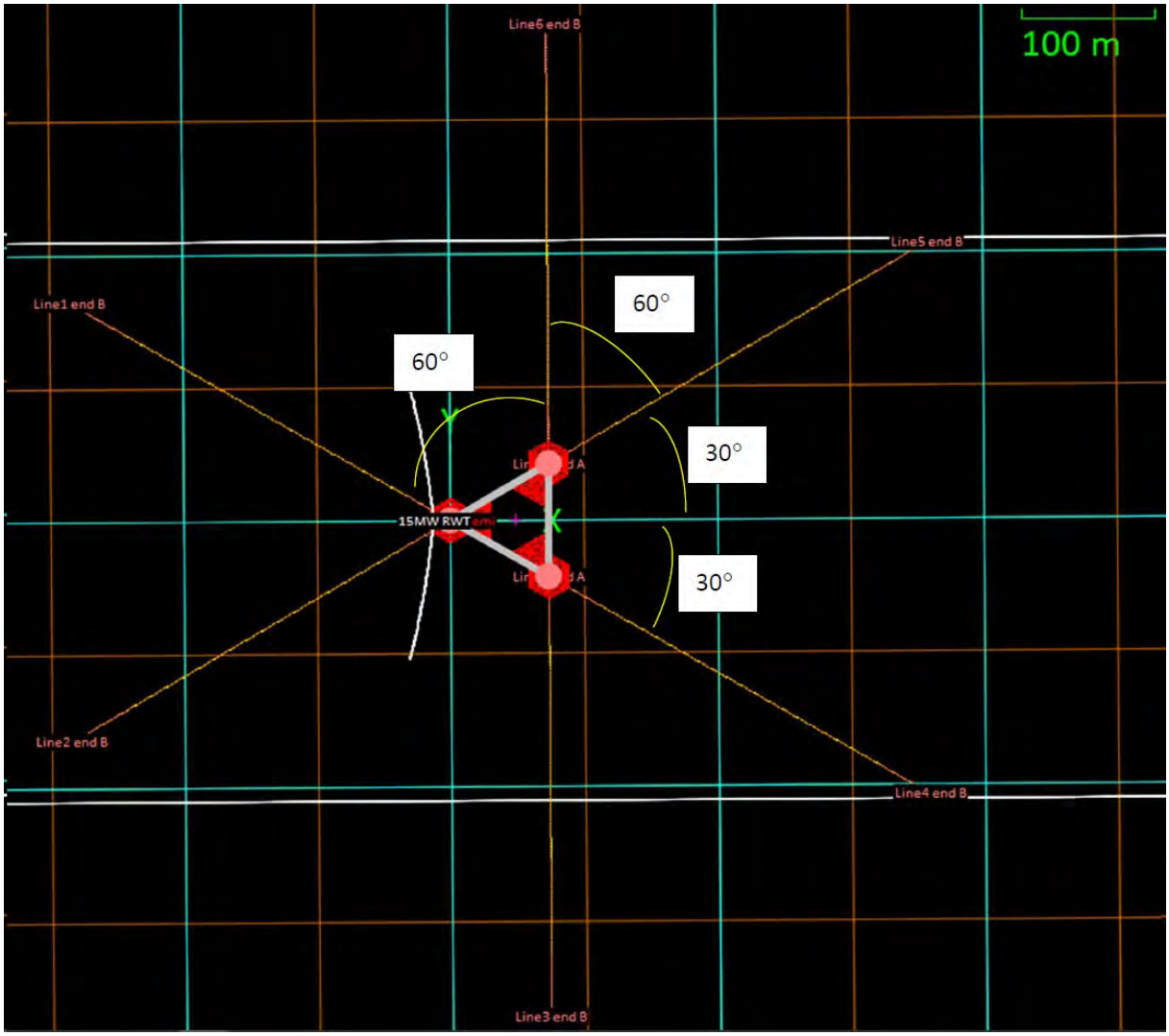
Laying on top can:

- significantly reduce the environmental impact on the Natura 2000 network site and on the other habitats along the cable duct,
- be a deterrent of trawling, illegally present in the area as found by geophysical investigations
- represent, thanks to the cast iron covering, a substrate that can be colonized by hard-bottomed organisms that would enrich the coastal area.

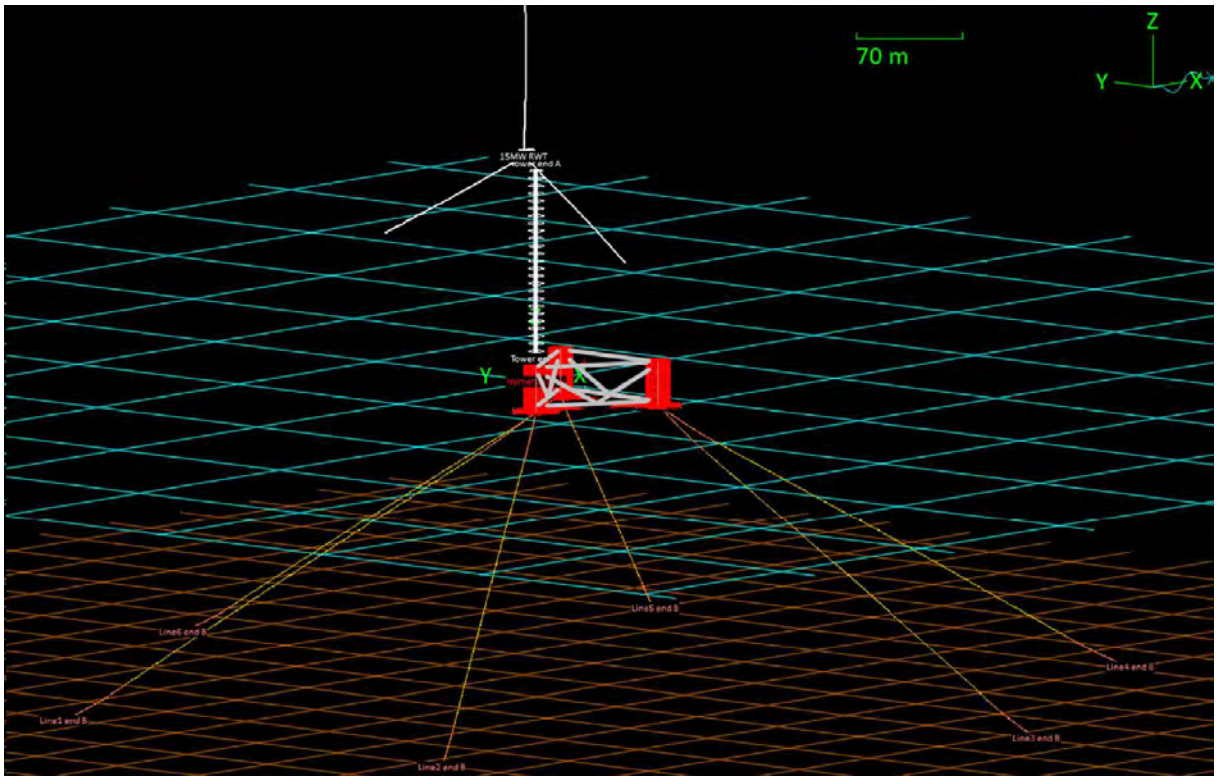
In addition, during the laying of the supporting cable conduit, the ROV and/or underwater technical operators will be used to meticulously position the cable conduit so as not to interfere with the biocoenoses present. Especially for the habitat MC1.5 - - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp* areas with loose sediments (habitat MC5.5 -

Mediterranean circalittoral sand) that are located in different areas between the bioconstructions will be selected.

The presence, in the area of the wind farm, of areas characterised by soft bottoms (MD6.5 - Mediterranean offshore circalittoral mud and ME6.5 - Mediterranean upper bathyal muds) makes these areas compatible with the presence of the anchors of the floating foundations.

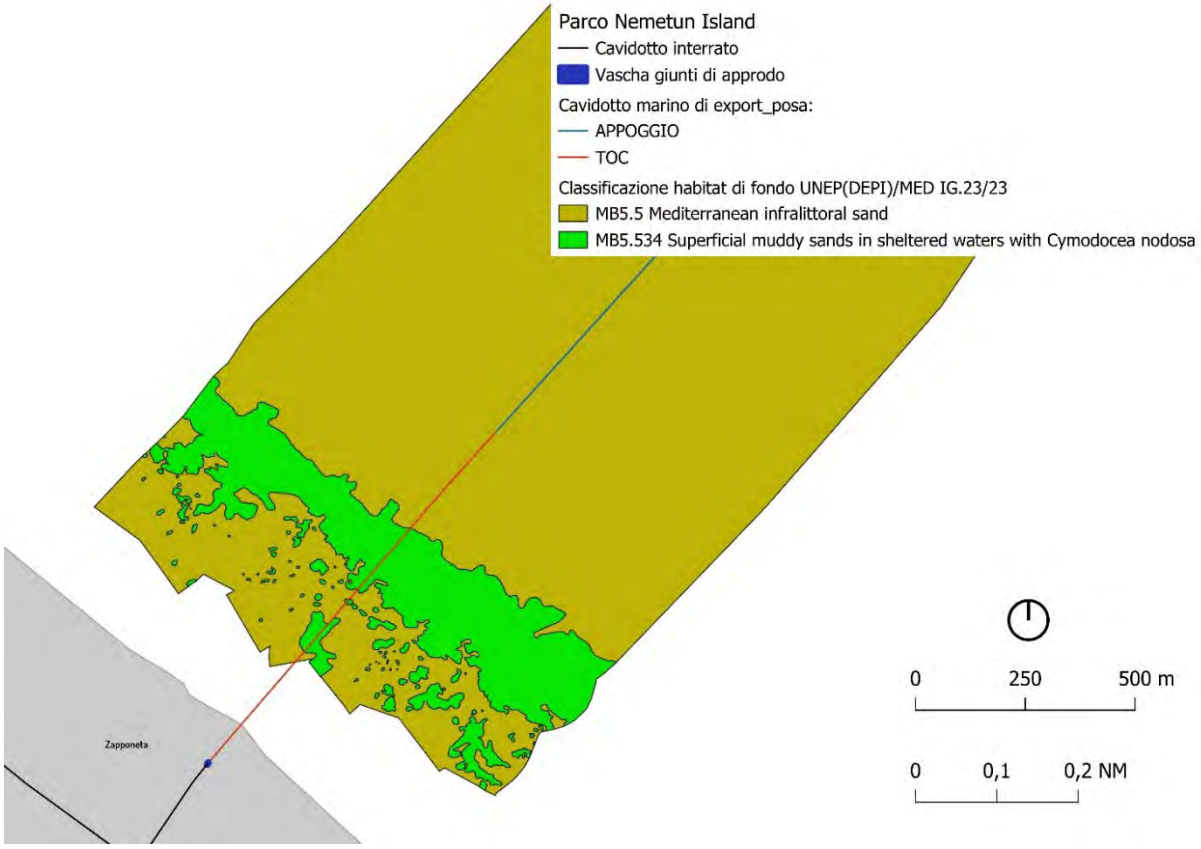


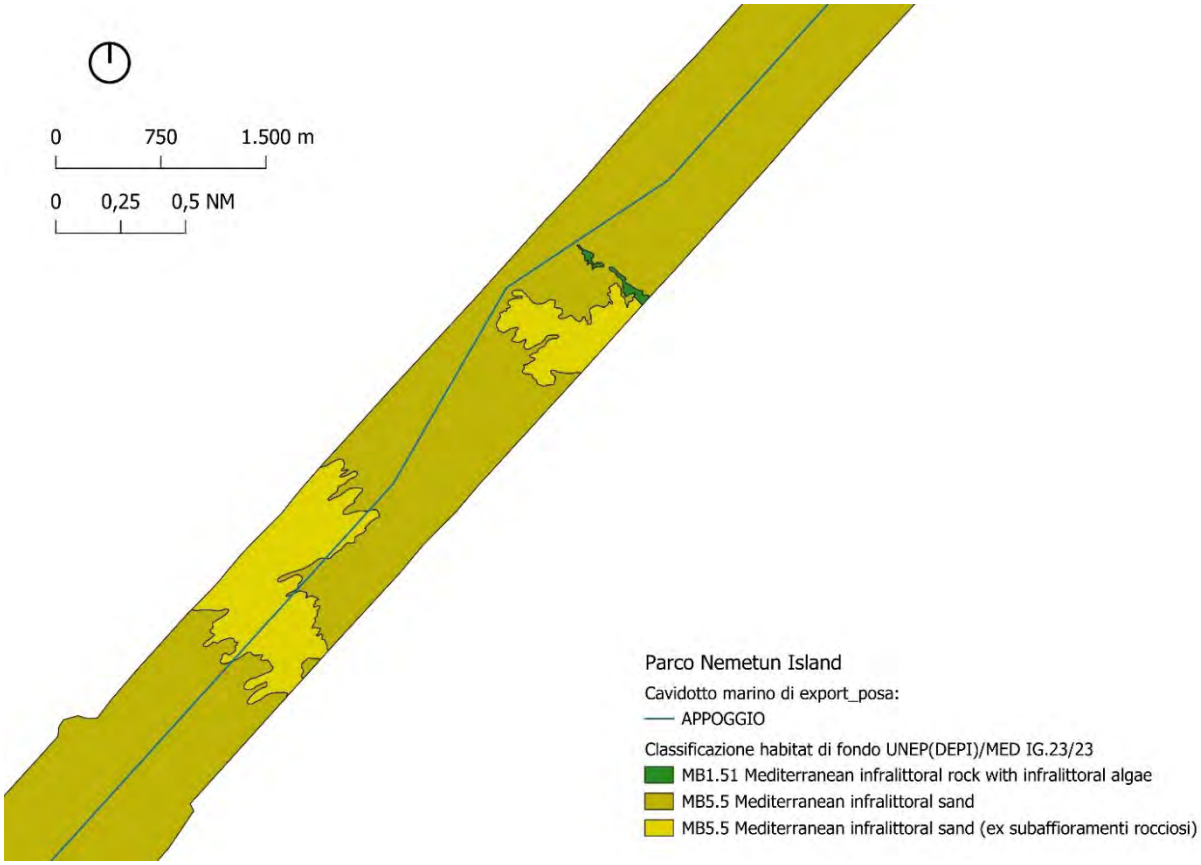
Graphic diagram of the mooring system – plan

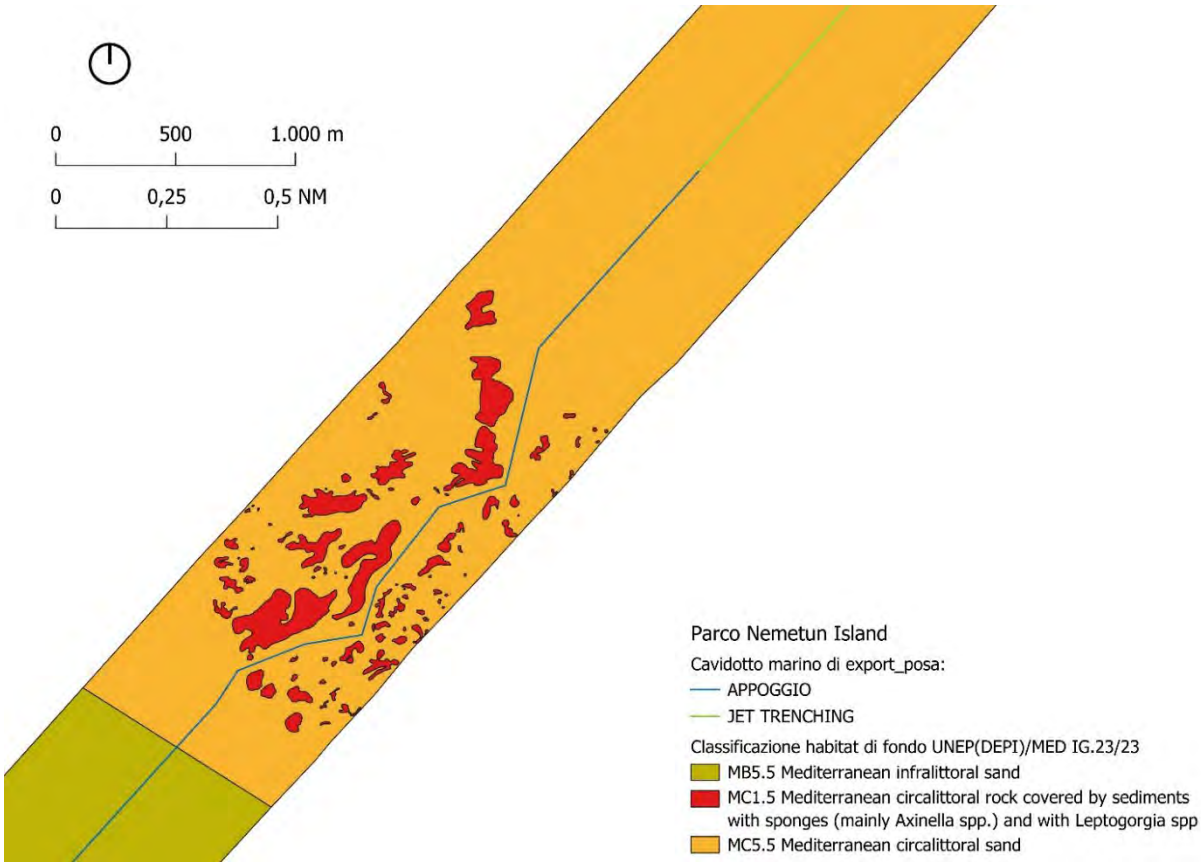


Graphic diagram of the mooring system with taut lines – 3D graphic

In the following Figure, the **HV offshore export cable duct route** with respect to valuable ecosystems or as resulting from the investigations carried out as part of the design (see section "*SIA.ES.6 Investigations and characterization of the seabed*"), with an indication of the type of installation.

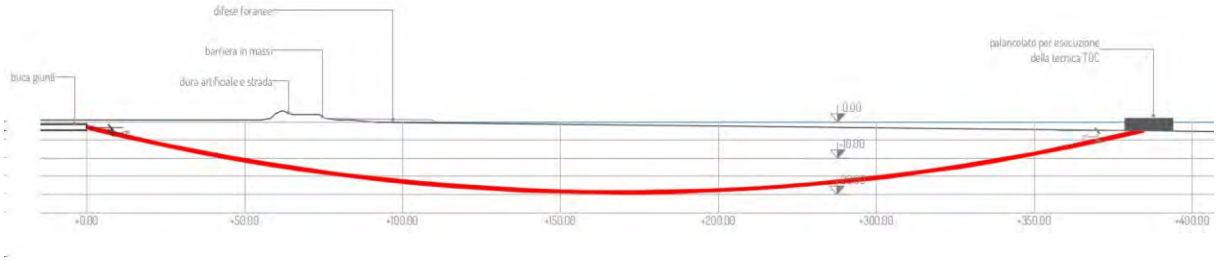

Parco Nemetun Island
Cavidotto interrato
Vascha giunti di approdo
Cavidotto marino di export_posa:
APPOGGIO
TOC
Classificazione habitat di fondo UNEP(DEPI)/MED IG.23/23
MB5.5 Mediterranean infralittoral sand
MB5.534 Superficial muddy sands in sheltered waters with Cymodocea nodosa
Zapponeta
0 250 500 m
0 0,1 0,2 NM


0 750 1.500 m
0 0,25 0,5 NM
Parco Nemetun Island
Cavidotto marino di export_posa:
APPOGGIO
Classificazione habitat di fondo UNEP(DEPI)/MED IG.23/23
MB1.51 Mediterranean infralittoral rock with infralittoral algae
MB5.5 Mediterranean infralittoral sand
MB5.5 Mediterranean infralittoral sand (ex subaffioramenti rocciosi)



BiocenoYes HV power line section from sea investigations (cf. ES.6.6_01)

Starting from the landing point, theThe first section of the export cable duct with habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*, which extends to a depth of 7 meters, will be laid **880 meters** (sea side), for a total of 1000 m (120 m land side), using the **HDD** (Horizontal Directional Drilling), leaving a buffer of about 300 m from the lower limit of the grassland towards the open sea.



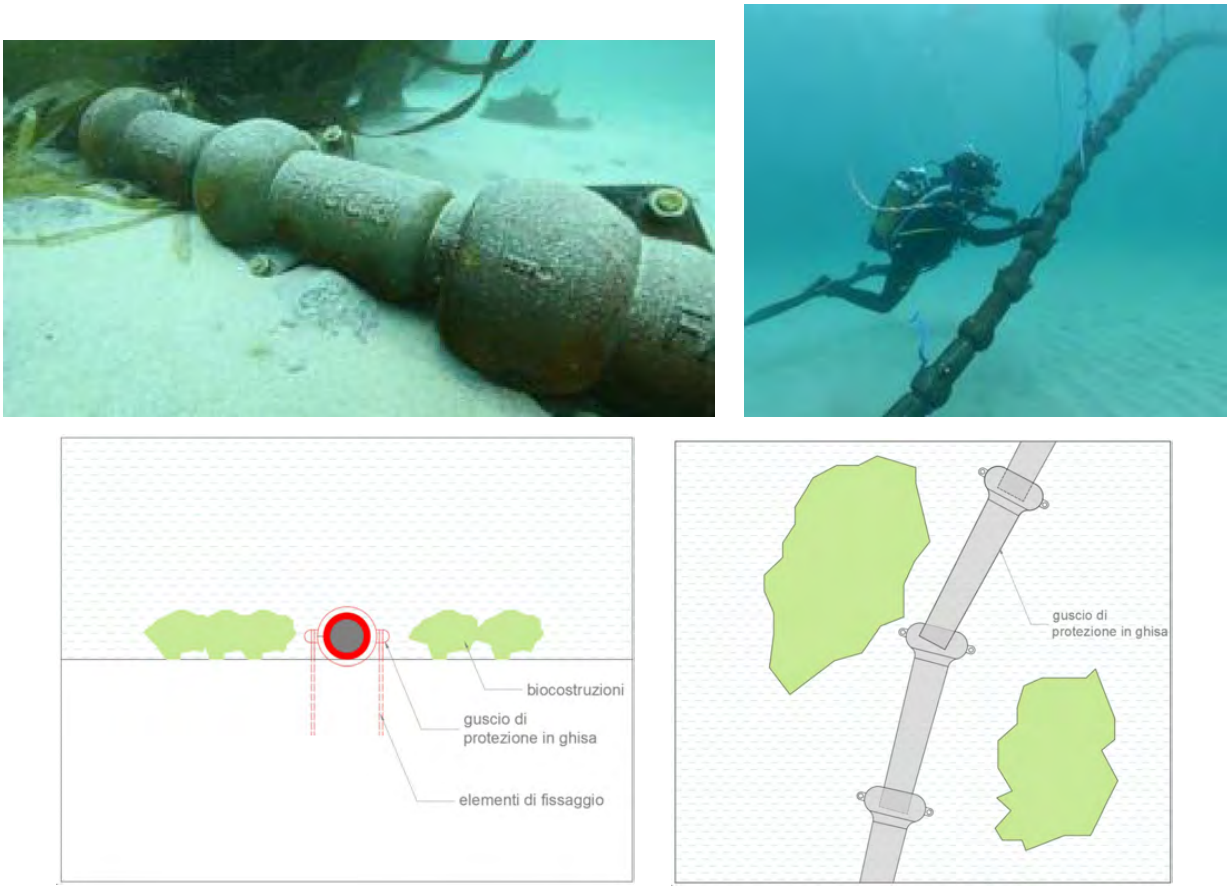
Horizontal Directional Drilling schematic profile

The second interfering section of the cable duct of about 12.5 km in length, where geophysical investigations with SSS, SBP and ROV (see ES.6 series drawings) have identified the presence of:

- rocky sub-outcrops covered by a significant layer of sandy-muddy sediment (habitat MB5.5 – Mediterranean infralittoral sand),
- habitat MB1.51 - MB1.51 Mediterranean infralittoral rock with infralittoral algae
- coralligenous bioconstructions (habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*)

it will be laid by means of a simple support system and mechanical protection with cast iron shells. This method of laying offers a certain flexibility to the cable even after the protection has been applied and

prevents contact with the bio-constructions present, ensuring the best protection. In addition, the metal material provides an optimal substrate for the growth and proliferation of hard-bottom biocoenoses. This type of installation is to be preferred as it greatly limits the impacts that the opening of a trench could have on bioconstructions, as a subtraction of a conspicuous strip of habitat, due both to the direct eradication of biocoenoses and to the "suffocation" of the portions closest to the excavation due to suspended sediments. Laying on support, while determining a subtraction of habitat, significantly limits both the width of the areas affected by the work and the movement of sediments. Protection with cast iron shells, in fact, is the system that minimizes the area occupied by the cable duct and, therefore, minimizes direct impacts on the priority habitats present, engaging a maximum diameter of 40 cm.



Example of Mechanical Protection with Cast-Iron Shells

The assembly of the shell will take place on board the ship-pontoon, from which it will be laid, minimizing the uplift of sediments and, therefore, the temporary increase in water turbidity, potentially impacting both the biocoenoses present. Please refer to the project documents for the necessary details on the installation method.

A further verification of the correctness of the choices made was carried out as part of the analysis of the macrozoobenthic communities present, this analysis verified the absence of valuable macrobenths in the area occupied by the wind farm and the presence of priority habitats in the terminal area of the cable duct, also underlining the possibility that the presence of the cable duct, although minimally impactful in an initial phase, can be protective for the organisms present as it reduces the possible anthropogenic impact on the areas crossed by the electrical connection.

The 12.5 km of laying also includes a buffer of about 1 km of cable duct that continues beyond the habitat MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*, where he will then begin the jet trenching installation. This design choice makes it

possible to maintain a distance that can significantly reduce the impact that jet trenching would have on this habitat. In fact, this design mitigation, together with the use of anti-turbidity breakdowns, will make it possible to further reduce the potential impact on bio-constructions caused by the suspension of sediments during the laying of the jet trenching cable duct.

The study of the benthic communities that will be affected by the future implementation of the cable duct and the wind farm as part of the project under analysis has therefore not revealed the presence of valuable biocoenoses and/or worthy of protection, nor of habitats potentially sensitive to the wind farm's implementation activities, with the exception of the prairie of *C. nodosa* (habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*) and coralligenous bioconstructions (MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp*.) and with *Leptogorgia spp*.) along the first section of cable duct. While in the larger portion it is found that almost all of the species observed were closely linked to the moving bottoms (habitats MC5.5 - Mediterranean circalittoral sand, MC6.51 - Coastal terrigenous muds, MD6.5 - Mediterranean offshore circalittoral mud, ME6.5 - Mediterranean upper bathyal muds and ME3.5 - Mediterranean upper bathyal coarse sediment), and in many cases they were infaunal species and therefore could be impacted in a low way by the grounding works work of the cable duct and the wind farm.

Biocenotic map of the investigation area characterized by the trajectory along which the cable duct will be built and the future wind farm. The different types of benthic habitats found according to the nomenclature UNEP(DEPI)/MED IG.23/23 are reported here

For **evaluate, in the sections being excavated, the extent of the suspended material, the extension of the plume, the possible overcoming of clear water conditions and the relative duration of such exceeding**, the study described in the "*ES.7.2_01_ Physical Oceanography – Modelling"*, to which reference is made for the necessary further information.

This phenomenon produces, in fact, potential direct impacts on sensitive organisms and biocoenoses, caused by the increase in turbidity and the concentration of suspended solids particles (decrease in light penetration and consequently in photosynthetic activity; increase in filtration activity; coating; damage to the respiratory system; abrasion of tissues; disturbance of nursery areas, etc.). The same vessels used for marine work can potentially have effects on the quality of the surrounding water and air. Air quality can be compromised due to:

- the exhaust gas emissions of the machinery used;
- by the noise caused by the engines.

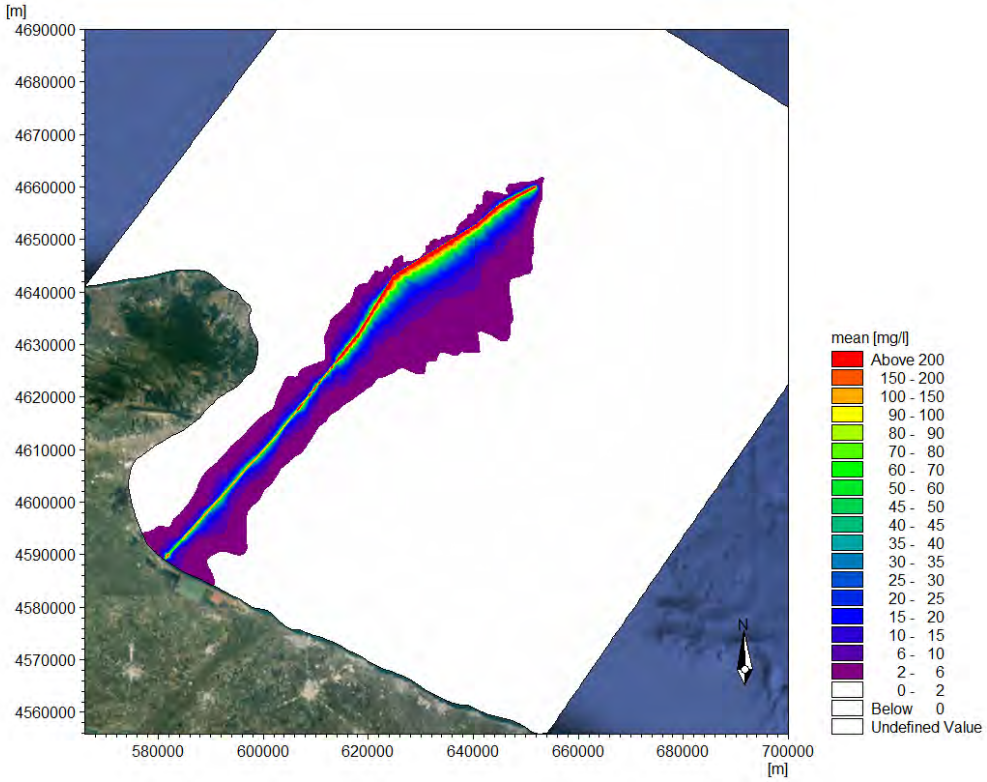
These effects are generally of low impact, since the activities often take place in spacious and airy environments, far from residential centers proper. The effects on water quality can be caused by:

- losses during the refuelling procedure of the vehicles used;
- inappropriate disposal of waste and waste oils.

In summary, in the aforementioned specialist study, all the possible combinations of currents, temperature and salinity in which the excavation operation could be carried out were numerically modelled, carrying out the three-dimensional modelling of the circulation with MIKE 3 HD for an entire year representative of the typical climate. The intensity fields of the currents were found to be in good agreement with the roses of the surface and bottom currents processed on the basis of CMEMS data.

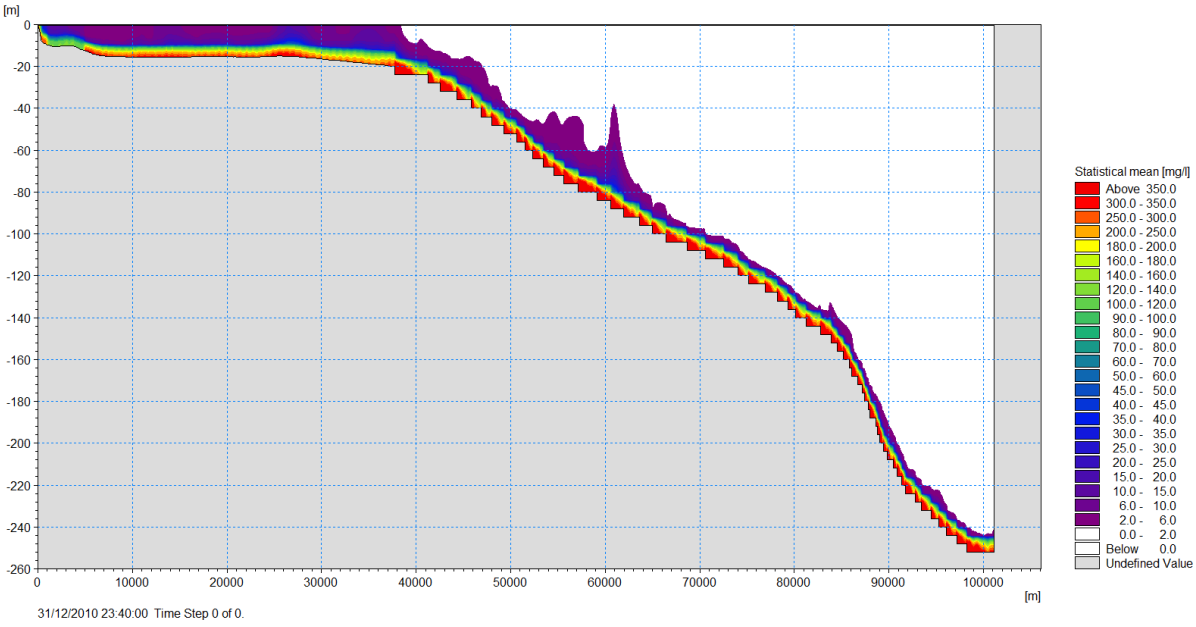
The results were statistically processed in order to determine the average values of the maximum concentration of the suspended sediment, specifically preparing:

- spatial maps of the maximum concentration of sediment suspended at the bottom, to assess the spatial extension of the plume also in relation to seasonality,



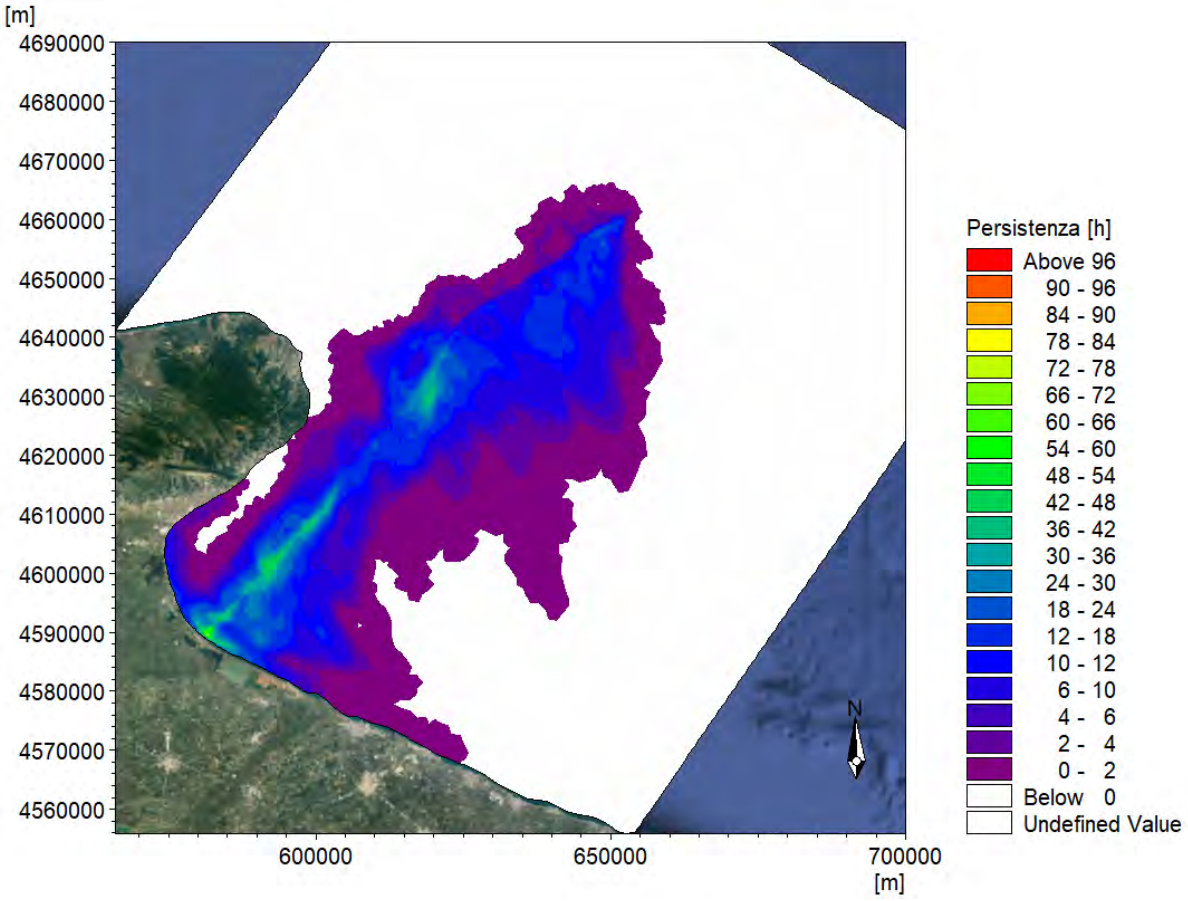
Map of the maximum concentration of all maximum concentrations at the bottom of the suspended material obtained in each sliding window throughout the year

- vertical profiles along the axis of the trench to assess the layers of the seabed affected by the suspension and the dependence on seasonality,



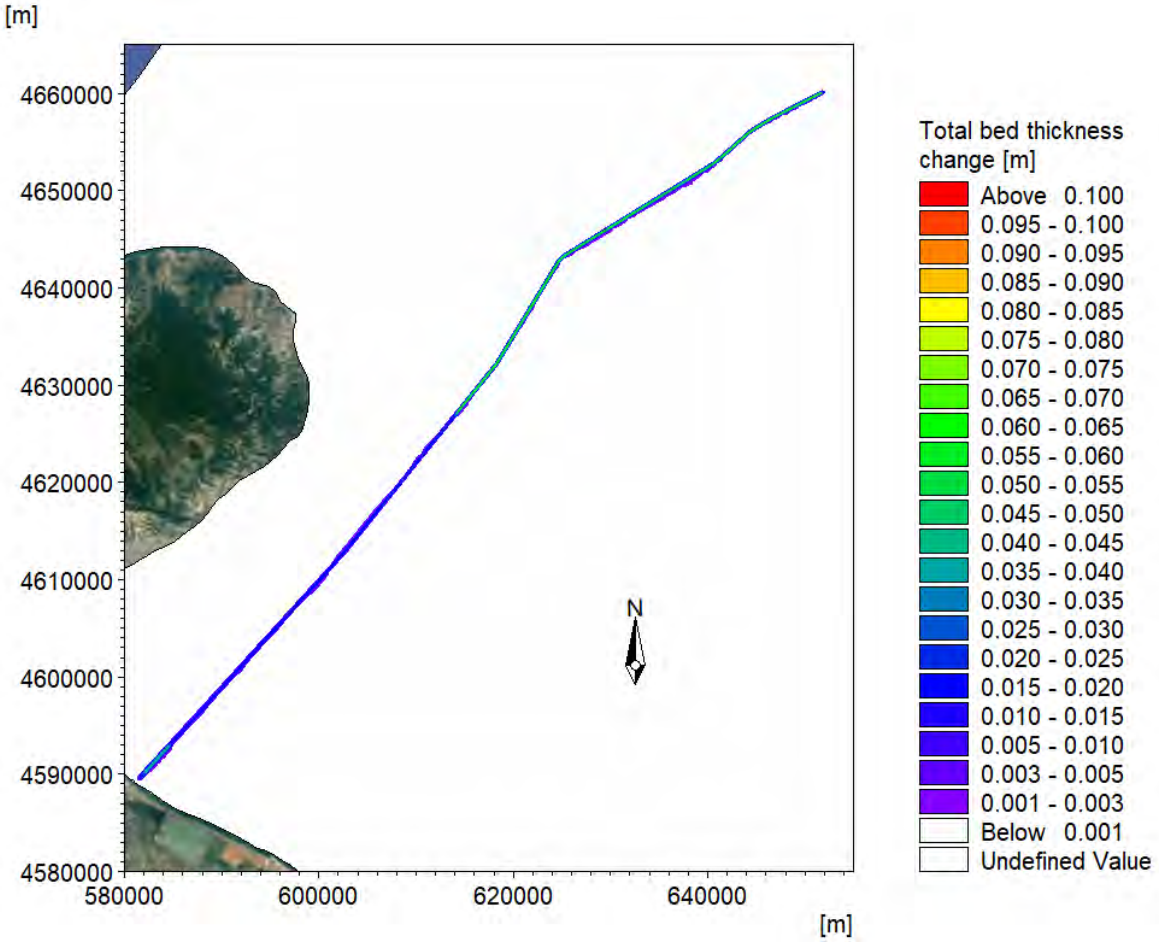
Vertical section of the average concentration of all maximum concentrations along the trench throughout the modeling year

- map of the duration of the conditions in which the threshold value for clear water is exceeded, equal to 2mg/l,



Map of the maximum persistence (in hours) of the excess suspended material (>2mg/l) evaluated on the maximum persistence of all sliding windows

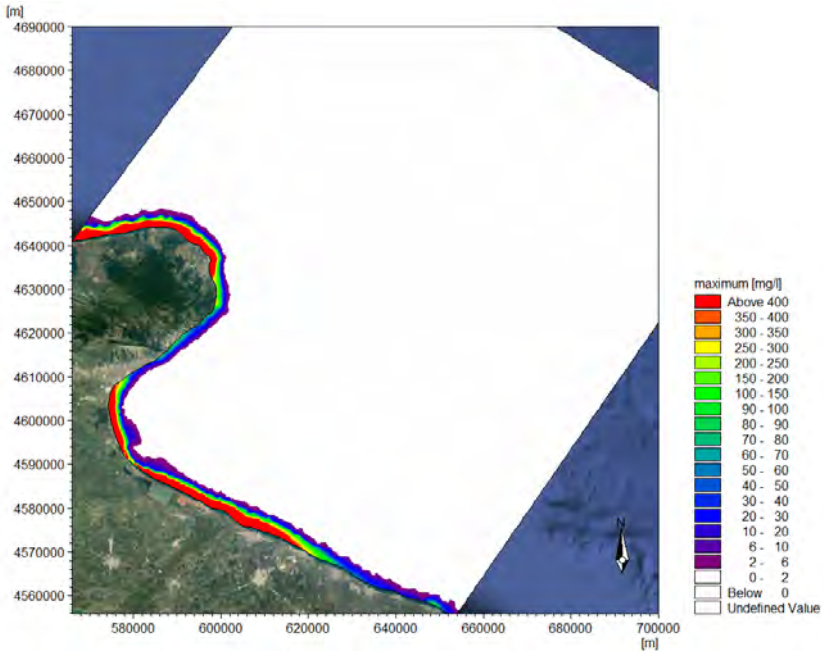
- Map of the sediment deposit at the end of the floating window.



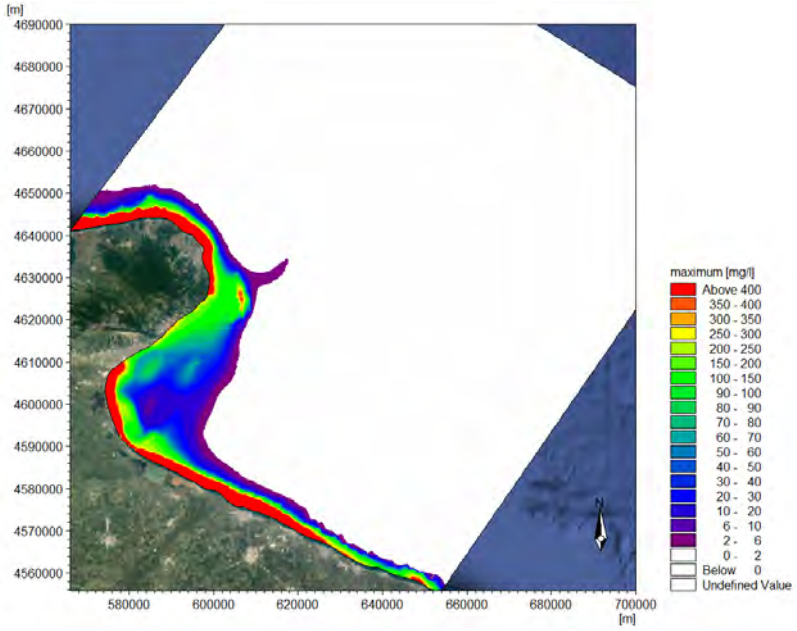
Material Deposit at the End of a Movable Window Modeled with MT

- maps of the natural turbidity that is generated during 4 storm surges with the following characteristics:

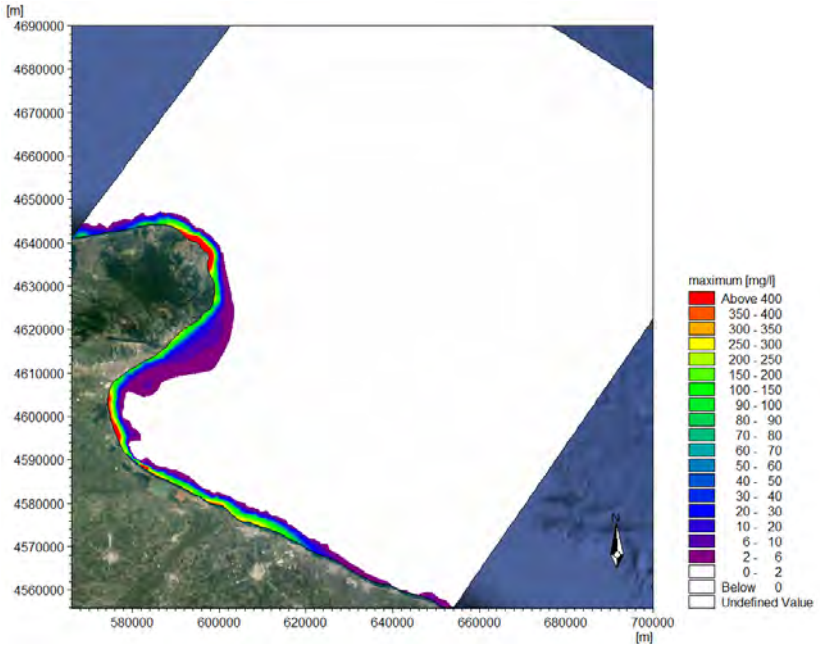
Sea storm #	Hs, m	Tp, s	Dir, °N
1	1.25	6.5	30
2	2.25	7.5	30
3	2.25	7.5	120
4	3.25	8.5	120



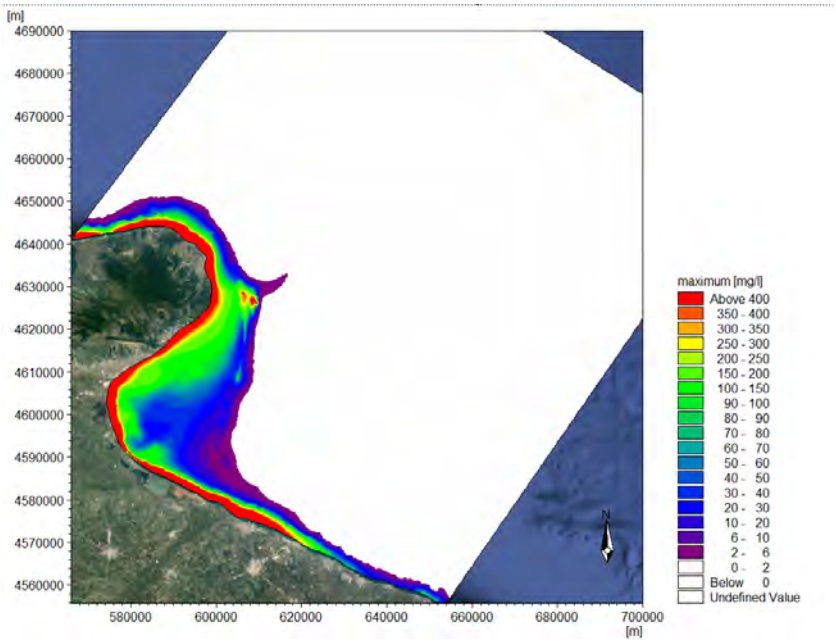
Maximum suspension at the bottom of the sediment during the Storm 1



Maximum suspension at the bottom of the sediment during the Storm 2



Maximum suspension at the bottom of the sediment during the Storm 3



Maximum suspension at the bottom of the sediment during the Storm 4

In conclusion, it can be deduced that the concentration of the suspended material decays to values of **100 mg/l, 20 mg/l and 2 mg/l at average distances of 800 m, 7 km and 18 km on the south-east side with respect to the trench axis**. The extent of the dispersion is similar in the different seasons, while its minimum extension occurs, overall, in winter.

The layers affected by an appreciable concentration (>10mg/l) of suspended material are concentrated at the bottom, varying from a minimum of 2 layers offshore (on seabeds greater than 120 m) to a maximum of 6 layers at seabeds between about 60 and 90 m. The most significant concentrations (>50 mg/l) occur, in most of the tracing, in the first 2 layers at the bottom. Looking at the seasonal profiles, it can be seen that the greatest dispersion along the vertical takes place in winter, followed by autumn.

The overcoming of the condition of clear water remains concentrated around the axis of the trench, with an asymmetrical shape towards the south-east due to the typical hydrodynamics. The maximum persistence value reaches only locally, in the excavation area, 72 hours. On average, the persistence is 12 hours up to depths of about 30 m, while it is 8 hours on higher depths. From a seasonal point of view, the least persistence in terms of both intensity and spatial extension occurs in winter, while the most severe combination occurs in spring. In winter, in fact, the column is mixed, so there is no confinement; therefore, the sediments are more distributed along the column and at the bottom the persistence is minimal.

In fact, therefore, **the summer season is the one in which the effect of the works is less burdensome, due to the limited extension of the plume and the dispersion of the sediment along the seabed**, while the **winter season is the one in which the effect of the works is less burdensome due to the intensity and extent of the persistence of the condition of turbid waters**.

The analysis of the deposit at the end of each mobile window shows that the variation in the seabed is negligible (of the order of ten centimeters) and is limited to the surroundings of the trench, for a total width of less than 1 km, with a symmetrical distribution around the axis of the trench.

Finally, 4 typical storm surges, of different heights and different directions, were simulated to evaluate the natural turbidity and compare it with the turbidity generated by the excavation operations. **The suspension during typical storm surges reaches maximum values twice as high as the suspension obtained during dredging operations in every season of the year, highlighting how the natural turbidity is significantly higher than the turbidity due to the operations**.

Overall, the summer and winter seasons are those in which the turbidity plume remains more confined, the suspension along the water column is lower and the dispersion and persistence are also lower; however, the undulating conditions of the winter season may not give rise to a continuous window of good weather to carry out excavation work. In addition, due to the presence of the Mare IT9110041 SPA, in which there is a ban on carrying out potentially impactful operations during the wintering season of the *Mergus serrator* (March-October), an attempt will be made to carry out these works near the SPA area during the summer season, implementing all mitigation works, such as anti-turbidity breakdowns to prevent excessive dispersion of sediment in the protected area and in the bathing areas along the coast. Instead, the organization of the construction site will aim to carry out the laying of the marine cable duct in *jet trenching* in the winter season and considering the short duration expected for the works (one week) and a time window with suitable wave conditions will be identified.

The proposed modelling considered the same laying method *jet trenching* along the entire length of the offshore cable duct. During the sea investigations, hard-bottom biocoenoses were identified (habitats MB1.51 - Mediterranean infralittoral rock with infralittoral algae and MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*) as well as a prairie of *Cymodocea nodosa* (habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*). It was therefore planned to change the type of cable duct laying to minimize the impact on these ecosystems: laying with cast iron shells and HDD. Both methods involve much less sediment movement, thus ensuring even less resuspension and diffusion of the sediment along these areas. In this regard, the model proposed in the report *ES.7.2_01_Oceanografia Fisica_modellazione* considers a more impactful scenario than what will be derived from the project works. In addition, the same report quantified the natural turbidity that is generated during storm surges in order to be able to compare it with the turbidity generated by the operations, returning a scenario that shows that the suspension is concentrated along the coast and, for storm surges of greater intensity (H_s=2.25 m, 3.25 m), in the area of stagnation of the currents immediately downstream of the Gargano promontory and that the suspension during typical storm surges

reaches maximum values twice as high as the suspension obtained during dredging operations in every season of the year, highlighting how the natural turbidity is clearly higher than the turbidity due to the operations.

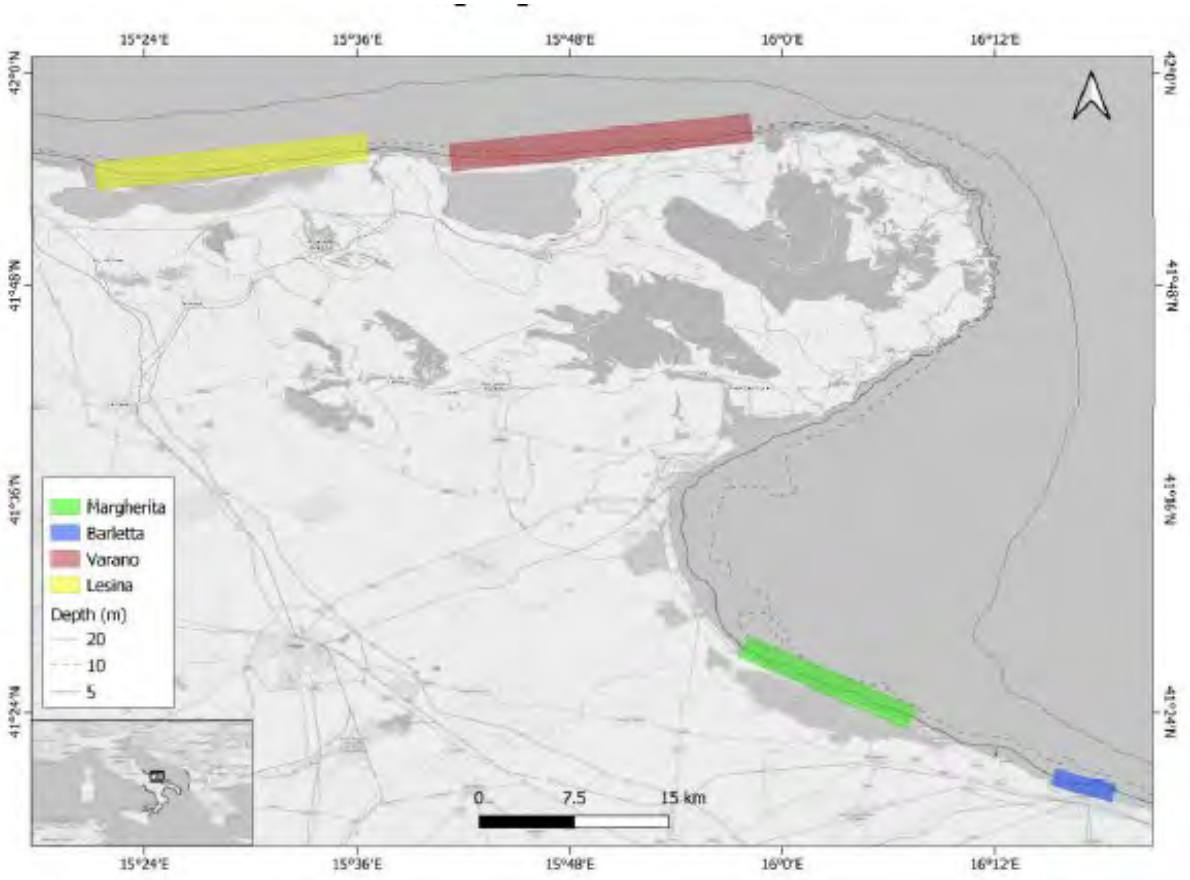
Therefore, in addition to reducing the persistence of **of turbid waters near the coast, due to the methods of installation of the cable duct and the use of anti-turbidity breakdowns, there is a natural condition already strongly characterized by high concentrations of suspended solids and turbidity deriving from storm surges. It follows, therefore, that the organisms present in the area of the cable duct should not be affected by the construction site works.** In particular, a minimal impact is expected in the area closest to the coast where the SPA and the grassland of *C. nodosa* (habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*) as well as along the stretch of cable duct that goes from the coast to a depth of 17 m, where there are already widely muddy bioconstructions (MB1.51 - Mediterranean infralittoral rock with infralittoral algae and MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp*.) and with *Leptogorgia spp.*). As regards the excavation stretch from coast to offshore, the overcoming of the clear water condition remains concentrated around the axis of the trench, with an asymmetrical shape towards the south-east due to the typical hydrodynamics. The maximum persistence value reaches only locally, in the excavation area, 72 hours. On average, the persistence is 12 hours up to depths of about 30 m, while it is 8 hours on higher depths. Therefore, in those areas there could be some effects on living organisms but of minimal magnitude, considering the ecology of the infaunal organisms that colonize the stretch of seabed affected by the excavation, as identified by the analysis of macrobenthos.

The study of the effects of anthropogenic pressure on benthic communities of mobile bottoms is a critical issue, mainly due to the composition of species and their relative abundance that can be influenced by natural stress associated with highly dynamic environments (Szostek et al., 2015). Therefore, changes driven by spatial variation in sediment type and seasonal environmental factors, such as temperature, salinity, oxygen and energy available in the environment (such as primary production), can mask the alteration of the structure of communities caused by anthropogenic mechanical impacts such as bottom trawling and dredgers on the seabed (e.g. jet trenching). No less relevant, species distributed in benthic habitats are constantly influenced throughout their life cycle by various environmental disturbances, including physical stress due to extreme events (e.g. storms) (Morello et al., 2006, 2021). As can be seen from the modeling presented above, the area affected by the increase in turbidity resulting from the laying of the cable duct in jet trenching is highly subjected to storm surges that determine a sediment suspension that reaches maximum values twice higher than the suspension obtained during dredging operations in every season of the year, highlighting how the natural turbidity is significantly higher than the turbidity due to the operations.

As a consequence of this condition, benthic species adapt to a dynamic system that tolerates different impacts, and stress responses are also driven by the traits and interactions of their life history (Thrush et al., 2003). The complexity of the interaction between benthic communities and environmental factors makes it difficult to fully understand the ecological characteristics of areas impacted by human activities compared to those not impacted (Vasapollo et al., 2020). From the study of macrozoobenthic communities (elaborated *ES.6.5_01*) that will be affected by the future implementation of the cable duct and the wind farm as part of the project analysis, almost all of the species observed were closely linked to the moving bottoms (especially infaunal species but also epifaunal) with a typical R strategy. In addition, among the species of movable bottoms, the absence of relevant and/or deserving communities emerges, which could conflict with the project to build the jet trenching cable duct and the wind farm in this area.

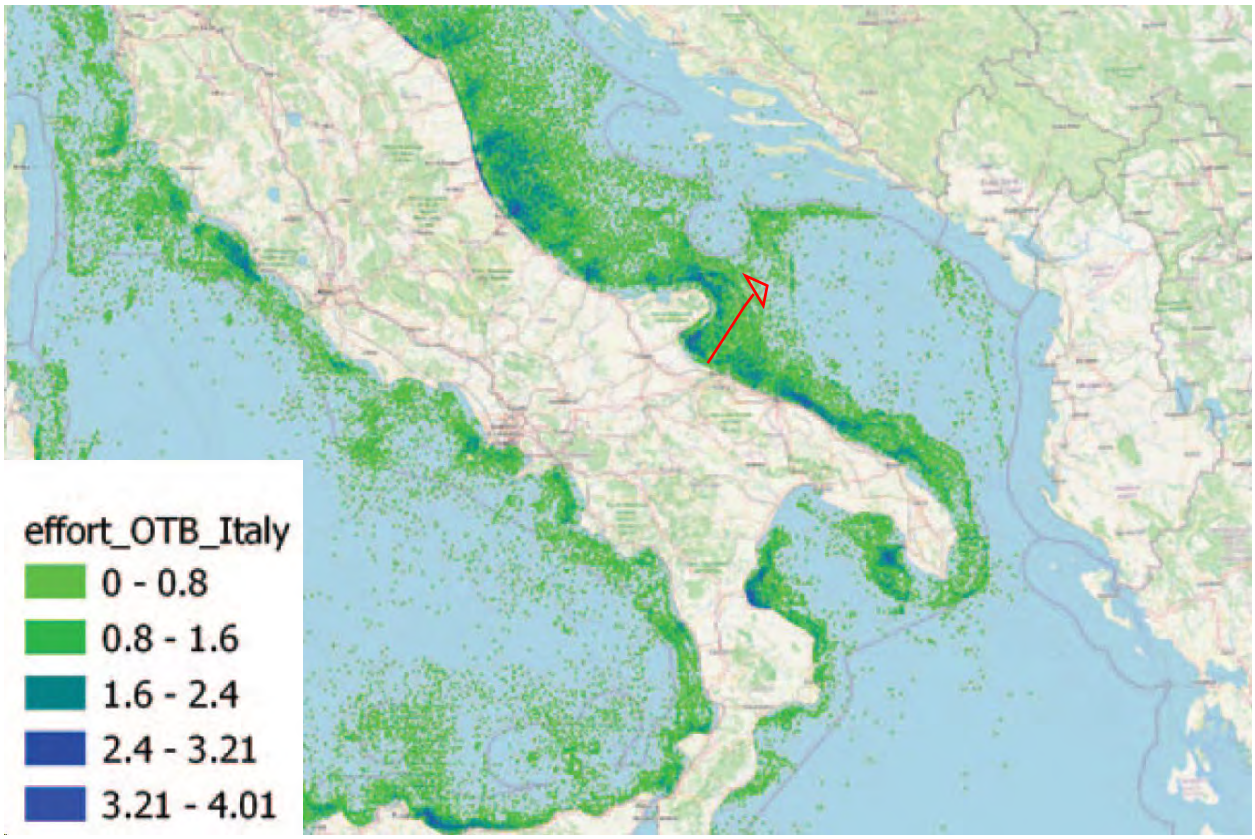
The characterisation of macrozoobenthos (*ES.6.5_01*) present did not report any specimens of *Chamelea hen* among the organisms collected during the sampling. Studies conducted along the Apulian coasts from

Gargano to Barletta report that the *C. hen* richest and therefore exploited by fishing are found along the coasts of Lesina, Varano, Margherita di Savoia and Barletta (Cascione et al., 2021; Carlucci et al., 2024a, b) as shown in the figure below.



Study area of the populations of Chamelea gallina in Puglia. The yellow, red, green and blue areas show the four investigated areas respectively in Lesina, Varano, Margherita and Barletta (from Cascione et al., 2021)

Finally, trawling activities are very concentrated in the area of interest. Trawling is the most important fishing activity in the entire area; in fact, the fishing effort is about 70% of the total effort (Irepa 2010 data). The area potentially exploited by trawling for the entire GSA 18 is about 15,000-17,000 km^2 (70% on the western side, 30% on the eastern side). The extension of the draggable area grows, according to a latitudinal gradient, from south to north of the basin, as can be seen from the figure below extrapolated from the publication drawn up as part of the fishing project by the FLAI CGIL, called "Italian fishing in the use of maritime space" of 2024 edited by Franco Andaloro. The geophysical surveys carried out during the environmental investigations (*ES.6.1_01* and *ES.6.3_01*) have clearly highlighted that along the cable duct and in the wind farm area there is a large amount of evident traces left by trawling below the permitted limit. In particular, areas characterized by a high density of furrows are evident along the entire stretch of the future cable duct laid with jet trenching, as well as in the area of the future wind farm.



Trawling activities logbook data 2021 (Andaloro, 2024)

Therefore, in consideration of these aspects **the negative impact on the epifauna and infauna communities present in the project area deriving from the jet trenching laying of the cable duct is very low**, mainly characterised by a **increase in turbidity in a very limited time window** (elaborated *ES.7.2_01*) and in any case **quantitatively lower than the phenomenology associated with storm surges** in the most coastal areas, where it is present *C. hen*. Other **Macrozoobenthos species** present from a depth of 100 m up to the entire area of the wind farm are **Tolerant** and **forming transitional stands**, which appear after a **natural sedimentary imbalance** (high hydrodynamics) and anthropogenic as **Intense trawling in the area** and therefore already adapted to mechanical, physical and biological disorders. It is reiterated that the overcoming of the condition of clear water remains concentrated around the axis of the trench, with an asymmetrical shape towards the south-east due to the typical hydrodynamics. The maximum persistence value reaches only locally, in the excavation area, 72 hours. On average, the persistence is 12 hours up to depths of about 30 m, while it is 8 hours on higher depths. This finding considers activities without potentially usable mitigation measures such as **anti-turbidity creams** which could significantly reduce the intensity and distribution area of the plume to the benefit of the communities present in the vast project area.

The presence of the plant and the cable duct could, on the contrary, favor the development of a richer and more stable benthic community in these environments, as the construction of the plant would cause the prohibition of trawling, present in these areas, even illegally; moreover, the plants would constitute a hard substrate, which, although artificial, could allow sessile benthic organisms to settle, thus bringing an overall beneficial effect to these seabeds.

The chemical characterization and ecotoxicology of sediments on the seabed, Have demonstrated a higher TOC and TN content in the sediments of the cable duct area, unlike TP which, on the other hand, showed homogeneous levels between all stations. In particular, TOC in sediments is considered a good indicator of organic pollution (e.g. Karichknoff et al., 1996). The TOC content measured in the sediments under this

study is partly in line with and partly greater than the average TOC content (0.6%) measured in Mediterranean sediments (Emelyanov and Shimkus, 1986; Hyland, 2005).
The same spatial trend of the TOC and TN was detected, in general, also for metals and PAHs, whose peaks were mostly highlighted in stations falling on the route of the cable duct. Among the other organic contaminants analyzed, PCBs and organotin compounds are, respectively, very low and <LOQ at all stations. The levels of organochlorine pesticides were also generally lower than the LOQ, with the exception of ∑DDT and ∑DDE which, present in almost all samples, show a spatial trend similar to that described for metals and PAHs, i.e. with higher values in the stations of the route than those falling within the area of the Wind Farm.
The concentrations of all organic contaminants (PAHs, light and heavy hydrocarbons, PCBs, organochlorine pesticides and organotin compounds) in the sediments were, in all samples, either below the limits of quantification or below the most conservative normative reference values.
As far as microbiological investigations are concerned, from an environmental point of view, no situations of microbiological pollution in progress have been highlighted. In fact, the absence of faecal streptococci clearly indicates no previous faecal contamination, while the most recent one, identified through the levels of faecal and total coliforms, is zero in terms of *E. coli* (Faecal coliforms) and very low in terms of total coliforms.
Finally, the ecotoxicological assays showed a picture of a general and widespread absence of toxicity both in relation to the criterion for evaluating the results of the batteries of three species by means of a "pass to fail" classification approach and by a "weight of evidences" approach.
In general, it can be said that the area affected by the future implementation of the off-shore wind farm as well as the cable duct connecting the plant and the onshore station does not present serious critical issues from an environmental point of view, also considering the exceedances of the EQS of some metals, which could be attributable to specific human activities falling within the territory. In fact, according to ISPRA (2018) "the Apulian coast is characterized by the presence of important industrial and port activities (Bari, Brindisi, Manfredonia, Taranto, of which the last three have been identified as Sites of National Interest) which have led to an impact on the surrounding environment, and on the marine-coastal area in front, with a contribution of numerous organic and inorganic contaminants".

Therefore, the suspended materials, as demonstrated by the modelling carried out, will not contribute to the diffusion in the aquatic environment of pollutants or harmful substances for the fauna present on the seabed.

The strip affected by the suspension of material may involve the habitats and the SPA IT9110041 Aloisa - Carapelle present along the cable duct, but **the suspension of sediment caused by dredging operations from construction works**, carried out in every season of the year, **will be twice as low as that encountered during typical storm surges** highlighting how the **natural turbidity** is clearly **higher than turbidity due to operations**.

The overall impact assessment at this stage is **negative sign**, because there is no risk of habitat loss; is evaluated with a **Medium entity**, as a result of the design measures described above; will have a limited duration in time, so the impact is judged as totally **reversible.**

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.3.2 Operation phase

The main interference between the project works and the marine biocoenoses is directly related to the laying of the offshore HV cable duct, whose route overlaps a coastal stretch where biocoenoses have been

detected and therefore specific studies have been developed and design measures have been adopted aimed at minimizing any significant interference.

The area of the project works was affected between December 2023 and September 2024 by geophysical surveys which have made it possible to develop detailed thematic maps (biocenotic and bathymetric cartography), to be used as tools to support the drafting of the project and for the identification of technical solutions characterized by the least impact on the environment and biodiversity. The results of these findings are contained in detail in the documents of the section called "*SIA.ES.6 Investigations and characterization of the seabed".* This characterization made it possible to decide which types of laying of the export cable duct will be used to minimize the impact on valuable biocoenoses, as amply explained in the chapters of interest.

To assess the potential impact of the presence of the cable duct during operation, in a GIS environment, the habitats characterized during the geophysical surveys were extrapolated: MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*, MB1.51 - Mediterranean infralittoral rock with infralittoral algae and MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp*.) and with *Leptogorgia spp*. The entire area (ha) covered and surveyed during the surveys was calculated in order to show the total extension along the analyzed route.

The surface area, in excess, of the export cable duct (consisting of two cables of 300 mm each) that will be laid along the biocoenoses and habitats has been calculated.

The width of the cables is 90 cm (0.9 m) because 45 cm of excess width is considered for both laying on top and for TOC.

Then the percentage of habitat potentially interfered with by the laying of the cable duct was calculated:

Habitat	Habitat area (ha)	Cable conduit surface on habitat (ha)	Percentage of cable duct habitats (%)
MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*	22,9	0	0
MB1.51 - Mediterranean infralittoral rock with infralittoral algae	2,4	0	0
MC1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp*.) and with *Leptogorgia spp*.	28,4	0	0
MB5.5 - Mediterranean infralittoral sand/MC5.5 - Mediterranean circalittoral sand	1834	1,125	0,06

The MB5.534 habitat will not be affected by the presence of the cable duct as it is positioned with the HDD technique. As far as habitats (MB1.51 and MC1.5) are concerned, there will be no direct compromise since the cable will be laid where possible between the bioconstructions, in those areas of loose sediments (MB5.5 - Mediterranean infralittoral sand and MC5.5 - Mediterranean circalittoral sand) that alternate with the hard substrate of the coralligenous and on the side of the rocky outcrops at depths of about 15 m and which will be, carefully located during the installation of the cable duct.

Therefore, considering that the laying of support will concern the habitats MB5.5 - Mediterranean infralittoral sand and MC5.5 - Mediterranean circalittoral sand, the percentage of these habitats (evaluated as if they were the same habitat), which will be covered by the cable duct, has been calculated: the area will cover about 1.125 hectares of habitat, which corresponds to 0.06% of the entire investigated area and of which the type of habitat is known, thus resulting in a minimal and insignificant portion of these habitats not of

value. In addition, it was also decided to evaluate the area of habitat MB5.5 that has rocky sub-outcrops affected by the laying of the cable duct: the area that will be affected is about 0.13 hectares and corresponds to 0.14% of the area considered.

These percentages are very low and not significant, especially considering the non-valuable habitats directly affected by the laying of the cable duct.

In addition, the cover with cast iron shells can be colonized by new benthic organisms of hard bottom since it represents a virgin substrate on which to proliferate and thus increase the coverage of the habitats themselves, especially considering the mobile bottoms that affect the MB5.5 and MC5.5 habitats.

Finally, the presence of the cable duct in support will determine a further deterrent for trawling which represents a danger to this type of habitat. In fact, despite the prohibitions, geophysical investigations have reported the presence of furrows left by this type of fishing even in the bio-construction area. From the macrobenthic investigations carried out the absence of relevant communities and/or deserving of conservation emerges, which could come into conflict with the presence of the wind farm in this area. The presence of the plant could, on the contrary, favor the development of a richer and more stable benthic community in these environments, as the construction of the plant would cause the prohibition of trawling, present in these areas and probably among the causes of the absence of relevant biocoenoses in the areas furthest from the coast; moreover, the plants would constitute a hard substrate, which, although artificial, could allow sessile benthic organisms to settle, thus bringing an overall beneficial effect to these seabeds.

Suitable mitigation or mitigation measures have also been defined (as described in chapter 6 of this document), provided for by Directive 92/43/EEC and aimed at minimizing or even eliminating the negative impact of the project, after its implementation, by carrying out surveys during operation to monitor the state of the habitats as described in the project *Environmental Monitoring S.7.1_02_Piano – Report*.

Considering the presence of these biocoenoses and the measures adopted during the installation of the cable duct, the assessment of the impact on the seabed at this stage therefore maintains the mark **negative of negligible magnitude,** based on the measures and analyses described; The effect is therefore long-term **non-reversible.**

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***
■						■		■

4.2.3.3 Decommissioning phase

During the removal of the marine cable duct for the restoration of the state of the places, negative effects on the seabed are hypothesized, due to the mobilization of sediments and modification of the morphology, very similar to those described during the construction phase, the entity is considered less impactful, by virtue of the return of the subtracted areas and the lesser significance of the planned interventions.

The overall impact in the removal phase of the Nemetun Island plant is assessed as **negative, low and reversible**.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***
■					■		■	

4.2.4 ESTIMATION OF IMPACTS ON SOIL, SUBSURFACE AND HYDROLOGY

The interventions planned in the onshore areas are substantially related to the construction of the connection works. The landing of the offshore cable duct is carried out by means of Horizontal Directional

Drilling, the joint basin between the marine and land cables occupies an area of about 30 square meters for a depth of 2.20 m, the power line onshore high voltage (380 kV) has a path of about 18 km, underground alongside a public road, will be interspersed with 22 intermediate Joint Bays located with a variable distance between 700 and 950 meters and the new electrical substation serving Nemetun Island will be located in an industrial building located in the municipality of Cerignola, will be equipped with a GIS isolated power factor correction unit.

4.2.4.1 Construction phase

The negative impacts on the soil component are linked to:

- extent of the excavations and the contribution of external materials, as well as more generally to the construction site of the area;
- interference with the hydrographic network and with the aquifer.

For the implementation of the onshore works described, the balance between excavated quantities and restorations is envisaged, represented in the following table and described in detail in the report *Preliminary R.1.5.1_01_Piano of use of excavated earth and rocks – ONSHORE areas*:

BILANCIO	
SCAVI	87 417,2
RINTERRI / RIUTILIZZO	65 059,8
ESUBERO	**22 357,4**

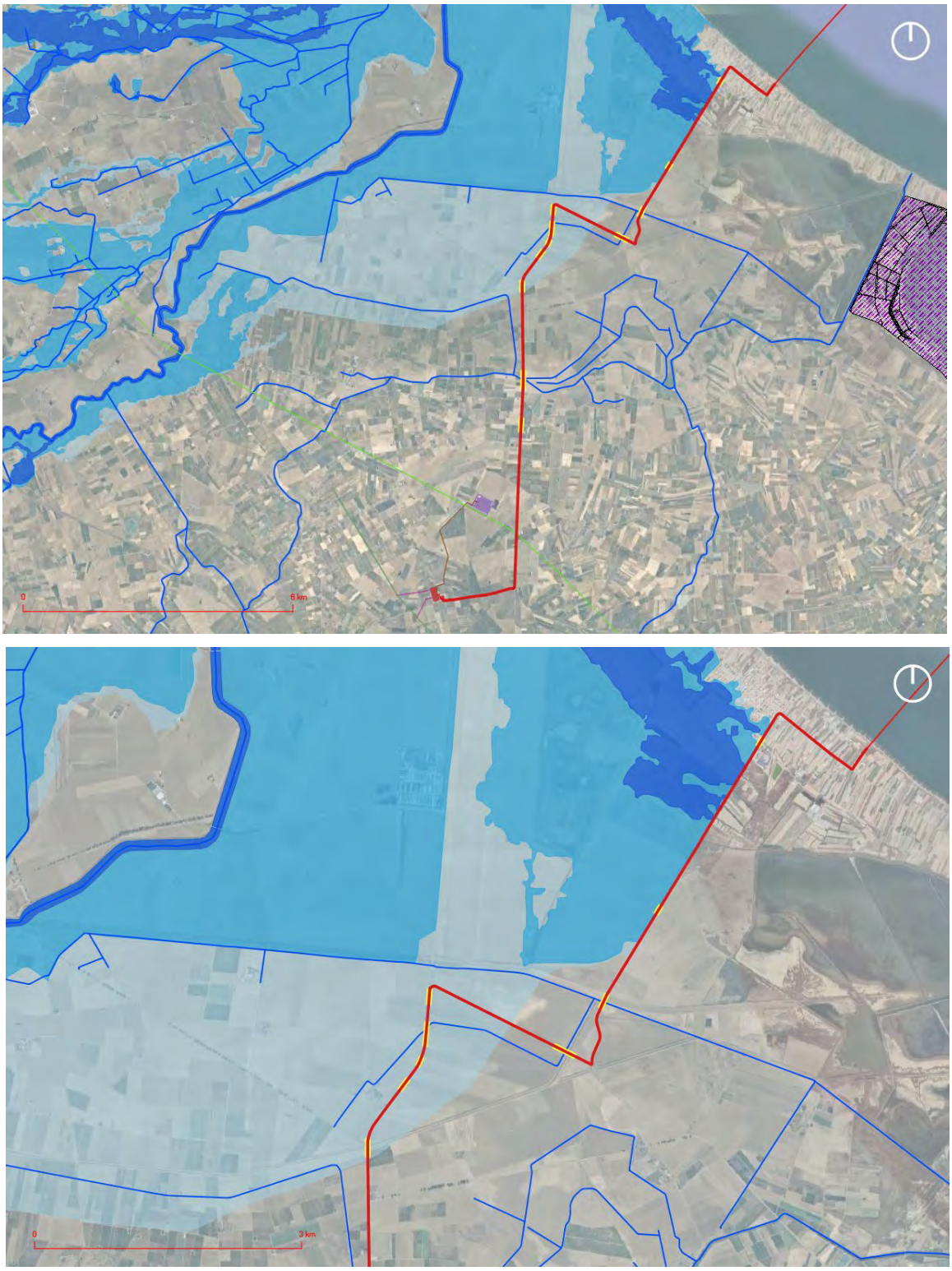
Balance between excavated quantities and backfilling with materials from excavations

All the material found from the excavations will be temporarily positioned at the edge of the excavation and then used for backfilling. **It is estimated that a percentage share to be reused for the filling of the cables, equal to about 70% of the materials coming from the excavations**.

The redundancies, equal to 30%, as calculated above, will be sent for disposal at authorized landfills. Especially It is expected to be delivered to authorized landfills, based on the assessments made in the project, the site identified for the transfer can be reached with a minimum of 14 km and a maximum of 25 km from the two ends and from the center of the intervention areas.

Landfill site, the routes in red from the center of the construction site and from the two ends

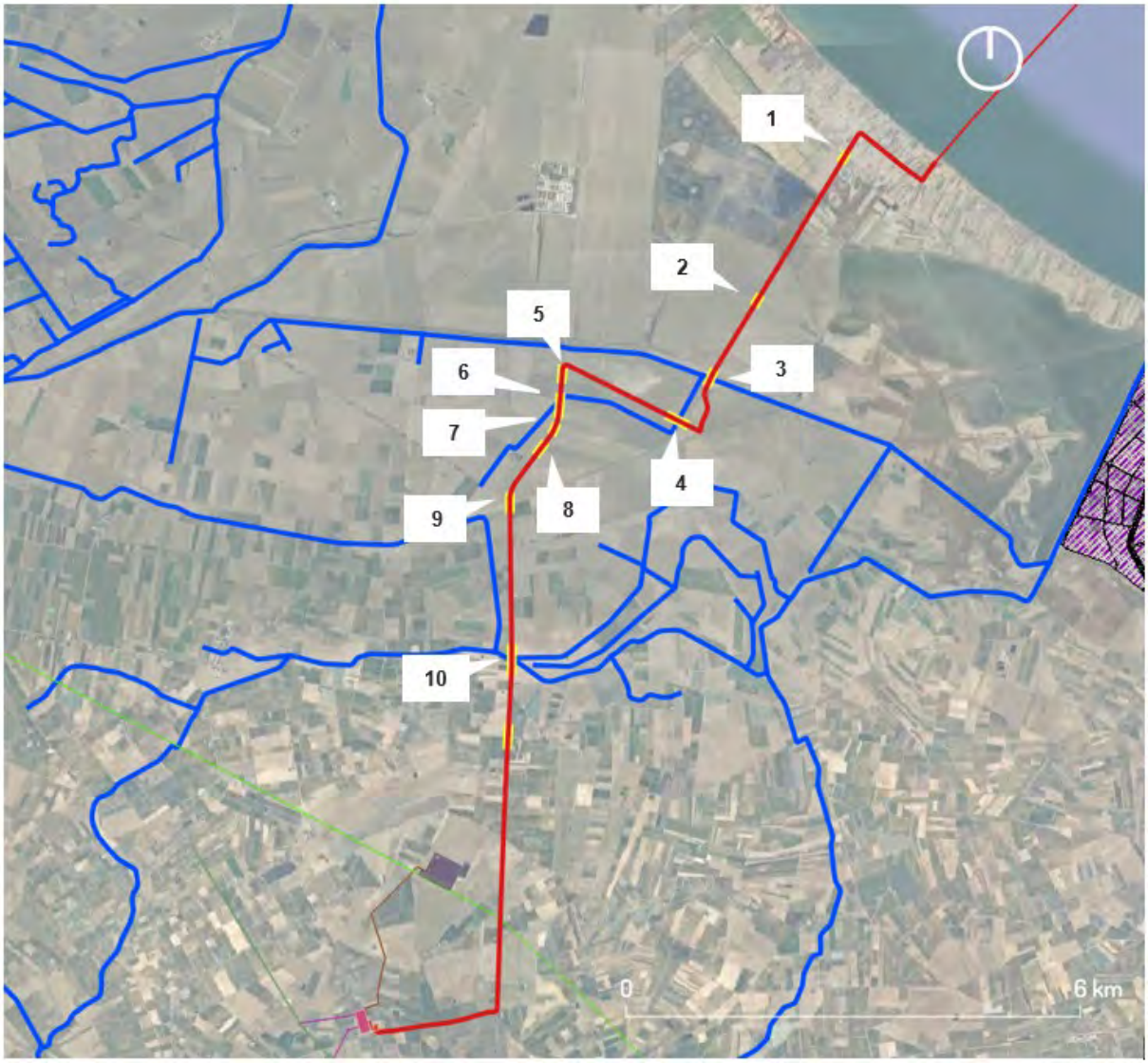
From a hydrographic point of view, the route of the connecting power line (onshore works), along its course is lapped by areas of high, medium and low hydraulic hazard and is affected by the presence of some hydrographic networks.



PAI constraints and hydrographic network along the route of the power line

The main interferences with the hydrographic network are a total of 4, however, following the inspections and surveys carried out along the route of the power line, the presence of several hydraulic manholes was detected, along the roads where the cable duct is to be laid, in addition to those present in correspondence with the official hydrographic network.

In particular, these are manholes crossing secondary hydrographic networks, which connect the dense network of reclamation canals present in the area of interest. Below is a diagram with an indication of the overall interferences identified.



Interference with the hydrographic network

All intersections with the hydrographic network or with unidentified canals will be resolved through the use of the technique of horizontal Directional Drilling, effectively eliminating any type of interference with surface water bodies.

As indicated in paragraph 4.1.4.1 and as can be deduced from the hydrogeological map, there is the presence of both the surface phreatic aquifer (Detrital Aquifer) and the deep aquifer, which, considering the heights of the area under consideration, is located at depths between 30.0 m a.s.l. and 35.0 m below sea level.

For this type of water body, the project is perfectly compatible with the territorial management and protection plans *(cf. R.1.6.1_01)*. **However, it is understood that all construction and monitoring measures will be implemented for protection, in order to ensure the maintenance of the state of environmental quality.**

By virtue of what has been reported, as far as construction sites are concerned, the underground cable duct has a development of about 18 km and that the temporary occupation of land will take place for

stretches of 85 meters only on existing roads and for the total duration of sixteen Months. As far as network works are concerned, the following consideration will apply:

- The technology designed for the new SUBStion andLettric – isolated in GIS - consentirà to drastically reduce land consumption and the area occupied compared to a traditional technology.

In order to minimise all impacts, appropriate measures must be taken to rationalise and contain the processing area, with particular attention to the service roads and the areas to be used for the temporary storage of materials near the excavations.

The impact assessed is **negative, low and reversible entity.**

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.4.2 Operation phase

The design choices to position the route of the underground cable along the existing road network with short transits on agricultural land and to overcome all interference with the hydrographic network by means of HDD, as well as the technological solutions for the new electrical substation make the impact on this component in the construction phase substantially nil exercise.

On the evaluation scale, if we want to take into account the areas involved in the new works, the impact considered will be **negative**, **of low magnitude**, **Non-reversible** as the duration is associated with the useful life of the plant and the new permanent network works.

It is understood that it will be the responsibility of the proponent to assess the state of qualitative conservation and/or the improvement of the interfered water bodies in accordance with the planning and organization plans of the territory.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.4.3 Decommissioning phase

In the decommissioning phase, very similar but reverse activities are planned to those planned during the construction phase. But linked to the decommissioning of user works only.

With a good approximation, we can say that the assessment of the impact on the component is similar to that estimated for the construction phase but with negligible magnitude.

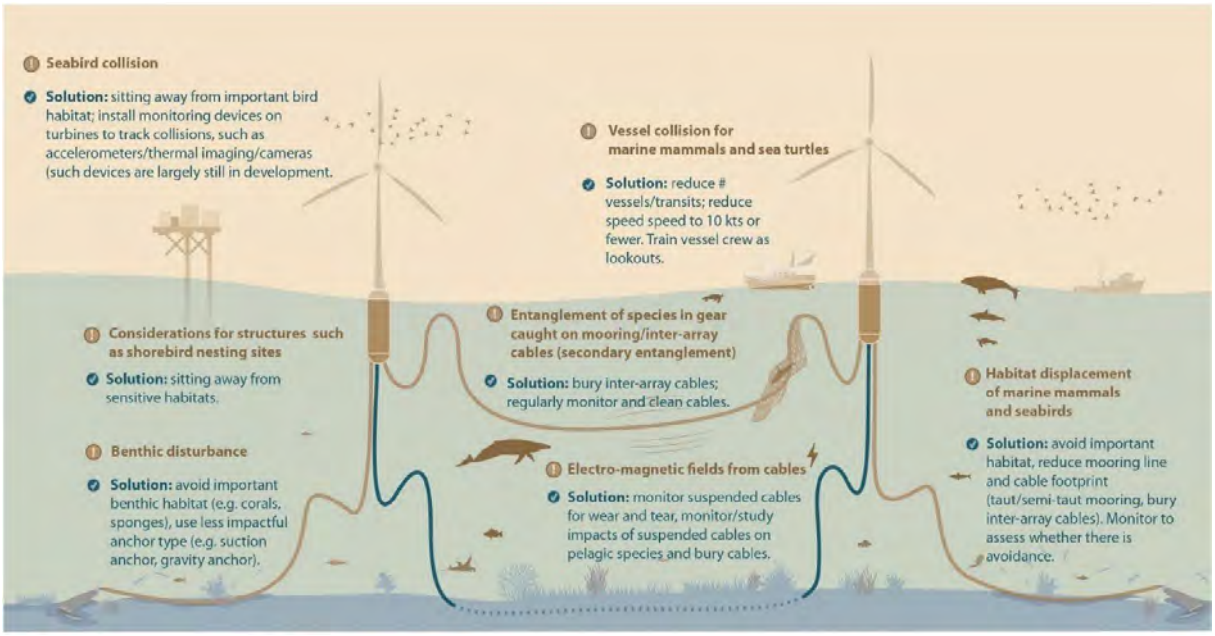
The same considerations already made in the previous paragraph for water bodies are to be implemented at the present processing stage.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.5 ESTIMATION OF IMPACTS ON NATURE AND BIODIVERSITY – INTRODUCTION

Offshore wind energy (OWE), although indispensable in the current international context, is not without potential impacts on the various components of the marine ecosystem and therefore the installation, operation and decommissioning of an offshore wind farm must be monitored and critically evaluated.

The most significant potential impacts and possible solutions are summarized in the Figure below.



Potential impacts of floating offshore wind and of the potential associated solutions. (Maxwell et al., 2022)

First of all, the seabed and the benthic habitat in the area are disrupted by the construction of a wind farm. *Situ* (Coates et al., 2014; Dannheim et al., 2020). The construction of wind turbine foundations and anchoring and piling platforms may require seafloor preparation (e.g. levelling), which is associated with mechanical disturbance of the seabed. The cables that connect the wind turbines and the wind farm to the mainland are generally placed below the surface of the seabed, resulting in disturbance to the seabed and benthic communities. The effects of mechanical disturbance due to the construction of an offshore wind farm can lead to subsequent changes, both negative (of disturbance and partial alteration as already mentioned) and positive changes in the physical environment (Van den Eynde et al., 2013), in the associated macro and megabenthos (Coates et al., 2014).

On the other hand, if we consider the pelagic habitat (Klunder et al., 2018; Mavraki et al., 2021) and related communities, noise generated during anchoring and piling activities can result in a change in the distribution of fish species and marine mammals (Nall et al., 2017; Brandt et al., 2018). In fact, once installed, an offshore wind farm determines an artificial barrier effect, with the rapid and extensive colonization of devices covered with sessile fauna (Krone, et al., 2013a; De Mesel et al., 2015), and the attraction of pelagic and demersal predators (Wilhelmsson et al., 2006; Reubens, et al., 2014), thus inducing a subsequent positive effect on the pelagic community of the site.

Furthermore, the presence of a structure that extends across the entire water column can lead to hydrographic changes such as the decrease or possible disappearance of stratification due to local turbulence (Floeter et al., 2017), through, for example, a micro *up-welling* of nutrients and, at the same time, a modification of local primary production and the flux of carbon to the benthos and the *Benthic-Pelagic Coupling* (Ricci et al., 2021).

Generally, there is always a repositioning of the fishing effort (BergstrÖm et al., 2014) associated with the construction of a new offshore plant. In this regard, it is necessary to specify how the structure of the wind farm can perform an unexpected function of ecological refuge for all fish species (of commercial or conservation interest), which could enrich the neighboring seabed exploitable by fishing in biomass, going so far as to guarantee the renewability of the fishery resource (Bailey et al., 2014). In this case, the exclusion of some or all fishing segments from the area could even lead, as happens in the case of the establishment of reserves in which fishing is prohibited (Marine Protected Areas, for example) to a significant local increase in the abundance of prey available for the *Feeding* top predators such as toothed whales, cartilaginous fish and some other species of teleosts (tuna, swordfish, amberjack, snapper, etc.) (Lindeboom et al., 2011).

However, a possible effect of an increase in fishing pressure in the areas adjacent to the offshore wind farm due to the redistribution of fishing effort should be monitored (Stelzenmüller et al., 2011). The emission of electromagnetic fields from submarine power cables can additionally, cause an effect on development, physiology and/or behavioral responses in invertebrates and sensitive fish (Scott et al., 2018; Hutchison et al., 2018; Solé et al., 2022).

In addition to all this, the indirect effects on macro- and megabenthos and on the bento-pelagic fauna must be taken into account (Krone, et al., 2013b; Coates et al., 2016; Hammar et al., 2016; BergstrÖm et al., 2013), as well as on the entire food web at the apex of which marine mammals themselves are found (Russell et al., 2014).

The Figure, which follows, well summarizes the main impacts that a wind farm could cause in a marine ecosystem (Galparsoro et al., 2022).

Potential impacts in the marine ecosystem

In the following paragraphs, the aspects described above are specified for each component and with reference to the proposed wind farm.

4.2.6 ESTIMATION OF IMPACTS ON NATURE AND BIODIVERSITY – AVIFAUNA

The relationship between birdlife and wind farms is rather complex and not always immediately quantifiable. As part of this study, the monitoring and evaluations contained in the series *SIA. ES.9*, in particular with regard to birdlife, field monitoring was carried out summarized in paragraph 4.1.5 and in the reports of the series "*SIA.ES.9 Nature and Biodiversity*".

4.2.6.1 Construction phase

The construction and assembly phase of the components the most significant impact on the birdlife derives from the displacement caused by the factor **"Disturbance"**.

This interaction could occur both during the construction and maintenance phases of the wind farm and could be caused by the presence of the turbines themselves during operation, as a result of the passage of a vehicle or personnel movements related to the maintenance of the site.

The scale and degree of disturbance will vary according to the site and species-specific factors and must be adjusted on a case-by-case basis.

Literature studies of onshore wind farms have recorded disturbance distances – that is, the distance from wind farms from which birds are absent or less abundant than expected – up to 800 m for wintering waterfowl (Pedersen & Poulsen 1991). In principle **600 m is the distance widely accepted as the maximum distance recorded**. The variability of displacement distance is well illustrated in a study that found a lower density of white-fronted geese (*Anser albifrons*) within 600 m of the turbines in a wind farm in Germany (Kruckenberg & Jaene 1999) while, in studies conducted in Denmark (Larsen & Madsen 2000), a displacement distance of between 100 and 200 m from the turbines was detected for the red-legged goose (*Anser brachyrhynchus*).

Studies conducted on the area affected by the implementation of the Nemetun Island wind farm have reported that the recorded seabirds belong to 8 species, six Larids and two petrels: Mediterranean herring gull (*Larus michahellis*), Black-headed Gull (*Larus melanocephalus*), Black-headed Gull (*Larus ridibundus*), Three-toed Gull (*Tridactyla brawl*), sandwich terns (*Thalasseus sandvicensis),* Black tern *(Chlidonias niger),* Cory's Shearwater (*Calonectris diomedea)* and Cory's Shearwater (*Puffinus yelkouan*).

In total, 125 contacts were made in the study area, involving 356 individuals. The species with the highest number of contacts is the Herring Gull (n=36); which is also the most abundant (34.3% of total individuals). Among the target species of this survey, the presence of the Cory's Shearwater (24.7% of individuals) and the Black-headed Gull (19.38%) is highlighted. The observations made would seem to confirm the non-representativeness of the area with regard to the main migratory routes, in fact in the face of the overall sampling effort no evidence has emerged in this sense, however the numerous variables must be considered and in order to fully understand the real migratory flow it would be essential to continuously monitor for the entire period both during spring and autumn.

The season with the highest number of contacts and individuals observed was autumn, mainly thanks to the presence of numerous shearwaters and Laridae.

79.2% of the observations concerned individuals in flight and of these as many as 92.9% at heights between sea level and 50 m.

Also of note is the observation of two individuals (1st calendar year 1cy) of Three-toed Gull, a species with predominantly pelagic habits, considered an irregular wintering in Puglia.

The migratory routes preferred by birds, most surveyed during these monitorings, follow the coastline, not crossing the marine area on which the wind farm will be built, since the width of the Adriatic south of the Gargano Promontory exceeds 200 km without any island capable of providing the fundamental thermals

necessary for birds of prey and gliders to make flights over long distances. TheThe passage of non-marine migratory birds was occasionally observed during the spring and mainly concerned individuals (in the case of the ror small groups.

In addition, it should be noted that the final stretch of the cable duct and its landing point fall within the SPA IT9110041 "Aloisa – Carapelle" which was recently established for the protection of the wintering habitat of the lesser merganser (*Mergus serrator*) which falls within the species of Community interest according to Directive 09/147/EC. Within the site there are also other species of wintering marine birds that are present in the Birds Directive (2009/147/EC) and in the Habitats Directive (92/43/EEC): *Gavia stellata, Larus melanocephalus, Melanitta fusca, Melanitta nigra, Podiceps auritus, Podiceps cristatus* and *Podiceps nigricollis*. Of these species, those with the largest number of individuals surveyed are *L. melanocephalus* and *P. cristatus.* Therefore, considering the importance of this site for these species, precautions will be taken in the construction phase for the laying of the cable duct, such as concentrating the laying activities of the last section of the cable duct during the months **Not** indicated as wintering (October-March) for the species *Mergus serrator* for which the SPA area was established. Precise monitoring is also envisaged to assess any impacts, which will be based on the ISPRA guidelines and manuals (in particular Manuals and Guidelines 190/2019), as described in the *S.7.1_02 Report.*

Maps indicative of the main migratory movements for each site investigated (on the left spring migrations, on the right the autumn ones); in red the main approach routes and in light blue the departure routes

Therefore, the impacts on the birdlife during the construction phase are considered to be short-lived and very low. In any case, a specific monitoring activity will be envisaged before the work, during the construction and in the subsequent phase of operation.

The overall impact assessment in the phase will be **negative, with medium and reversible entity.**

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.6.2 Operation phase

The data, collected in the "*ES.9.2_02_Avifauna - marine area monitoring"*, show that the total number of bird species detected in the project area is n°8 for the four seasons of the planned survey. Qualitative data have been acquired about the presence and distribution of fauna outside the project area, in particular between the project area and the coast. The species with the highest number of contacts is the Herring Gull (n=36); which is also the most abundant (34.3% of total individuals). Among the target species of this survey, the presence of the Cory's Shearwater (24.7% of individuals) and the Black-headed Gull (19.38%) is highlighted. The observations made would seem to confirm the non-representativeness of the area with regard to the main migratory routes, in fact in the face of the overall sampling effort no evidence has emerged in this sense, however the numerous variables must be considered and in order to fully understand

the real migratory flow it would be essential to continuously monitor for the entire period both during spring and autumn.

tabella coordinate dei vertici principali (WGS 84 fuso 33 n) coordinate geografiche espresse in metri

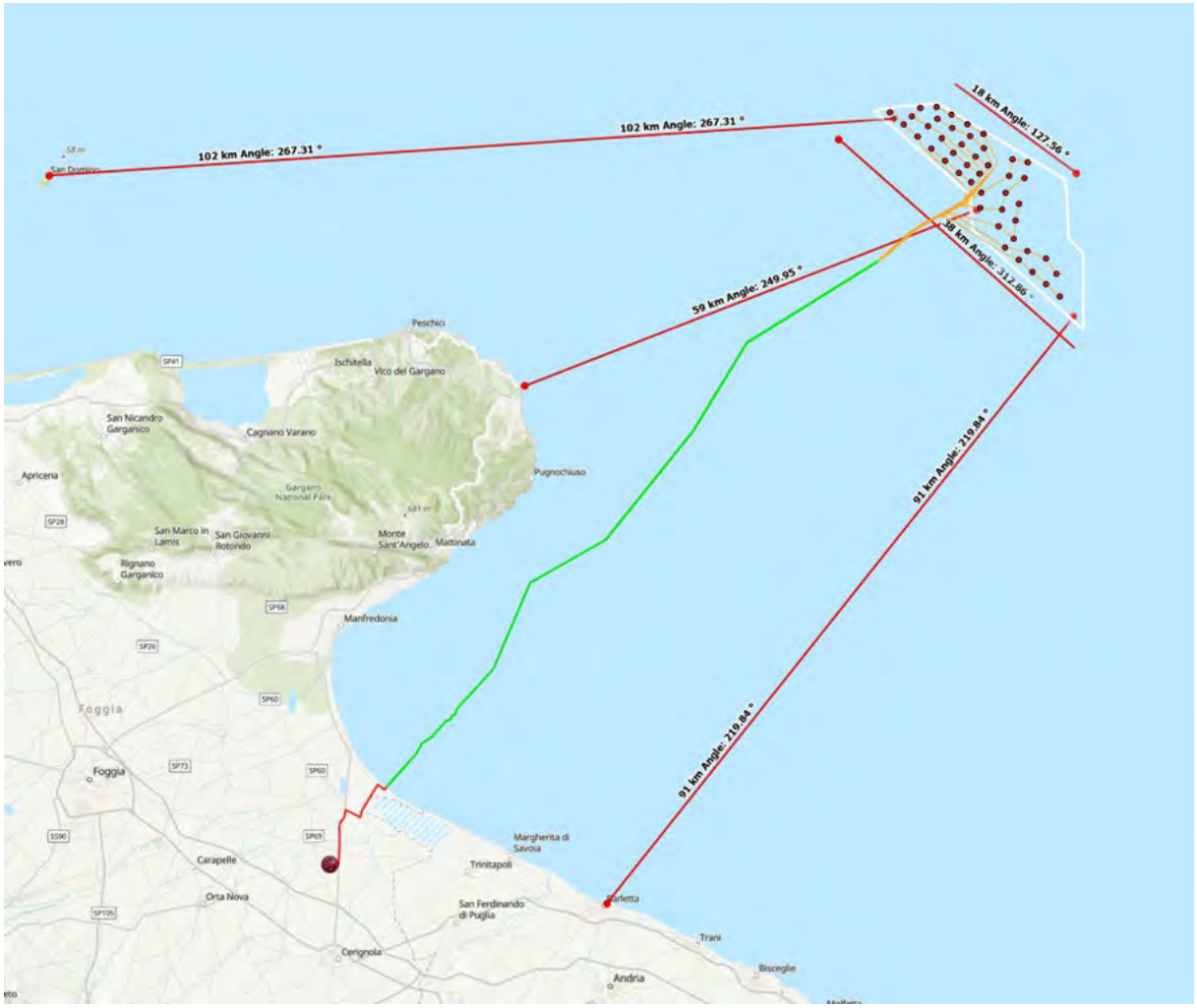
Vertice	coordinata Y (N)	coordinata X (E)
V1	4670597.5448	638627.8145
V2	4669738.4433	650976.3739
V3	4654869.5958	652153.7787
V4	4643479.5972	664419.8525
V5	4653440.1119	682574.1194
V6	4654989.3915	659825.2589
V7	4665468.2507	669578.5432
V8	4673282.9446	648567.8462
V9	4672944.978	641833.2768

superficie totale dell'area interdetta
24.167,3 ha

Area inhibited from navigation (see ES.4.2_01)

For the other species of birds surveyed, the attendance is occasional, linked to migratory transit or for some species such as Blackshank and Cory's Shearwater for trophic purposes.

The centre of gravity of the project layout (16° 54' 1" E – 42° 4' 59" N) of the Nemetun Island offshore wind farm is located approximately 115 km, equal to 62.1 NM from the Tremiti Islands; the nearest wind turbine in the project is about 102 km away, equal to 55 NM, while the furthest is about 124 km, equal to 66.9 NM. In total, the offshore plant in the project occupies an approximately trapezoidal surface, with a larger base of approx. 38 km, a smaller base of approx. 18 km and a height/depth that varies between 11 and 6 km; The total area occupied is approx. 82.3 km^2. Compared to the coast of Gargano (Vieste) the plant is about 59 km away, equal to 31.9 NM, while compared to the coast south of the promontory (Barletta) approx. 91 km, equal to 49 NM.



Distance (km) of the project from the Tremiti, Gargano coast and port of Barletta

The data, collected in the "*ES.9.1_01_Avifauna - Monitoring of migratory routes"*, they point out that the crossing of the Adriatic by birds of prey and gliders takes place almost exclusively north of the Gargano along the route that connects the Tremiti to the Pelagosa Islands, while no migration fronts have been recorded on E-W routes in the sites studied south of the Gargano. The width of the Adriatic south of the Gargano Promontory exceeds 200 km without any island capable of providing the fundamental thermals necessary for birds of prey and you have gliders to make flights over long distances. Therefore **the area where the Nemetun Island wind farm will be built does not seem to represent an obstacle for the migratory routes of these birds**.

The main impact factors for the operating phase are represented by:

1. **Displacement** - modification of the flight path to avoid the airspace occupied by the wind farm;
2. **Collision -** impact of a migrating bird with the blades of the wind turbine.

According to what is reported in the *ES.9.1_01*, it can reasonably be said that:

1. the planned offshore wind farm does not interfere with the migratory route of the Tremiti/Gargano Islands and the potential negative impact from **Displacement** for birds of prey and other species of large gliders, which use the migratory route of the Tremiti, it is to be considered **null value**. In fact the migratory routes observed on the Tremiti have a clear NE - SW orientation with a direction that reverses between the spring migration SW - NE and the autumn migration NE - SW; This

migration pattern overlaps perfectly with the theoretical migration route. The distances listed above show that the offshore wind farm project is located in a sea space at a considerable distance from the coast of central-northern Puglia. The birds of prey observed migrating on the Tremiti, and in particular the Honey Buzzard and Marsh Harrier, as well as other species such as kites, sparrowhawks and large gliders such as storks, cranes and numerous large Ardeidae, take advantage of the thermal currents to rapidly gain altitude (*Soaring*) and move over long distances by gliding (*gliding*) until it intercepts another thermal on the next island, which in this specific case are represented by the Pelagosa Islands about 70 km NE of the Tremiti, and from here continue for the last leap towards the Croatian coast approx. 45 km (Susàc Island). The migratory flow is therefore massive, individuals tend to concentrate and cross the group taking advantage of the best wind conditions, and strongly directional in order to minimize the stretches of travel on the sea.

2. migration takes place during the daylight hours with maximum visibility and that the flight heights of birds of prey and other species of large gliders are often well above the airspace occupied by the blades of the wind turbines, it can reasonably be said that the potential **Collision Negative Impact** is to be considered to be **low value**. In fact, the use of thermals by birds of prey, and other groups such as storks, pelicans and cranes, means that they migrate almost exclusively during daylight hours, when the thermals have their maximum development (Newton, 2008) and the visibility of the surrounding airspace is maximum. Studies conducted, with the use of radar, along the migratory route that crosses the State of Israel and the Red Sea (one of the most important migratory routes in the world for birds of prey and large gliders with millions of birds observed every spring) have analyzed the height reached in thermals by different species before "launching" into gliding flight. Leshem & Yom-Tov (1996) related the wing loading of some species of birds of prey and large gliders as a function of the heights reached in thermals, defining altitude bands for each of the species investigated. The study showed that a bird of prey with low wing loading such as the honey buzzard can reach a height of more than 1,000 meters above the ground with a speed ranging between 1.5 and 2.1 m/s in thermals, almost without flapping its wings (Newton, 2008). Other species of birds of prey as well as large gliders such as pelicans and storks can reach heights of over 800 m in a few minutes in thermals. From what has been reported above, birds of prey and other species of gliders migrate during daylight hours when the visibility of the airspace is maximum and from heights that can even exceed 1,000 meters above sea level. Given the location of the offshore wind farm "Nemetun Island" in the open sea and the distances from the Tremiti Islands and from the coast in general, it can be said that any birds of prey and gliders in general cross the airspace of the plant, in normal migratory flight conditions, at altitudes well above the height of the planned wind turbines. The verification of flight heights, although well characterized in other migration sites, would require confirmation for areas climatically closer to the one in the project.

For what has been said, also in this case the impact assessment will be **negative**, because there is a minimal risk of collision with bird specimens; will have a**negligible entity** as the position of the planting area does not intercept certain migration routes and that the possible collision with occasionally transiting specimens can be avoided thanks to anti-avian radar devices; Finally, the evaluation is classified as **Non-reversible** because it is extended to the entire period of operation of the plant.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.6.3 Decommissioning phase

With sufficient approximation in the removal phase of the Nemetun Island wind farm, the same assessments made during the construction phase for the impact component on birdlife can be reiterated.

The overall impact assessment in the phase will be **negative, with low and reversible magnitude.**

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.7 ESTIMATION OF IMPACTS ON NATURE AND BIODIVERSITY – MARINE FAUNA

As part of the activities of **monitoring, which covered 4 seasons of monitoring**, were carried out **Five sightings the different groups of striped dolphins**, **1 Bottlenose dolphin sightings**, the sighting of **2 groups of Risa** and **3 sightings of *C. caretta***. During the activity, acoustic detection was also carried out for a total of 63 hours and 42 minutes which made it possible to obtain information relating to the different vocalizations produced during the sightings made. Whistles, clicks and click trains were the main vocalizations heard and observed in real-time as spectrograms during the sightings of all the species of toothed whales encountered followed by burst pulses recorded only during the sighting of Risso's dolphins.

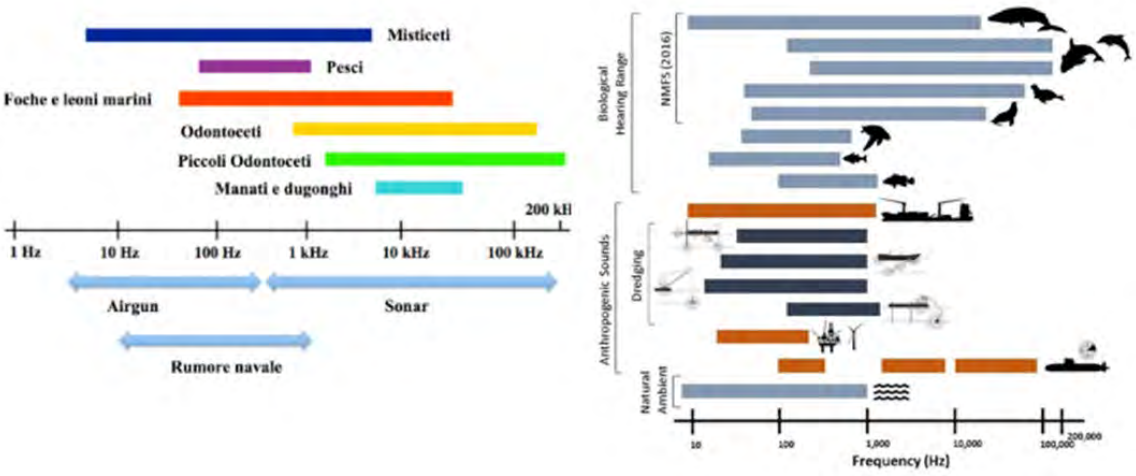
From the analysis of the photographic images taken during the entire campaign, it was possible to photo-identify the 5 individuals of bottlenose dolphins encountered in the autumn campaign and 22 of the 45 individuals of Risso's dolphin sighted in the winter and spring campaigns. None of the dolphin individuals encountered have been photo-identified. This result is expected because dolphins generally have little or no marked dorsal fin, making the application of this technique useless. On the contrary, bottlenose dolphins and Risso's dolphins are among the species with a very high number of visible and persistent markers and therefore allows an effective application of this technique.

Neither the photo-identified bottlenose dolphins nor the photo-identified Risso's dolphins were re-encountered during the entire annual campaign, however, future investigations to be carried out in the area will benefit from the existence of photo-identification catalogues already developed which may represent the preliminary knowledge base to refer to.

The *Coeruleoalba dolphin* And the *C. caretta* are two of the species for which EBSA 126 was established. A total of 135 individuals of dolphins have been sighted in different areas of the wind farm, in all seasons with a prevalent behavior of traveling and 3 individuals of *C. caretta* (in winter, spring and summer). It is therefore deducible that dolphins and loggerhead sea turtles may habitually frequent the area of the future Nemetun Island wind farm.

That is well known, mammals and other organisms of the megafauna can be affected in various ways by offshore wind farms. The main disturbance and risk factor for cetaceans associated with an offshore wind farm is the **underwater noise**. The European Community in the Marine Strategy Framework Directive has required in a specific descriptor of the quality of the marine environment that the introduction of energy into the sea, including noise, be considered as a precautionary measure, avoiding any type of transboundary pollution. This Directive (transposed in Italy with Legislative Decree 190/2010) recognized that "the intentional or accidental introduction of acoustic energy into the water column, from point or diffuse sources" represents a form of noise pollution and an emerging anthropogenic pressure, elevating it to the subject of specific studies (Licitra et al., 2015; Maglio et al., 2016) and regulatory legislation at international and national level (UNEP/CMS/COP12/Doc.24.2.2; ISPRA, 2011). In this regard, in the context of this EIS, studies have been carried out *ES.2.1_01_ Offshore Acoustic Surveys* and *ES.2.2_02_ Forecast Assessment of Acoustic Impact in offshore areas*, of which a summary is given below.

In the literature, cetaceans are defined as the major targets of acoustic stress (Southall et al., 2007, 2019; Ellison et al., 2012; Farcas et al., 2016; Dunlop et al., 2017; Faulkner et al., 2018), since they use sound not only to communicate, but also to orient themselves in the social and physical environment around them and to navigate and hunt/feed. The vocalizations of cetaceans are added to the natural noise of the underwater environment, drawing a complex acoustic landscape, represented in Figure (Urick, 1983).



Emission frequencies of misticeti, orDontocetes and their overlap with the frequencies of major sources of anthropogenic and natural noise (taken from McQueen et al., 2018)

As mentioned above, a **model for predicting the acoustic impact of the work**, contained in the report "*SIA.ES.2.2_02_ Predictive Acoustic Impact Assessment for Offshore Areas"*. In the study conducted by JASCO, to determine threshold values that can originate the first significant behavioral responses in the species of marine mammals considered, reference is made to the Italian guidelines of Borsani and Farchi (2011) on the study and regulation of noise. Although more recent studies on the impact of anthropogenic noise have been published (Southall et al. 2019, Southall et al. 2021), these are not currently considered by Italian legislation. The modelling concerns the two activities that have been considered to have the greatest impact in terms of potential underwater noise emissions for the construction and operation phases of the wind farm, i.e. the installation of anchors and the regular operation of turbines.

For the construction phase, the installation of anchors made with driven poles was evaluated: the source has been modelled taking into consideration the installation by means of pile drivers with a hammer with a maximum capacity of 550 kJ (**Impulsive pile driver noise**).

For the operational phase, the median (unscaled) noise profile of a turbine derived from the results of measurements taken at the Kinkardine Offshore Wind Farm was used as input for the model, with a broadband source level (10Hz-22kHz) of 152 dB re 1 µPa m for an individual turbine. The sound generated by the turbines during operation includes the generator and rotor, the gearbox, the moorings and the occasional operation of the pumps to balance the structure (**Continuous mooring noise**). Underwater noise propagation was carried out using the low-frequency parabolic equation (MONM) model combined with Bellhop for frequencies above 1kHz. The modelling for the construction scenario was carried out for a site that represents the most precautionary case, i.e. the wind turbine that will be installed where the water is deepest, and with an isotropic speed of sound profile (typical of the month of February) that favours propagation over long distances. For the operation phase, in addition to the most precautionary site, a site more representative of the entire wind farm was modeled, at intermediate water depths.

In the following paragraphs, the safety "distances" corresponding to the excess of the behavioral disturbance threshold are calculated. The threshold values that can give rise to the first significant

behavioural responses in the marine mammal species considered in this report refer to the Italian guidelines of Borsani and Farchi (2011) on the study and regulation of noise.

The values used are as follows:

VALUE TYPE	THRESHOLD
Excess threshold for behavioral disturbance for all hearing groups exposed to continuous noise according to ACCOBAMS (2013).	**120 dB re 1 µPa**
Excess threshold for high-frequency cetacean behavioral disorder reported as medium frequency in Borsani and Farchi (2011).	**110 dB re 1 µPa**
Excess threshold for behavioral disturbance of low-frequency cetaceans in Borsani and Farchi (2011).	**100 dB re 1 µPa**

Overage thresholds for behavioral disorder

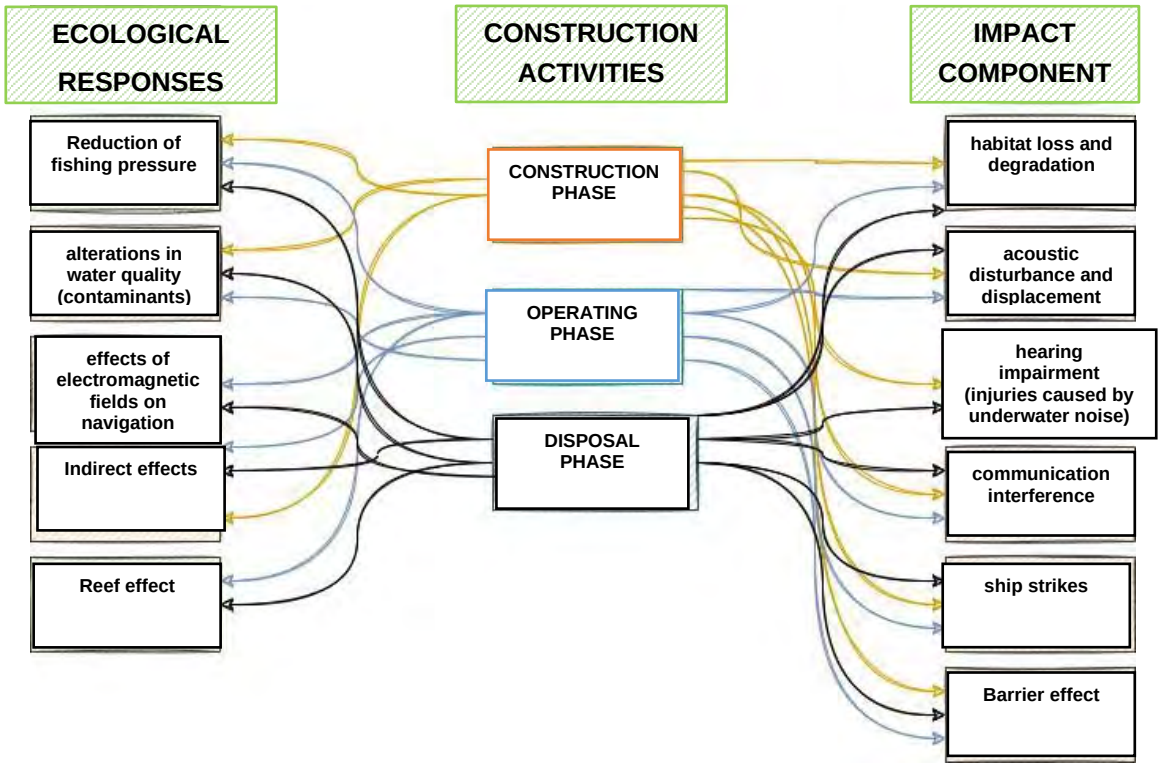
SPECIES	Received level per single pulse Cumulative SEL (dB re 1µPa² s)	non-impulsive noise received level Lp (dB re 1µPa)
minke whale (*Balaenoptera acutorostrata*) fin whale ((*Balaenoptera physalus*)	183 LF weighted Southall 2007)	100-110
Common dolphin (*Delphinus delphis*) Striped dolphin (*Stenella coeruleoalba*) Bottlenose dolphin (*Tursiops truncatus*) Risso's dolphin (*Grampus griseus*) Sperm whale (*Physeter macrocephalus*)	183 LF weighted Southall 2007)	110-120

Threshold values capable of originating the first significant behavioral responses in different species of marine mammals as reported in Borsani & Farchi (2011)

Another potential impact is related to the formation of **electromagnetic fields** following the laying and entry into operation of the power lines. From the state of the art of the scientific literature on magnetoception, it emerges that it plays an important role for many terrestrial and aquatic species, which use the Earth's magnetic field to orient themselves and navigate in the surrounding environment (Bauer et al., 1985; Walker and Dennis, 2005; Wang et al., 2007; Begall et al., 2008; Červený et al., 2011). Cetaceans are among those species that exploit the physiological process of magnetoception to travel long-distance migratory routes (Klinowska, 1988, 1989;) and therefore are affected by those variations, albeit slight (oscillations) of the Earth's geomagnetic field (Kirschvink 1990; Walker et al., 1992; Vanselow and Ricklefs, 2005; Vanselow et al., 2009). It has been shown that even minimal oscillations of the Earth's magnetic field, such as those that occur during geomagnetic storms, are correlated with cetacean stranding events (Figure 27, Ferrari, 2017).

Magnetic fields that are created by an electric current flowing through conducting cables can prevent the correct perception of the geomagnetic field (Smith Stegen and Seel, 2013).

Given the above, a variety of additional potential effects should be considered, the importance of which could increase in parallel with the improvement of the understanding of their significance for marine mammals and reptiles. The following graph schematically shows the variety of these impact components and their summary distribution over the life cycle of the plant.



Matrix of ecological pressures and responses

4.2.7.1 Construction phase

As highlighted in the matrix of pressures on the "marine fauna" component, the pressure on marine fauna in the construction phase is caused by the following components: *habitat loss and degradation, noise disturbance, visual or hearing impairment*, *creation of interference in communication, collision with boats, creation of "barrier effect"*. Below is a summary of the main factors and a reasoned assessment of the impact in the phase. Please refer to the section *SIA.ES.9* of the annexes to the Environmental Impact Assessment for further information.

Habitat loss

During the construction phase of an offshore wind farm, any loss of habitat can occur in the space used by the foundations and marine cable ducts. In the case at hand, this may concern effects on the biocoenosis of the seabed, on the SPA IT9110041 and on EBSA 126, but specific measures and design arrangements have been envisaged to minimise this impact, including:

- Installation in HDD and support of the marine cable duct in areas of greater biodiversity, or in the sections interfering with valuable habitats as detected as part of the investigations carried out;
- Choice to use floating or semi-submerged foundations who Reduce The occupation of the seabed;
- concentrate the offshore cable duct laying activities in the most coastal area during the months **Not** indicated as wintering (October-March) for the species *Mergus serrator* for which the SPA area was established;
- Iin anticipation of Compensation measures, compliant with the regulations and guidelines of the sector as better reported in detail in section. *6_Compensation and enhancement measures* of final project.

Acoustic disturbance and displacement, hearing impairment, interference in communication

During the construction phase, it is possible that the noises generated may temporarily drive away marine mammals.

As regards the underwater sound pressure levels attributable to the creation of the offshore wind farm and impacting on marine fauna, careful modeling was conducted in the report called "*SIA. ES.2.2_02_ Predictive Acoustic Impact Assessment for Offshore Areas".*

The results of modeling on Behavioral Disorder (displacement), were evaluated on the basis of the distance from the emission point in the following table, referring to the construction phase, taking into consideration the installation of the anchors by pile drivers with a hammer with a maximum capacity of 550 kJ, considered the noisiest machining compared to the other modeled ones.

For noise during construction with anchor piles, the behavioural disturbance threshold for cetaceans, corresponding to a weighted SEL of 183 dB re 1 µPa2s, for the single impulse generated by the driving activity with a maximum expected energy of 550 kJ is exceeded only within 70 m for low-frequency cetaceans. The radii corresponding to the peak threshold values (L_{Pk} 224 dB re 1 μPa^2) which are not exceeded for any auditory group of interest. For sea turtles, the distance of behavioral disturbance can extend up to 3.3 km. The impact on fish has been quantified for potential lethal or auditory damage (Popper et al. 2014); for these species, behavioral thresholds have not yet been quantified. Threshold levels for hearing impairment can be exceeded at distances of up to 600 m for the installation of a single pile in 24 hours at a turbine site. TTS for all types of fish can occur at a distance of 7.8 km for a single pile driven in 24 hours to a turbine site if an animal remained within that radius of the activities for the entire period.

For the sake of completeness, the cumulative impact of construction and operation activities with reference to the onset thresholds of PTS and TTS based on Southall *et al*. (2019) were calculated to determine the distances at which there is a risk of these physical harms to marine mammals and turtles. These thresholds are based on frequency-weighted levels depending on the hearing group of cetaceans and accumulated for the durations of actual operations, assuming that the receivers (animals exposed to noise) remain static for the duration of the activities. A 24-hour accumulation period was considered in line with Southall et al. (2019) although it is generally unrealistic for animals to remain in the exposed zone for such a long period of time.

For the construction phase, it was assumed that only one turbine anchor pile was driven to the site within 24 hours.

It should be reiterated that in the modelling it was taken into account that more intense blows are required as the pole penetrates the seabed, causing a gradual increase in noise emission partly compensated by the shorter length of the pole exposed. This security assumption is considered; A study based on the specific characteristics of the pile driver to be used and the actual progression of the energy of the hammer and the radiant surface in the water as the pile is driven would refine and could reduce these estimates.

Hearing group	Metric	threshold level	installation of an individual pile	
			Most representative case	
			Rmax (km) 10Hz-25kHz	R95 (km) 10Hz-25kHz
LF cetaceans	Lpeak (dB re 1µPa)	224	-	-
	Weighted SEL (dB re 1µPa²s)	183	0.07	0.07
MF cetaceans	Lpeak (dB re 1µPa)	224	-	-
	Weighted SEL (dB re 1µPa²s)	183	-	-
Sea turtles	Lp (dB re 1 µPa)	166	3.68	3.32

Construction phase: radii exceeding the threshold (in bold) corresponding to the first significant behavioral responses (impulsive noise) for marine mammal species present in the study area (Borsani and Farchi 2011) and for sea turtles

Weighted SEL (dB re 1 µPa2s)			Pile driving Most representative case	
			1 palo in 24 h	
			R_{max} (km)	R_{95} (km)
			10 Hz to 25 kHz	10 Hz to 25 kHz
LF cetaceans	PTS	183	8.84	7.57
	TTS	168	>57	>57
HF cetaceans (MF in Borsani & Farchi 2011)	PTS	185	0.1	0.1
	TTS	170	0.52	0.49
pinnipeds in water	PTS	185	0.82	0.76
	TTS	170	8.40	7.36
Sea turtles	PTS	204	0.52	0.50
	TTS	189	5.52	5.02

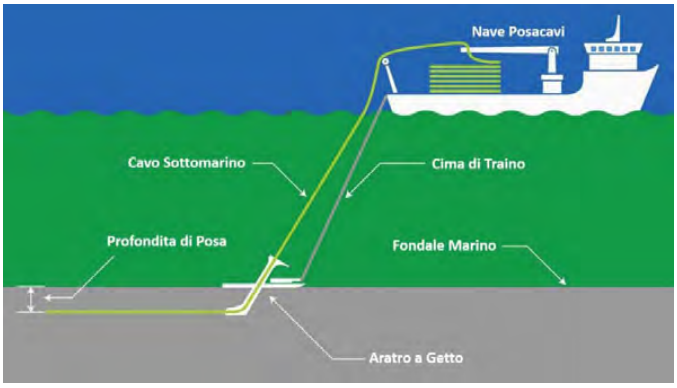
Construction phase - distances corresponding to the PTS and TTS thresholds for the different hearing groups of marine mammals according to Southall 2019 and for sea turtles. The '-' symbol indicates that the threshold is not reached

Type of animal	Damage type	threshold level	Metric	1 pile in 24h	
				Rmax (km)	R95 (km)
fish without swim bladders	Mortality (potential)	219	SEL24h	0.10	0.10
	hearing damage	216	SEL24h	0.11	0.11
	hearing damage or potential lethal injury	213	PK	0.07	0.07
fish with non-auditory swim bladders	Mortality (potential)	210	SEL24h	0.30	0.29
	hearing damage	203	SEL24h	0.63	0.60
	hearing damage or potential lethal injury	207	PK	0.16	0.16
fish with auditory swim bladders	Mortality (potential)	207	SEL24h	0.46	0.43
	hearing damage	203	SEL24h	0.63	0.60
	hearing damage or potential lethal injury	207	PK	0.16	0.16
fish of all species	TTS	186	SEL24h	9.95	7.81

Construction phase: distances corresponding to the damage thresholds for fish - deepest site. The '-' symbol indicates that the source level is less than the indicated threshold level. SEL 24 h is expressed as the unit of measurement dB re 1 µPa²·s while the peak level PK is expressed in dB re 1 µPa

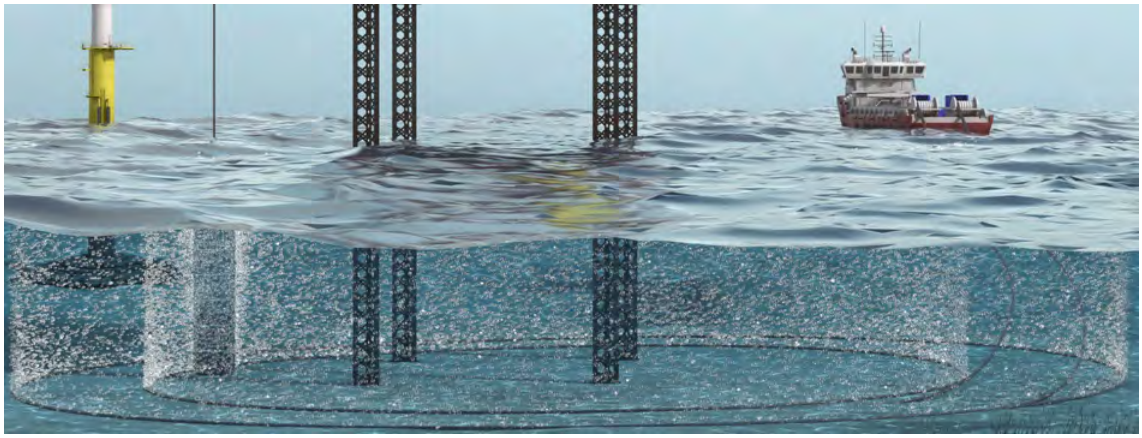
The possible anchoring solutions for the floaters of the Nemetun Island project are therefore suction anchors or driven piles, currently considered the most suitable anchoring solutions for the project. The selection takes into account both the type of sediments expected in the project area and the characteristics of the mooring system envisaged ('taut' system). As far as the environmental impact of these anchors is concerned, the installation (and eventual decommissioning) phase is the most critical. As far as the driven poles are concerned, the levels of noise pollution during the installation phase were assessed in the report *ES2.2_02* (above), while no studies have been carried out for suction anchors because they have particular advantages from this point of view since, unlike driven poles, their installation does not determine significant levels of noise pollution. In addition, suction anchors have additional advantages in the decommissioning phase, as they can be effectively removed by reversing the installation procedure (i.e. pumping water inside the caissons).

In order to keep the impacts deriving from the construction site/decommissioning works to a minimum, already in the design phase, theUse of Technologies that allow short times for noisier activities, such as the laying of underground submarine cable ducts and the construction of anchors for the moorings of floating foundations, using driven piles. For example, the technology used for the laying of the marine cable duct allows the installation of the entire underground section in just 78 hours.



Marine cable duct laying technology

The project includes a series of mitigation and attention measures - in line with the ISPRA 2012 technical report for noise containment and respect for the marine environment during the short period of execution of the most impactful works: from the reading of the modeled data it is possible to highlight that the exclusion zone *"Exclusion Zone"* to be dealt with with the operations of "*Mitigation"* it is in the order of a few hundred meters. In addition, with regard to the installation of anchors with fixed poles, 'bubble curtain' systems could be used to reduce noise pollution levels. In addition, systems could be used that reduce noise pollution levels, such as hydrohammer or technologies available on the market that can dampen the noise generated by the beating of the pole without affecting the efficiency and timing of installation.



Noise mitigation via bubble curtains

Vibration effect in the marine environment

Seabed vibrations caused by offshore wind farms have not yet been measured, either during the installation phase of the poles or during the operation of the wind turbines. Data acquired in the field will be essential to quantify the vibrational energy in the seafloor and the extent of the potential effects. The study of substrate vibrations and how they correlate with aquatic life is an important emerging field of research.

Although the installation of a floating wind turbine largely eliminates the creation of vibrations in the seabed by driving large piles requiring considerable percussive energy, it nevertheless requires the installation of

relatively small diameter anchor piles by driving, drilling or similar techniques which can induce vibrations even for a limited time.

As far as biological receptors of substrate vibrations are concerned, benthic taxa, i.e. animals that spend most of their time near the seabed or in contact with it, are of particular importance. Fish and invertebrates are known to be sensitive to the motion of water particles (Popper and Hawkins 2018), and invertebrates can detect seabed vibrations (Roberts et al. 2015, Roberts and Breithaupt 2016, Roberts and Elliott 2017). Substrate vibrations are in fact detectable signals for invertebrates and fish, and could interfere with communication mechanisms. It is known that fish's internal organs act as accelerometers, but the lower frequency they are able to detect is still unknown due to the limitations of measuring equipment. Fish and invertebrates including molluscs could potentially be impacted by masking important biological signals, behavioral changes, stress response, injury, and mortality (Solé et al., 2017; Mooney et al., 2016; Nedelec et al., 2014; Mosher, 1972; Ellers, 1995; Kastelein 2008.

The hearing of marine mammals is optimized to detect sound pressure and not the motion of water particles; The sensitivity of these groups to vibrations via the water column is therefore limited compared to fish and invertebrates. It is therefore believed that substrate vibrations are much less of a concern for them, as they would rarely be exposed by direct contact with the seabed. Mammal species that draw food from the seabed might sense the vibrations with their whiskers (for seals) or other biological sensors, but the most concrete concern about them would be the impacts on their benthic prey.

In the present state of knowledge, there are no parameters or criteria to quantitatively evaluate the effects of substrate vibrations on any form of aquatic fauna.

Collision with boats, barrier effect

There is a possibility of collisions between marine mammals and reptiles in the area and the ships associated with the construction of the proposed wind farm. It is, in fact, known that ship collisions with marine mammals and reptiles occur and can account for a large percentage of deaths. Vessels larger than at least 80 m are believed to cause the most injuries and fatalities, particularly those traveling at 14 knots or faster. It is also believed that slower or smaller vessels do not have such a significant effect (Laist et al., 2001).

In addition, potentially the activation of several simultaneous activities in the same area could increase the risk that this impact could make it difficult to move from one area to another.

In the case at hand, no high-speed vessels are expected to be used during the construction phase. In addition, the launching and towing operations of the wind turbines and floating foundations will be deferred over time with the Launching frequency of 1 *Floaters* every two weeks.

Water quality (contaminants)

The phenomenon of bioaccumulation in the same individual and in subsequent generations through lactation (Bustamante et al., 2007) makes vulnerability to toxic contaminants much higher in marine mammals than in marine reptiles. Most of the pollutants affected by this phenomenon are no longer used or released into the environment and, therefore, their presence is due to discharges made in the past and trapped in the sediments of the seabed. For this reason, the mobilization of suspended sediments, during the work affecting the soft bottoms, could cause local impacts of low magnitude and duration over time.

Industrial polychlorinated biphenyls (PCBs) are fat-soluble chlorinated organic compounds that can be ingested through food and cause damage to the reproductive and immune systems.

Any offshore plant requires the use of various chemicals such as: engine lubricating oils, hydraulic fluids and antifouling products to preserve the submerged infrastructure.

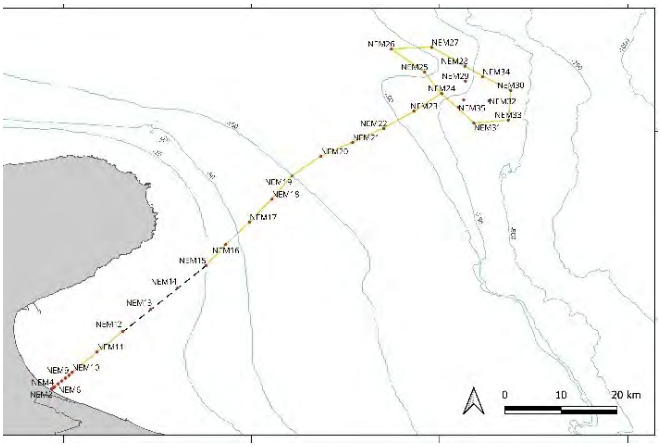
As part of the Environmental Impact Study, the following studies were conducted:

- an Evaluation of the extent of suspended material, the extent of the plume and the possible exceedance of clear water conditions, including the estimation of the duration of such exceedance in the excavated sections (cf. "*SIA.ES.7.2_01_Physical oceanography_modeling"*), referred to in the chapter on impacts on seabed biocoenoses (see Chapter 4.2.3);
- a Chemical and physical characterization of sediments (cf. "*SIA.ES.6.5_01_Chemical-physical, microbiological and ecotoxicological characterization of sediments and benthic communities and test reports of the analyses conducted"*).

The conclusions of the first study show that The turbidity generated during dredging operations is significantly lower than the turbidity generated by typical storm surges (natural turbidity after storm surges), which reaches maximum values twice as high. The concentration of the suspended material decreases to values of 100 mg/l, 20 mg/l and 2 mg/l respectively at distances of an average of 800 m, 7 km and 18 km on the south-east side with respect to the axis of the trench, the shape of the plume is almost symmetrical from the coast to Vieste, asymmetrical from Vieste towards the open with respect to the axis of the trench, with a greater extension on the south-east side of the same due to the typical hydrodynamics with current from North-West to South-East that detaches from the Gargano promontory to reattach in front of about Orno. The extent of the dispersion is similar in the different seasons, while its minimum extension occurs, overall, in winter. The layers affected by an appreciable concentration (>10mg/l) of suspended material are concentrated at the bottom, varying from a minimum of 2 layers offshore (on depths greater than 120 m) to a maximum of 6 layers in correspondence with depths between about 60 and 90 m. The most significant concentrations (>50 mg/l) occur, in most of the route, in the first 2 layers at the bottom. Observing the seasonal profiles, it can be seen that the greatest dispersion along the vertical occurs in winter, followed by autumn. The overcoming of the condition of clear water remains concentrated around the axis of the trench, with an asymmetrical shape towards the south-east due to the typical hydrodynamics. The maximum persistence value reaches only locally, in the excavation area, 72 hours. On average, the persistence is 12 hours up to depths of about 30 m, while it is 8 hours on higher depths. From a seasonal point of view, the least persistence in terms of both intensity and spatial extension occurs in winter, while the most severe combination occurs in spring. In winter, in fact, the column is mixed, so there is no confinement; therefore, the sediments are more distributed along the column and at the bottom the persistence is minimal. The analysis of the deposit at the end of each sliding window shows that the change in seabed is negligible (of the order of ten centimeters) and is limited to the circumference of the trench, for a total width of less than 1 km, with a symmetrical distribution around the axis of the trench.

The summer season is the one in which the effect of the works is less burdensome, due to the limited extension of the plume and the dispersion of the sediment along the seabed, while the winter season is the one in which the effect of the works is less burdensome due to the intensity and extent of the persistence of the condition of turbid waters.

The Study on sediment characterization and benthos refers to the Ministerial Decree of 24/01/1996, takes into consideration both the route of the wind farm's land connections and the area of the windfarm.



Sediment sampling stations

Sample collection

The following physical, chemical, microbiological and ecotoxicological determinations were made in all the sediment samples collected:

- Grain size,
- Percentage humidity,
- Own weight
- TOC
- Total nitrogen,
- Total phosphorus,
- Metals (Hg, Cd, Pb, As, Total Cr, Cu, Ni, Zn, V, Al, Fe),
- PAHs (Naphthalene, Acenaphthene, Acenaphthylene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[j]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Dibenzo[a,h]anthracene, Benzo[ghi]perylene, Indeno[1,2,3-cd]pyrene and their sum),
- Pesticides (Aldrin, Dieldrin, Alpha-HexachlorocycloHexane, Beta-HexachlorocycloHexane, Gamma-HexachlorocycloHexane, DDT, DDD, DDE, Hexachlorobenzene, Hexachlorobutadiene, Alachlor, Chlorfenvinfos, Chlorpyrifos, Endosulfan),
- Hydrocarbons C> 12 and C<12,
- PCBs (PCB 28, PCB 52, PCB 77, PCB 81, PCB 101, PCB 118, PCB 126, PCB 128, PCB 138, PCB 153, PCB 156, PCB 169, PCB 180, PCB 105, PCB 114, PCB 123, PCB 157, PCB 167, PCB 170, PCB 189 and their sum),
- Organotin compounds (TBT, DBT, MBT),
- Microbiological determinations (fecal and total coliforms, fecal streptococci).

The particle size determination showed sandy and pelitic sediments, with low % of gravel and, in general, without major differences in humidity values and specific gravity between the stations.

By dividing the stations between those falling on the route of the cable duct and the area of the Wind Farm, it is possible to highlight a higher content of TOC and TN in the sediments of the cable duct area, unlike the TP which, on the other hand, showed homogeneous levels between all the stations. In particular, TOC in sediments is considered a good indicator of organic pollution (e.g. Karichknoff et al., 1996). The TOC content measured in the sediments under this study is partly in line with and partly greater than the average TOC content (0.6%) measured in Mediterranean sediments (Emelyanov and Shimkus, 1986; Hyland, 2005).

The same spatial trend of the TOC and TN was detected, in general, also for metals and PAHs, whose peaks were mostly highlighted in stations falling on the route of the cable duct. Among the other organic contaminants analyzed, PCBs and organotin compounds are, respectively, very low and <LOQ at all stations. The levels of organochlorine pesticides were also generally lower than the LOQ, with the exception of ∑DDT and ∑DDE which, present in almost all samples, show a spatial trend similar to that described for metals and PAHs, i.e. with higher values in the stations of the route than those falling within the area of the Wind Farm.

The concentrations of all organic contaminants (PAHs, light and heavy hydrocarbons, PCBs, organochlorine pesticides and organotin compounds) in the sediments were, in all samples, either below the limits of quantification or below the most conservative normative reference values.

As far as microbiological investigations are concerned, from an environmental point of view, no situations of microbiological pollution in progress have been highlighted. In fact, the absence of faecal streptococci clearly indicates no previous faecal contamination, while the most recent one, identified through the levels of faecal and total coliforms, is zero in terms of *E. coli* (Faecal coliforms) and very low in terms of total coliforms.

Finally, the ecotoxicological assays showed a picture of general and widespread absence of toxicity both in relation to the criterion for evaluating the results of the batteries of three species by means of a classification approach"*pass to fail*" and by means of an approach "*weight of evidences*".

In general, it can be said that the area affected by the future implementation of the off-shore wind farm as well as the cable duct connecting the plant and the onshore station does not present serious critical issues from an environmental point of view, also considering the exceedances of the EQS of some metals, which could be attributable to specific human activities falling within the territory. In fact, according to ISPRA (2018) "the Apulian coast is characterized by the presence of important industrial and port activities (Bari, Brindisi, Manfredonia, Taranto, of which the last three have been identified as Sites of National Interest) which have led to an impact on the surrounding environment, and on the marine-coastal area in front, with a contribution of numerous organic and inorganic contaminants".

In conclusion, the impact assessment at this stage is **negative sign**, because the construction site is large and the impacts on fauna are still likely; Has **Medium entity** because of the design measures and the results of the studies conducted; can be defined **reversible** because it has a limited duration in time.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.7.2 Operation phase

There are many components capable of generating impacts on marine fauna during the operation phase. In the following examination, in order to assess the degree of impact pressure, the most significant ones of both negative and positive sign are analyzed.

Noise disturbance and displacement

In addition to the noise generated by construction, the operating phases (vessels involved in the maintenance and operation of wind turbines) can also lead to high levels of noise that could potentially generate permanent/temporary damage to the hearing system, distancing and behavioral disturbances for marine fauna.

The modelling carried out in the report "*SIA.ES.2.2_02_Predictive Acoustic Impact Assessment for Offshore Areas"* it also assessed the effects on marine fauna due to the operation of the wind farm with wind turbines, considering that the contribution of the boats involved in maintenance is very low.

Regarding the effects of the operational Nemetun Island plant on the Behavioral Disorder, with regard to the distances from the sources, we will have the following data:

Unweighted Lp (dB re 1 µPa²)	Operational phase Individual turbine – Representative Site		Operational phase Individual turbine – Deep Site		Operational phase Entire wind farm	
	Rmax (km) 10Hz-25kHz	R95 (km) 10Hz-25kHz	Rmax (km) 10Hz-25kHz	R95 (km) 10Hz-25kHz	Rmax (km) 10Hz-25kHz	R95 (km) 10Hz-25kHz
100	**0.67**	**0.63**	**0.56**	**0.55**	**3.30**	**2.07**
110	**0.18**	**0.18**	**0.18**	**0.18**	**0.22**	**0.19**
120	0.06	0.06	0.06	0.06	0.07	0.06
130	0.02	0.02	0.01	0.01	0.03	0.03
140	0.02	0.02	0.01	0.01	0.03	0.02
150	0.01	0.01	-	-	0.02	0.01

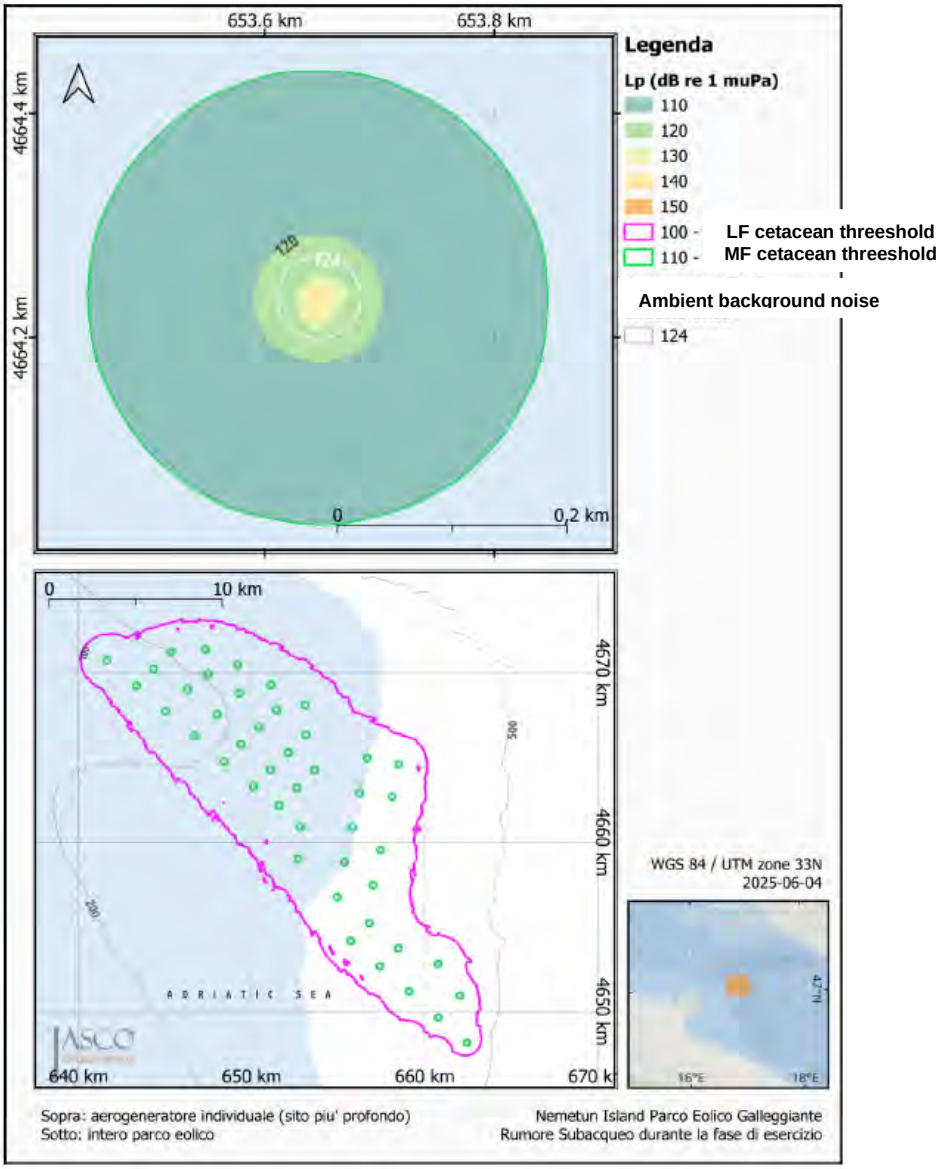
Operational phase: radii exceeding the thresholds (in bold) corresponding to the first significant behavioural responses (continuous noise) for the marine mammal species occurring in the study area (Borsani and Farchi 2011). The impact radii are presented for the two modelled individual turbines and for the wind farm as a whole.

For the operation phase, modelling for individual operational turbines shows that the unweighted impact distances are a few metres longer for the most representative site than for the deepest case of the farm. For both sites, the first threshold of behavioral disturbance is ~600-500m for fin whales (Lp of 100 dB re 1 µPa^2) and ~200 meters for dolphins and sperm whales (Lp of 110 dB re 1 µPa^2), referring to the lowest value for the onset of the disorder according to Borsani and Farchi (2011). Considering instead the totality of the wind farm consisting of 45 wind turbines, the R95% values shown in the following table show that the Lp of 100 dB re 1 µPa^2 is exceeded up to ~2 km and the Lp of 110 dB re 1 µPa^2 within 200 meters. The map in the following figure shows that the propagation occurs symmetrically throughout the wind farm. The excess of noise generated by the wind farm compared to the median environmental level measured in the field (Lp of 124 dB re 1 µPa^2, a 10-second time window) is also presented on the map. From this it can be deduced that the noise generated by each turbine remains above the ambient noise level only in a locally circumscribed area; this suggests that the noises (tones and creaks and squeaks of the catenaries) are discernible from the background noise only within less than 40 meters of the relative wind turbine.

The operating subsea noise is slightly higher than the ambient sound for the individual turbines and the overall fleet; however, sound levels drop to ambient levels (i.e. below an Lp of 124 dB re 1µPa calculated over 10 seconds) within a few tens of meters from the source in all scenarios explored for the operational phase. In addition, within less than 100 m of the turbine, levels drop by another 10 dB. The results obtained

show that during the operation phase of the farm, the noise generated by each turbine remains above the ambient noise level only in a locally circumscribed area; this suggests that the noises (tones and creaks and squeaks of the catenaries) are discernible from the background noise only within less than 40 meters of the relative wind turbine.

These results are consistent with what has been reported in other studies (Kraus et al. 2016, HDR 2019). Any behavioral changes caused by exposure to underwater sounds should be short-term and localized in areas adjacent to wind turbines.



Operation phase - distance maps to the various behavioral disturbance thresholds for marine mammals for a single turbine (top) and for the entire wind farm with reference to the excess of the ambient background noise level (bottom)

For the sake of completeness, the cumulative impact of operating activities with reference to the PTS and TTS onset thresholds based on Southall *et al*. (2019) were calculated to determine the distances at which there is a risk of these physical harms to marine mammals. These thresholds are based on frequency-weighted levels depending on the hearing group of cetaceans and accumulated for the durations of actual operations, assuming that the receivers (animals exposed to noise) remain static for the duration of the activities. A 24-hour accumulation period was considered in line with Southall *et al*. (2019) although it is generally unrealistic for animals to remain in the exposed area for such a long period of time.

Hearing group	Hearing damage	Weighted SEL	OPERATIONAL PHASE					
			Individual turbine				Entire wind farm	
			Deep Site		Representative Site			
Nomenclature according toSouthall 2019		(dB re 1µPa²·m)	Rmax (km) 10Hz-25kHz	R95 (km) 10Hz-25kHz	Rmax (km) 10Hz-25kHz	R95 (km) 10Hz-25kHz	Rmax (km) 10Hz-25kHz	R95 (km) 10Hz-25kHz
LF cetaceans	PTS	199	-	-	-	-	-	-
	TTS	179	<0.02	<0.02	<0.02	<0.02	0.026	0.023
HF cetaceans (MF in Borsani & Farchi 2011)	PTS	198	-	-	-	-	-	-
	TTS	178	<0.02	<0.02	-	-	<0.02	<0.02
Sea turtles	PTS	220	-	-	-	-	-	-
	TTS	200	-	-	-	-	-	-
pinnipeds in water	PTS	201	-	-	-	-	-	-
	TTS	181	<0.02	<0.02	<0.02	<0.02	0.026	0.023

Operation phase - distances corresponding to the PTS and TTS thresholds for the different hearing groups of marine mammals according to Southall 2019 and for sea turtles. The '-' symbol indicates that the threshold is not reached

Therefore, the wind farm would seem not to generate sounds that could cause a danger of damage to the auditory system of marine mammals. However, it is possible to provide for measures of operational mitigation, with safety areas and detection systems (radar) that interrupt the operation of the Nemetun Island plant in the event of the approach of large cetaceans beyond the threshold of risk of exposure. Pinnipeds in the water, on the other hand, inhabit marine areas below the coast, so the risk of exposure is very low. Due to marine sound levels below basic levels, other marine wildlife, such as turtles or fish, is unlikely to detect the sounds generated by wind turbines at great distances from the installation area.

Finally, it should be noted that the baseline acoustic climate measured in the studies conducted (see section 4.1.6 *and processed SIA.ES.2.1_01*) notes a marine environment marked by the presence of a strong background noise, and that the prohibition of navigation and fishing of the entire planting area.

tabella coordinate dei vertici principali (WGS 84 fuso 33 N) coordinate geografiche espresse in metri		
Vertice	coordinata Y (N)	coordinata X (E)
V1	4670587.5448	638827.8845
V2	4660738.4433	650176.3728
V3	4654868.5958	652153.7787
V4	4643479.9772	664418.8525
V5	4653440.118	683574.1184
V6	4656989.2915	678625.2589
V7	4665458.2507	669378.5432
V8	4673282.9446	648567.8462
V9	4672944.978	641831.2758

superficie totale dell'area interdetta
2418.73 ha

Area inhibited from navigation (see ES.4.2_01)

Despite the contribution due to the presence of the implant, it is possible to expect that during this phase there will also be favorable effects on the acoustic climate of the area and consequently on marine fauna.

Vibration effect in the marine environment

When considering the vibrations of the seabed, a floating wind turbine is preferable to reduce possible impacts on aquatic fauna as it avoids the presence of a large diameter pole directly driven into the seabed. The latter transmits the vibrations caused by the movement of the blades and mechanical elements to the water column (Sigray and Andersson 2012), and to the seabed. Seabed vibrations caused by offshore wind farms have not yet been measured, either during the installation phase of the poles or during the operation of the wind turbines. Data acquired in the field will be essential to quantify the vibrational energy in the seafloor and the extent of the potential effects. The study of substrate vibrations and how they correlate with aquatic life is an important emerging field of research.

During the operation of the turbines, it can be expected that some transmission of vibrations from the floating platform to the anchor points can occur if the mooring lines (chains or cables) are under high mechanical tension. The mooring system itself can generate noise and vibration associated with its movements. **However, these coupling mechanisms are not expected to transmit much vibratory energy to the seabed; However, this point represents a knowledge gap that requires field measurements.**

As far as biological receptors of substrate vibrations are concerned, benthic taxa, i.e. animals that spend most of their time near the seabed or in contact with it, are of particular importance. Fish and invertebrates

are known to be sensitive to the motion of water particles (Popper and Hawkins 2018), and invertebrates can detect seabed vibrations (Roberts et al. 2015, Roberts and Breithaupt 2016, Roberts and Elliott 2017). Substrate vibrations are in fact detectable signals for invertebrates and fish, and could interfere with communication mechanisms. It is known that fish's internal organs act as accelerometers, but the lower frequency they are able to detect is still unknown due to the limitations of measuring equipment. Fish and invertebrates including molluscs could potentially be impacted by masking important biological signals, behavioral changes, stress response, injury, and mortality (Solé et al., 2017; Mooney et al., 2016; Nedelec et al., 2014; Mosher, 1972; Ellers, 1995; Kastelein 2008).

The hearing of marine mammals is optimized to detect sound pressure and not the motion of water particles; The sensitivity of these groups to vibrations via the water column is therefore limited compared to fish and invertebrates. It is therefore believed that substrate vibrations are much less of a concern for them, as they would rarely be exposed by direct contact with the seabed. Mammal species that draw food from the seabed might sense the vibrations with their whiskers (for seals) or other biological sensors, but the most concrete concern about them would be the impacts on their benthic prey.

In the present state of knowledge, there are no parameters or criteria to quantitatively evaluate the effects of substrate vibrations on any form of aquatic fauna.

Mixing and oxygenation of the water column

The water column has a seasonal stratification called a thermocline that reduces as solar energy decreases and wind strength increases, leading to a consequent mixing of water and exchange of nutrients between the bottom and the surface of the column. This seasonal process influences the productivity of the water column, as well as the dynamics of the food web (Carpenter et al.,2016; Dannheim et al., 2020). Studies of stationary wind farms in the North Sea have shown that a single turbine can increase local water mixing by 7-10%, up to about 1 km from each turbine (Schultze et., 2020). A significant reduction in stratification could be possible after a large-scale development of fixed offshore wind farms, but it is not yet clear whether this impact can have positive or negative effects on marine ecosystems. However, the use of floating or semi-submersible platforms has less impact on the mixing of the water column, the Floating offshore wind farms can, yes, increase turbulence by promoting water mixing, but on a local scale (Carpenter et al., 2016; Cazenave et al., 2016), these effects are extremely localized, within a 100 m buffer around the structure. Water mixing, temperature, salinity, nutrient presence and the amount of marine biomass can also affect the oxygenation of the sea.

From the analysis of the interactions between the waves and the Nemetun Island wind farm, present in the *ES.7.2_01_Physical Oceanography Modelling*, the following is quite clear:

- in terms of large area, the reduction in wave height is such that it cannot determine any significant variation in the oxygenation of the water, both near the wind farm areas and along the coast;
- locally, in the wake of the turbine piles, the greatest variations are recorded, but it must be taken into account that, due to the presence of floating foundations, this variation is certainly accompanied by greater turbulence of the wave motion, a condition that favors better oxygenation locally.

In consideration of this, there should be no reduction in the phenomenon of oxygen diffusion along the water column attributable to the attenuation, albeit local, of wave motion, currents and wind, since the diffusion process is articulated on different spatial scales.

The effect of the current parameters on the populations could have a greater impact on the nursery areas. This phenomenon was analyzed by "in situ" measurements of the current parameters (speed, turbulence,

etc.) along the water column and video recordings of the type and abundance of the different species. Research on fish, for example the work of Parsons et al. (2015), shows that the reduction of speed and turbulence are both positive elements, because they determine greater protection (the "refuge" area effect), effectively increasing the abundance of typical species. Therefore, although there are minimal changes to the surface wave regime, the possible effects at intermediate depths and at the bottom will still be lower than the surface ones and therefore any impact on nursery areas and organisms in general will be completely negligible. For further information on this aspect, please refer to the *ES.9.5_01_Potential Impacts on Marine Biodiversity*.

Barrier effect

The presence of wind turbines and related anchoring infrastructures could represent an impediment to the movement of marine mammals and reptiles. To date, however, there are not enough monitoring carried out that can highlight the influence of this aspect on the behavior of the fauna.

In the case in question, the high distance (minimum 1.5 km) between the wind turbines and the structures in the project is underlined, the impact of this component is therefore not to be considered significant for marine fauna.

Reef effect

The phenomenon of biofouling represents the accumulation, with increasing complexity, of living organisms, coming from the plant and animal kingdoms, unicellular and multicellular, on supports or surfaces immersed in an aquatic environment. These biotic structures include many levels of functional and structural complexity: they are continuously adapting to the environmental conditions of marine ecosystems and represent an element capable of altering the food chain on the water column.

The different stages of development can attract predators (molluscs, crustaceans, fish) that could potentially positively affect the presence and richness of marine mammals and reptiles.

In the present case, this effect, combined with the prohibition of navigation and fishing in the scoping area,it wants the birth of hard-core communities that would increase the biodiversity present. For further information on this aspect, please refer to the *ES.9.5_01_Impatti potential on marine biodiversity*.

Alien species

Alien species also known as *Non-indigenous species* (NIS) are species, subspecies or lower taxa, introduced outside their original potential and actual range of distribution (EU Regulation 1143/2014). Their introduction is the result, intentional or not, of human activities. The Mediterranean Sea is considered a hotspot of biological invasions, hosting over 700 NIS (Galil et al., 2018; Bailey et al., 2020). Over time, the Mediterranean has undergone drastic biological changes, which have sometimes involved the replacement of most of its biota. These changes, however, have occurred naturally over thousands of years due to, for example, extreme variations in environmental conditions (Rilov & Galil, 2009). In the Anthropocene, human activities (especially shipping and aquaculture) are leading to changes in biodiversity that are comparable but are occurring at a much faster rate and on shorter timescales (Rilov & Galil, 2009; Giangrande et al., 2020). The opening of the Suez Canal in 1869 facilitated the arrival of new Indo-Pacific species and climate change is favoring further migrations in the Mediterranean which, in the last five decades, have resulted in the highest rate of biological introductions (Mannino et al. 2017; Zenetos et al. 2017; Galil et al. 2018). Each of these "pathways" can have different "vectors" that represent the means by which the species were transported (Minchin et al., 2009; Olenin et al., 2014).

Biological invasions are currently a source of great concern globally, they are considered the second greatest threat to biodiversity, after habitat destruction. They are not only important to understand, however, for their ecological and economic impacts, but they are also important for other important biogeographical processes such as long-distance dispersal, adaptation and range expansion processes (Viard et al., 2016; Katsanevakis et al., 2016; Ulman et al., 2017; Servello et al., 2019).

However, the establishment of NIS in an environment does not necessarily imply the initiation of a biological invasion that can lead to degradation effects on ecological communities and with repercussions on the entire ecosystem.

Submerged artificial structures can either be colonized by native organisms (see reef effect, elaborated *ES.9.5_01*), which act as a stepping stone for the dispersal of the larval stages of alien species (Coates et al., 2014). Some areas of the sea are affected by multiple activities; in others, only a few may be significant. Overall, more activity is expected towards 2030 for aquaculture, renewable energy and tourism, and an increase in the impacts of climate change, including on the Mediterranean Sea. Therefore, estimation of their potential stepping stone effect for NIS is necessary. In particular, it is useful to understand how infrastructures for the production of energy from renewable sources (wind, wave and tidal energy) contribute and to what extent to this bioinvasion compared to other structures and activities related to the exploitation of the marine environment already widely distributed globally (e.g. maritime traffic, aquaculture). It is well known that the structures useful for the installation of an offshore wind farm, like any hard substrate present in the sea (piles, catenaries, basements, submerged platforms, etc.), can be considered substrates that can potentially be exploited for the settlement of benthic sessile species. Therefore, they could potentially favor processes of diffusion of alien species in the areas surrounding the plant, requiring an assessment of possible risks and potential negative effects on biodiversity and ecosystems (Galparsoro et al., 2022; Lloret et al., 2022). The literature information on the presence and distribution of NIS species in the Adriatic basin and in the area affected by the work in question show a high presence of alien species but a very low impact of NIS for priority habitats; however, they do not allow us to exclude that the structures used for the installation of wind turbines may contribute to the potential spread of these species. In considering the potential process of establishment and spread of alien species, it is necessary to take into account the location of the plant in terms of geography and bathymetric range. In the case of the "Nemetun Island" offshore wind farm (southern Adriatic), the plant extends over the Italian Continental Shelf, at a minimum orthogonal distance from the Italian coast of about 55 km, equal to about 29.69 NM, and the seabed pertaining to the work is between the bathymetric depths of 100 and 500 m.

Studies carried out on the effects of NIS colonization and spread in port areas of Australia, report how artificial substrates introduced into the marine environment can contribute to an increase in the settlement of these species up to 2.5 times higher than that of native species (Glasby et al., 2007). However, it should be emphasized that these effects have been observed in intertidal environments characterized by tidal range, analyzing the communities of benthic organisms present on pier piles at a depth of about 1.5 m. A similar study, conducted in the North Sea on wind turbine poles, investigated NIS communities and settlement up to a maximum depth of 20 m (De Mesel et al., 2015). Such environments near the coastline or the surface of the water are characterized by a high environmental variability, where stress due to the action of various environmental factors (temperatures, salinity variations, hydrodynamics, etc.) can favor the spread of alien species. In particular, temperature is the most important factor that affects the spread of these thermophilic species, which respond positively to water warming. De Mesel et al. (2015) also points out that as the depth increases, after about 10 m, the NIS tend to decrease and show lower settlement rates.

Deepening the aspects related to the relationships between species and temperature, the question emerges concerning a possible effect of the plant structures on the modification of the thermohaline

condition of the waters, with the consequence of indirectly favoring or not the diffusion of NIS even in the deep environment. One of the few studies carried out in detail on these aspects concerns an offshore plant characterized by 80 turbines driven with piles on a seabed of 40 m depth in the North Sea (Germany) (Floeter et al., 2017). In the investigated area, a change in temperature and salinity conditions in the surface layer was detected within 30 m depth, while below this bathymetric limit no particular variations in the hydrography of the site emerge. In addition, the same study observes the absence of effects of the plant on the distribution of pelagic fish, indicating the absence of influences on possible migrations to deeper areas that the piles of the plant could determine. In general, the authors underline how difficult it is to discriminate anthropogenic disturbance from natural disturbance in the study of the changes observed in the chemical-physical structure of the water column. Although the study was conducted in a different geographical area from the Mediterranean, it should be noted that these effects have been studied on rigid and fixed structures such as piles, which influence the hydrodynamic aspects more than chains and floating support forms such as those identified for the "Nemetun Island" wind farm. Therefore, to the best of available knowledge, these observations indicate a very low risk of NIS spread in the deep environment, given that the location of floating plant structures affects areas far from the coast for seabeds with depths greater than 100 m, where temperatures are between 14-16°C.

It should be noted, however, that it may be appropriate to investigate and monitor the surface areas of the installed structures where the possibility of settlement of juvenile forms of pelagic species, such as jellyfish polyps, could increase. In particular, it has been observed that, in general, human infrastructures at sea could have effects in facilitating the settlement of jellyfish polyps, favoring population increases over time (Duarte et al., 2013). However, in this global study, we are referring to human infrastructure in a general sense, and it should be noted that no settlements of polyps on piles or wind turbine infrastructure were observed. Therefore, paying attention to this aspect with monitoring of the plant and the hydrography of the area could be useful to better understand if the risks of spread associated with the plant structures are real.

The assessment of the diffusion effects of NIS, potentially facilitated by offshore wind farms, must overall take into account an increase in biodiversity in the area where the ecological community tends to evolve on the basis of trophic interactions (Zupan et al., 2023). The increase in biodiversity is driven as much by the availability of new settlement substrates as by the refuge and conservation effect. *spill-over* induced by protected areas by the installation of turbines (Halouani et al., 2020). The refuge effect, which is essentially represented by the limitation of fishing activities and other disturbances within the area of the wind farm, can favor the aggregation of top predators in the area that can intervene in the control of the NIS and in the stabilization of the entire food network. In particular, if the beneficial effects also affect the increase in populations of planktivorous and bentivore species of intermediate trophic levels, then there could also be trophic control effects on plankton components and benthic larval stages. This condition substantially limits and reduces the risk of any uncontrolled spread and proliferation, which in any case does not affect the deep environment near the plant.

In view of what has been described, further monitoring will provide more details regarding the presence of alien species in the project area and that they can potentially exploit the submerged structures to spread in the marine ecosystem. A monitoring plan is therefore prepared for the NIS potentially present both in the port areas affected by the project activities and in the wind farm area, as well as the mitigation measures to be implemented to avoid their spread, as well described in the report *S.7.1_02_Environmental Monitoring Plan – Report.*

Please refer to the *ES.9.5_01_Potential Impacts on Marine Biodiversity* for further information.

Electromagnetic field effect

Within the SIA, a qualitative and quantitative assessment of the emission of EMFs in the offshore environment has been launched (elaborated *ES.3.2_01_Assessment of Electric and Magnetic Fields in Offshore Areas*) and the possible effects generated by the electromagnetic fields emitted by underwater cable ducts on marine fauna. In particular, literature searches were carried out by overlapping the results obtained from it with the data deriving from the surveys and sampling carried out for the SIA of this project.

It is known that several marine species are sensitive to electromagnetic fields (EMFs): from elasmobranchs, known to possess specific receptor cells for this type of radiation, to turtles, fish, molluscs, crustaceans and mammals. Broadly speaking, all these taxa have the ability to sense the Earth's magnetic field to orient themselves and perceive the presence of potential predators (Hutchison et al., 2018). Therefore, the generation of EMFs deriving from anthropogenic activities can interfere with those naturally present in the marine environment and cause variations in the behavioral patterns of different species. Data from a study conducted by a group of researchers from the University of Bologna and the INGV of Cagliari show that the geomagnetic intensity in the Mediterranean area is around 20 μT with a standard deviation of 5 μT; therefore, the marine organisms that populate this part of the planet are accustomed to constant variation in geomagnetic fields.

Several studies conducted to understand the dynamics of this phenomenon have shown contrasting effects for different fish species (Agency, 2013; Wyman et al., 2018; Hutchison et al., 2018). From the state of the art of the scientific literature on magnetoception, it emerges that it plays an important role for many terrestrial and aquatic species, which use the Earth's magnetic field to orient themselves and navigate in the surrounding environment (Bauer et al., 1985; Walker et al., 2002; Wang et al., 2003; Burda et al., 2009; Červený et al., 2010). Cetaceans and turtles are among those species that exploit the physiological process of magnetoception to travel long-distance migratory routes (Klinowska, 1985, 1990) and therefore are affected by those variations, albeit slight (oscillations) of the Earth's geomagnetic field (Kirschvink 1990; Walker et al., 1992; Vanselow and Ricklefs, 2005; Vanselow et al., 2009; Ferrari et al., 2017; Smith Stegen and Seel, 2013). Sea turtles are known to use multiple signals (both geomagnetic and non-geomagnetic) for navigation and migration. However, conclusions about the effects of magnetic fields from submarine cables are still hypothetical as it is not known how sea turtles detect or process magnetic field fluctuations. In addition, some experiments have shown the ability to compensate for any course errors; therefore, the absolute importance of the geomagnetic field is still unclear (Normandeau et al., 2011).

Normandeau et al (2011) report that there is behavioral, physiological and anatomical evidence indicating that some vertebrate species are able to detect electric or magnetic fields. However, most of the available data comes from studies designed to evaluate responses to natural stimuli of electric or magnetic fields (e.g., bioelectric fields, geomagnetic fields). Only a few studies have produced the data needed to characterize the responses of marine species to the electromagnetic fields of submarine cables. For example, Gill et al. (2009) reported that some individuals of two of the three species of benthic elasmobranchs (*Raja clavata and Scyliorhinus canicula*) were observed more frequently within 2 m of an experimental cable when current flowed than a cable not crossed. Westerberg (2000) and Öhman et al. (2007) described slowed and oblique swimming of some European eels crossing a DC cable. There are still too many gaps that can allow us to assess not only the response to EMFs generated by submarine cables, but also the potential consequences or impacts. The latter can be positive or negative and can be measured in terms of magnitude, spatial extent and duration. Species can have different effects depending on sex or stage of life and at the individual or population level.

Teleosts, and especially diadrome species, i.e. species that live in both fresh and salt water for reproductive reasons, are the ones mainly affected by this phenomenon. In this particular context, there are no species

of this type, so this impact is possibly negligible. As far as crustaceans and molluscs are concerned, information on the effects of electromagnetic emissions is scarce with the exception of a few studies relating to minor or non-significant impacts of anthropogenic electromagnetic fields on specific benthic species (Taormina et al., 2018; Albert et al., 2020 and references within them). It should be noted that many of these results derive from experiments carried out in the laboratory under conditions of exposure to electromagnetic fields of much greater intensity than that returned by the modeling of the EMFs emitted by the cable ducts of the Nemetun Island project.

Beyond the immediate question of whether species known to sense electric or magnetic fields can be affected by the electromagnetic fields of cables, there remains a large gap in basic scientific research on the magnetic sense of marine organisms, the mechanisms behind sensory systems, and the application of electric or magnetic senses in vital functions.

Field studies have shown no significant effect associated with magnetic fields generated by underwater cable ducts (Love et al., 2015, 2017 and Hutchinson et al., 2018).

In conclusion, two considerations can be made regarding the EMFs produced by submarine cable ducts:

- when the cable is buried, the sediment layer does not completely eliminate electromagnetic fields but reduces exposure to benthic species to the stronger ones (CMACS, 2003), from the modeling produced for the project cable ducts it can be seen that within a radius of 3-4 m the EMF produced is almost negligible and that above the surface of the seabed their intensity is reduced to a range of 3-5 μT;
- the strength of both magnetic and induced electric fields increases with current flow and decreases rapidly with distance from the cable (Normandeau, 2011). The species mainly affected by this phenomenon are pelagic ones, since they can transit closer to the floating cable ducts and therefore perceive the EMF emitted in the surrounding meters more. In particular, elasmobranchs that can detect very low electric fields (starting from 0.005 μV cm-1, Normandeau, 2011) and magnetic fields starting from 20–75 μT (Walker et al., 2002; Bochert & Zettler, 2006).

As regards the possible fauna exposed to EMFs, the studies conducted by COISPA (*ES.9.4_01_Study on the Status of Fishery Resources and Fishing/Aquaculture Activities*) on the area where the wind farm will develop, it is clear that there are reproduction areas and areas of *nursery* for certain fish species (*Aristeus antennatus, Illex coindetii, Merluccius merluccius, Eledone cirrhosa, Aristaeomorpha foliacea, Galeus melastomus, Mullus barbatus, Pagellus erythrinus, Parapenaeus longirostris and Nephrops norvegicus*) but mainly above 200 m depth, which in itself reduces the greater effects that may eventually occur in the most coastal area, where there are areas of breeding and nurseries of *Mullus barbatus* and *Pagellus erythrinus.* There are breeding areas of *Galeus melastomus* (a small deep-sea shark) in the S-E part of the offshore wind farm, while its nursery area is more concentrated in the central part of the wind farm. However, juveniles and reproducers of this species are also concentrated above 200 m depth, near the southern Adriatic trench. Teleosts, and especially diadrome species, i.e. species that live in both fresh and salt water for breeding reasons, are those mainly influenced by EMFs. There are no species of this type in the project area; therefore, impacts on these organisms can be excluded. As far as crustaceans and molluscs are concerned, information on the effects of electromagnetic emissions is scarce with the exception of a few studies related to minor or non-significant impacts of anthropogenic electromagnetic fields on benthic invertebrates (Taormina et al., 2018; Albert et al., 2020 and references within them). In the wind farm area there are both recruitment and reproduction areas of various benthic invertebrates (cfr *ES.9.4_01_Study on the Status of Fishery Resources and Fishing/Aquaculture Activities*), but from the studies in the literature, it is possible to state with a high degree of confidence that the impacts on these organisms are zero or negligible.

As for cetaceans and sea turtles, studies have shown that they have a common magnetic sense, i.e. that EMFs are sensitive and that they use them mainly for movement. However, the information available to date is limited to a few species and concerns individual phases of the life cycle (e.g. early life stages of the turtle *Caretta caretta*). There are few studies that focus on possible effects deriving from EMFs on behavior and intra- and interspecific interactions (Gill et al. 2009; Westerberg 2000; Andrulewicz et al. 2003). The paucity of information on physiological responses resulting from prolonged exposure to high levels of EMFs makes assessing potential negative impacts highly difficult. What can be indicated is that the high mobility of marine mammals and turtles would make the probability of being negatively affected, significantly, by electromagnetic fields low despite being magnetosensitive. In the area of the Nemetun Island wind farm, groups of individuals belonging to two species of toothed whales (*Stenella coeruleoalba and Tursiops truncatus*), observed at a depth of more than 200 m. In the surveys concerning megafauna (cetaceans and turtles), it is highlighted that the area represents a site of frequentation of 4 species *STenella coeruleoalba, Tursiops truncatus*, *Grampus griseus* and *Caretta caretta*. In fact, 5 sightings of different groups of striped dolphins, 1 sightings of bottlenose dolphins, the sighting of 2 groups of Risso's dolphins and 3 sightings of *C. caretta*. With regard to dolphins in two seasons (spring and summer) their prevalent behaviour was to travel (elaborated *ES.9.3_02*). From the modeling results previously presented, it can be deduced that the magnetic field generated by the design cable ducts is reduced by up to 1 µT already a few meters from the cable itself. Especially:

- bentonechthonic organisms present in the wind farm area and along the export cable duct (such as *A. antennatus, I. coindetii, M. merluccius, E. cirrhosa, A. foliacea, G. melastomus, M. barbatus, P. erythrinus, P. longirostris, and N. norvegicus)* which will cross the areas with 66 and 380 kV underground cable ducts, may be exposed to EMF ranges ranging from 3 to a maximum of 5 µT;
- pelagic organisms (such as *M. merluccius*, *C. caretta*, *T. truncatus*, S, *coeruleoalba* and *G. griseus*) that will pass through the floating cable ducts inside the field may be exposed to EMF with values ranging from 7 to 450 µT in the first meter from the cable, up to 1 µT at a distance between 3 and 4 m from the cable. It should be noted that this is the worst condition with respect to the power of the cable and the electrical capacity, the modelling was carried out using the 66 kV 1200 mm cable[2] in the sections between the last wind turbine of each 6 WTG string and the offshore substation under maximum production conditions of the plant. Therefore, in the other areas of the plant, the intensity of EMF emission can be significantly lower, thus generating a very narrow area of influence, in most cases.

Furthermore, as already mentioned at the beginning of this chapter, the geomagnetic intensity in the Mediterranean area is about 20 µT with a standard deviation of 5 µT; therefore, these magnetosensitive organisms detected in the project area may not undergo behavioral and physiological changes as they are already accustomed to constant variation of geomagnetic fields. Moreover, it is not yet clear to what extent EMFs produced by submarine cable ducts can really influence these organisms and their reproductive, hunting and migratory behaviours (Normandeau, 2011). Therefore, only with a careful Environmental Monitoring Plan already envisaged for this project (drawn up *S.7.1_02*) it will be possible to evaluate how much the presence of EMFs generated by the alternating current circulating inside the submarine cable ducts can impact on the fauna present in the project area.

It can therefore be said with a high degree of confidence that the possible impacts deriving from the EMFs emitted by the submarine cable ducts on the organisms present in the project area can be considered low and localized around the cable duct.

Please refer to the *ES.3.2_01_Assessment of Electric and Magnetic Fields in Offshore Areas*.

In conclusion, for an overall assessment of the impact at this stage, for the information on the individual effects available to date, it seems appropriate to give it a **negative sign.** However, the creation of new repopulation areas and greater quiet than the current state will give the alteration a **Low entity** and **non-reversible.**

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.7.3 Decommissioning phase

The contributions of the various components that generate the impact during the dismantling phase are comparable to those reported during the construction phase; however, the contribution of the acoustic input component is practically nil, also considering the condition of the baseline scenario.

The overall evaluation will be negative but of negligible and reversible magnitude.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

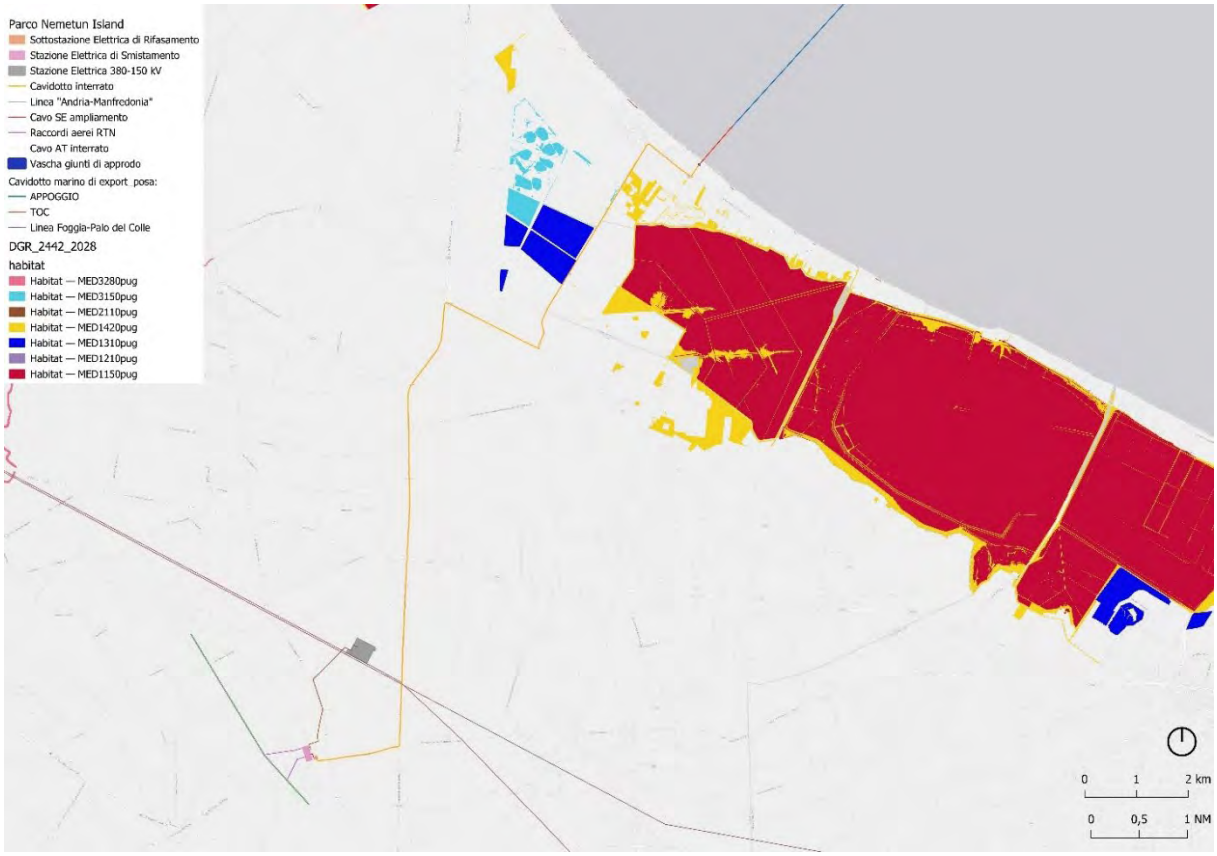
4.2.8 ESTIMATION OF IMPACTS ON NATURE AND BIODIVERSITY – TERRESTRIAL HABITATS, FAUNA AND FLORA

This paragraph estimates the potential impacts on terrestrial fauna and flora due to the construction of onshore works.

The following subparagraphs evaluate the impacts on terrestrial fauna in the various phases of construction of the works.

It should be noted that 8 km of stretch of underground cable duct on land cross the land SPA IT9110038 "Marshes near the Gulf of Manfredonia" and the SAC/SCI IT9110005 "Wetlands of the Capitanata" which extend between the municipalities of Manfredonia, Zapponeta, Cerignola, Trinitapoli and Margherita di Savoia, as shown in the figure below.

However, it should be noted that the transit of the onshore cable duct and the installation of the intermediate Joint Bays will only affect the road layout of the SP 66, which rises above the surrounding areas. As a result, direct interferences such as the loss of significant habitats in the land portion are not expected. Please refer to the *S.3_02_ Appropriate Assessment* for further information on the type of habitat and the fauna and floristic species of community interest, which can be found in the project area.



Categories of Habitats of Community Interest (Directive 92/43/EEC and DGR 2442-2018) present in the survey area

4.2.8.1 Construction phase

During the construction phase, the negative impacts on terrestrial habitats, flora and fauna are linked to the dispersion of dust and/or contaminants, the storage of materials and any damage caused by the movement of vehicles and the noise and vibrations generated by them.

The route of the onshore HV cable duct essentially concerns the existing road network or short stretches in agricultural areas, in any case devoid of floristic and vegetation interest. Even the section interfering with the sites of the Natura 2000 Network should not generate habitat loss since it will be buried alongside the public road. It follows that no type of spontaneous vegetation, no important floristic species and no valuable habitat will be directly affected by the route. Moreover, after the installation, the state of the places will be restored, respecting the habitats present, as indicated below.

- **IT9110038 Marshes near the Gulf of Manfredonia**:

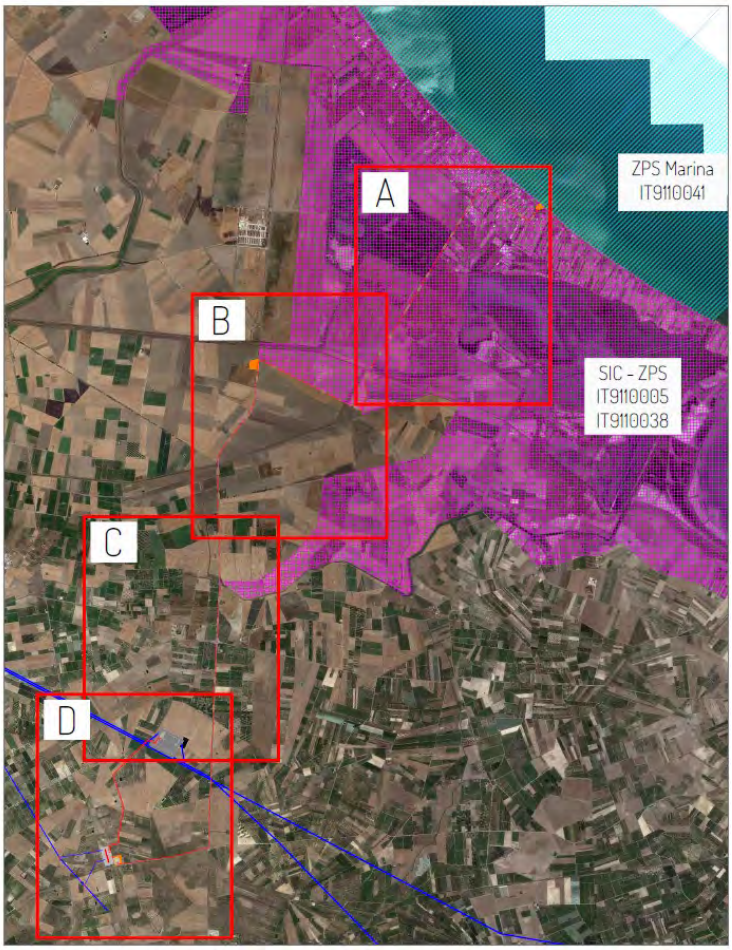
Habitat types - *IT9110038 Marshes near the Gulf of Manfredonia*	**Surface** (ha)
1150*: Coastal lagoons	2830,4
1310: Pioneer annual vegetation in *Salicornia* and other species of muddy and sandy areas	721,85
1410: Mediterranean flooded pastures (*Juncetalia maritimi*)	1443,7
1420: Mediterranean and thermo-Atlantic halophilous grasslands and orchards (*Sarcocornietea fruticosi*)	3320,51

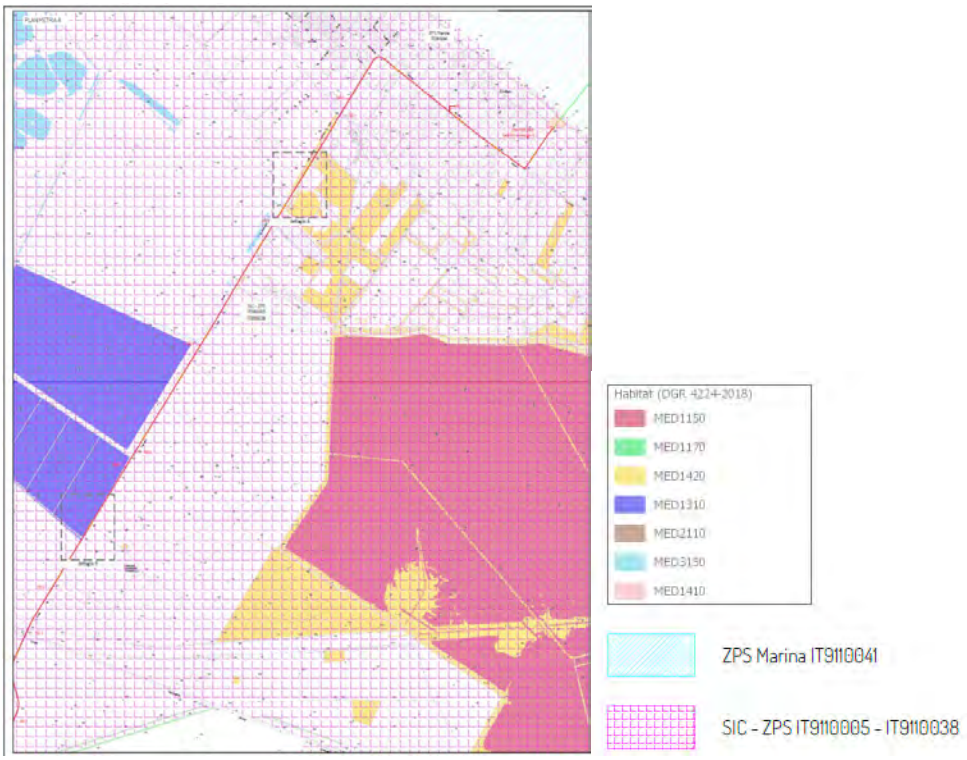
- **IT9110005 Wetlands of the Capitanata**:

Habitat types - *IT9110005 Wetlands of the Capitanata*	**Surface** (ha)
1150*: Coastal lagoons	2830,4
1210: Annual vegetation of marine deposit lines	282,18
1310: Pioneer annual vegetation in *Salicornia* and other species of muddy and sandy areas	2821,8
1410: Mediterranean flooded pastures (*Juncetalia maritimi*)	846,54
1420: Mediterranean and thermo-Atlantic halophilous grasslands and orchards (*Sarcocornietea fruticosi*)	5220,33
92D0: Tunnels and fortified southern shelters (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)	60,4

The construction sites that will affect the IT9110038 and IT9110005 sites concern the laying of the HDD cable duct in the landing area, the joint hole and the underground land cable duct.

In the project package, document *T.7.4_01_Onshore Works – Mobile Construction Activities and Interactions with Natura 2000 Sites* illustrates the onshore connection works and the Natura 2000 network sites, together with the areal indication of the construction facilities. The maps are presented below.





Details of apparent interferences with habitats within IT9110005 and IT9110038 sites (see T.7.4_01)

The landing area of the cable duct to be positioned in HDD and the joint hole will be located on a beach in the municipality of Zapponeta. From a landscape point of view, the fixed construction site, although part of the SCI area, is positioned on an asphalted area currently in the process of degradation, as can be seen from the photographs, not directly interfering with the protected habitats of the Site.

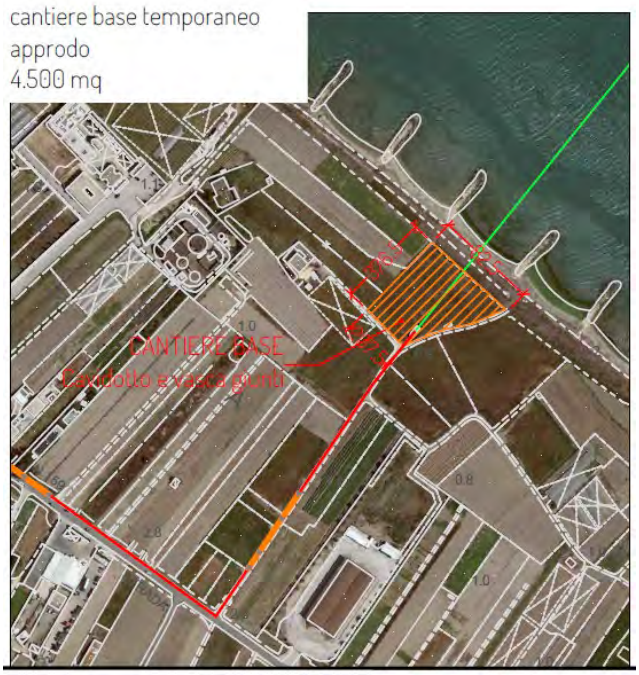
The land-sea joint will be made of a special concrete artifact, to be buried at the landing in a joint hole. The "joint hole" will have approximate dimensions of 10 m (length) x 6 m (width) x 2.1 m (depth).

Photographs of the construction site area state of affairs

The type of works to be carried out for the landing in HDD **no need** the use of extraordinary means, capable of determining a significant and irreversible environmental-landscape impact.

At the end of the works, the areas will be restored and arranged for its use by the community, the site operations will be scheduled so as not to interfere temporally with the natural state of the places.

Below is a brief description of the work required for the installation in HDD in the land portion and the potential environmental impacts with the related mitigation measures. As already mentioned, the HDD technique will make it possible to cross the coastal strip reducing the impact of the works and minimizing interference, without compromising the future use of the beach.

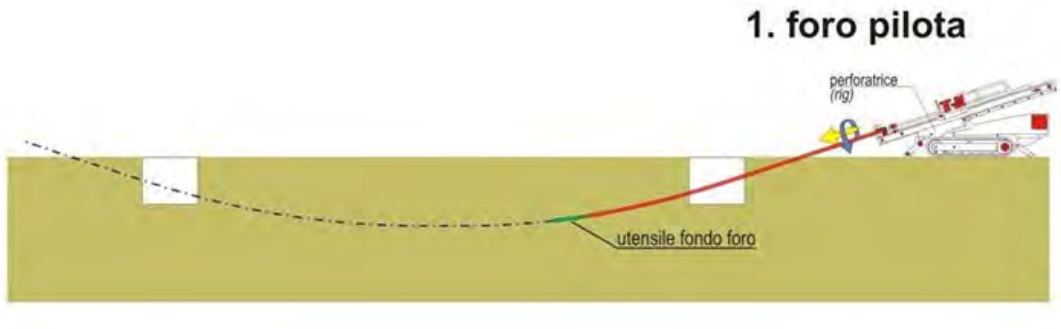


Information on temporary construction sites for the HDD and the joint hole

The drilling system to be used involves the execution of the installation in three successive and distinct phases:

1. Pilot drilling:

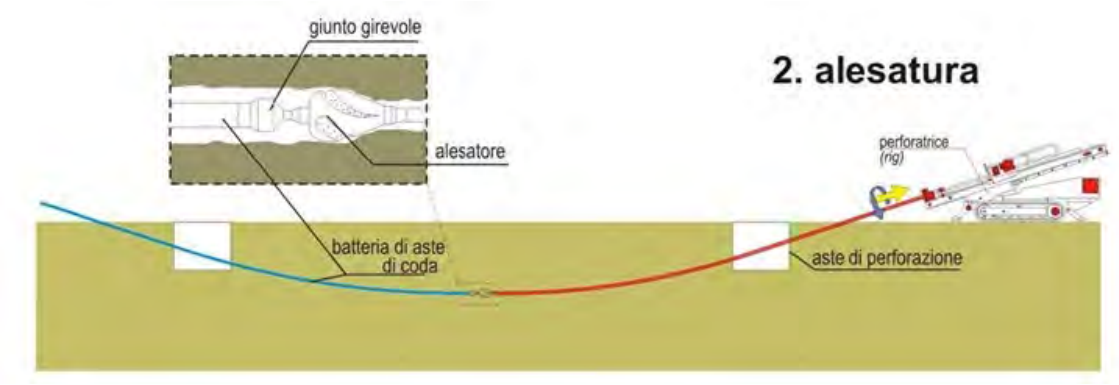
Drilling takes place by eroding the ground by means of a mix of water and mud or materials of different nature which, passing through the drill pipes, come out of the drilling head at high pressure. The drilling head is equipped with a special instrumentation which, by emitting radio waves, allows, through an external receiver, to monitor its depth, inclination and direction on the horizontal plane at any time. The data collected are also useful for the subsequent creation of maps or graphic reports of the work performed.



Construction phases of an excavation with the Horizontal Directional Drilling technique – I. Pilot Drilling

2. Bore Bore:

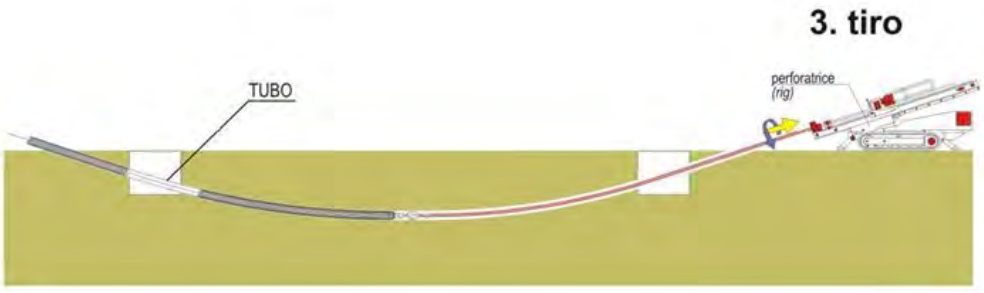
Once the pilot hole is completed, the drilling head will be replaced with special reamers that are dragged backwards along the same path. They rotate thanks to the motion transmitted by the drill pipes and exert a milling action on the ground still assisted by the water jets.



Phases of an excavation with the Horizontal Directional Drilling technique – II. Bore

3. Inserting the cable:

During the boring phase, the pipe to be laid is hooked to the drilling column and towed backwards towards the drilling rig. For very large diameters, it is necessary to perform several borings to widen the drilling path according to the diameter of the pipe to be pulled.



Phases of an excavation with the Horizontal Directional Drilling technique – III. Shooting

Below is a typological diagram of the basic construction site on land.

Horizontal Directional Drilling, the basic onshore construction site

The incidences that can be generated by the HDD construction site activities and that can involve the Natura 2000 Network Sites IT9110038 and IT9110005 are:

1. **Soil and groundwater contamination:** The main causes of environmental impacts related to the drilling process include: the accidental leakage of drilling fluid, known as the "frac-out" phenomenon, the infiltration of mud into aquifer levels and the dispersion of substances used to improve the rheology of the mud. The consequences of such events could lead to altered groundwater quality and soil contamination.

2. **Noise emissions and vibrations:** The joint operation of drilling rigs and mud management pumps can generate various impacts due to excessive noise emissions and the propagation of vibrations underground, with related impacts on nearby buildings as well as stress on the local population.
3. **Impacts on vegetation and landscape:** The removal of vegetation for the installation of the construction site, together with the alteration of the soil profile along the drilling route, can lead to the destruction of natural habitats.

The mitigations that can be implemented are:

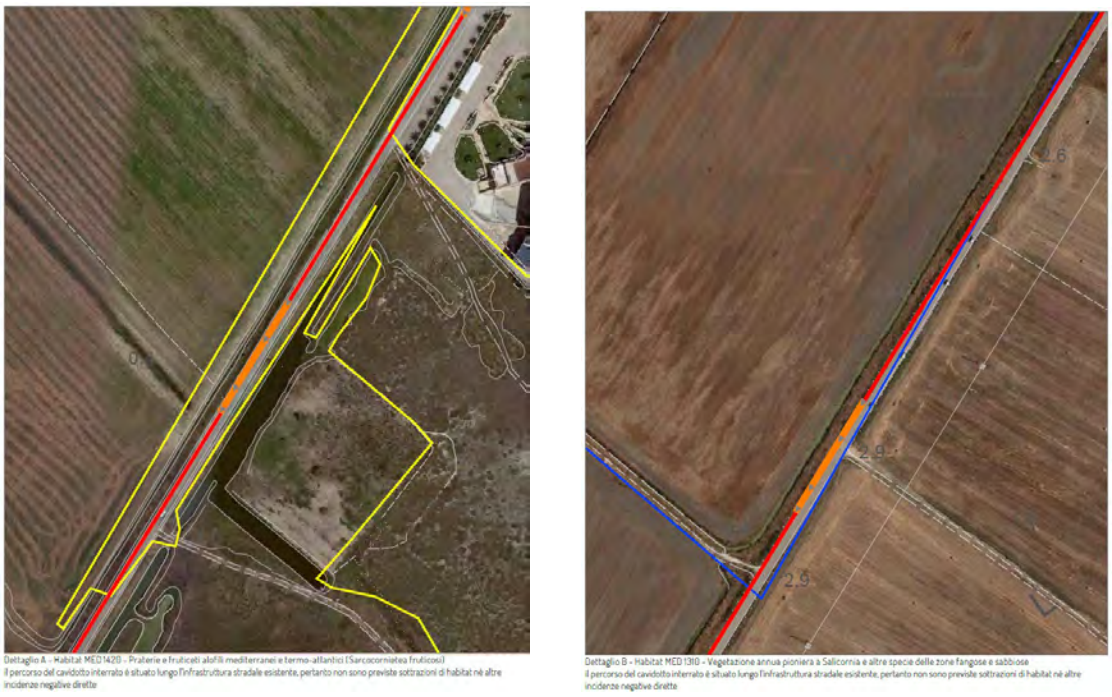
1. To prevent or reduce soil and groundwater contamination, continuous monitoring of sludge pressure will be carried out to prevent spills, the installation of geotextile barriers to intercept any spills. In order to mitigate the risks deriving from fluid infiltration/dispersion, a system of drilling fluids based on seawater and biodegradable biopolymers will be used. The fluid will be packaged by mixing guam gum (a galactomannan extracted from a legume - guam in fact) with water. The fluid that is obtained certainly has a higher cost than a traditional fluid, but it allows you to achieve two important results:
   a) it is completely biodegradable, so even in the event of accidental spills, it would not cause soil and groundwater pollution;
   b) it does not involve the consumption of a significant amount of drinking water resources.
2. The acoustic and vibrational impact of the work is limited and will not exceed the limit values imposed by the national and local legislation in force (see the report *"ES.2.3.1_02_Valutazione Forecast of Acoustic and Vibrational Impact onshore areas*" and the analysis sheets for each receptor, processed *ES.2.3.2_01*). However, to the benefit of greater mitigation of these effects, the use of different intervention systems will be envisaged, including the use of sound-absorbing barriers around the drilling machines, the regulation of working hours to avoid night-time disturbances, the monitoring of vibrations to prevent damage to the surrounding structures and the use of drilling technologies with low acoustic impact.
3. The preparation of the construction site area and the execution of the drilling will not affect the local habitats and flora as it will affect an already urbanized area with the presence of cultivated fields and as regards the beach in a state of neglect and with the presence of a large amount of waste (see previous images). There is therefore no need for mitigation systems, without prejudice to what is planned for the restoration of the areas at the end of the works.

As for the laying of the onshore underground cable duct, a mobile construction site will be required, which is a temporary work area set up along the laying route to allow the safe and efficient installation of the cable duct.

The construction site will be developed entirely along existing roads, thus excluding the direct impact on habitats and areas of landscape and conservation interest as most of these sites are man-made and/or in poor environmental status due to the presence of waste (see report *Photographic S.3.1_Photographic Report of Onshore Natura 2000 Sites*). The machinery and equipment will be commensurate with the work and in any case the use of vehicles outside the ordinary management of the restoration and construction of new pipelines is not envisaged.

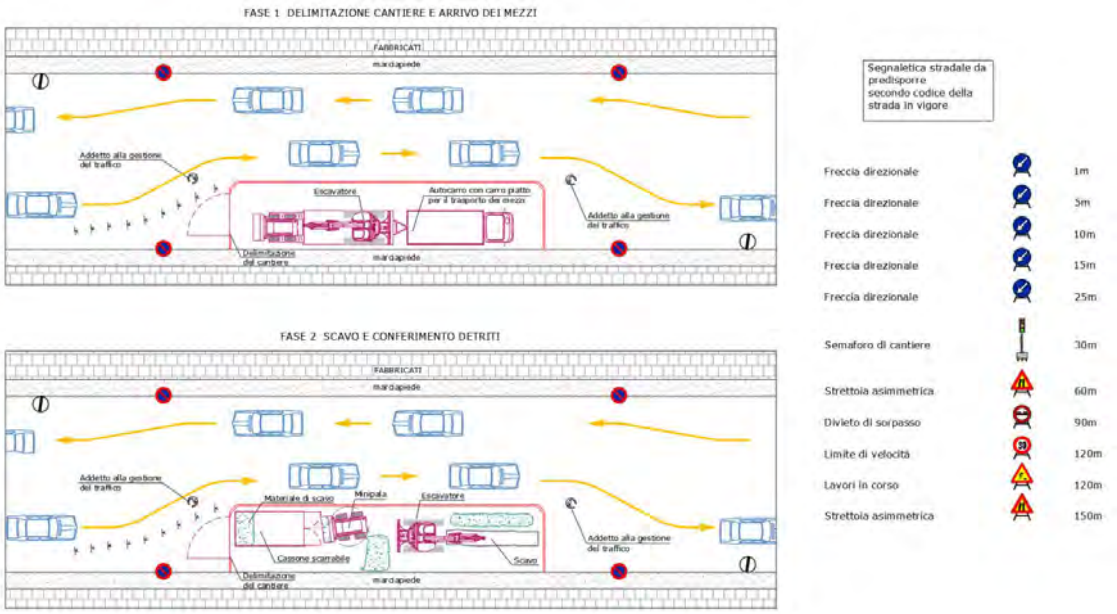
Unlike a fixed construction site, the disturbance produced will be temporary as the construction site moves rapidly along the route, and this will allow easier mitigation of indirect impacts on the Natura 2000 Network Sites.

As far as interference with habitats of Community interest is concerned, there are no particular overlaps. In the following details, some interferences between the mapped habitats and the route of the cable duct are reported; however, these cartographic intersections are only apparent, since both the underground cable duct and the construction site preparations will be built, in those sections, within the roadway. Therefore **the removal of vegetation covers of conservation interest is not envisaged**.



Details of apparent interference with habitats DGR 4224-2018

The additional document also includes some typological details from which it is possible to deduce that the deposit sites will be located near the excavations and that the construction of the cable duct can be carried out without interrupting road traffic and confining a construction site area in which it will be possible to monitor and avoid disturbing fauna or the removal of individuals, The noisiest operations will be carried out away from the mating and nesting periods of the fauna present.

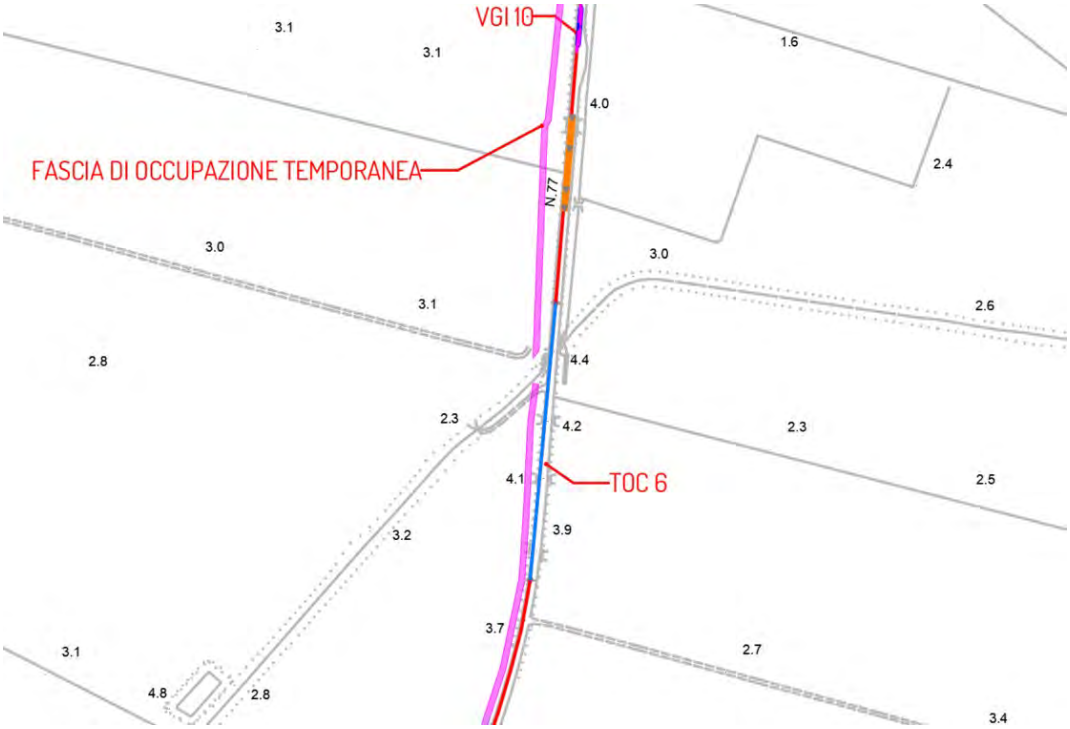


Typological detail of the site preparations

Finally, the additional document provides summary information regarding the location of the temporary, basic and mobile construction sites, necessary for the construction of the cable duct and the main user works.

Information on temporary construction sites

With regard to the construction site roads and other temporary occupations, it should be noted, as already envisaged by the project, the presence of an occupation strip placed alongside the public road network. The temporary occupation zone does not interfere with Natura 2000 sites or habitats of community interest.



Temporary occupation zone alongside the road network outside the Natura 2000 Network sites

Furthermore, in the According to the SCI Management Plan, the main threat to which the wetlands close to the intervention site are subjected is linked to the strong anthropogenic pressure exerted on the porous aquifer and surface waters in recent decades. The Management Plan of the SCI, in the elaboration "*Critical issues and threats*" defines this pressure as "unsustainable", with negative consequences for the integrity of the water resource, both in quantitative and qualitative terms. The project under consideration obviously has no impact on this type of threat.

As regards the impact on the terrestrial fauna component, the main impact may be determined by the increase in dust and noise level due to the progress of the work (elaborated *ES.2.3.1_02*): this may result in the temporary removal of the most sensitive species, which inhabit or stay in the neighboring areas, especially birds. It should be noted that the planned works do not differ in extent from normal road maintenance operations. In addition, it should be noted that:

- the more generalist animal species tend to activate quite quickly a gradual adaptation to repeated and constant disorders (habituation mechanism);
- the most sensitive and demanding species, on the other hand, tend to move away from the sources of disturbance, to eventually return when the disturbance ceases (possible end of construction site activities);
- The construction site will be carried out for stretches of 80 meters in length, this minimal extension makes the component of habitat loss of terrestrial fauna negligible.

Any dust generated by site activity, as well as acoustic or vibrational impacts will be limited to a maximum period of 31 months and will be continuously monitored during the construction phases to minimize dispersion and the consequent possible impact (according to the Monitoring Plan described in the document *S.7.1_02*). Moreover, after the installation, the state of the places will be restored, respecting the habitats present.

With regard to visual disturbances and interferences and direct interactions with humans, it can be observed that they represent appreciable problems for wildlife and it can be estimated that, in absolute terms, both impacts are negative and not negligible, but in any case partially mitigated and, in any case, reversible.

In conclusion, the negative impacts of the mobile construction site on the Natura 2000 Network Sites are linked to the dispersion of dust, the storage of materials/waste and any damage caused by the movement of vehicles and the noise and vibrations generated by them. It is, however, to be considered contained as the works are very similar to those of ordinary maintenance of public infrastructures, therefore they do not represent a problem either for the community or for the landscape-environmental structure of the areas crossed, especially those falling within the IT9110038 and IT9110005 sites.

In any case, specific mitigation measures are envisaged to further limit the potential impacts on these sites. These measures concern the following environmental components that affect the Sites.

1. Atmosphere and climate, with particular reference to the Dust emissions due to the excavation phases and the passage of construction vehicles:
    - periodic wetting of the construction site tracks and heaps of materials in storage during the processing phases of the fixed construction sites, in order to limit the raising of dust and the consequent diffusion into the atmosphere;
    - covering of vehicles used for the transport of powdery materials both loaded and empty by means of tarpaulins;
    - the areas of the fixed construction sites must contain a pitch intended for washing the wheels of vehicles leaving the construction site area;
    - constant washing and wet sweeping of the streets adjacent to the construction site and of the first stretches of public roads leaving these areas;
    - constant maintenance of the vehicles in place, with particular regard to the regulation of engine combustion to minimize emissions of pollutants at the exhaust (periodic exhaust gas check in accordance with the law).

- As regards emissions due to the road traffic of construction vehicles, the possible mitigations concern the use of vehicles powered by LPG, CNG and falling within the exhaust regulations provided for by the European Union (Euro III and Euro IV).

It should be noted that all the impacts produced concern exclusively the construction phase and therefore are reversible in a short time, i.e. at the end of the construction phases.

2. Flora, fauna and ecosystems:

- the removal of the surface soil will be carried out after its conservation and protection;
- the removal of the soil will be limited to the project areas, which are strictly necessary. The removed soil will be deposited in a dedicated area of the project site to prevent it from being mixed with the material from the excavations;
- the restoration will be carried out using the local soil removed to avoid the development and spread of invasive herbaceous species, removing all the material used, in order to accelerate the natural process of reconstitution of the original vegetation cover;
- during the works, the protection of the habitats, flora and fauna present will be guaranteed as much as possible;
- non-native species will not be introduced into the environment;
- In the decommissioning phase of the plant, the restoration of the altered surfaces will be carried out in their original conditions with the construction of the project works.
- periods of work stoppage during the reproductive months in order to reduce the disturbance of potentially nesting species during the reproductive period;
- measures limiting noise and vibration emissions as described in the report *ES.2.3.1_02* and point 3;
- to reduce the dispersion of dust, indications will be given to companies on the road system to be followed to avoid rising dust; tyres that are not particularly worn and that can therefore promote the rise of dust will be checked; have mitigation measures adopted in a reasonable time to avoid the rise of dust.
- movement of means of transport of the land with the use of suitable measures to avoid the dispersion of dust (see point 1);
- implementation of management regulations such as anti-pollution devices and devices for all construction site vehicles (mufflers, soundproofing systems, etc.) and safety regulations to avoid the risk of accidents;
- The excavation, filling and demolition works must be carried out using methods, systems and means of work such as not to create environmental problems, waste deposits, soiling of the road system and disfigurement of the landscape.
- monitoring that makes use of the ISPRA guidelines "Manuals for the monitoring of species and habitats of Community interest (Directive 92/43/EEC) in Italy: Animal species" and "Manuals for the monitoring of species and habitats of Community interest (Directive 92/43/EEC) in Italy: Habitats" as described in the *S.7.1_02*;

3. Noise and vibrations, the impacts on this environmental component are mainly due to the construction site/decommissioning phase of the work in question and therefore are reversible in the short term:

- use of construction machinery and equipment that comply with Directive 2000/14/EC and are subject to constant maintenance and that can generate very low noise and vibration levels;
- organization of the hours of access to the construction site by means of transport, in order to avoid the concentration of the same during peak hours. Management of road surface demolition operations, with temporal coordination of activities during the most sensitive periods;
- development of a work program that avoids situations of simultaneous use of several machines with high noise emissions in neighboring areas;
- adoption of sound-absorbing panels to be connected to the construction site fence. Currently on the market there are soundproofing panels with a soundproofing power index Rw = 14 dB certifiable in the laboratory according to the UNI EN ISO 140-3 2066 and UNI EN ISO 717-1 1997 tests. These can be mounted on the construction site fence as the panel is equipped with eyelets, metal hooks and accessories that allow it to be installed. This type of barrier can also reduce the propagation of vibrations to the surrounding areas.
- Use of shock-absorbing materials: using shock-absorbing materials or layers of insulation between equipment and the ground can absorb some of the vibrations generated.
- Controlling vehicle speeds and routes: Limiting the speed of vehicles within the construction site and planning routes to avoid sensitive areas can help reduce traffic-induced vibrations.
- Continuous monitoring: Constant monitoring of noise and vibration during the construction site allows you to identify any critical situations at an early stage and take further corrective action.

4. Waste, in order to reduce the production of waste during the construction phase:
   - on-site reuse, in the highest possible quantity, of the excavated material, in particular the layer of surface vegetal soil, corresponding to the fertile layer, which must be set aside in the construction site area separately from the remaining excavated material, for subsequent use in green works;
   - transfer of excavated material, which is not reusable on site, to a landfill authorised in accordance with current regulatory provisions or to other construction sites, also in relation to the availability of the waste production basin in which the plant is located;
   - collection and separate disposal of waste produced by construction site activities (packaging, timber, iron, etc.).

It is reiterated again that during the construction site/decommissioning activities, all possible precautions will be implemented to avoid causing significant further impacts to the fauna and landscape that are already compromised as reported in the PdG of the Sites in the "Criticalities/threats" document. For this reason, a careful MAP (elaborated *S.7.1_02*), as already mentioned before, which can allow immediate intervention where significant critical issues occur on the environment and terrestrial organisms.

Finally, several compensatory actions are envisaged for IT9110038 and IT9110005 sites that are based on the actions already envisaged in the PdG, please refer to paragraph 6.1 of this study and to the R.6 report for further information.

In conclusion, considering that:

- the large project area already has a medium-low anthropogenic pressure value;
- the anthropization of the sites and the threats to which habitats, flora and fauna are subjected are already having a high impact;
- the construction site activities are attributable to normal road maintenance interventions, commonly carried out on the road layouts concerned;

- The practices of good management of the construction and decommissioning phases, which will be adopted, will allow thenot to be in conflict with the protection guidelines of the Management Plan and to be compliant with the indications regarding the methods of implementation of the intervention.

The impact assessment will be **negative, with low and reversible magnitude.**

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR
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4.2.8.2 Operation phase

The adjacent portions of habitats of community interest, potentially affected by indirect effects of the intervention, have such an extension that they do not cause significant impacts in terms of habitat removal. Similarly, the interventions are not of such a magnitude as to determine significant impacts on protected flora and fauna species, much less on ecosystem units and on the quality of the latter. Nor are there any other potentially negative impacts on soil/subsoil, water environment or atmosphere during operation. On the other hand, as reported in the *R.6*, it is planned to implement specific interventions aimed at strengthening and improving existing wetlands. These have a clear positive impact on the fauna, flora and ecosystems.

Noting the above, it is not considered that the **planned interventions** may compromise the management and conservation of the sites of naturalistic importance within which the project works fall and which are, therefore, **consistent with the constraints determined by the presence of the sites Same**.

Ultimately, the interventions do not lead to the disturbance of fundamental species, nor to the fragmentation of habitats or species, being as already highlighted located along the existing route, nor to a reduction in the density of the species, nor any change in the key indicators of conservation value.

Considering these comments, it is considered that the impact assessment will be **positive** of **medium and non-reversible entity**.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR
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4.2.8.3 Decommissioning phase

The expected impact in this phase is equivalent to that assessed for the construction phase.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR
■					■		■	

4.2.9 ESTIMATION OF NOISE AND VIBRATION IMPACTS

As part of the baseline scenario of the EIA, specific investigations and modelling have been carried out regarding the terrestrial and underwater acoustic climate and their possible disturbance during the construction phase/decommissioning and operation of the offshore wind farm and the onshore connection works.

With reference to the **Investigations carried out**, summarizing the data of the acoustic analysis carried out in the marine environment, the following results can be highlighted, referring to the "*ES.2.1_01_ Offshore Acoustic Surveys"* for the necessary further information.

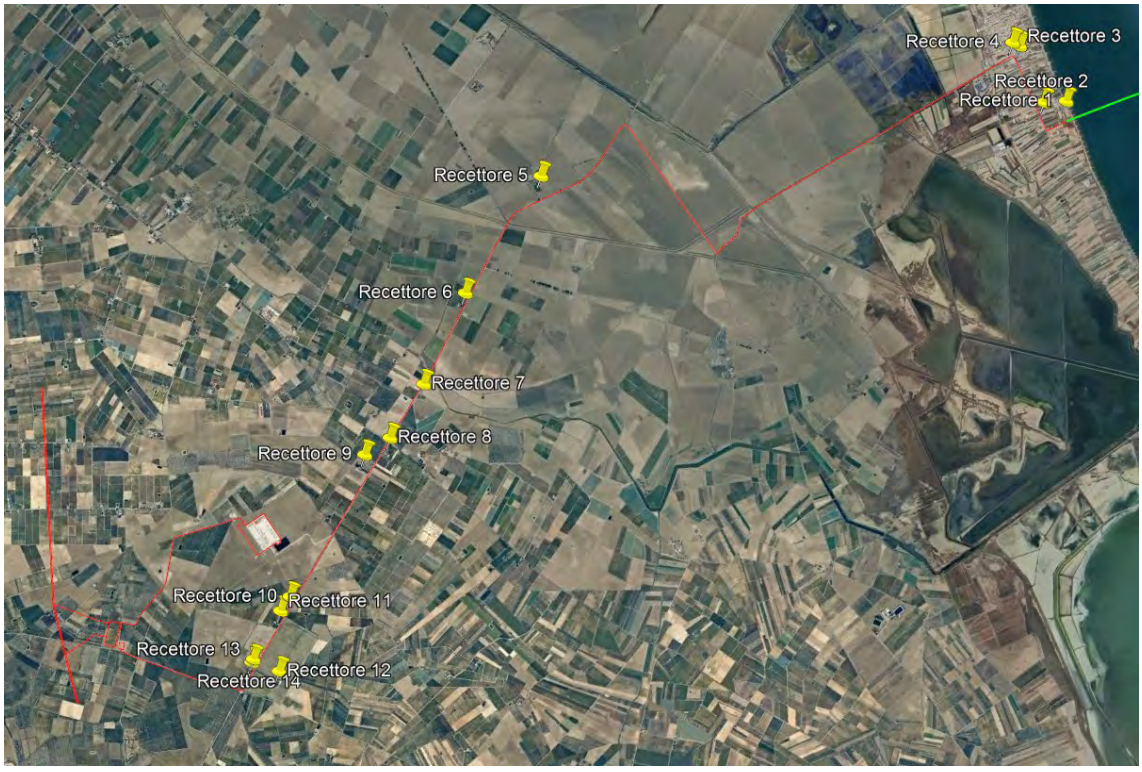
4 sampling stations of 24 hours were carried out, plus a fifth point added to have possible redundancy of recorders, given the presence of numerous trawlers that can compromise the success of the operation. It was possible to highlight the presence of alfeid clicks for the entire observation period, without significant variations between day and night.

The results clearly demonstrate how **the area in question at present is extremely noisy**. The analysis of the acoustic files showed that this noise is directly linked to the maritime traffic present. Thanks to AIS data that identify, for example, cumulative routes over a period of 1 year, it is possible to understand how the recordings made are representative of a constant situation and not linked to a particular event.

In this largely compromised context, where noise levels are much higher than in other areas of the Adriatic Sea, the contribution of the wind farm in the operational phase is likely to have little impact.

The model for predicting the acoustic impact of the work, contained in the report – "*SIA.ES.2.2_02_ Predictive Assessment of Acoustic Impact in Offshore Areas"* - modelled the expected noise emission values during the construction phase and the operational phase, i.e. the noise produced respectively by the most impactful construction site operations, such as the laying of floater anchors on the seabed, excavation in *jet trenching* and the noise "transmitted" by the operation of wind turbines in the water environment. This argument has already been covered in the estimate of the impacts on marine wildlife, an area on which acoustic alteration can have the greatest reflection. The evaluations made are reported below, referring to paragraph 4.2.7 for the specific discussion.

As regards the assessment of onshore noise and vibration impact, with reference to the analyses carried out in the report *SIA.ES.2.3.1_02_ Predictive Assessment of Noise and Vibration Impact in Onshore Areas,* it should be noted that the choice of the route of the underground power line and the user substation was made by trying to eliminate areas affected by constraints and inhabited areas. In fact, along the final trace it is possible to state that there is no significant receptor (along the path there are residential buildings), as evident from the following planimetric excerpt, which shows all the inhabited areas along the route of the cable duct. Below are the evaluations made for the individual phases of the plant.



Receptors present along the cable duct and in the vicinity of the others Onshore works

4.2.9.1 Construction phase

Acoustic and vibrational impact for offshore works

The results of the noise modelling on Behavioural Disturbance (displacement) and hearing damage (PTS and TTS) and on vibrational impacts have been extensively described in paragraph 4.2.7.1 concerning the impact on marine fauna during the construction phase, therefore please refer to this paragraph for further information.

Acoustic and vibrational impact for onshore works

As regards the acoustic and vibrational impact deriving from the works for onshore works, as evident from the map in the previous paragraph, the receptors present along the route of the cable duct construction site are homes. From a regulatory point of view, the construction site activity for the construction of the works covered by this study can be framed and assimilated as **Temporary noisy activity**, since the construction site will only be active during normal daytime working hours. In the forecast analysis of the acoustic impact, the most critical conditions relating to the construction phase of the civil works and the assembly and construction phase of the equipped areas envisaged by the project were considered. The mechanical and civil works are rather limited and consist, in this specific case, of the following processes:

- Construction of a 380 kV user substation;
- Construction of the 380 kV Switching Station - in extension to the Cerignola electrical substation;
- Excavation and laying of underground cable ducts. The cables are laid at the depths provided for by the project and the excavation, carried out with a shovel/excavator, is filled with the same resulting material.

Sound pressure levels or sound power are indicative and derived from literature data. Among the main sources identified as an aid in the characterization of the sources we can mention:

- ISPESL guidelines relating to workplace safety;
- Means/equipment technical sheets.

The noise emission levels produced by each individual machine on site during the different work phases, as part of the simulations produced, have been taken from the sector literature and are shown in the following table:

Machine/Equipment	Sound Power Level in dB(A)	Sound pressure level at 1m in dB(A)
Loader excavator	106.0	98.0
Cranes	110	102.0
Truck	80.0	72.0
Road roller	105.0	97.0
Concrete mixer	112.0	104.0

A spatial and uniform distribution of the springs within the perimeter of the construction site is assumed (precautionary hypothesis) which is identified at the edges of the pipeline route.

The work activities on the construction site will be carried out according to a detailed timetable, attached to the executive project.

According to the planning document, which is summarized below in the main phases, the works will be carried out in 15 consecutive months for the electrical substation and may require the temporal overlap in the execution of the various activities in the different areas of the construction site.

The emitted level was calculated at predefined distances, i.e. 50 m, 100 m and 150 m from the site limit.

Phase of arrangement of the base site area		
Processing	*hardware*	*Sum of Levels (Lw)*
Surface soil removal and soil leveling	*Loader excavator*	*111.5 dB(A)*
Arrangement of barracks, toilets, changing rooms	*Truck + crane*	
Temporary construction site viability	*Loader excavator*	*108.5 dB(A)*
Stabilized layer compaction	*Road roller*	
SSE station construction phase		
Processing	*hardware*	*Sum of Levels*
C.A.V. fence assembly	*truck + crane*	*110.0 dB(A)*
Foundations for fencing and technical room	*Concrete mixer + truck*	*112.0 dB(A)*
Transport and assembly of prefabricated cabins	*truck + crane*	*110.0 dB(A)*

To know the level emitted by the previously encoded sources, we use the free-field propagation simulation model:

Expected sound pressure level fed from the base site			
Construction phases	Distance 50 m	Distance 100 m	Distance 150 m
Surface soil removal and soil leveling	69.5 *dB(A)*	63.5 *dB(A)*	60.0 *dB(A)*
Arrangement of barracks, toilets, changing rooms			
Temporary construction site viability	66.5 *dB(A)*	60.5 *dB(A)*	57.0 *dB(A)*
Stabilized layer compaction			

Noise level emitted from the base construction site at known distances

Only in the event that the work is carried out at the same time, as indicated, will it be carried out*will* to check at what distance the construction site input level is maximum, i.e. 70 dB(A). It should be noted that the forecast calculations do not take into account the obstacles present*the* (vegetation, other vehicles, workers, etc.) for safety purposes and therefore in any case overestimate the result.

Expected sound pressure level fed from the SSE station construction site			
Construction phases	Distance 50 m	Distance 100 m	Distance 150 m
C.A.V. fence assembly	68.0 *dB(A)*	62.0 *dB(A)*	58.5 *dB(A)*
Foundations for fencing and technical room	70.0 *dB(A)*	64.0 *dB(A)*	60.5 *dB(A)*
Transport and assembly of prefabricated cabins	68.0 *dB(A)*	62.0 *dB(A)*	58.5 *dB(A)*

Noise level emitted from the SSE station construction site at known distances

It is believed that the same results are also applicable to the construction of the Switching Station, by virtue of the use of the same means and equipment indicated in the previous table and the substantial similarity of the planned works.

Certainly, for receivers located at shorter distances, the executing company will request an exemption from the noise limits as established by art. 17 of Law 3/2002.

For the underground cable conduit, since it is *Mobile sources* and being employed as such in the succession of work phases (for a total of 16 consecutive months) along the route of the pipeline, it was decided to quantify the global sound pressure value on site in the phase that is the most characterizing of the activities (i.e. the one with the longest duration).

As regards the construction of the connecting cable conduit, the excavation, the laying of the electrical cables and the covering take place in rapid succession with an average forward speed estimated at about 80/100 meters per day. It is therefore a real *Road construction site*, whose route follows that of the existing roads, limiting interference in agricultural lots as much as possible.

The main machines provided and used alternatively are the following:

Construction phase of underground cable duct		
processing	hardware	Sound pressure level in dB(A) [dist.1m]
Excavation	Mini Excavator	85.0 *dB(A)*
Restoration	Road roller	95.9 *dB(A)*
Cable laying	Manual equipment	65.0 *dB(A)*

Within a radius of 50 m from the *Road construction site* The expected level will be:

Expected sound pressure level input from the typical construction site	
processing	Distance 50 m
Excavation	51.0 *dB(A)*
Restoration	62.0 *dB(A)*
Cable laying	31.0 *dB(A)*

In the case of interference with other infrastructures or crossings of various kinds, i.e. with sections of road (SP and SS) or hydrographic network, crossings with a more advanced excavation system is envisaged, i.e. HDD (Horizontal Directional Drilling) type.

It is expected that the HDD phase is particularly impactful by nature, but at the same time it is limited to specific areas: since it is a "trenchless" technique, this allows not to affect the surface of the ground since it does not involve open-cast excavations.
The greatest difficulty related to the creation of a general model for the entire construction site arises from the high spatial and temporal variability of the springs, as well as from the orographic characteristics of the territory. In the specific case of the construction site in question, the sensitive receptors most exposed to sound propagation were chosen.

Expected sound pressure level fed from the construction site with interference			
Construction phases	Distance 100 m	Distance 150 m	Distance 200 m
Excavation	67.0 *dB(A)*	63.5 *dB(A)*	61.0 *dB(A)*
Drilling System – HDD			
Backfilling – restoration			

The values calculated for the construction phases for onshore works must be respected in the time intervals provided, i.e. the daily working hours allowed by Regional Law no. 3 of 12/02/2002 which for noise emissions from construction sites are set from 7.00 to 12.00 and from 15.00 to 19.00.

In addition, they are conduct of sound propagation analyses in compliance with the following UNI EN 9613-1 and UNI EN 9613-2 standards:

- **UNI ISO 9613-1: "Acoustics – Sound attenuation of outdoor propagation – Calculation of atmospheric absorption";**
- **UNI ISO 9613-2: "Acoustics – Sound attenuation of outdoor propagation – General calculation method".**

The calculation method takes into account the distance between the source and the receptors present and the possible presence of existing barriers. On the basis of this information, assigned the type of sound source that in the case in question is represented by the mobile construction site, it was possible to determine the sound propagation and the incidence of noise.

It should be noted that the "Mobile Construction Site" sound source has been modelled considering the vehicles shown in the cable duct construction site table, considering a 10-tonne excavation vehicle as a replacement for the mini-excavator.

As indicated in the introduction, following the relocation of the Switching Station and the Substation and the related lengthening of the cable duct route (increase of 2), 5 new receptors have been identified, all positioned along the SP77, whose greater exposure is to be associated with the cable duct laying activities.

The results obtained for each of the receptors are shown below.

Id. Receptor	Receptor-emission point distance (m)	dB (A)
Receptor No. 1	97 m	60,89
Receptor No. 2	8 m	75,11
Receptor No. 3	5 m	74,16
Receptor No. 4	15 m	76,18

Receptor No. 5	140 m	56,83
Receptor No. 6	24.50 m	70,82
Receptor No. 7	38 m	70,95
Receptor No. 8	21.50 m	73,67
Receptor No. 9	116 m	58,52
Receptor No. 10	32	70,88
Receptor No. 11	45 m	69,09
Receptor No. 12	322.80 m	53,69
Receptor No. 13	34.79 m	71,41
Receptor No. 14	31 m	74,40

Taking into account that Regional Law no. 3/2002 establishes, in paragraph 3 of art. 17, that the noise emissions, in terms of the equivalent continuous level of weighted sound pressure (A) [LAeq] measured on the façade of the most exposed building, cannot exceed 70 dB(A), and that for the municipalities of Zapponeta and Cerignola an acoustic zoning has not yet been defined, in compliance with the regional law, for all the receptors whose level is higher the request for authorization will be made in derogation.
It should be borne in mind, however, that since the noise levels are not very far from the maximum permitted limit, the use of special site equipment, such as sound-absorbing barriers, could be sufficient to reduce the perceived noise intensity, making it not necessary to request authorization.
Currently on the market there are soundproofing panels with a soundproofing power index Rw = 14 dB certifiable in the laboratory according to the UNI EN ISO 140-3 2066 and UNI EN ISO 717-1 1997 tests. These can be mounted on the construction site fence as the panel is equipped with eyelets, metal hooks and accessories that allow installation.
Considering that the maximum calculated sound incidence value is approximately 76.18 dB(A), the soundproofing power of the aforementioned devices, as anticipated, would be such as to mitigate the perceived noise intensity below the maximum limit allowed by law.
For more details on the results obtained and the emission graphs, please refer to the *ES.2.3.2_01_Predictive Assessment of Noise and Vibration Impact in Onshore Areas – Receptor Data Sheets and Distances*".

The purpose of vibration assessment is to estimate the effects on the surrounding environment of the vibrations emitted by the construction site machinery used for the construction of the work.

In detail, the main sources envisaged according to the work activities were analysed, which will be substantially grouped into operating machines (excavator, drilling probe, etc.) and transport vehicles (trucks, concrete mixers, etc.). The method adopted for predicting the vibrational levels induced during the construction of the works was described and these levels were compared with the limits of the relevant legislation regarding the effect of vibrations on people and structures.

The vibrational study for the construction phase (contained in the *ES.2.3.1_02*) wants to ascertain whether there is a disturbance to people, which has more restrictive limits than those determined on the structures. Therefore, if the presence of buildings in the most critical areas is verified from the examination of the vibration propagation forecast, this element does not constitute a factor for the estimation of possible damage to the structures, highlighting only the exceeding of a disturbance threshold for the residents of the

building itself. This threshold, although derived from the existing technical regulations at national and international level, is not set by any legislative act.

As regards the effects on structures, structural damage to buildings and/or structures has been observed in the presence of high and prolonged levels of vibration. It should be noted, however, that these levels are higher than those normally tolerated by humans, the levels of which are reported in the ISO 2631 and UNI 9614 standards. This consideration is easily deduced from the comparison of the values reported in the standards that report damage to humans (ISO 2631 and UNI 9614) with the values in the standards that concern structural damage (UNI 9916 and ISO 4866), therefore the former have been chosen as a reference, since they report more restrictive limit values.

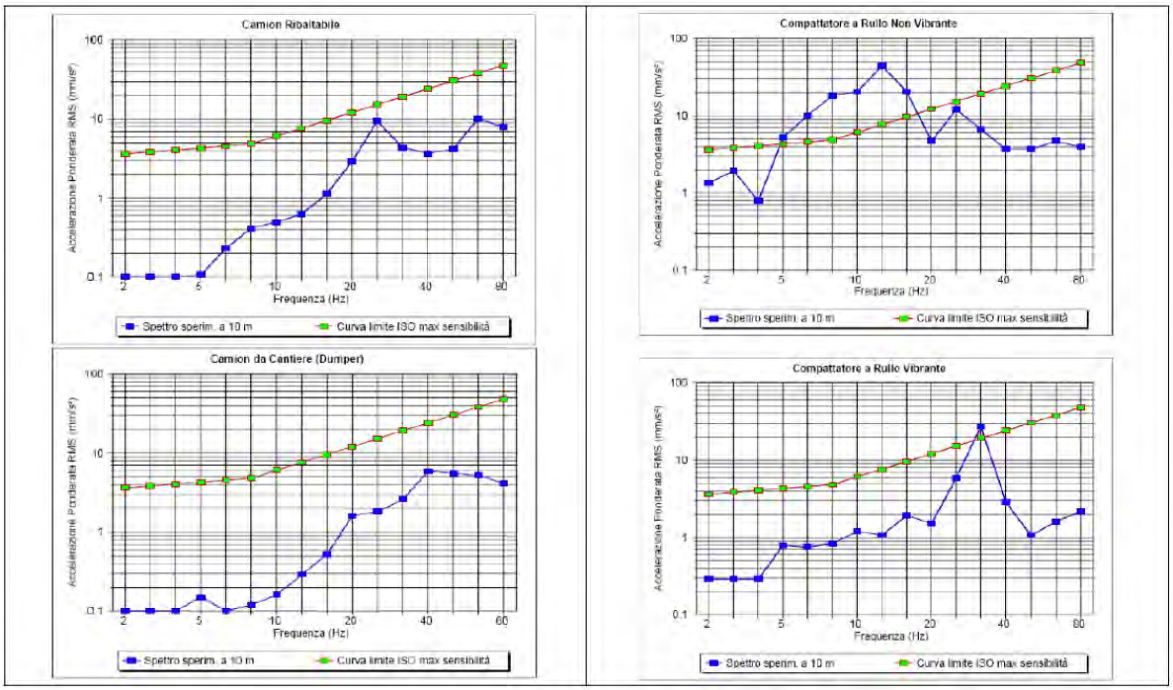
Ultimately, once the objective of guaranteeing acceptable vibration levels for people has been met, the need to avoid structural damage to buildings, at least as far as civilian homes are concerned, is automatically fulfilled. The only exception is to be counted the vibrations that affect monuments and artistic assets of considerable historical-monumental importance, which must be treated as singular points with targeted studies and evaluations. In the context of this study, conducted for a strip of width of 50 m on each side of the planned cable duct, no buildings and/or structures of this type were detected.

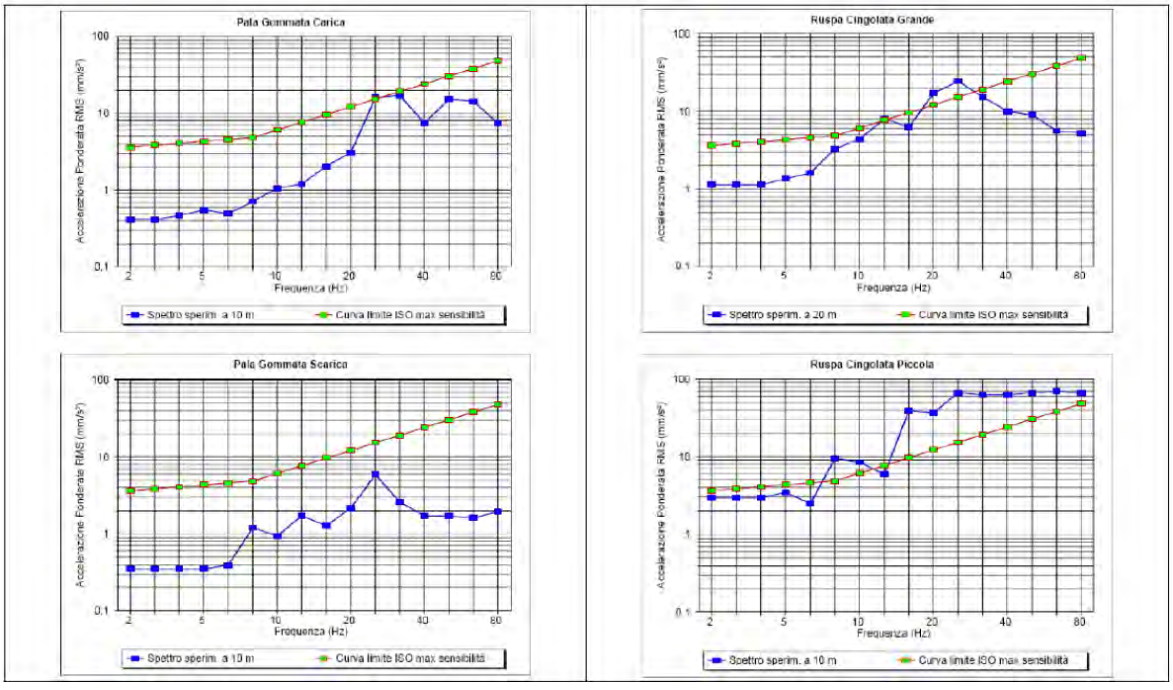
Vibrations can be measured in terms of displacement, velocity or acceleration: displacement coincides with the amplitude of the vibratory event, velocity with the ratio between the displacement and the time in which it takes place, and acceleration with the ratio between the change in speed and the time in which this variation takes place. Usually, for the quantitative evaluation of the disturbance caused by vibrations, effective acceleration (a) is used: it represents the root mean square (RMS) of the values assumed by the acceleration during the time of an oscillation and is obtained numerically by dividing the amplitude of the acceleration by the square root of two. The adoption of this quantity is justified by two main reasons: it is directly measurable with an accelerometer and the sensitivity of the human body is related to accelerations. However, it is also important to know the nature of Teran and how vibrations attenuate in the ground as the distance from the source increases. The ground is a non-homogeneous medium in which vibrational elastic waves propagate, the elastic constants will vary and determine different phenomena such as reflection, refraction and above all attenuation of the elastic wave.
In order to quantify the vibration emissions generated by the machines used in the typical construction site, reference is made here to data available in the bibliography; specifically that these data were obtained from L.*H. Watkins – "Environmental impact of roads and traffic" - Appl. Science Publ. (L.H. Watkins, 1990), which on pages 231-241* which reports a series of experimental data on the emission of vibrations by various types of construction machinery, used in road and railway construction, but also for the realization of the project in question and, in particular, for the construction of civil works and for the demolition phase.
The following table shows an assessment of the vibrational impact distances (distances beyond which the effects are no longer significant) for the "typical" construction machinery that has been examined.

N.	Macchina	Distanza di impatto (m)
1	Camion da cantiere	---
2	Camion ribaltabile	--
3	Compattatore a rullo non vibrante	61
4	Compattatore a rullo vibrante	11
5	Pala gommata carica	11
6	Pala gommata scarica	---
7	Ruspa cingolata grande	34
8	Ruspa cingolata piccola	45

The following data are also reported spectral of vibrational emission shown in the following table with reference to the various machines operators that are typically used on site in relation to the perceptibility limit curve according to UNI 9614.

Macchina/Attrezzatura	Distanza	1	1.25	1.6	2	2.5	3.15	4	5	6.3	8	10	12.5	16	20	25	31.5	40	50	63	80
Camion da cantiere	10	0	0	0	0	0	0	0	0.15	0	0.12	0.15	0.29	0.5	1.67	1.85	2.5	6	5.5	5.2	4
Camion ribaltabile	10	0	0	0	0	0	0	0	0.11	0.23	0.41	0.5	0.6	1.1	2.99	9	3.9	3.3	4	10	8
Rullo compattatore vibrante	10	0	0	0	0.3	0.3	0.3	0.3	0.8	0.7	0.8	1.1	1	2	1.55	6	29	3	1	1.6	2
Rullo compattatore (non vibrante)	10	0	0	0	1.6	1.7	2	0.85	5.8	11	18	20	40	20	4	12	7	3.7	3.7	5	4
Pala gommata carica	10	0	0	0	0.41	0.41	0.41	0.48	0.52	0.50	0.76	1.10	1.25	2	3	17	17	7.8	15	14	7.8
Pala gommata scarica	20	0	0	0	0.35	0.35	0.35	0.35	0.35	0.4	1.2	0.9	1.75	1.26	2	5.2	2.6	1.6	1.6	1.5	2
Ruspa cingolata piccola	10	0	0	0	1.1	1.1	1.1	1.1	1.4	1.6	3.2	4.2	8	6	18	24	16	10	9	6	5.5





From comparison, it can therefore be seen that the transit of heavy construction vehicles at a distance of 10 m, in the absence of jolts of the loads or particularly uneven floors, is generally not accompanied by accelerations that exceed the threshold of human sensitivity, and for longer distances these considerations are all the more valid.

While the processes produced by compactors, vibrating rollers, shovels and bulldozers are instead characterized by significant emissions towards human sensitivity and the possible disturbing effects on the receptors and potential damage on buildings located at a measured distance of 10 m.

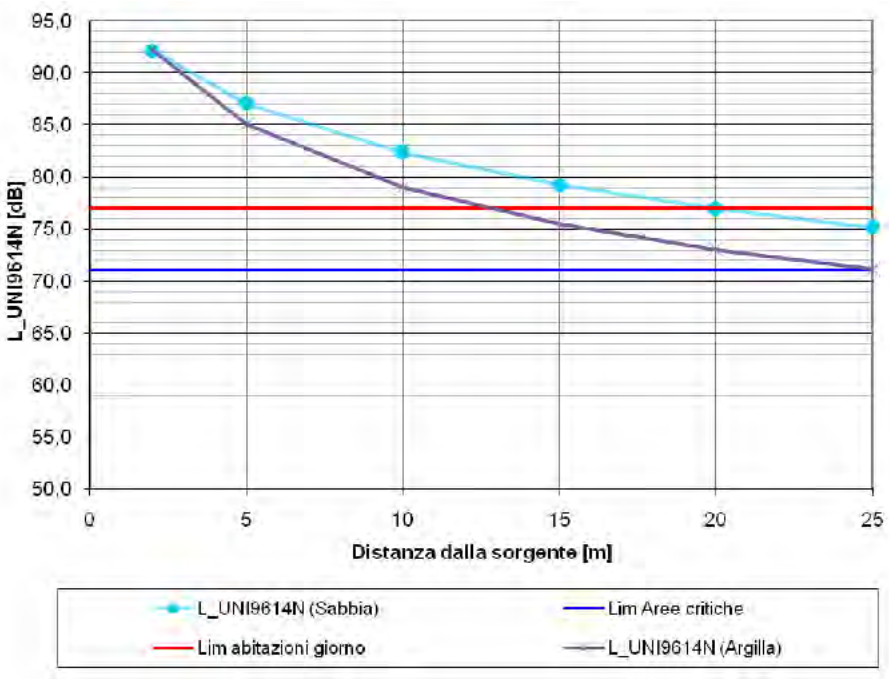
With reference to significant works from the point of view of vibrational impact, it is possible to estimate the level of vibration introduced into a generic building as a function of the distance of the foundation from the source, precautionarily considering minimum values of loss of soil-foundation coupling (reinforced concrete buildings). The estimated weighted acceleration level for generic postures and not known a priori, can then be compared with the disturbance limit indicated by the reference standard UNI 9614 for daytime homes and critical areas. Construction site work, in fact, is normally limited to the daytime period only.

Destinazione d'uso	Accelerazione Vettore V_{sorg} (m/s²)
Abitazioni (periodo notturno dalle 22:00 alle 6:00)	$3{,}6\ 10^{-3}$
Abitazioni (periodo diurno dalle 6:00 alle 22:00)	$7{,}2\ 10^{-3}$
Abitazioni (periodo diurno festivo dalle 6:00 alle 22:00)	$5{,}4\ 10^{-3}$
Luoghi di lavoro	$14\ 10^{-3}$
Ospedali, case di cura e affini (indipendentemente dal periodo)	$2\ 10^{-3}$
Asili e case di riposo (valido anche nel periodo diurno in caso sia previsto il riposo delle persone)	$3{,}6\ 10^{-3}$
Scuole (nel periodo di utilizzo degli allievi e limitatamente alle aule usate)	$5{,}4\ 10^{-3}$

Interference limits UNI 9614

The forecast estimates of the vibrational emissions of construction site vehicles can therefore be carried out, as a precautionary measure, for the phase of activity characterized by the maximum values of vibrational emissions, corresponding to the rolling for the construction of the substrates of the slabs considering 2 standard types of soils: "sands, silts, gravels, loess" and "clays, clayey soils".

The following figure shows the results of these estimates (typical literature data) with reference to the activity with compaction operating machines.



Estimation of the decay curves of the vibrations generated during compaction operations by means of compactors, of the substrates of the reinforced concrete slabs in correspondence with different types of soil through which propagation takes place and comparison with the acceptability limit curves of the UNI 9614 standard

From what has been illustrated above, it is possible to deduce that the activities that require the use of rollers for the compaction of the substrates, considered the most impactful machinery, as they transmit vibrations directly to the ground, determine significant and disturbing vibrational levels up to distances of the order of about 20 m for propagation through "sands, silts, gravels, loess" and up to about 12.5 m in the case of "clays, clayey soils".

Taking into account the fact that the first receptors that can be considered potentially exposed to vibrational phenomena induced by the construction phase of the new plant, are located at distances from the perimeter of the construction site area of the order of about ten meters, it therefore seems immediate to verify with sufficient confidence that the risk of the occurrence of phenomena of disturbance to people or structural/aesthetic damage, induced by the construction activities of the civil works envisaged in the timetable, phases judged to have the greatest impact from the point of view of vibrations, is averted.

Finally, with regard to the phenomena of potential impact from vibrations generated by traffic induced to and from the construction site area, also in this case possible phenomena of disturbance to people and/or structural/aesthetic damage to buildings can be avoided. In fact, the access roads to the construction site, which will be used by heavy vehicles entering and exiting it, consist of the current road system adjacent to the area of interest. Numerous studies have shown that the passage of heavy trucks and articulated vehicles at 70 km/h, along roads that are not particularly bumpy, does not produce significant alterations in the vibrational climate already starting from about 10-15 m away from the transit trajectory; at lower speeds, such as those presumably estimated for the road network of interest, the distance of potential significant impact decreases further.

To define whether the vibration impact is to be considered bearable or not, reference was made to what has already been illustrated in the previous paragraph, comparing the incidence of the construction site vehicles with the actual distance of the identified receptors. It should be noted that the latter is the same as that considered for sound impact assessments in such a way that the propagation path is unchanged.

The following table shows the coordinates of each individual point as well as the distance from the nearest source considered (representation of the mobile construction site).

ID	Common	Typology	Coordinates	Distance from source (m)
Receptor 1	Zapponeta	Home	lat 41°27'2.81"N; Long 15°58'16.54"E	97
Receptor 2	Zapponeta	Home	lat 41°26'58.26"N; Long 15°58'6.17"E	8
Receptor 3	Zapponeta	Home	lat 41°27'13.99"N; Long 15°57'40.27"E	5
Receptor 4	Zapponeta	Home	lat 41°27'13.88"N Long 15°57'36.14"E	15
Receptor 5	Cerignola	Home	lat 41°24'56.79"N Long 15°54'22.64"E	140
Receptor 6	Cerignola	Home	lat 41°24'0.41"N Long 15°54'15.64"E	24,50
Receptor 7	Cerignola	Home	lat 41°23'19.75"N Long 15°54'18.49"E	38
Receptor 8	Cerignola	Home	lat 41°22'54.02"N Long 15°54'15.79"E	21,50
Receptor 9	Cerignola	Home	lat 41°22'43.20"N Long 15°54'7.89"E	116
Receptor 10	Cerignola	Home	lat 41°21'37.96"N Long 15°54'7.60"E	32
Receptor 11	Cerignola	Home	lat 41°21'31.04"N Long 5°54'6.63"E	45 m
Receptor 12	Cerignola	Home	lat 41°21'9.01"N Long 15°54'21.13"E	322.80 m
Receptor 13	Cerignola	Home	lat 41°21'8.48"N Long 15°54'5.64"E	34.79 m
Receptor 14	Cerignola	Home	lat 41°21'7.06"N Long 15°54'5.67"E	31 m

Once the distances of the source are known, a comparison has been made with respect to the limit emission distance values with respect to the main construction site vehicles that are intended to be used and of which the table is shown again.

N.	Macchina	Distanza di impatto (m)
1	Camion da cantiere	---
2	Camion ribaltabile	--
3	Compattatore a rullo non vibrante	61
4	Compattatore a rullo vibrante	11
5	Pala gommata carica	11
6	Pala gommata scarica	---
7	Ruspa cingolata grande	34
8	Ruspa cingolata piccola	45

The red box indicates the means to be used. While as far as the bulldozer is concerned, wheeled machinery will be used for which the impact distance is around 8-10 m.

It can therefore be said that of the 14 receptors only receptor no. 2 and no. 3 are within the vibrational impact buffer produced by the construction site vehicles and for this reason during the construction phase it will be necessary to provide all the appropriate mitigation measures as well as measures necessary to minimize the vibrational impact.

For only the two receptors subject to a greater impact from vibrations, a further investigation was carried out by comparing the duration of permanence of the onshore work with the vibration incidence buffer.

As can be seen from the images, the waves produced during the work will have a cone of incidence, with respect to the positioning of the receptors, with a maximum length of 11 m and 16 m respectively, which means that the maximum action of the vibrations will have a maximum effect in the time needed to complete sections of the cable duct of length equal to those indicated.

Taking into account that during the design phase an average daily production of parts was estimated at 85 ml, for a working day of 8 h the action of vibrations will have a temporal incidence of 1h 03' for receptor no. 2 and 1 h and 50' for receptor no. 3.

Without prejudice to the previous information regarding the use of suitable instrumentation and measurement systems, the estimated durations can easily be considered a small part of the total onshore cable duct laying works.

In the light of the above considerations, it is therefore not believed that the activities that will be carried out within the construction site area for the realization of the project, may induce significant impacts from vibrations, and consequent potential disturbances to people and/or

structural/aesthetic damage to buildings, at the receptors closest to the construction site itself, consisting essentially of residential buildings that arise along the route of the cable duct construction site.

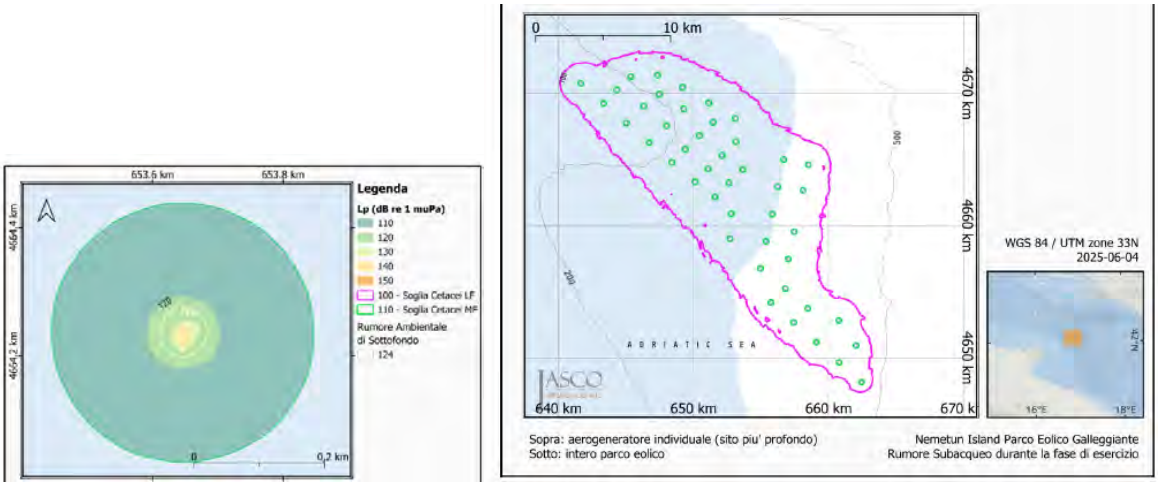
The impact derived from noise and vibrational emissions for offshore and onshore works can be classified with value **negative of medium magnitude and reversible**, due to the implications that can be produced on marine and terrestrial fauna.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

Please refer to the reports "*SIA. ES.2.2_02_Predictive Assessment of Acoustic Impact in Offshore Areas"*, *SIA.ES.2.3.1_02_Predictive Assessment of Noise and Vibration Impact in Onshore Areas"* and "*SIA. ES.2.3.2_01_Predictive Assessment of Noise and Vibration Impact in Onshore Areas – Receptor Sheets and Distances*" for the necessary further information.

4.2.9.2 Operation phase

The operation phase does not see the performance of particularly noisy operations at sea, the emission of noise into the environment is therefore linked to the presence of wind turbines in operation and above all to their limited impact on marine wildlife components, as described in paragraph 4.2.7.2.



Map of noise emission values during operation

This kind of introduction will not introduce no significant risk factor for human health, also considering the baseline scenario of the range marked by strong background noise. On the fauna component, the results obtained show that during the operation phase of the wind farm, the noise generated by each turbine remains above the ambient noise level only in a locally circumscribed area; this suggests that the noises (tones and creaks and squeaks of the catenaries) are discernible from the background noise only within less than 100 meters of the relative wind turbine. Therefore, the wind farm will not determine sounds that could induce a danger of damage to the auditory system of marine mammals and therefore although negative, it does not have a high magnitude. The impact considered in this phase is non-reversible because it extends to the entire operation of the plant.

We will be able to classify the alteration with value **negative, low entity, non-reversible.**

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.9.3 Decommissioning phase

In the process of being dismantled **Noisy work or with vibrations assessed during the construction phase is not expected.** The magnitude of the impact can be classified as **negligible**, because no significant or altering emission sources will be introduced with respect to the basic context.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

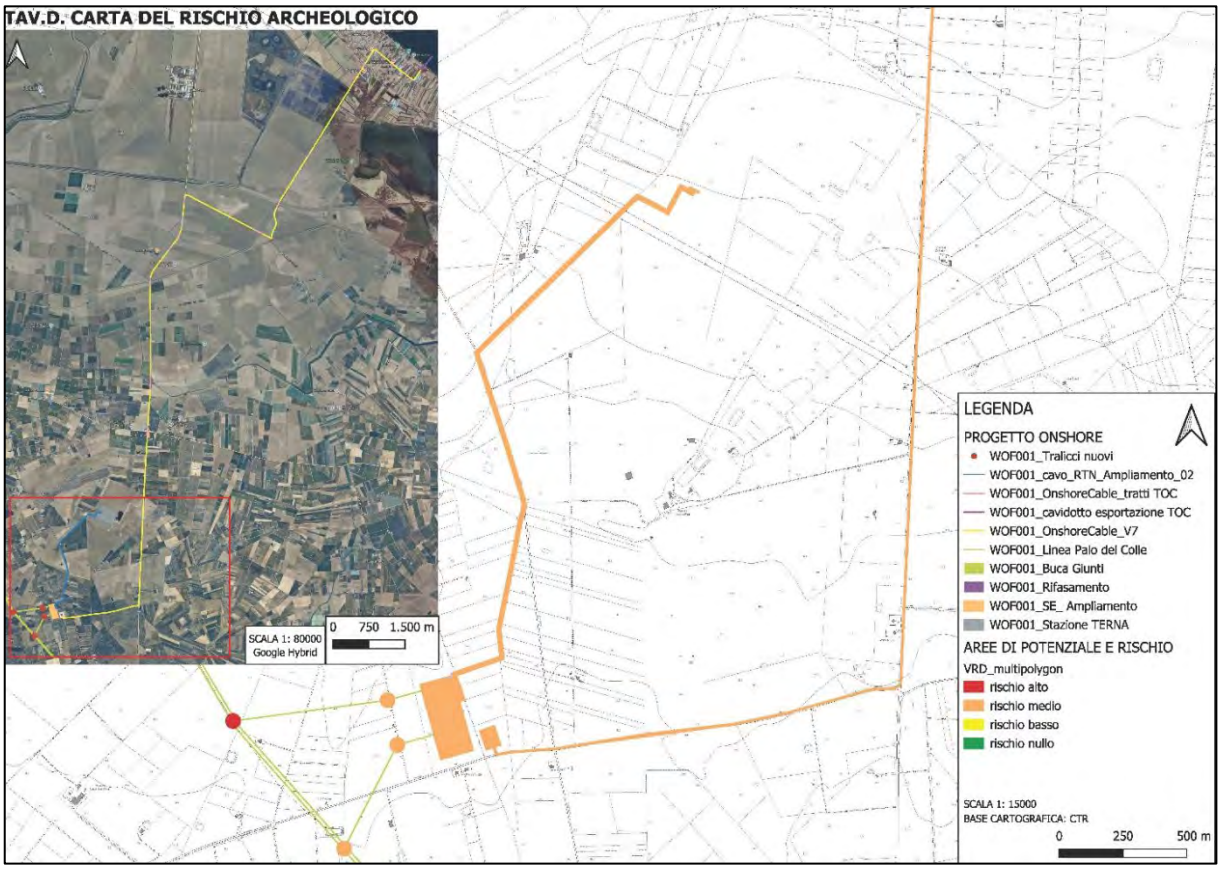
4.2.10 ESTIMATION OF IMPACTS ON ARCHAEOLOGICAL HERITAGE

In order to define and assess the consistency of a possible "archaeological risk" in the areas affected by the interventions, a careful analysis and a risk assessment study were carried out, contained in the section *Ex.10-11* attached to the Environmental Impact Study, the summary of the investigations carried out is also included in the basic scenario of this study in paragraph 4.1.7.

At the end of the analysis carried out on the studies carried out on the **Onshore archaeology**, all the data listed above have been incorporated into the *ES.10.7_01_Map of archaeological risk*.

Considering the degree of visibility on the ground during the reconnaissance, the distance of the known archaeological evidence and that all the project roads are elevated with respect to the surrounding land due to the geomorphological conformation of the territory, the following degrees of risk have been established:

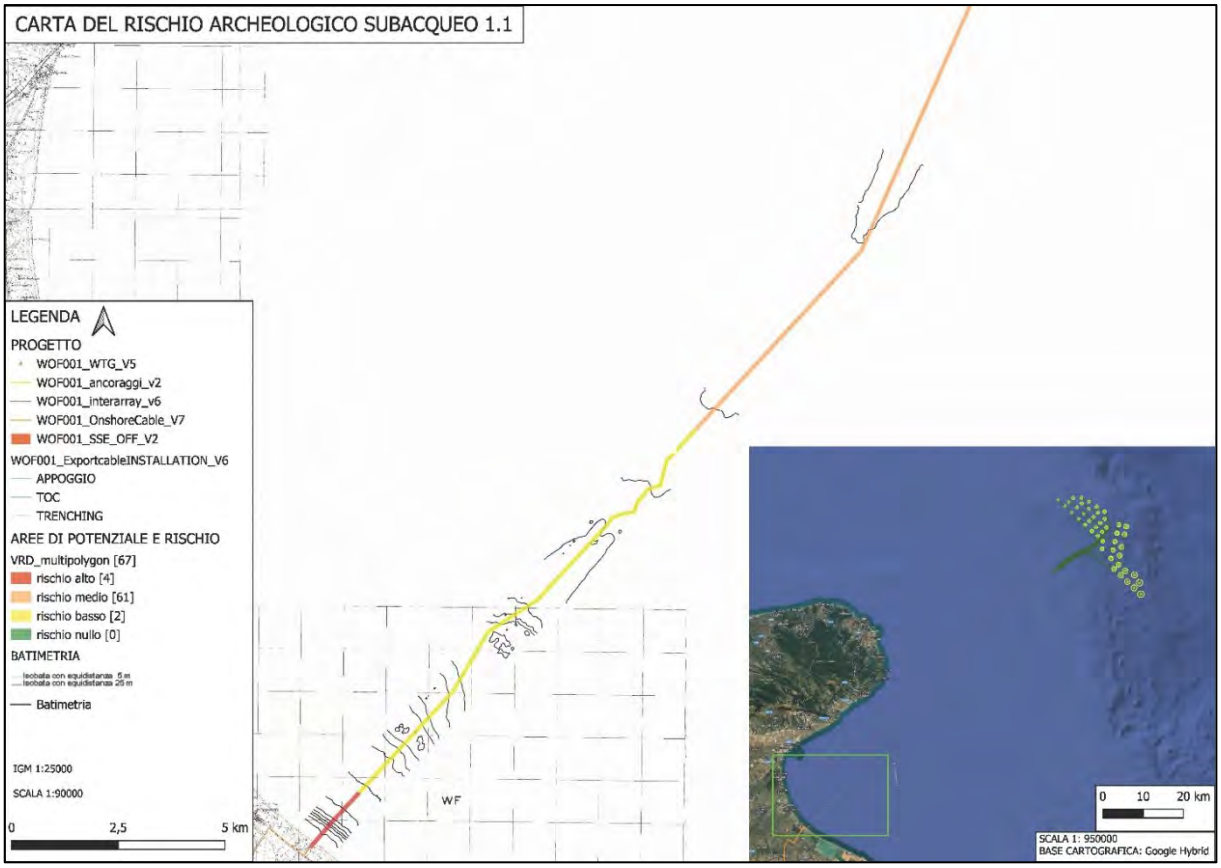
- **Archaeological risk High** for the pylon close to the site known as "Località Masseria Acquarulo di Grillo";
- **Low archaeological risk** for sections of cable ducts built on elevated roads or with HDD technique;
- **Medium archaeological risk** for all other project areas.

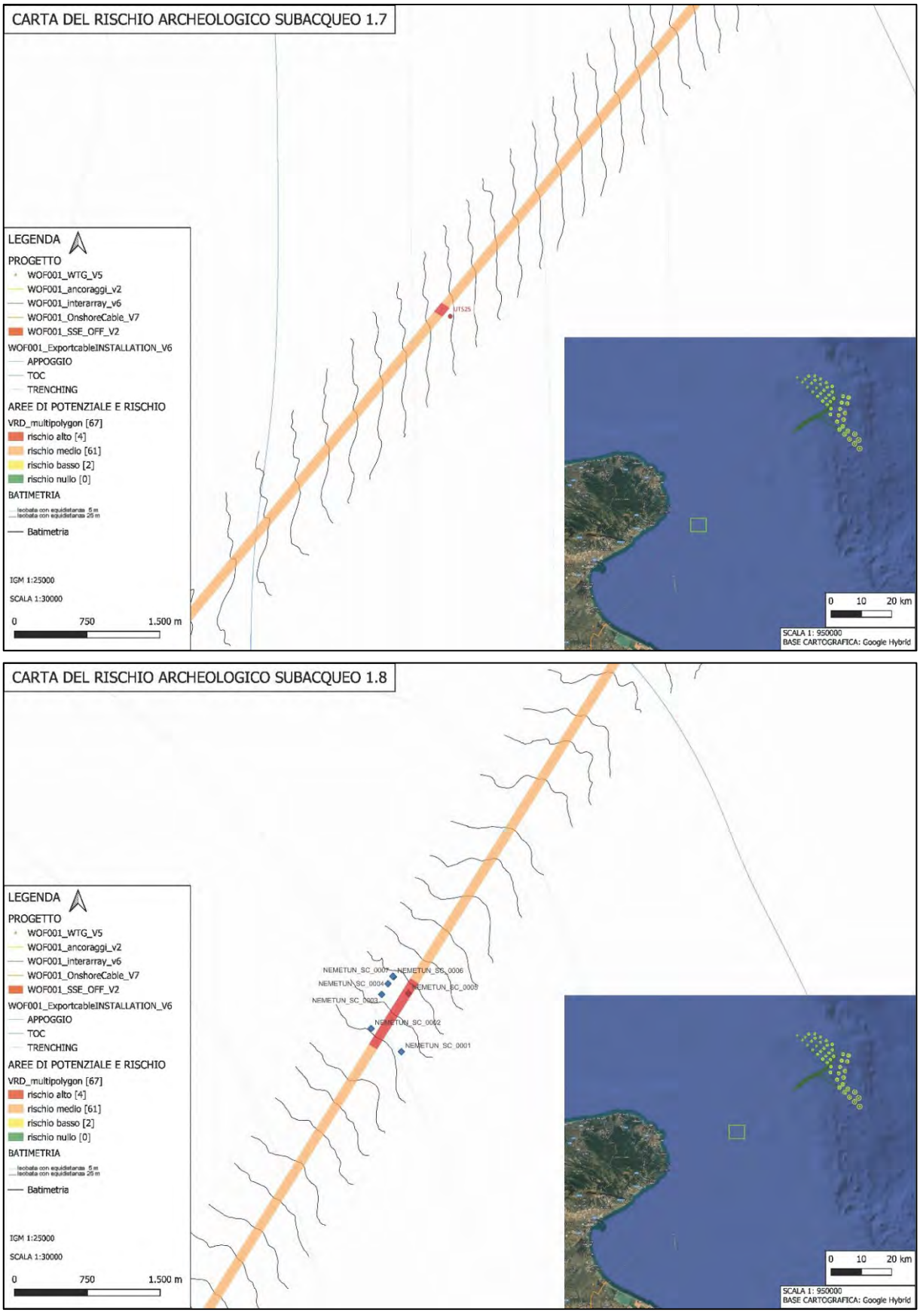


Archaeological risk map – excerpt

Regarding **Underwater archaeology** On the basis of the surveys and direct surveys carried out and reported in paragraph 4.1.7.2, we can summarize that:The underwater archaeological evaluation of the data obtained from the instrumental reconnaissance has made it possible to assess the absence of evidence of a historical/archaeological nature or inherent to the submerged cultural heritage. However, the presence of coastal evidence, port sites with important commercial roles, the discovery of finds (amphorae, anchors, etc.) decontextualized and isolated, rarer ancient wrecks and more frequent contemporary

shipwrecks, which occurred in previous decades, in correspondence with the reference area of the coastal municipalities involved in the Project *Nemetun Island*, which have been affected in the past by frequentations, stationing, navigation and anchoring and stopover activities – especially in correspondence with the *Guillemot*/Vieste, Siponto and *Salapia*/Salpi – suggest that specific checks will be necessary during the processing and implementation phases of the project precisely in correspondence with the latter area and in those specifically indicated in the "Underwater Archaeological Risk Maps" (***ES. 11.1_01***). Was defined the archaeological risk of offshore works as a high, medium and low risk, to be investigated more by means of the supervision of the works.





ES. 11.1_01 - Archaeological Risk Maps

4.2.10.1 Construction phase

As far as has been highlighted, the impact of the Nemetun Island wind farm on the archaeological heritage is **negative**, of **Low entity** but **reversible** in the construction phase resulting from the study of onshore archaeology. To avoid any possible - albeit remote - impact on the historical evidence during the excavation operations, all the work that involves the removal of soil will be carried out with archaeological surveillance, any finds will be reported and protected as required by current legislation.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

In the other two phases of the life cycle of the work, the impact is **null**.

4.2.10.2 Operation phase

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.10.3 Decommissioning phase

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.11 ESTIMATION OF IMPACTS ON THE LANDSCAPE – VISIBILITY

4.2.11.1 Visual impact

For the assessment of the impact of offshore wind farms, an important reference is the document *"Guidance on the Assessment of Impact of Offshore Wind Farms: Seascape and Visual Impact Report. Department of Trade and Industry (2005)"*, in which the concept of "seascape" is first introduced.

- The "seascape" is defined as the landscape of the coastline and adjacent marine areas, including views from land to sea, from sea to land, as well as along the coastline.
- In other words, the coastal landscape includes an area at sea, an area of land and a stretch of coastline, as identified in the Figure on the side, i.e. it represents an area in which there is a common intervisibility between land and sea.

The guidelines highlight how the concept of "seascape" represents an evolution of that of "landscape" and, referring to the definition proposed in the European Landscape Convention, identifies it as the result of the interaction between different natural and anthropogenic environmental components and how this interaction is perceived by the inhabitants/users of a given area.

Visual impacts on the seascape, similarly to those on the landscape, derive from changes in its appearance and/or perception, i.e. they concern the presence of elements of visual intrusion, obstacles, changes in the context or specific views, which determine a change in the attitude and behavior of observers.

The most relevant factors for the purpose of assessing the impact that a wind farm determines with respect to the perception of the landscape in which it is inserted are:

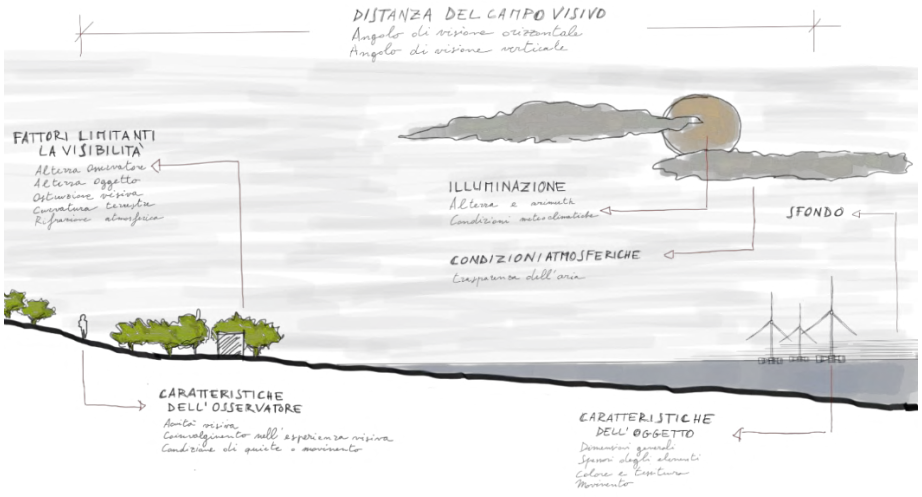
- the total number of wind turbines and the distance between the wind turbines, i.e. the position of the plant and the occupation of the field of vision;
- the landscape value of the areas on land and at sea, as well as along the coastline, in which the offshore wind farm is located;
- the usability of the landscape and, therefore, the presence of points of view of particular importance.
- The need to pay specific attention to the identification of the planting site to prevent significant effects on the seascape and the related visual impacts is clearly highlighted in the Guidelines drawn up by the UK Department of Business and Industry in 2005.

The location is the result of a careful analysis of the alternatives, which also takes into account the possible mitigation actions to be implemented. In this specific case, this analysis is explained in detail in the *S.5_01_ Analysis of Alternatives*.

Given that the layout of a wind farm is the result of a compromise between maximizing energy efficiency and respecting technical constraints (depth of the seabed, navigation routes, etc.) and environmental constraints (marine ecology, archaeology, bird protection, fishing, etc.), the identification of the wind farm installation area must then be associated with a careful design of the layout, which considers the most significant landscape views and verifies the new visual interrelationships, which will be defined in the context of the "seascape".

In other words, the criterion for assessing the visual impact cannot consist only of the distance from the coast, but the new relationships that will be established between the wind turbines and the "seascape" must be evaluated.

The interaction between the observer, the new layout and the landscape can be studied with reference to specific factors, which characterize each of the interacting elements and which are summarized in the following Figure.



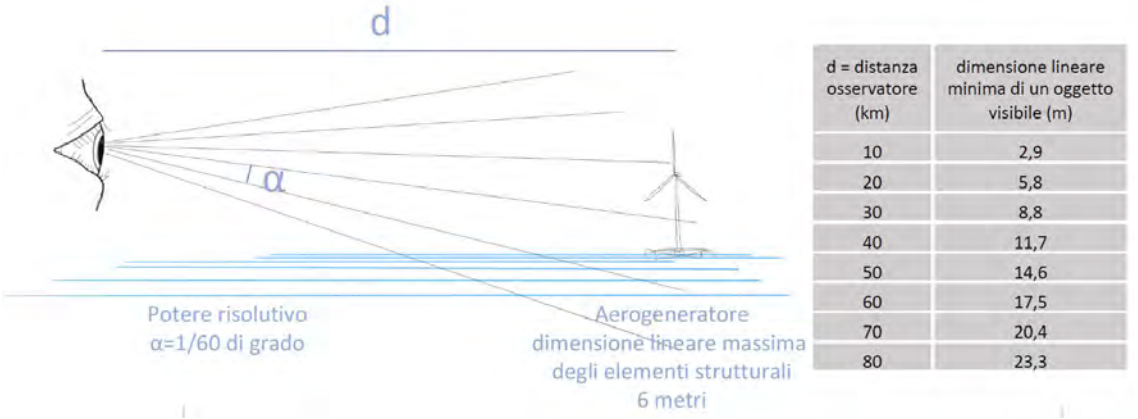
Visibility factors

The resolution of the human eye and its ability to distinguish details from a distance are crucial factors for the visibility of objects such as offshore wind turbines. Visual acuity, or visual acuity, is the ability to discern the fine details of an object and is measured in several ways, including the minimum angle of resolution (MAR), which is the smallest angular distance at which two lines can be perceived as separate.

The normal eye has a resolution acuity of about 35-50 arcseconds, and the maximum resolution for a healthy eye is about 20/10, with an average value of about 16/10. This means that, under ideal conditions, two points must be separated by at least one first of an arc to be distinguished as separated. However, as distance increases, the resolution of the human eye decreases. For example, at a distance of 20 km, the human eye has a resolution of about 5.8 m, which means that objects larger than about 6 m are visible (ref. Figure below).

The visibility of an offshore wind farm depends on various factors, including the visibility distance, which is the maximum distance expressed in km from which a wind turbine of a given height is visible. However, this distance of visibility is strongly influenced by factors such as the presence of obstacles, weather conditions and the brightness of the environment.

It is evident that the loss of resolution of the human eye with distance is a determining factor for the visibility of offshore wind turbines. While at close distances the eye can distinguish very fine details, at longer distances, such as those typical for offshore installations, the ability to resolve significantly decreases, affecting the visual perception of such structures.



d = distanza osservatore (km)	dimensione lineare minima di un oggetto visibile (m)
10	2,9
20	5,8
30	8,8
40	11,7
50	14,6
60	17,5
70	20,4
80	23,3

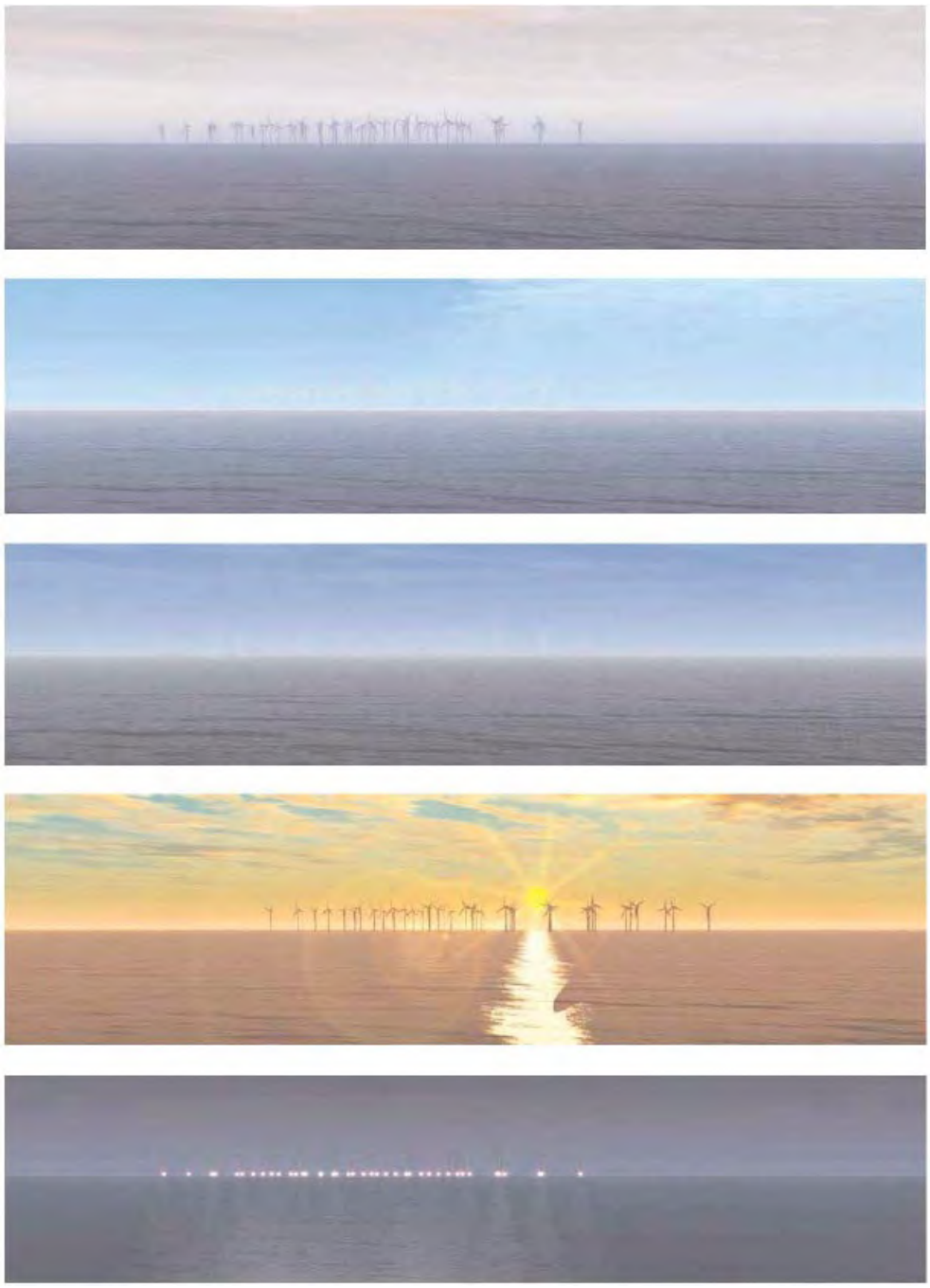
Resolving power of the human eye as a function of distance

In this regard, before proceeding with an analysis of site-specific effects, it is useful to underline some specific elements regarding the interrelationship and the factors mentioned above:

- Observer factors, the visibility of the observer is influenced, in addition to distance, by horizontal and vertical viewing angles. Within the field of vision of the human eye, attention, or the response to stimuli, is maximum in the central area and decreases towards the periphery. It follows that the perception of an object varies considerably depending on the position occupied by it within the visual field, as well as with respect to the percentage of field that it occupies. In addition, the perception of objects within the visual scene increases according to the level of attention and information he already has available about what he is observing. In other words, active and aware observers identify certain objects or visual patterns more easily, having a different perception of elements that may remain less visible to others, depending on their color or shape, rather than on the characteristics of their background.

- environmental factors, the visibility of a structure, in particular of a wind farm, is strongly influenced by weather and atmospheric conditions, as well as by the type of lighting, i.e. the time of day when the wind turbines are observed. To confirm this, the following is an image extracted from the British

Guidelines, from which it emerges that there are conditions in which wind turbines do not appear distinguishable from the background.



Visibility of an offshore wind farm under changing lighting conditions (DTI Guidelines, 2005)

To this end, as described in the following paragraphs, the following steps have been taken:

- edit **Intervisibility maps**, in order to identify the areas from which the intervention is visible and to be able to assess the "weight of the visual impact" through a quantification of the level of visibility from each area;
- identify the **Sensitive points of view**, chosen from community sites and protected areas, significant elements of the natural system, architectural and archaeological constraints, significant elements of the historical-cultural system, panoramic and landscape roads, inhabited centers, etc., from which the plant could be targeted;

- develop specific **photo insertions**, able to return in a more realistic way any visual interference and alterations of the landscape value from the observation points considered most sensitive.

4.2.11.2 Intervisibility maps

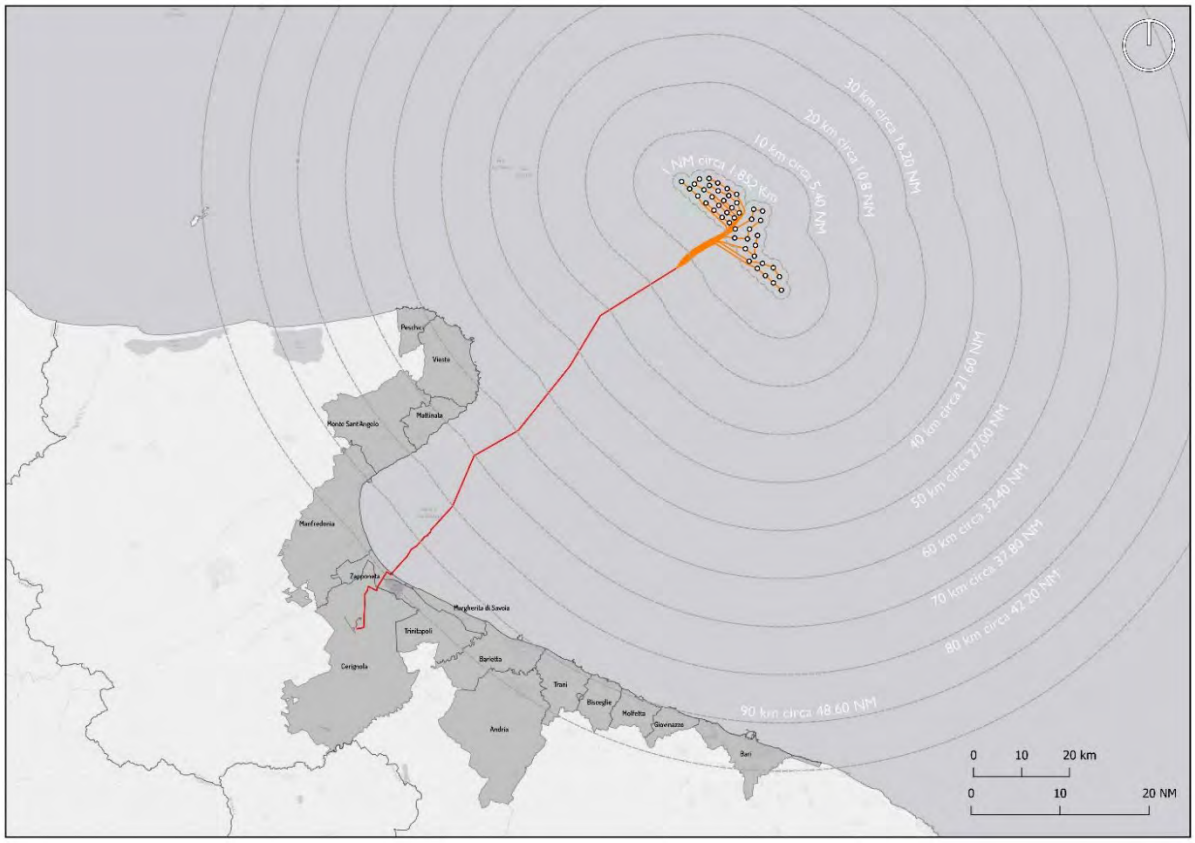
The assessment of visual impacts first presupposes the identification of a theoretical visibility zone (ZTV), defined as the area in which the new plant can theoretically be seen. According to the ministerial guidelines referred to in the Ministerial Decree of 10 September 2010, the minimum spacer to be considered is 50 times the height of the wind turbines, or in the case in question equal to 13.4 km.

In the case at hand, since it is an offshore installation, this area was assumed to correspond to an area defined by a radius of 50 km from the project wind turbines. At this distance, if we consider the effect of the Earth's curvature on the visibility of the objects schematized in the following figure, applying the Pythagorean theorem and considering an average volumetric radius of the planet equal to 6,371 km, given an observation point at 1.5 m above the surface (corresponding to the eye of an average observer), the part of the observed object that is not visible has a height of about 163 m (the hub of the wind turbines would not be visible anyway). Considering that the territorial context in question is characterized by particular morphological emergencies such as the Gargano promontory and part of the northern Murgia, it was considered to push the investigation to a distance of 80 km, since from the aforementioned areas, raised a few hundred meters above sea level, the wind farm could be visible.

Earth's curvature effect scheme on the visibility of objects

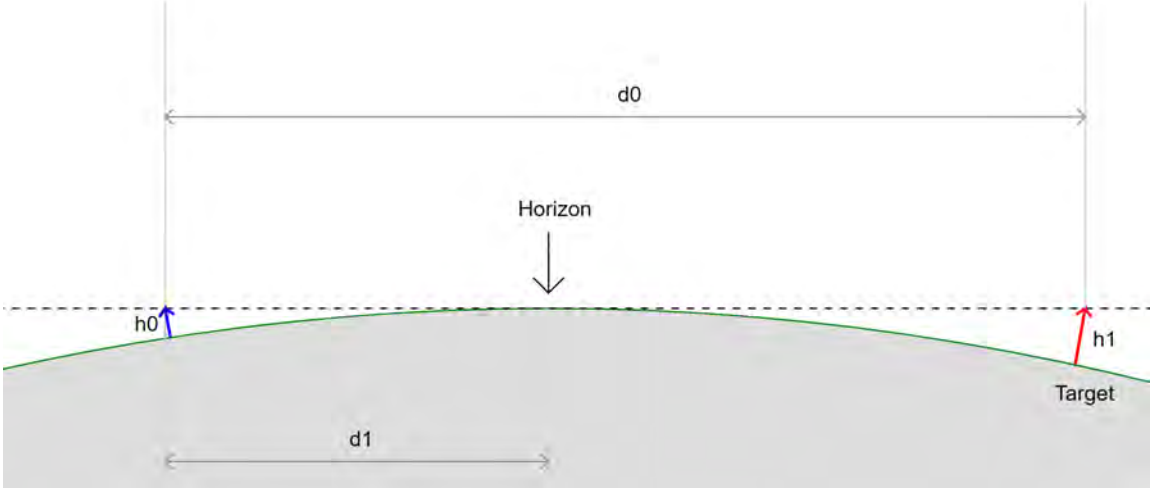
Map of theoretical intervisibility

The following figure shows the location of the wind farm and the buffer areas of 20, 30, 40, 50, 60, 70, 80, 90 and 100 km in order to evaluate its possible theoretical intervisibility.



Location of the plant area and wind turbines with buffer areas from 20 to 100 km

In the following figure, d0 is the distance at which the observer with height h0 is placed, while d1 is the distance of the horizon, beyond which the part of the target (in this case the wind turbine) with height h1 will not be visible.



Calculating the effect of the Earth's curvature

In order to appreciate the extent of the potential visibility of the wind turbines, the following table lists the data relating to different distances for an observer placed on the coastline at sea level.

Distance (d0)	Observer height (h0)	Horizon distance (d1)	Height not visible wind turbine (h1)	Carrycot visibility	Wind turbine visibility
20 km	1.5 m	4.37 km	19.16 m	YES	YES
30 km	1.5 m	4.37 km	51.54 m	YES	YES
40 km	1.5 m	4.37 km	99.61 m	YES	YES
50 km	1.5 m	4.37 km	163.38 m	NO	YES
60 km	1.5 m	4.37 km	242.85 m	NO	YES
70 km	1.5 m	4.37 km	338.01 m	NO	NO
80 km	1.5 m	4.37 km	448.86 m	NO	NO

The wind turbines in the project are characterized by a nacelle height of 155 meters and a rotor of 260 meters in diameter, developing a total height of 285 meters. Considering an observer placed on the coast line, therefore at sea level, it can be said that at a distance of 55 km (the point of the coast closest to the plant corresponding to the Municipality of Vieste) the visible part of the wind turbine closest beyond the horizon would be about 160 meters. Beyond 55 km the spacecraft would no longer be visible, while beyond 70 km no wind turbine beyond the horizon would be visible. Basically, moving away from Vieste towards the interior of the Gargano, an observer will barely be able to visually perceive a wind turbine. The visible part of the rotor that passes the nacelle, in fact, is actually not visually perceptible both because the blades are thinner structures than the support pylon and the nacelle itself, and because they are in continuous motion.

With reference to the hinterland areas, the study involves the analysis of the visibility of the wind farm through the creation of theoretical intervisibility maps for the entire territory falling within 100 km, in order to identify the areas from which the intervention is visible and to be able to assess the "weight of the visual impact" through a quantification of the level of visibility from each area.

The Theoretical Intervisibility Maps were calculated using specific software starting from the DTM (Digital Terrain Model) TINITALY 1.1 Digital Terrain Model made available by INGV, with raster grid resolution of 10 meters on each side.

The DTM has been integrated with some classes of the urbanized area as of 2011, made available by the Puglia Region, with the aim of taking into account the effect of shielding the view and masking of these classes of objects. The following table lists the objects taken into consideration and their heights that were added to the DTM, thus obtaining a DSM (Digital Surface Model) that was then used to calculate the Theoretical Intervisibility Maps (MIT).

TYPE	H_{Min} [m]	Notes
Projection	4,00	*1 floor housing height above ground*
Shed	2,50	Minimum height of type shack
Aqueduct cabin	0,50	minimum height of AQP manholes/operating chambers
Electrical substation	2,50	Minimum height of electrical substations (modern)
Gas cabin	2,00	Minimum height
bell tower	20,00	average height
Indoor sports field	8,00	Minimum height of the sports structure
Shed	7,00	minimum height of small shed
farm shed	7,00	StreetView Detected Height

TYPE	H_{Min} [m]	Notes
Ruined shed	6,00	average height
Shed under construction	7,00	Estimated minimum height per shed nearing completion (rustic generally complete)
Cemetery chapel	3,00	Minimum height of a typical chapel
Toll booth	7,00	railway building Guagnano
castle	20,00	average height
Telecom control unit	1,50	Minimum height of control unit type
Church	5,00	Minimum height of non-monumental churches
Chimney	15,00	average height
Civil building	4,00	height of 1-storey houses above ground (NB, all houses were considered for the minimum height as if they were one-storey, even in larger towns)
Ruined building	3,00	Minimum height of incomplete buildings
Building under construction	4,00	Minimum height of single-storey buildings
Basement building	2,00	Minimum height for basement buildings
Lighthouse	4,00	Minimum height
thick retaining wall	6,00	average height
Representable wall thickness	6,00	average height
Pagghiara	3,50	Minimum height Pagghiara typical of the area
Bridge	7,00	Minimum road bridge height
porch	3,00	Porch height single-storey buildings
reservoir	8,00	Minimum height small water tanks
Reservoir	8,50	Minimum height of industrial products
Tank Piezometric Tower	10,00	minimum height of water towers (verified on a sample basis)
Greenhouse	2,50	Minimum height of greenhouses in the most common types
Sylos	8,50	minimum height of industrial products (see tanks)
pressurized marquee	8,00	Minimum height of pressurized marquees (sports activities)
Shed	2,50	Minimum canopy height in urban and rural areas
tower	15,00	Minimum height of towers merged with farms
Wind farm pylon	80,00	average height
Sports field grandstand	5,00	Minimum height of a grandstand
Trullo	3,50	V. Pagghiara

In this specific case, the MIT was obtained through the specialized functions in visibility analysis typical of G.I.S. (Geographical Information Systems) software. The functions used in the analysis made it possible to determine, with reference to the planimetric and altimetric conformation of the terrain and the presence on it of the main territorial shielding objects, the areas within which the project wind turbines are visible from an observation point conventionally placed at an altitude of 1.50 m above the ground and, conversely, the areas from which the wind turbines are not visible.

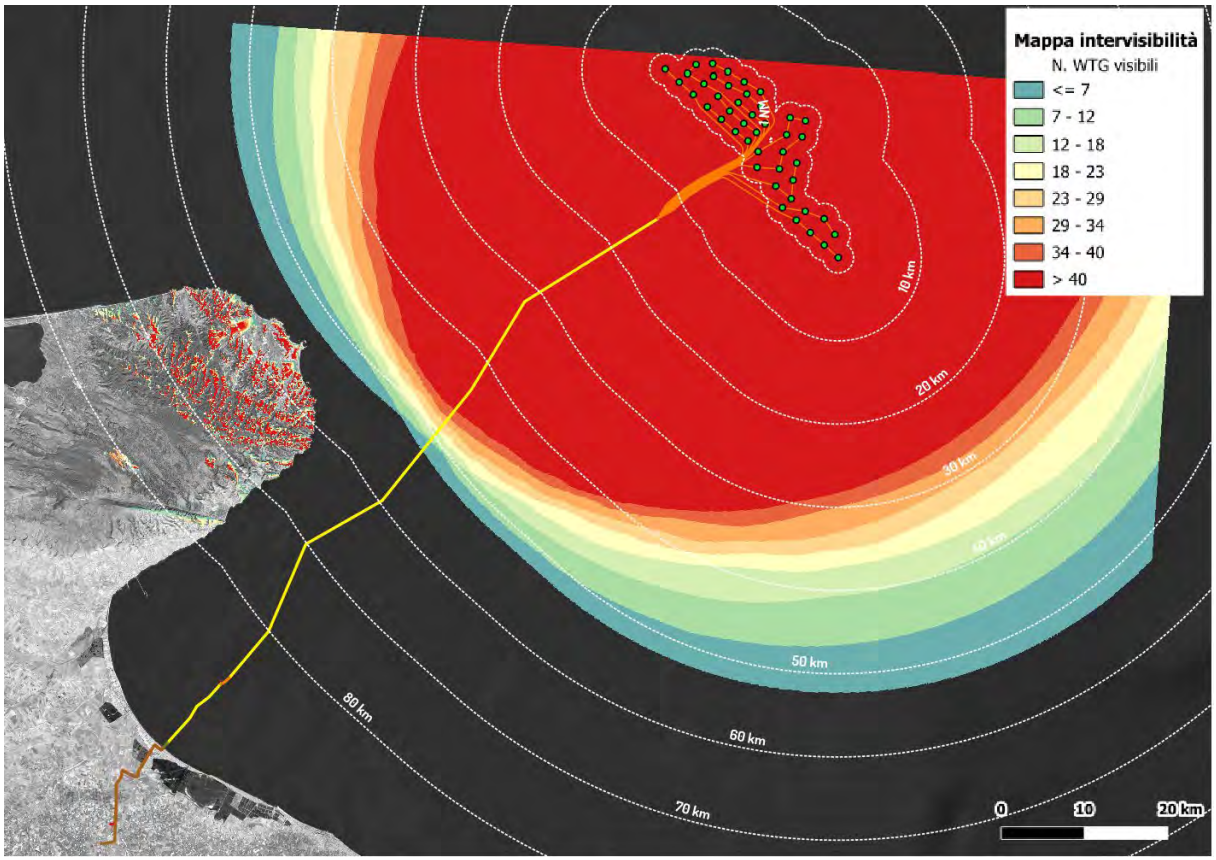
There are two maps calculated: the first concerns the visibility of the wind turbines considering a target height of 155 m, i.e. at the hub (note that the 151 meters indicated by the supplier have been increased by adopting a prudential criterion), a second considering a target height of 285 m, i.e. the entire height of the individual wind turbine, including the rotor tip.

The result of the visibility analysis by GIS consists of raster maps in which the study area is discretized in a regular square grid with a resolution of 10x10 meters (derived from the DTM/DSM used for the

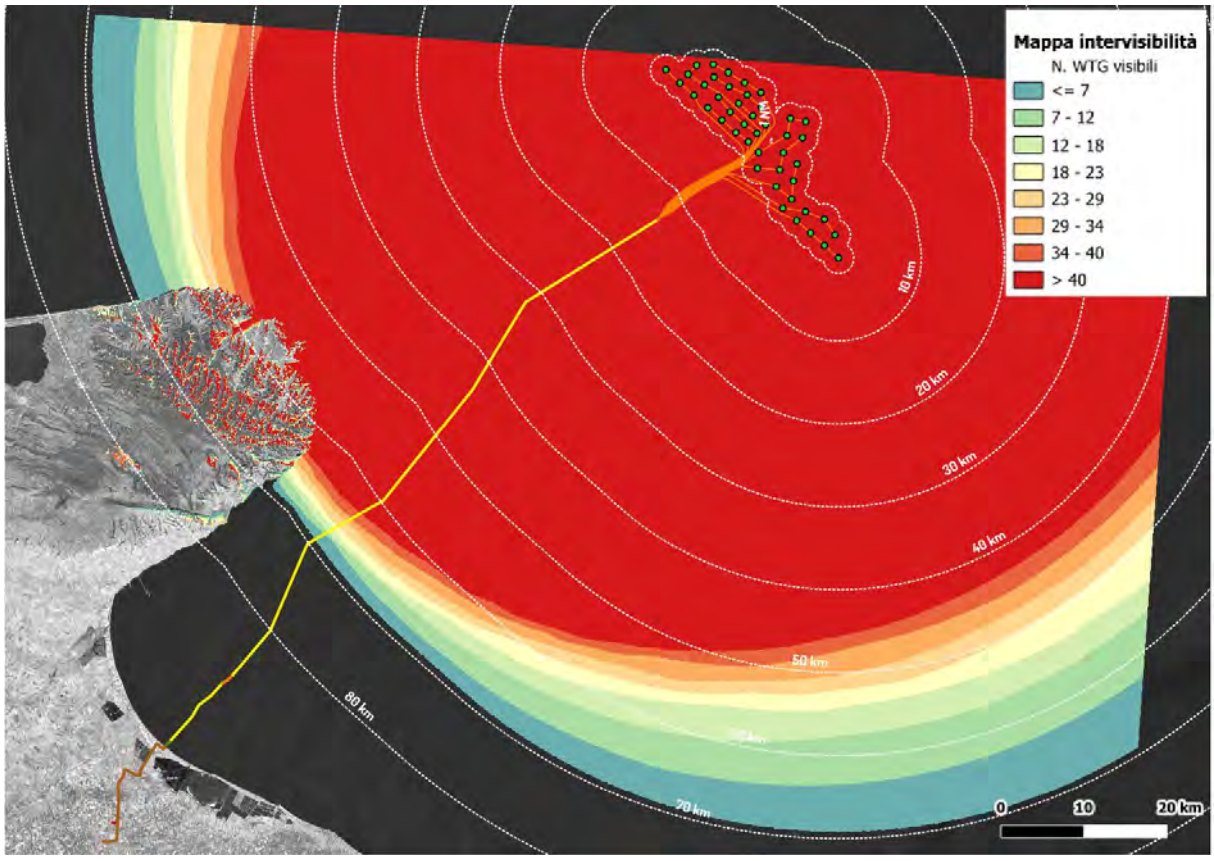
calculation). Each cell of the grid is associated with an integer numerical value, varying from 0 to 45, which corresponds to the number of wind turbines that are visible from all points located within the cell.

In this case, the value 0 is associated with the points from which none of the wind turbines is visible; the value 1 is associated with the points from which only one of the wind turbines is visible; the value 2 is associated with the points from which only two of the wind turbines are visible and so on, up to 45.

In the next two images, the calculated and reclassified theoretical intervisibility maps are shown.



Theoretical Intervisibility Map spacecraft altitude 155 m



Theoretical Intervisibility Map rotor tip height 285 m

These two maps were then further elaborated to eliminate the fictitious areas of visibility. The use of the DSM as obtained in the manner explained above has led to an overestimated calculation of the MIT, as it is calculated as if the observer were placed above the DSM itself. Consequently, where there are buildings or wooded areas (woods, olive groves, etc.) above the level of the eaves of the buildings or above the tops of the trees.

To reduce this overestimation, the MIT obtained were further elaborated, eliminating the wooded areas and the industrial or commercial built-up areas, while the areas corresponding to the residential buildings were left in the MIT, to represent the visibility by an observer placed on the roof plane (terraces) of the same.

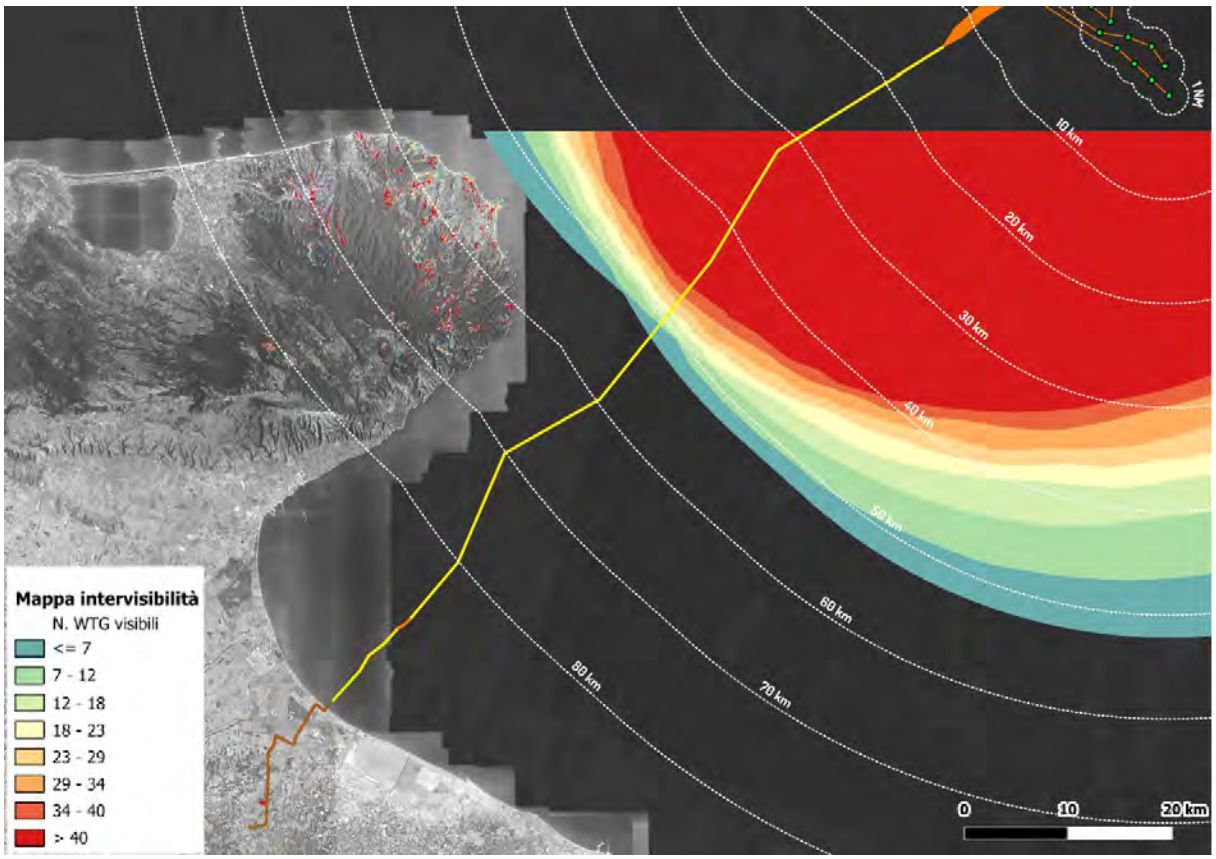
The land use classes in which the observer would be completely shielded from the visibility of the wind turbines are therefore the following:

- 'mining areas'
- 'urban green areas'
- 'coniferous forests'
- 'deciduous forests'
- 'mixed coniferous and deciduous forests'
- 'olive groves'
- 'Orchards and minor fruits'
- 'wooded meadows, wooded pastures'
- 'large concentration and sorting plants for goods'
- 'commercial settlement'
- 'installation of technological systems'
- 'Establishment of large public and private service facilities'
- 'industrial or craft settlement with annexed spaces'

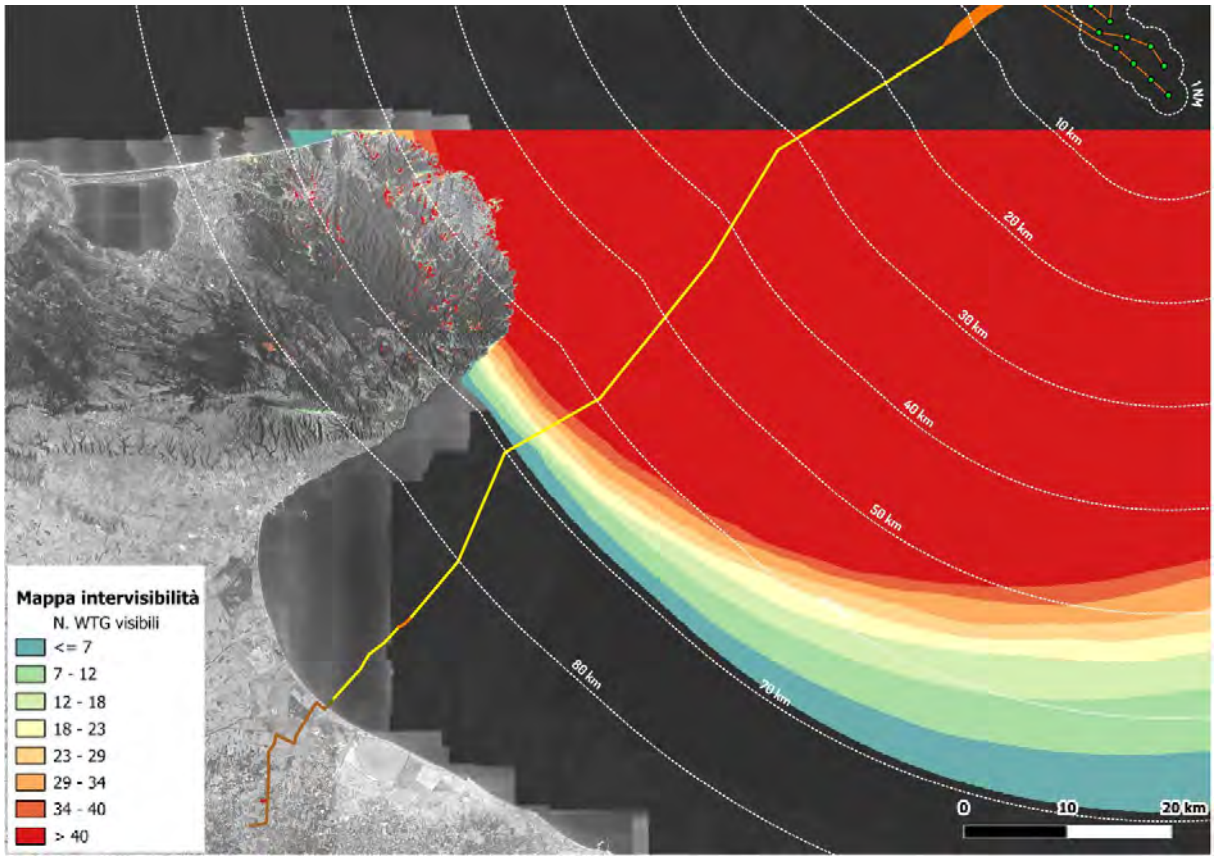
- 'landfills and quarry depots, mines, industries'

From these land use classes, an additional raster map was obtained, used in a map algebra operation in a GIS environment to "clip" the aforementioned areas from the previously calculated MITs.

The following figures show the final MITs, referring to the annex *ES.8.2_01_Map of theoretical intervisibility (M.I.T) of the project wind turbines* for the necessary further information.



Theoretical Intervisibility Map with exclusion of masking areas 155 m nacelle height



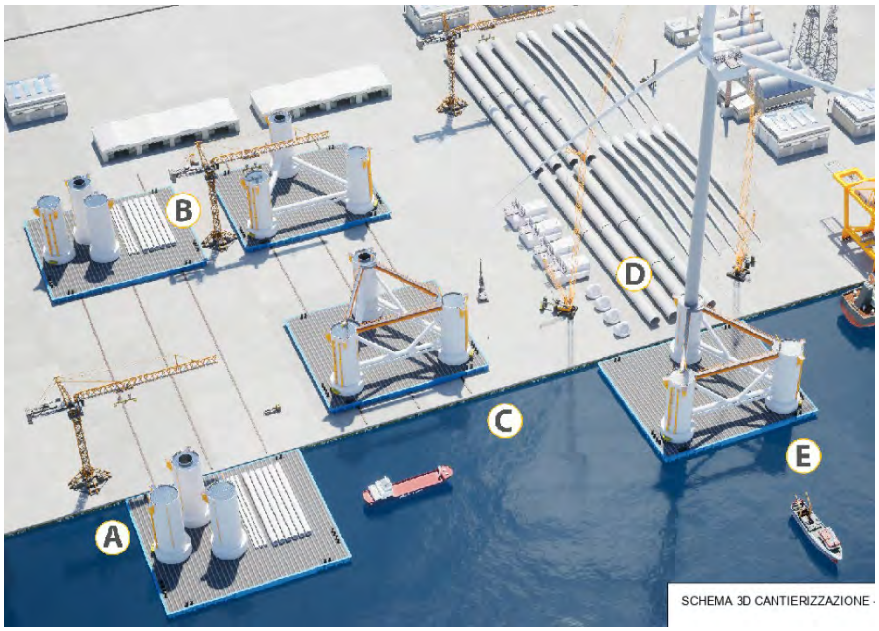
Theoretical Intervisibility Map with exclusion of masking areas rotor tip height 285 m

As can be seen from the two maps, in the sea areas the visibility of the system at an altitude of 155 m is negligible starting from 50 km away, while it is not for the altitude of 285 m, which in any case is the perception of the rotor tip. From the high areas above sea level of the Gargano, the wind farm is potentially visible again, but much of this region is characterized by both natural (i.e. woods) and agricultural (olive groves and orchards) tree covers from which the plant is not substantially visible.

4.2.11.3 Construction phase

The visual impact during construction is substantially limited to the assembly and transport activities of the wind turbines and the offshore substation, on the quay and subsequently in the floating regime at the offshore installation site.

In order to be able to build a wind farm such as the one under consideration in a reasonable time, it is necessary to have a production chain capable of assembling a floater every two weeks: to achieve this objective, at least 4 lines should be planned in parallel. For the subsequent integration of the wind turbine, the ideal solution would be to have useful areas as close as possible to the final installation site. Given the size of the works to be carried out and the number of wind turbines (45) it will probably be necessary to rely on several port infrastructures, perhaps managing different functions. Below is the schematization of a typological construction site with 2 lines in parallel and the area equipped for the integration of the wind turbine.



Outline of the site layout

In order to identify the port areas that have the potential to accommodate a construction site of this type, as part of the design, a reconnaissance of the Apulian ports was conducted: those that possess (or will possess as a result of ongoing or planned adaptation interventions) the characteristics necessary for the installation of floaters are those of Bari, Brindisi and Taranto. Please refer to the *Section 7 – Construction site, maintenance and decommissioning* of the final project for the necessary in-depth analysis.

The aforementioned activities are similar to those that normally occur in port areas and do not determine substantial changes in the visual scene. Moreover, the impact will certainly be greatly reduced once the ships involved in the transport and installation activities move away from the coast. These ships will be equipped with suitable signalling devices in case of carrying out operations at night or in conditions of low ambient light.

For the contribution of activities related to onshore works, a reduced impact on visibility is considered due to the ordinary nature of purely construction works, such as the laying of the cable duct on the road and the construction of the new GIS insulated NTG electrical substation.

In fact, the visual impact during the construction phase, as well as that in the decommissioning phase, for which similar considerations can be made, albeit **negative** can be considered **low** and **reversible** over time.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

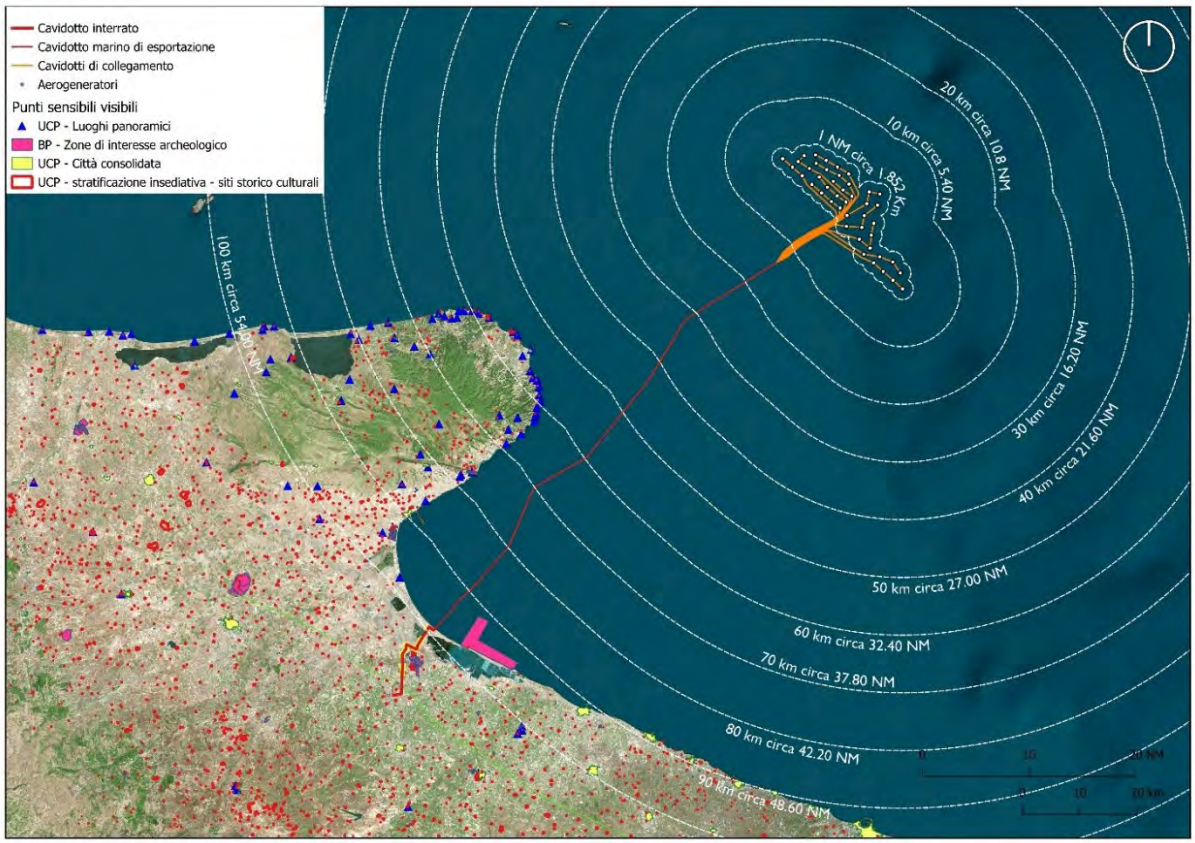
4.2.11.4 Operation phase

The analysis of visual interferences and alteration of the landscape value for the impact assessment during operation was conducted by the individual observation points and was completed by the processing of specific photographic simulations.

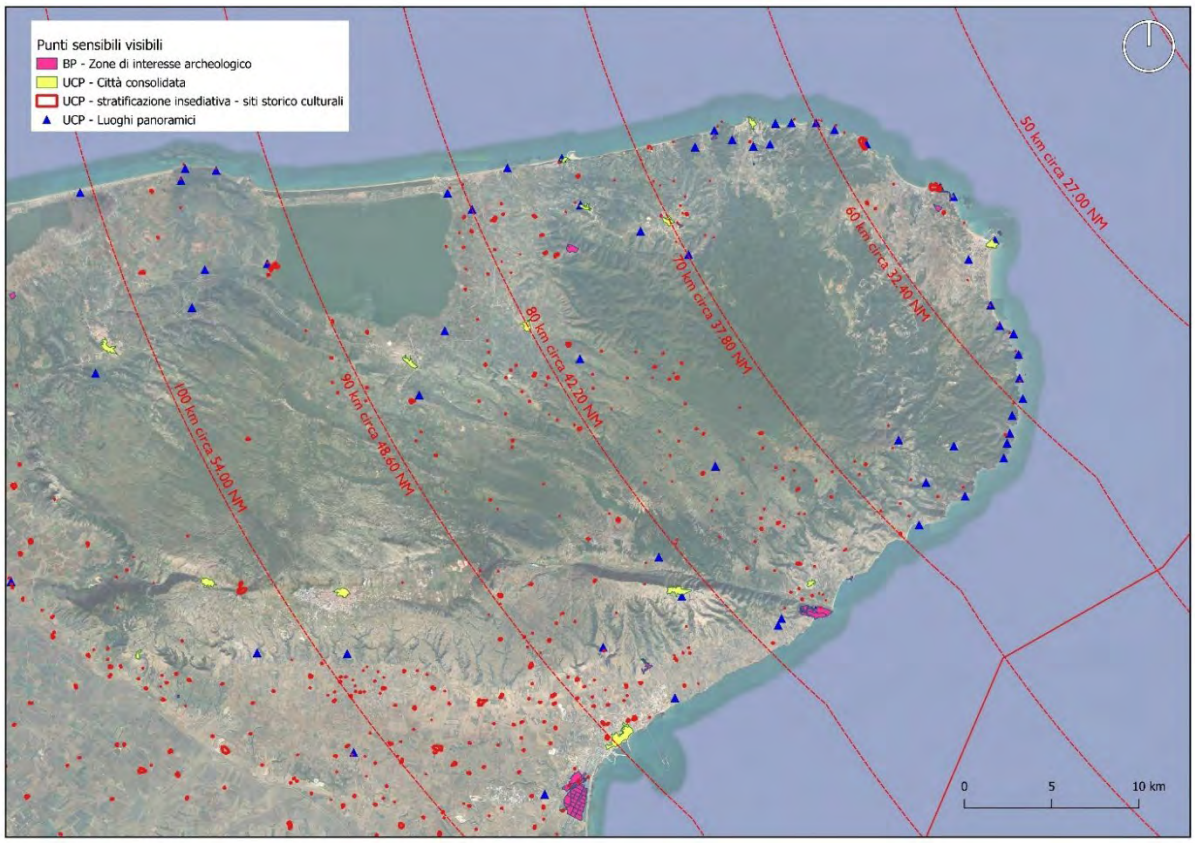
The significant points of view, which have been chosen to be considered in the analysis and identified as in the Table and in the Figures that follow, consist of community sites and protected areas, significant elements of the natural system, architectural and archaeological constraints, significant elements of the

historical-cultural system, scenic and landscape roads, as well as the inhabited centers of the municipalities, around 80 km, coinciding with the theoretical visibility zone (ZTV).

Since the investigation area is extremely large, only the 83 sensitive points from which the plant is potentially visible have been identified. For each of them, the number of wind turbines is indicated potentially visible with a height of 150 m (nacelle) and 260 m (maximum rotor height).

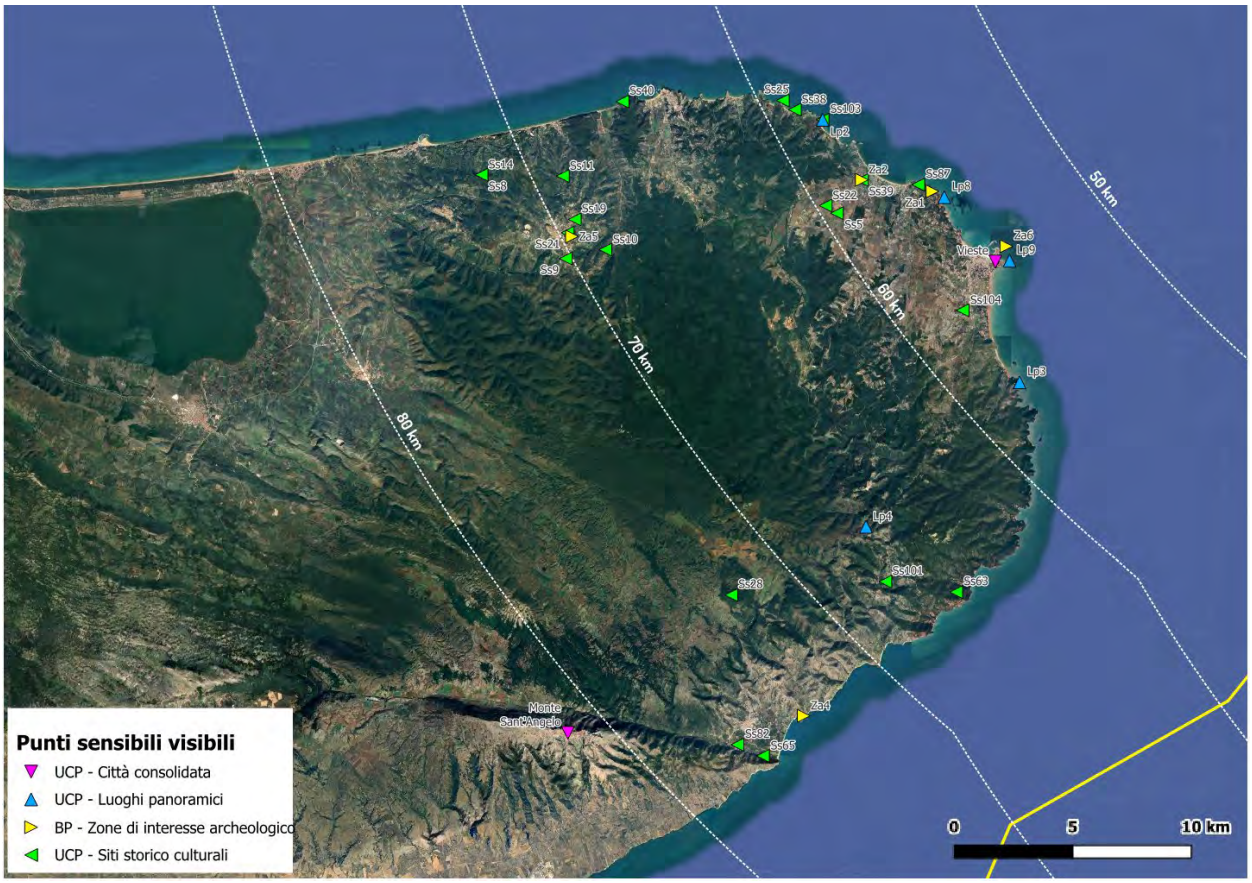


Sensitive Viewpoints – Overall Location



Sensitive points of view – Overall location (detail)

With reference to the potential points of view corresponding to historical and cultural sites, it should be noted that they coincide with the additional landscape contexts included among the cultural and settlement components as identified in the graphic drawings of the Regional Territorial Landscape Plan and which are all located on the Gargano, the highest sub-region morphologically. It should be noted that in no other landscape area are there points of view from which the wind farm is potentially visible, in accordance with the theoretical intervisibility maps discussed in paragraph 4.2.11.2 above.

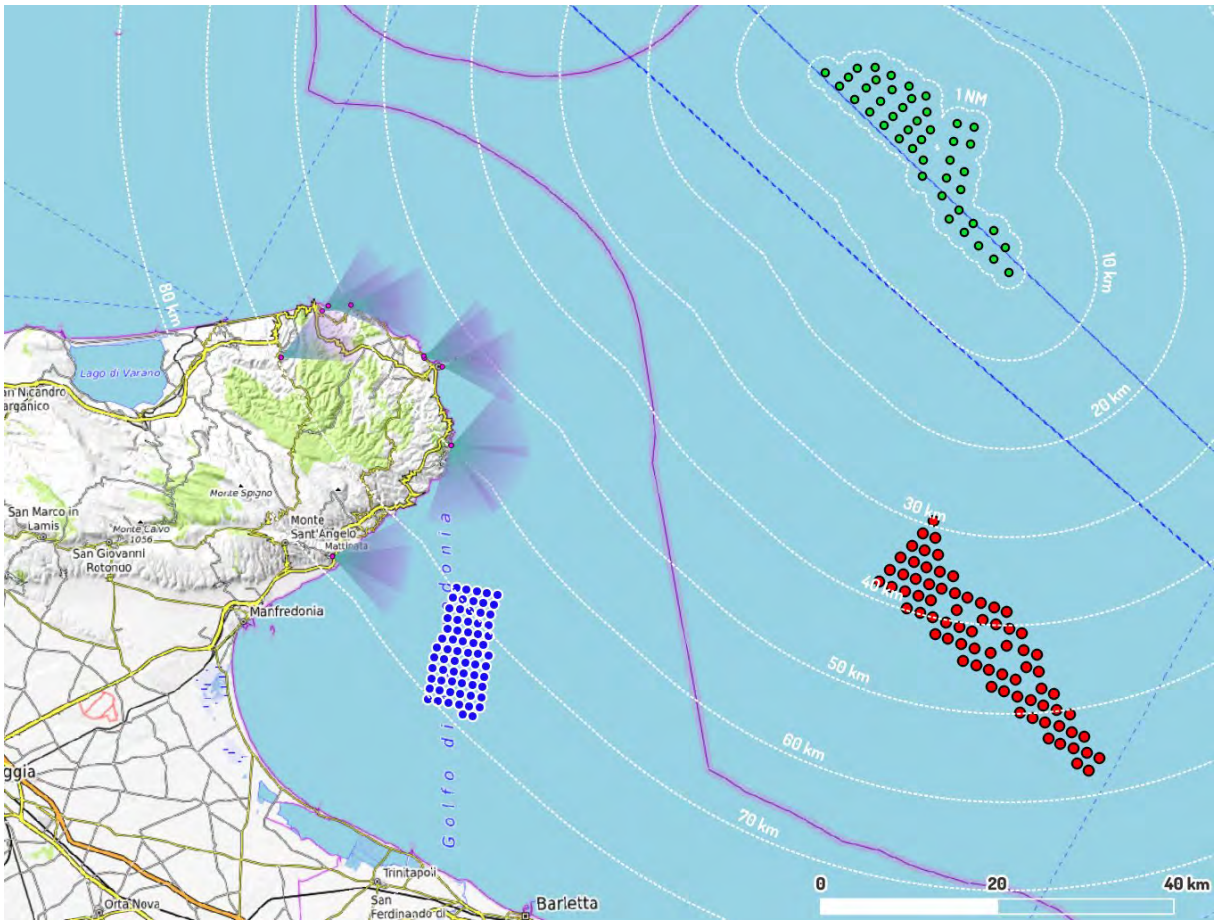


Sensitive points of view from which wind turbines are potentially visible

As for the sites indicated as "consolidated city" as they coincide with the landscape of the same name identified in the PPTR, on the Gargano the inhabited centers from which the plant is potentially visible are Vieste, as it is located on the coast directly exposed to the wind farm, and Monte Sant'Angelo, as the highest location on the Gargano plateau.

Since urban centers and panoramic places are certainly the most frequented sensitive points, it was considered appropriate to continue the analysis through the processing of specific photographic simulations from individual observation points located along the stretch of the Gargano coast, preferring the realization of the shots from places of possible greater use such as coastal towers, beaches, piers and / or other type of access to the coast.

The analysis of visual interferences and alteration of the landscape value from the individual observation points was completed by the **Processing of specific photo insertions**. It should be noted that the photographs were taken in the direction of the barycentric point of the project wind farm, that the photographic simulations were carried out, as far as possible, on days without haze and with the use of a 35 mm focal length (about 60°), whose image is closer to that perceived by the human eye in the environment. In the choice of shooting points, however, an attempt was made to avoid the interposition of obstacles between the observer and the wind farm.
The observation points are identified in the following planimetric excerpt.



Observation points - Photoinsertions

The study photos of the photographic simulations made are inserted, specifying that the turbines have been shown in these images before rendering; therefore, the wind turbines in the images below are represented in the raw state coming from the three-dimensional model in order to better highlight their position with respect to the horizon line. Please refer to the *ES.8.5_01_Photomontages* for the necessary in-depth analysis and for viewing the final images rendered with the three-dimensional modeling software.

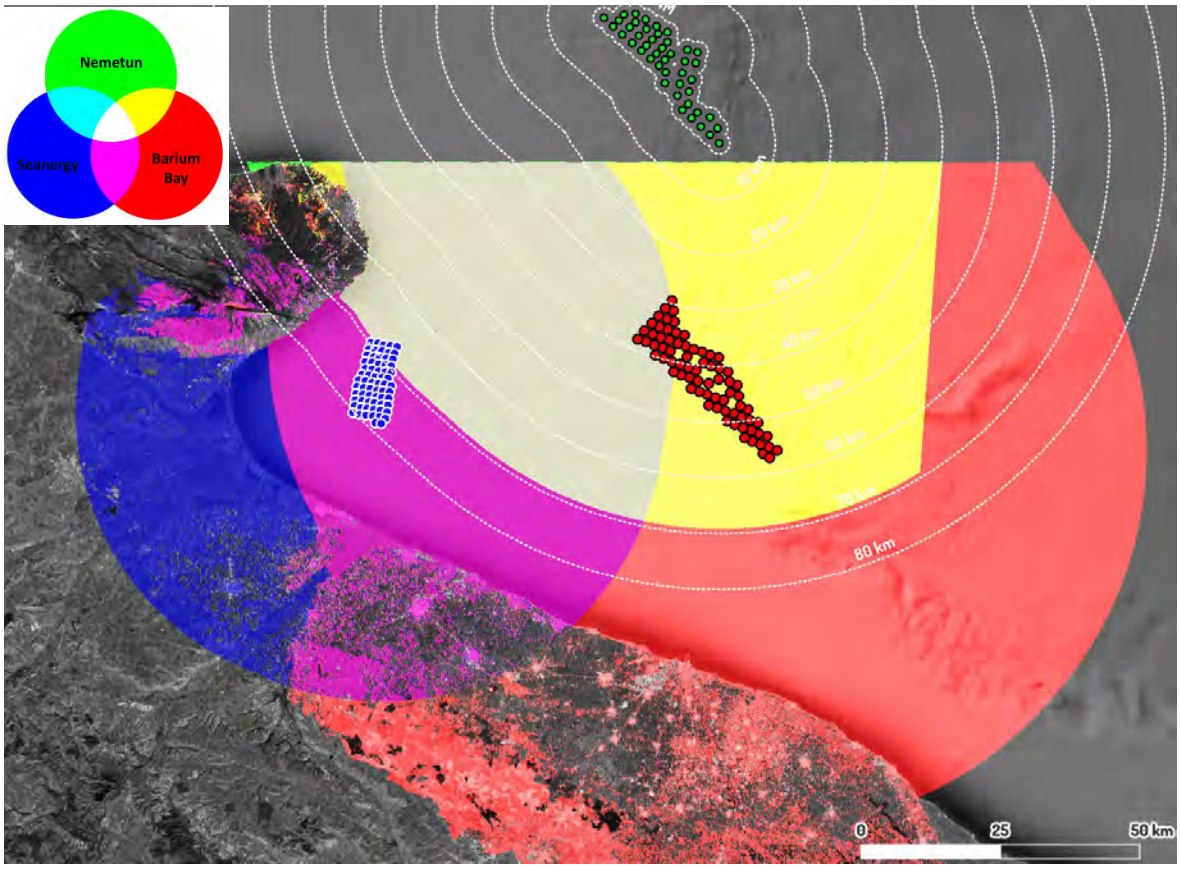
In the following images **the cumulative effect was also assessed** with other initiatives potentially interfering from a visual point of view, it was decided to follow an approach that considers the potential visibility of each wind farm as a whole, highlighting the areas from which one, two or three can potentially be observed, regardless of the number of wind turbines actually visible.

This approach is motivated by the fact that for the two projects Nemetun Island and Barium Bay, no less than 40 km from the coast, the individual wind turbines are difficult to distinguish individually; therefore, the offshore wind farms must be evaluated in their unity at the landscape level.

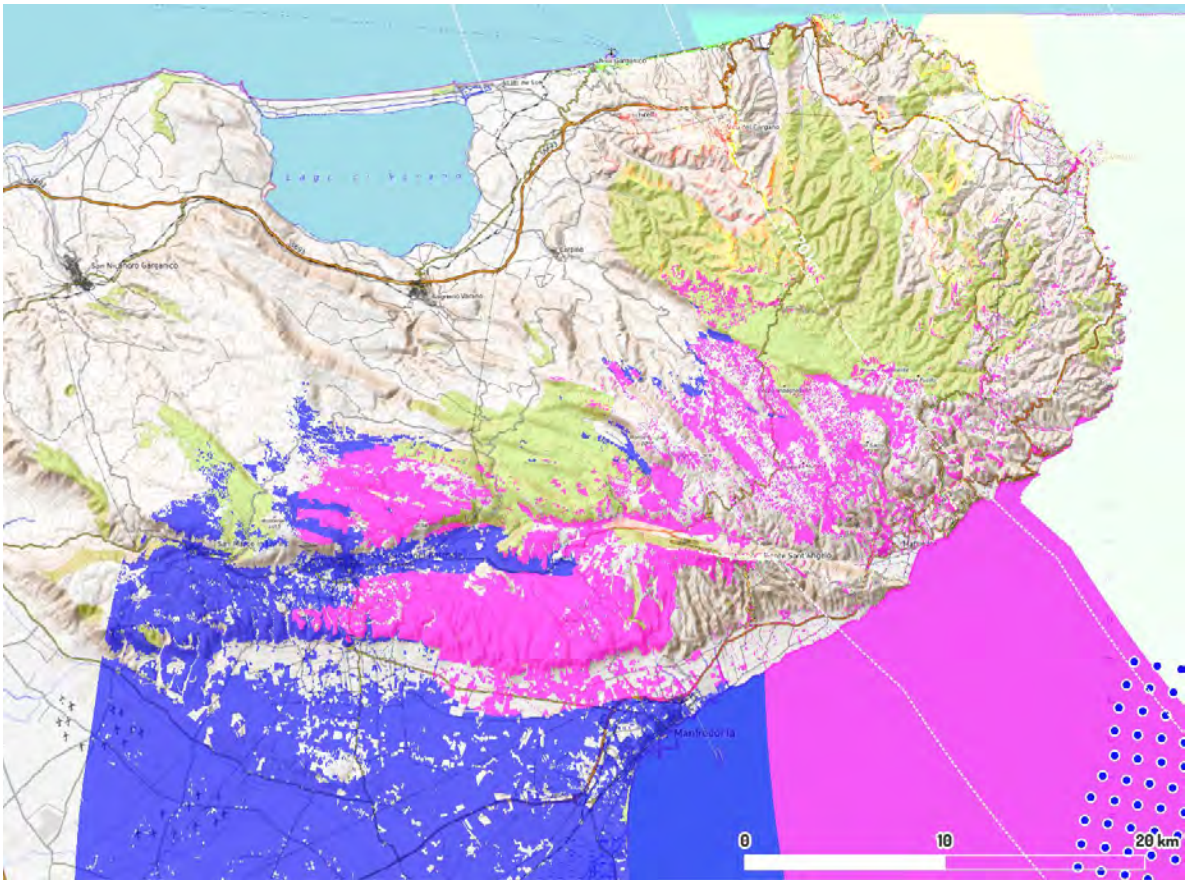
The procedure was therefore as follows:

- Calculation of the distinct theoretical visibility maps for the 3 wind farms.
- Creation of a map of the cumulative theoretical visibility, combining the 3 distinct maps.

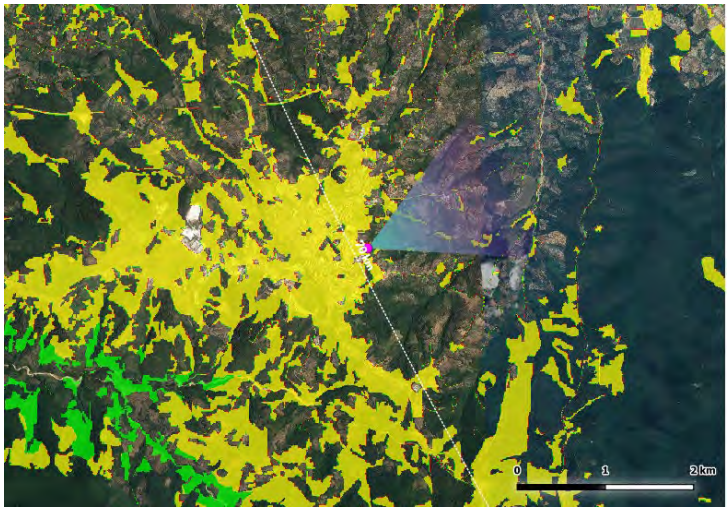
The cumulative raster map is the result of the chromatic combination of the individual 3 visibility maps of the wind farms, to which the 3 RGB bands (Red, Green, Blue) have been assigned as shown in the following figure. Specifically, the color combinations that can be obtained are more clearly represented in the table, with the potential visibility of the individual systems explicit.



Cumulative potential visibility of the three offshore wind projects (overall view)



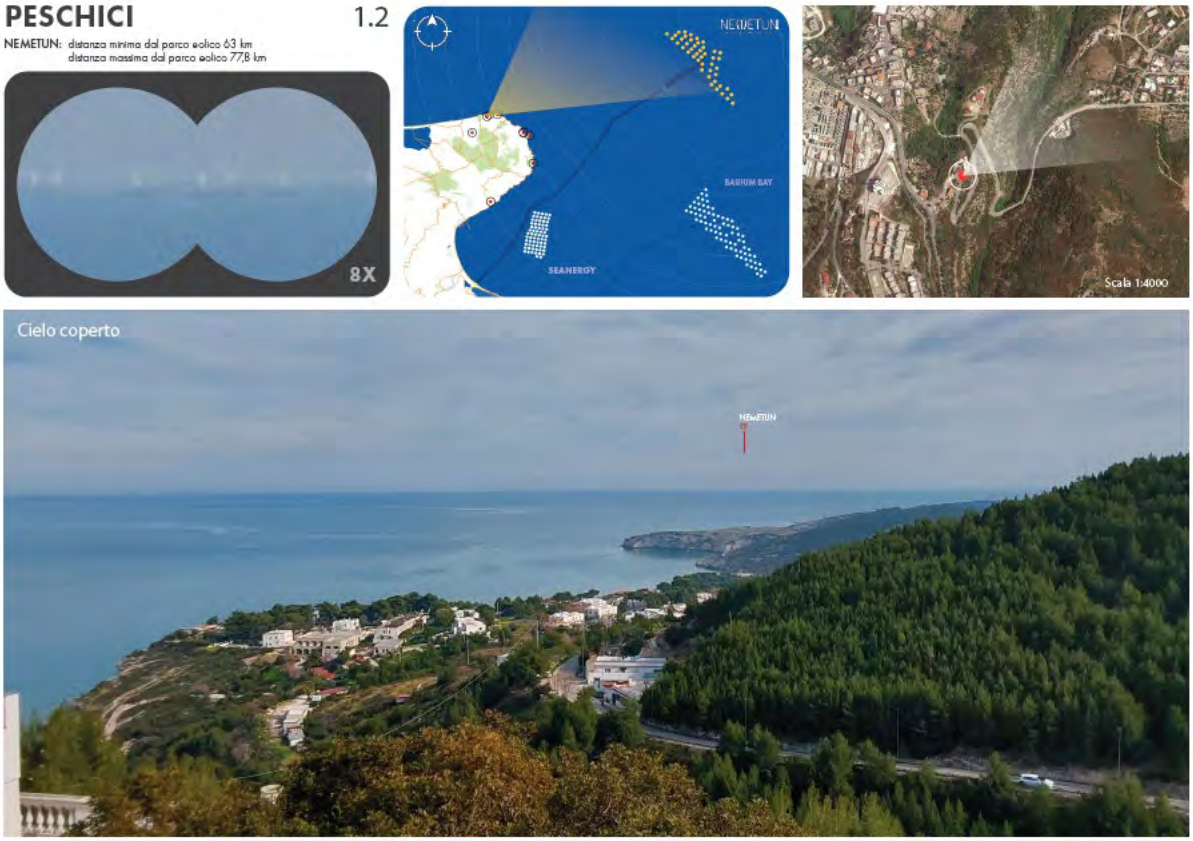
Cumulative potential visibility of the three offshore wind projects (detail on the Gargano)

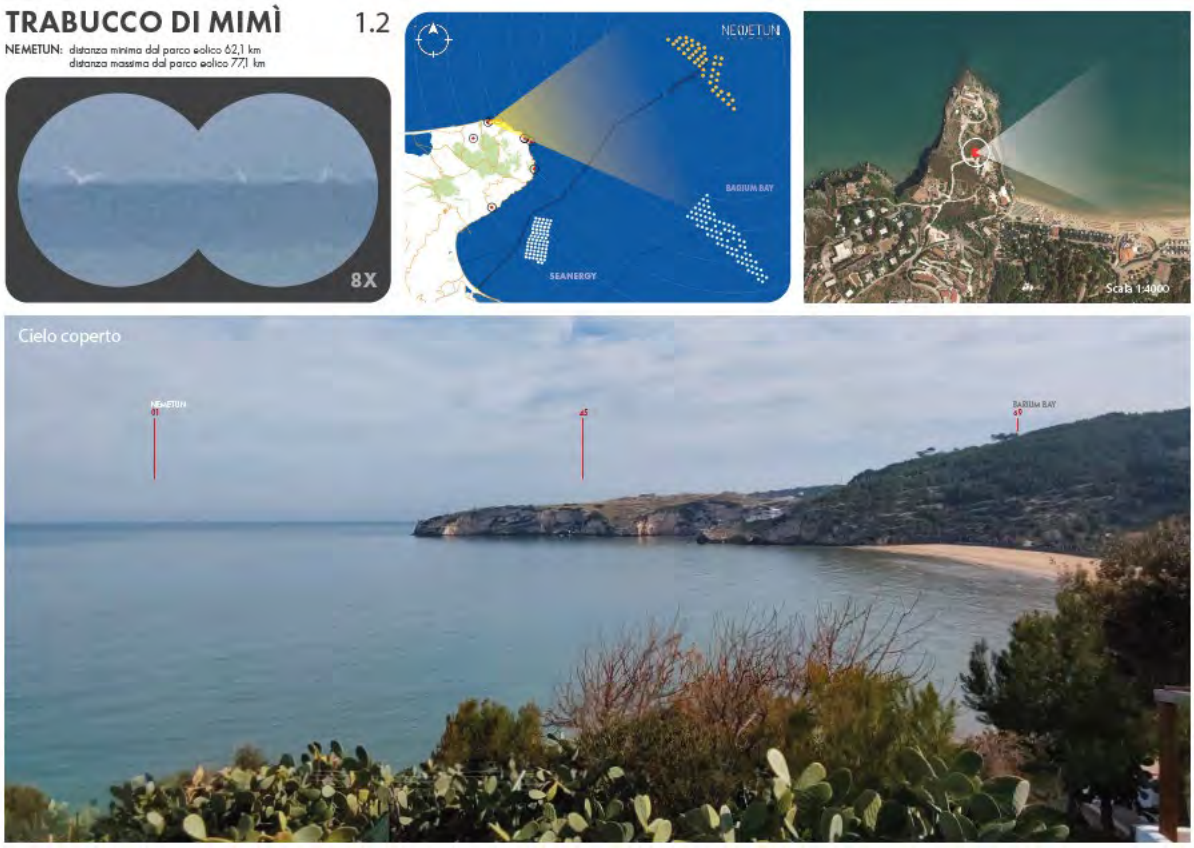


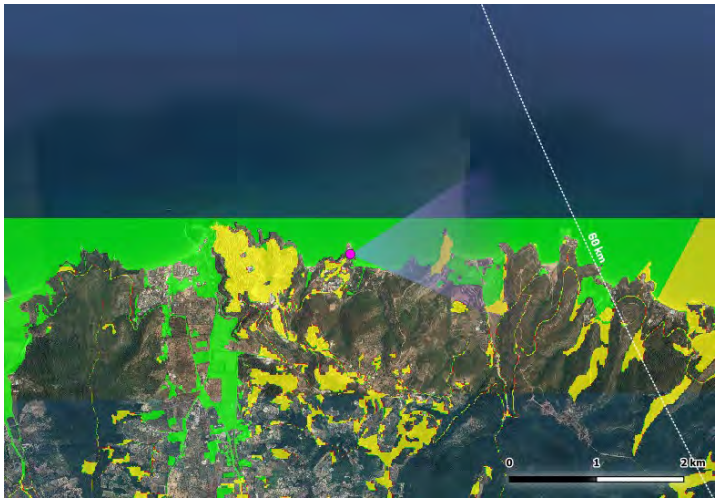
From the point of view of Vico del Gargano, and more generally in the surrounding area, the potentially visible wind farms are Nemetun Island and Barium Bay, while Seanergy is not visible.

Both Nemetun Island and Barium Bay have a minimum distance from the considered point of view of about 70 km, a visual clearance width of 27 linear km for Nemetun Island and 20 km for Barium Bay, and a reciprocal distance of about 27 km.

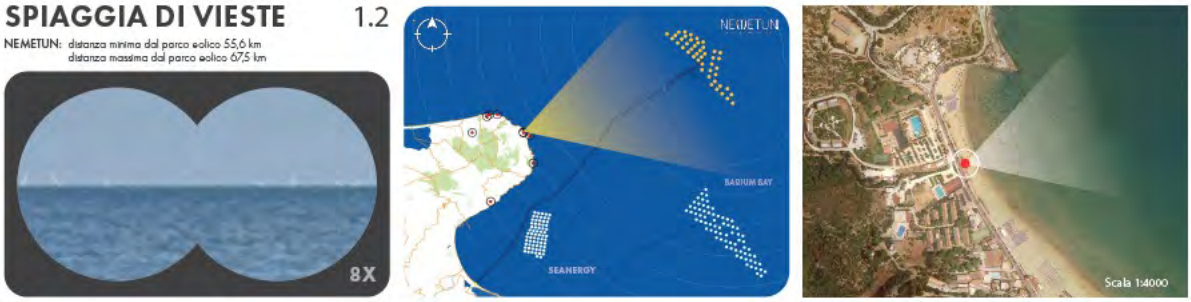
As can be appreciated from the photographic simulation, in reality it is only the Nemetun Island offshore wind farm that is actually visible; therefore, the cumulative impact is to be considered negligible.


PESCHICI
1.2
NEMETUN: distanza minima dal parco eolico 63 km
distanza massima dal parco eolico 77,8 km
8X
NEMETUN
BARIUM BAY
SEANERGY
Scala 1:4000
Cielo coperto
NEMETUN

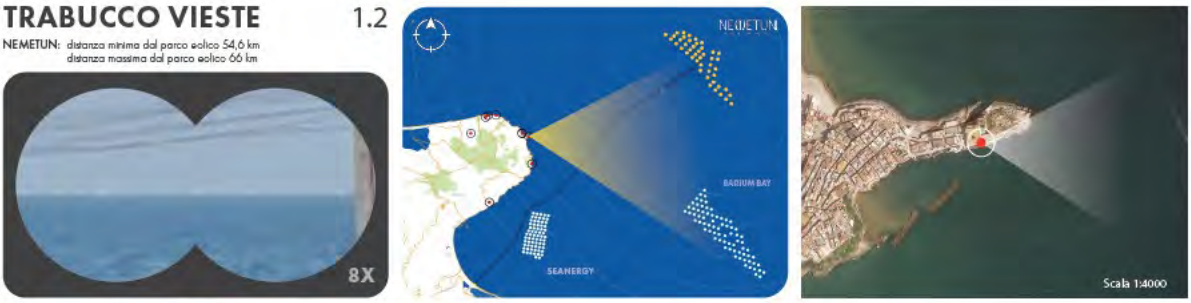




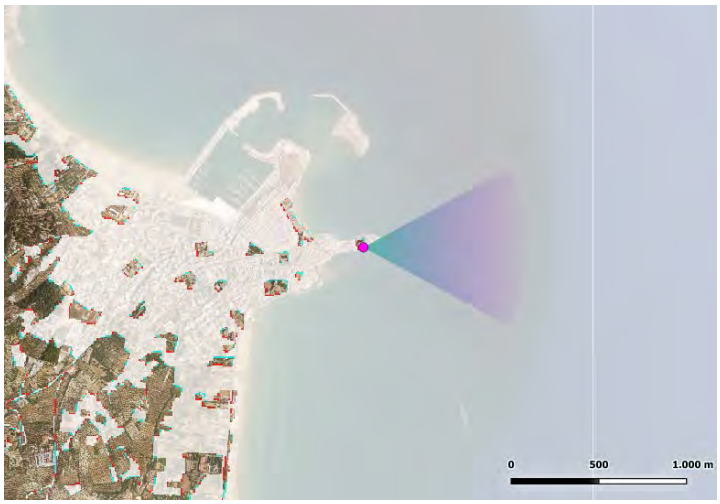
The trabucco di Mimì is a structure located on one of the numerous promontories along the peschiciana coast of the northern Gargano. From it only the Nemetun Island wind farm is visible, but as can be appreciated from the photographic simulation, only the wind turbines of the northern area of the wind farm are perceptible, thanks to the obstruction of the easternmost promontory. Also in this case, the cumulative impact can be assessed as negligible.


SPIAGGIA DI VIESTE
1.2
NEMETUN: distanza minima dal parco eolico 55,6 km
distanza massima dal parco eolico 67,5 km
8X
NEMETUN
BARIUM BAY
SEANERGY
Scala 1:4000

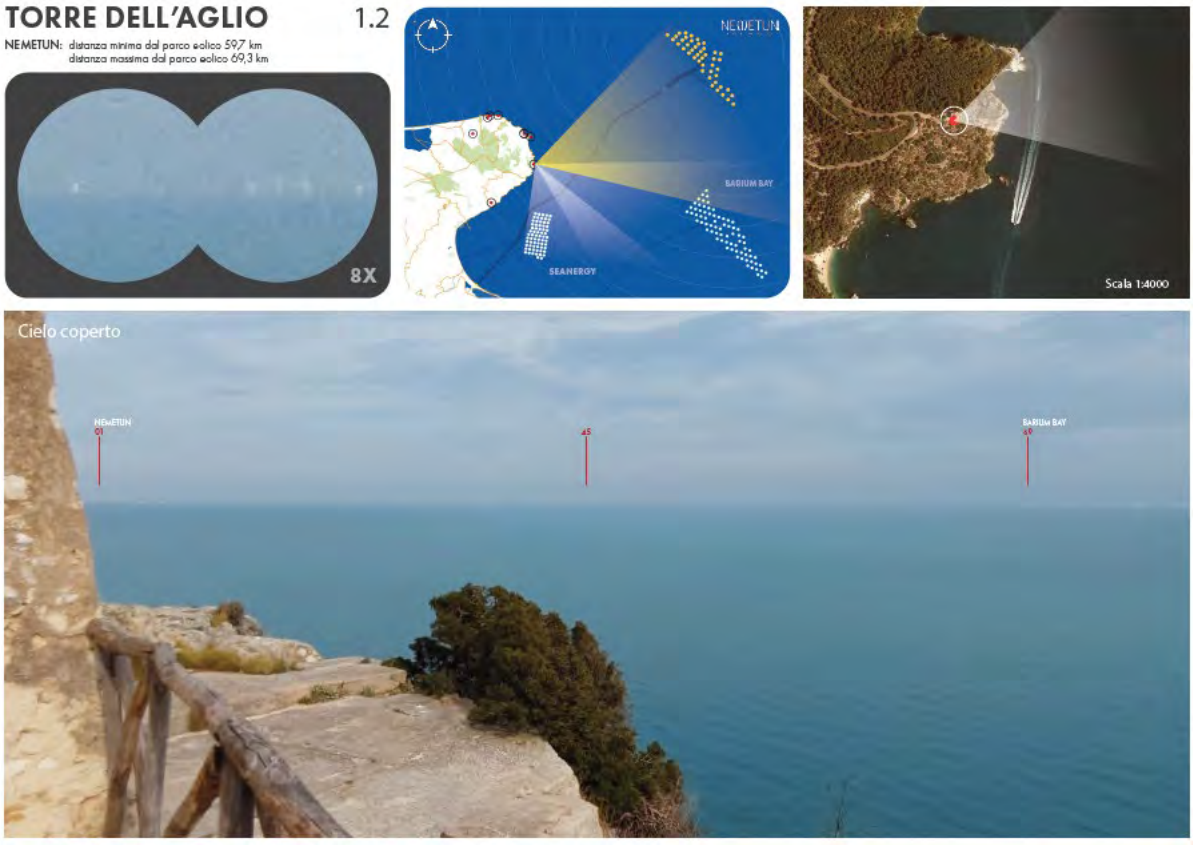
Cielo parzialmente coperto

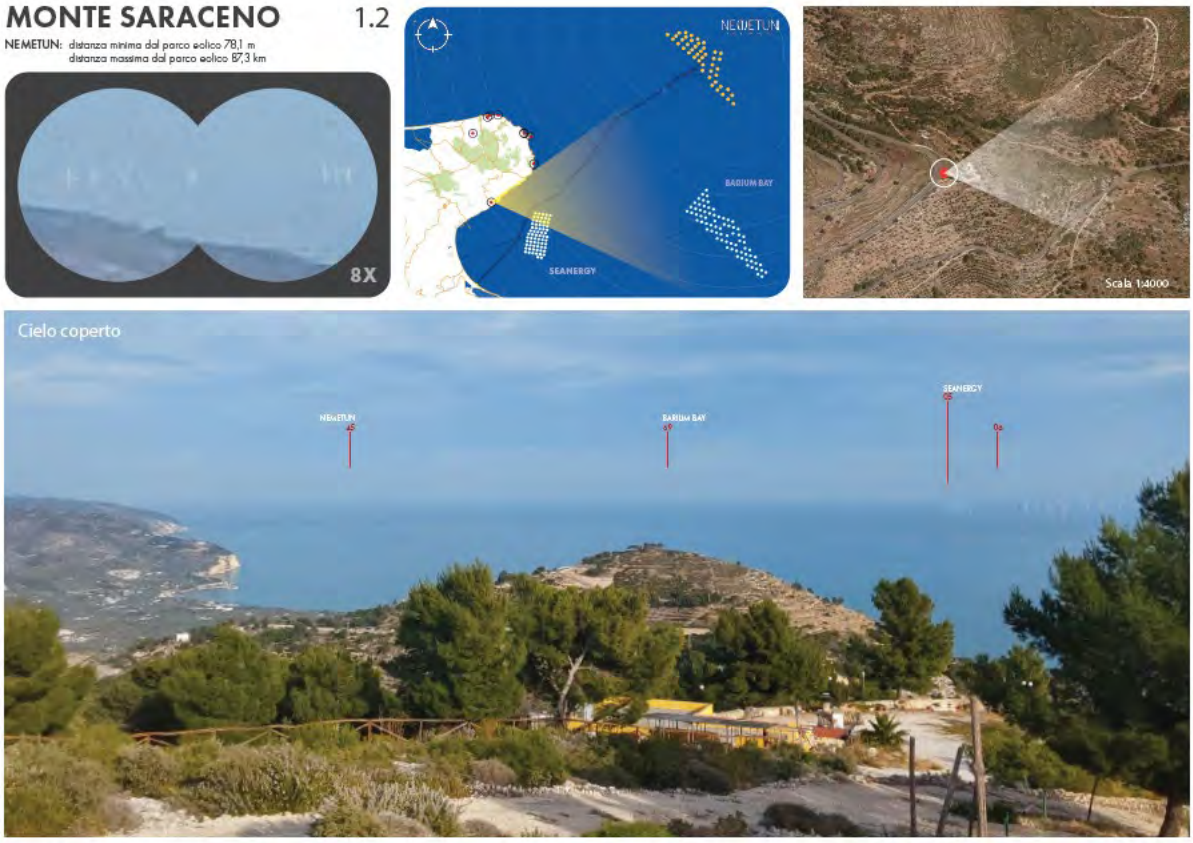

TRABUCCO VIESTE
1.2
NEMETUN: distanza minima dal parco eolico 54,6 km
distanza massima dal parco eolico 66 km
8X
NEMETUN
BARIUM BAY
SEANERGY
Scala 1:4000

Cielo coperto

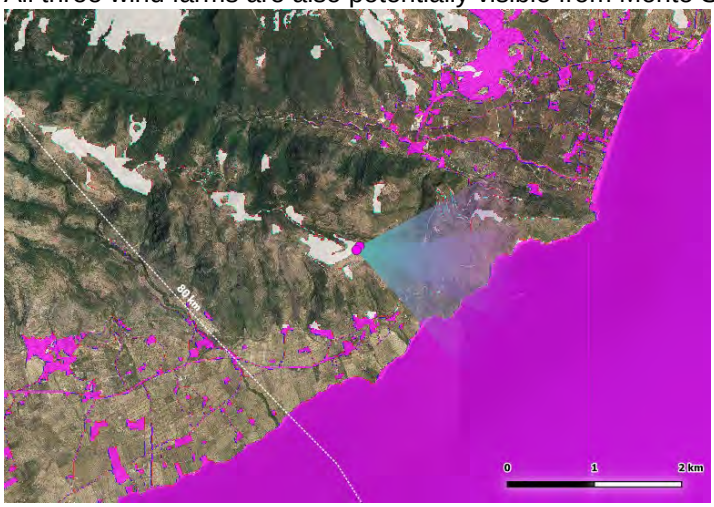


The trebuchet is located in an elevated area on the south side of the most prominent promontory of Vieste, for which the cumulative MIT classifies all three wind farms as visible. In fact, the photographic simulation shows visible only the southern half of the wind turbines of Nemetun Island, while the Barium Bay wind farm appears visible in its entirety, albeit with a very angled point of view, with a rather small width. The photographic simulation does not frame the Seanergy wind farm, but it can be said with certainty that it is.





All three wind farms are also potentially visible from Monte Saraceno, although only partially, as shown by the subsequent photo insertions. The site is in fact located on the southern slope of the Carbonara Valley, on a ridge that juts out towards the sea. The photo insertions show that the Nemetun Island wind farm stands practically on the horizon, at a distance of 78 km to the north, Barium Bay at 62 km, while the closest is Seanergy, at 13 km, although only partially visible.



Onshore works

The project involves the construction of new infrastructure to connect to the NTG in the municipality of Cerignola. In particular, the plant will be equipped with a new Electrical User Substation located near the 380 kV Electrical Sorting Substation in addition to the Cerignola Electrical Substation. The 380 kV Switching Station is also included in the Nemetun Island project and will allow the energy produced to be connected to the National Transmission Grid (NTG).

For the insertion of the new user station in GIS, the intervention involves the construction of an industrial building that can house and protect the electrical infrastructure. In this context, the new substation has been designed with an appearance similar to that of an industrial architecture, integrating harmoniously into the rural landscape and drawing inspiration from local agricultural buildings, such as silos and stereometric architectures typical of large farms in the board, using the materials available on site.

The industrial building will be a large parallelepiped in white plaster and local stone. The goal is to work on the transparencies of the perimeter walls and the regular metal structure to give the industrial equipment container an authentic and sincere look. Transparency aims to encourage communication and interaction between the internal and external spaces, in the industrial building an attempt is made to allow a view of the internal machines, while maintaining a harmonious integration with the surrounding environment. In this way, the systems become an integral part of the architectural composition, creating a unique visual experience that enhances both the industrial functionality and the aesthetic appearance of the building.

In addition, the project aims to create new visual screening elements towards the provincial road and the surrounding agricultural context, using essences and intervention techniques typical of the area. This approach is in line with the recommendations of the ISPRA guidelines for the landscape insertion of infrastructures, which underline the importance of choosing a route that follows the conformation of the territory and landscape and of using native vegetation to ensure better adaptation.

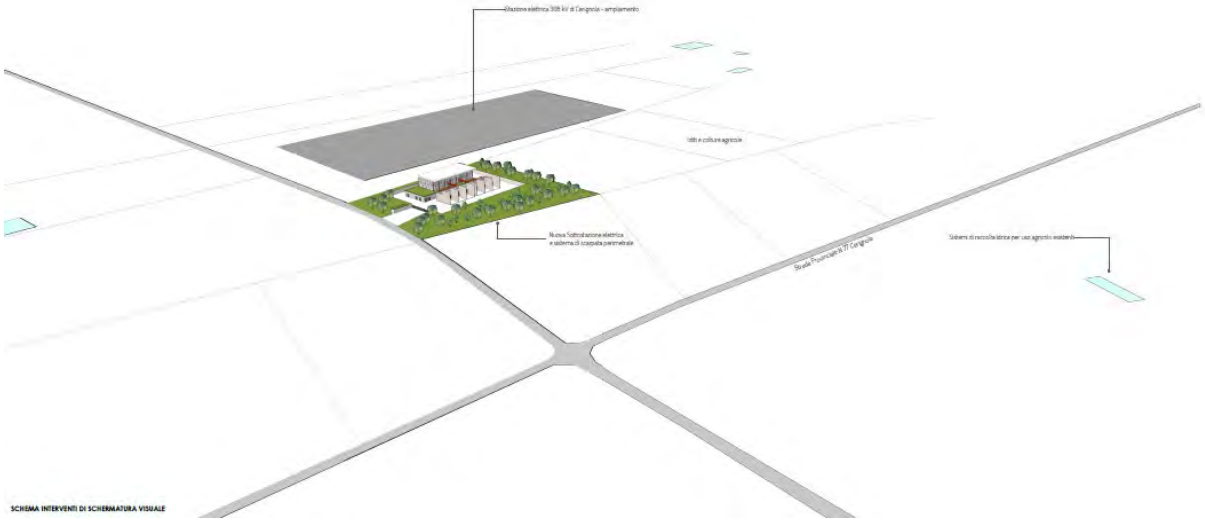
The stereometry of the main building of the power factor correction station

The creation of new natural areas is envisaged through the formation of tree-lined slopes, using the excavated material for the construction of the substation.

The covering with ground cover essences and shrubs of short stature will help to recreate an ecological terrain suitable for wildlife habitats, promoting biodiversity and improving the ecological connectivity of the area.

The intervention involves the creation of two new tree and shrub strips located on the artificial slopes positioned around the Electrical User Substation and around the 380 kV Electrical Sorting Substation. These strips made up of native essences, aim to improve local biodiversity, provide habitats for fauna and contribute to the ecological connectivity of the area.

The planned environmental inclusion interventions, for which reference is made to the *T.6.1.4_01_Onshore Electrical Substation and Reactive Power Compensation Unit – Mitigation Measures* and *T.6.1.5_01_Onshore Electrical Substation and Expansion of the Electrical Station – Insights on Compensation and Landscape Integration*, a broader scheme has been thought of, which can be evolved and used for ongoing and future interventions in the agricultural area of Cerignola.



The visual screening system towards the SP 77

The photo insertions shown in the extract, the landscape report and the work *SIA.ES.8.5_01_Photomontages* confirm the following:

- **The visual impact of the wind farm can generally be considered low**, even where there is a shorter distance between the observation point and the wind turbines and a greater occupation of the field of view, i.e. a higher intensity of potential perception;
- **The visibility of wind turbines is influenced by the effect of the earth's curvature and atmospheric conditions**, as well as the type of light;
- **From the most distant and secluded points of view, wind turbines are difficult to perceive or completely invisible**;
- **No negative impact from onshore works is expected**.

The impact assessment will also have a positive impact on this case. **negative sign**. The analysis conducted shows a **Low level** of the visual alteration considered **Non-reversible** for its long-term extension.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.11.5 Decommissioning phase

The same considerations and evaluations as during the construction phase apply.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.12 ESTIMATION OF IMPACTS ON THE POPULATION AND HUMAN HEALTH

With reference to the baseline scenario, the impact on the "population" component of the Nemetun Island wind farm is mainly produced in the effects that will be described in the following paragraphs dedicated to production activities. In paragraph 4.2.13 the changes in the productivity sector will be described, generated by well-being driven by new investments and the creation of market movements that can create new employment and development in the tertiary sector.

In this paragraph we will briefly summarize the potential effects that the planned plant brings in terms of human health and morbidity indices of the reference area.

In particular, a comparison will be made between what is reported in section 4.1.9 of the baseline scenario and the beneficial effect that the insertion of the implant can transfer to the area. The trigger for a process of "decarbonization" of the reference area passes above all through the conversion of energy production to renewables.

4.2.12.1 Construction phase

In this phase, the effects on human health depend on emissions into the atmosphere and the impacts related to noise and vibrations expected during the construction phase. Please refer to paragraph 4.2.1 for the specific discussion of the pollutants released as a result of the increase in traffic generated by the construction site; while reference is made to paragraph 4.2.9 for the specific treatment of the impacts deriving from noise and vibrations emitted by site operations.

So also an impact **negative** of **Low entity** and **reversible**, estimated here for the construction phase is amply rewarded in terms of payback in the life cycle of the offshore plant.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.12.2 Operation phase

Compared to what is described in the baseline scenario on **Air quality** In the project area, the offshore wind farm project described here has a ***strong positive impact***.

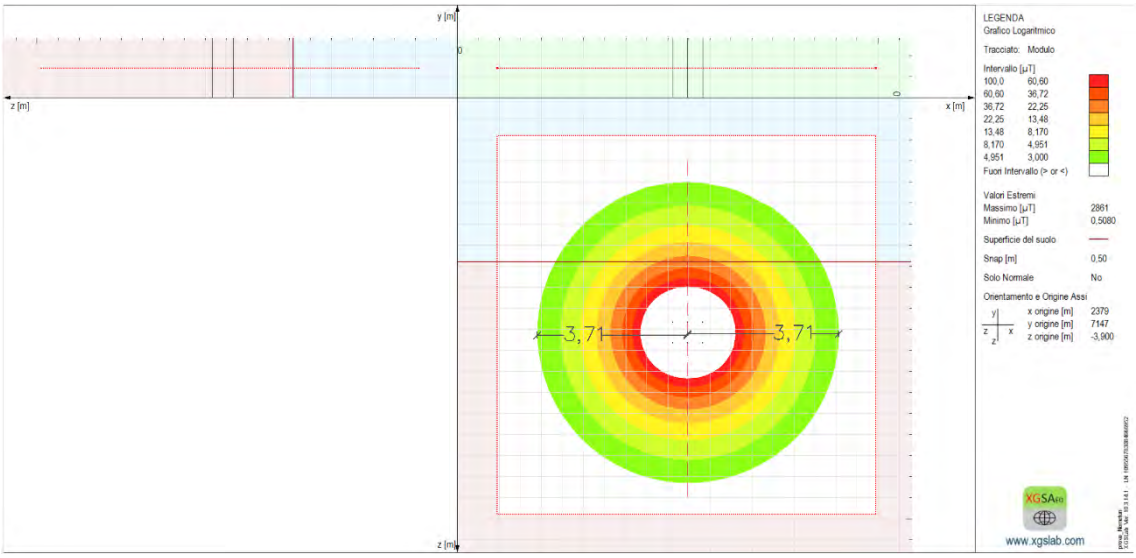
A combined cycle natural gas power plant has an impact of around 456 t CO_{2eq}/GWh, while an offshore wind farm has an impact of an order of magnitude lower than the cleanest of traditional energy sources.

The Nemetun Island wind farm has an estimated production of clean energy **equal to 2.856 equivalent hours per year**, **corresponding to the annual consumption of approximately 817.000 families.**

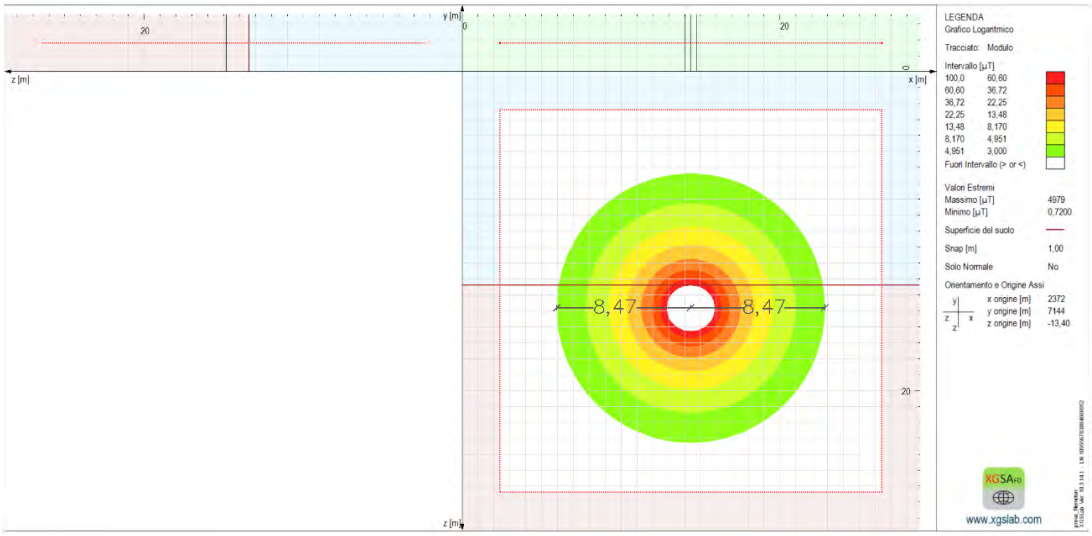
The figures graphically show the intensity of the magnetic field generated by the 2 triads of underground cable ducts.

Remembering that the objective to be respected is the quality objective of 3 μT, set by the Prime Ministerial Decree of 08/07/2003.

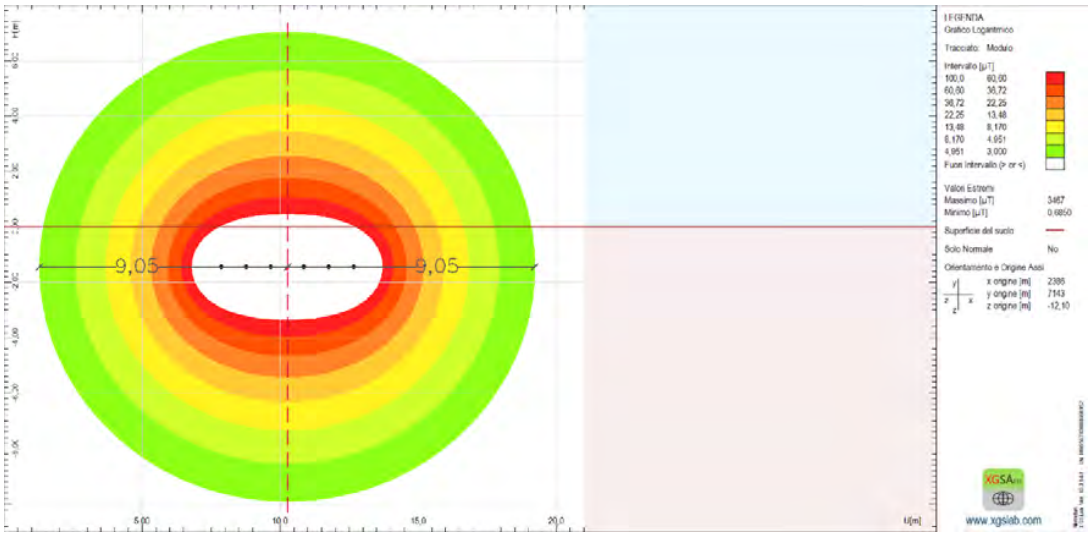
Some of the results of the analyses carried out in the report are reported below. *ES.3.1_02_Evaluation of electric and magnetic fields in onshore areas* to which reference is made for further information.



Magnetic Indiction Calculation on the section of 2000 mm AAT cables[2]



Magnetic Indiction Calculation on the section of 2500 mm AAT cables[2]



Magnetic Indiction calculation on the cable splice section at the 2000 mm AAT landing point[2]

As regards the impact component relating to **electromagnetic radiation** produced by the electrical components of the connection systems, following the studies conducted on the calculation of First Approximation Distances (DPA) (cf. *ES.3.1_02*), we can make the following considerations:

- At the point of landing on land where the transition between marine and land cable begins by means of a Joint Bay, in no case are the buildings located within the calculated buffer zones (18.2 m);

- along the route of the new AAT cable duct underground in double circuit in no case are the buildings located within the buffer strips calculated both in the case of flat underground installation (7.5 m) and in the case of HDD (22.2 m) or Joint Bay (10.2 m);

- along the route of the new underground AAT cable duct connecting the AAT between the electrical transformer substation and Terna's SE, in no case are the buildings located within the calculated buffer zones (17 m);

- The user electrical substations built in GIS and the NTG electrical substation determine electric and magnetic fields near the fences to be considered negligible, therefore, only the DPAs relating to the incoming lines will be considered for these structures;

- along the route of the new 380 kV junctions to the "Manfredonia 380 – Andria" line, in no case are the residential properties located within the calculated buffer zone (116 m);

- along the route of the new 380 kV underground power line connections, for the connection of the new Switching Station to the SE RTN 380 kV "Cerignola 380" under construction, in no case are residential properties located within the buffer zone identified in paragraph 5.6.

Although there is no presence of sensitive receptors (structures inhabited by people for a time of more than 4 hours) within the buffer zones calculated and represented in the reference graphic drawings (*T.5.4.1_01_Underground Onshore Power Line – Plans on Regional Technical Maps (CTR) with DPA T.5.4.2_01_Underground Onshore Power Line – Plans on Orthophotos with DPA, T.5.4.3_01_Underground Onshore Power Line – Plans on Cadastral Maps with DPA*), the project involves the adoption of shielding systems for the underground line and the holes that have reached (which represent the points where the calculated DPA assumes the highest values) along the most critical sections of the power line. In particular, these measures will be adopted at the land landing Joint Bay in the municipality of Zapponeta (FG).
During the executive design phase, more precise assessments and calculations will be carried out and, if necessary, the proposed mitigation measures can be adopted in correspondence with further sections. Please also refer to this phase for the design and correct sizing of the shields adopted to ensure compliance with the quality objective of 3 μT everywhere, provided for by current legislation. In the same way, in correspondence with the HDD sections, it will be possible to increase the depth of laying of the conductors by confining the buffer zone underground.
Therefore, the effect of ionizing radiation on human health can be considered null because the project, both for its territorial location and for its construction characteristics, will comply with the limits imposed by Law 36/2001 and the Prime Ministerial Decree of 8 July 2003 on the protection of the population from the effects of electromagnetic, magnetic and electric fields, ensuring the protection of human health.

The estimated impact will therefore be of a **positive** of **High entity** and **Non-reversible** because it is projected in the long term.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.12.3 Decommissioning phase

The estimated impact is similar to that already assessed for the construction phase.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.13 ESTIMATION OF IMPACTS ON PRODUCTION ACTIVITIES - INTRODUCTION

Compared to the framework defined in the baseline scenario, the presence of the Nemetun Island wind farm produces a series of modifications and alterations of different types and of positive or negative value.

In this paragraph we want to briefly describe the range of impacts on the production sector of the area affected by the project, with the aim of defining a "preliminary balance" on the economic and productive sector of the stretches of coast concerned, in the following paragraphs the impacts on the various sectors will be analytically analyzed.

In the first instance, it is worth mentioning the basic employment data, derived on the basis of Istat data and included in paragraph 4.1.9, the data concerning the employment, productivity and quality of life indices, sees the province of Foggia placed in a very backward position compared to many other Italian provinces, with unsatisfactory employment and business and finance asset indices.

Among the productive and driving sectors of the province can be mentioned:

- **Fishing**
- **Navigation**
- **Tourism**
- **Tertiary sector**
- **Agriculture**

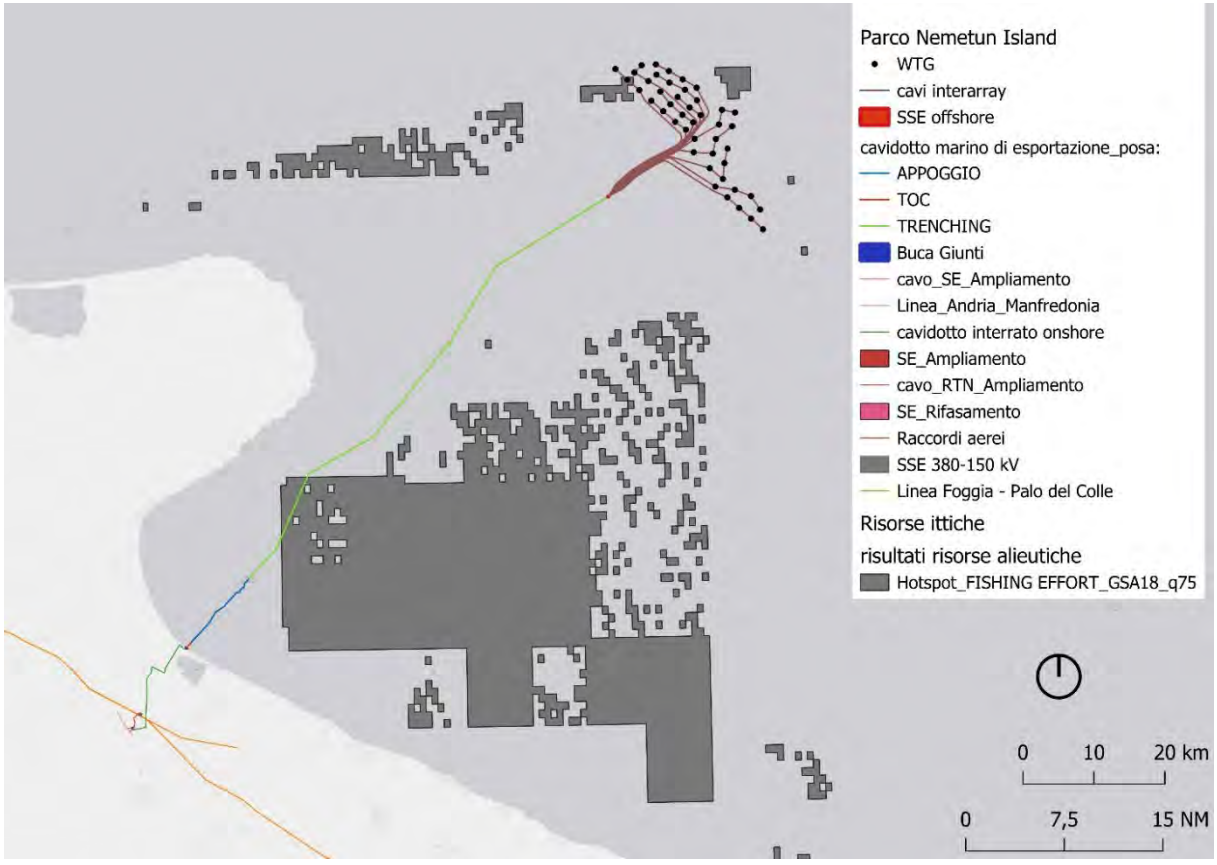
The agricultural component is excluded from this analysis as no impacts on this sector are expected. The potential risk of dust emission during the laying phase of the onshore cable duct is in any case limited in time and has no impact on agriculture, the underground cable duct is in fact mainly located along the public road network in the territories of the municipalities of Zapponeta, Trinitapoli and Cerignola, with short transits on agricultural land.

4.2.14 ESTIMATION OF IMPACTS ON FISHERIES

The potential impact of the presence of the plant is mainly focused on the construction phase, but also during the operation and decommissioning phase, fishing activities can be modified by operations at sea and the creation of sources of disturbance on marine fauna. Potentially positive effects for the sector include the possibility of installing aquaculture facilities in the mirror occupied by the wind farm, the neutrality of the presence of the facility for local and surface small-scale fishing, the creation of a source of deterrence and potential disturbance for illegal trawling activities within 3 miles of the coast and 50 meters deep and, the slowdown, due to the presence of the cable duct on the seabed, of an industrial fishing system, widespread in the area and potentially harmful to the fauna itself and to the biocoenosis of the seabed.

To understand the potential impact on fishing activities, the study *ES.9.4_01_Study on the Status of Fishery Resources and Fishing/Aquaculture Activities,* the fishing effort for the 10 species of greatest commercial interest identified as priorities for the GFCM (General Fisheries Commission for the Mediterranean) was assessed: *Aristeus antennatus, Illex coindetii, Merluccius merluccius, Eledone cirrhosa, Aristaeomorpha foliacea, Galeus melastomus, Mullus barbatus, Pagellus erythrinus, Parapenaeus longirostris* and *Nephrops norvegicus*. An overlap analysis of the fishing effort was carried out with the persistence hot spots of recruits and breeding animals of the species. The analysis was conducted with the statistical software R (R Core Team, 2021) exploiting the potential of the GIS tools integrated in it (Bivand et al., 2021; Hijmans, 2021).

The total effort map of each individual GSA derived from GFW and integrated with the effort information derived from the questionnaires completed by the fishermen was developed to determine the value corresponding to the 75th percentile of the distribution. This value was used as a threshold value to identify the hot spot areas of the fishing activity. The spatial information in GeoTIFF raster was then filtered by selecting areas with standardized stress values above the threshold value of the 75th percentile (following image).



75th percentile of the total fishing effort of the 10 selected fish species in the project area

It can be seen that the fishing effort related to the 10 fish species mentioned above is very low.

4.2.14.1 Construction phase

With reference to the baseline scenario, in particular to what is described in paragraphs 4.1.10, several factors influence the assessment of the impact on the fishing sector of the Nemetun Island facility, some of the most important ones are summarized below:

- Inhibition of navigation (and therefore fishing) in the area where the wind farm is installed.

- Disturbance to industrial fishing and fish fauna due to the construction of the marine cable duct caused by the movement of the seabed and the inhibition of traffic during the laying phases.

Going into the merits of these negative effects, we can observe that:

Inhibition of navigation concerns a rather large area at the limits of the boundary of territorial waters, a specific survey was carried out among the annexes to the Environmental Impact Study. **Biocenotics** (see section *SIA.ES.6*), from the results of the study, the presence of valuable habitats in the surroundings of the wind turbines and the substation is not identified, the inhibition of navigation could provide favorable effects for the entire area.

tabella coordinate dei vertici principali (WGS 84 fuso 33 N) coordinate geografiche espresse in metri

Vertice	coordinata Y (N)	coordinata X (E)
V1	4673597.5448	638827.8145
V2	4669738.4433	650976.3731
V3	4654869.5958	652153.7787
V4	4643479.5772	664419.8525
V5	4653440.1119	682574.1194
V6	4654989.3915	679825.2389
V7	4665468.2507	669578.5432
V8	4673282.9446	648567.8462
V9	4672944.978	641833.2758

superficie totale dell'area interdetta

24.167,3 ha

Area inhibited from navigation (see ES.4.2_01)

As indicated in the baseline scenario, in the specialist documentation and in the section on offsetting interventions, **fishing activity in the area of the Nemetun Island project (wind farm and cable duct area) appears to be practiced at low intensity**.

Therefore, in consideration of the above, it is believed that the marine area chosen for the Nemetun Island project is not among those most suitable for fishing during the construction phase, it is limited to the period of laying the marine cable duct and caused above all by noise and the lifting of suspended material during the excavation phase with the use of the sea plough, since, although it is not an area beaten by fishing, there are nursery and reproduction areas of some of the 10 fish species (see *ES.9.4_01*), which may be impacted by the laying of the marine cable duct and the wind turbines.

The concentration of the suspended material decreases to values of 100 mg/l, 20 mg/l and 2 mg/l respectively at distances of an average of 800 m, 7 km and 18 km on the south-east side with respect to

the axis of the trench with the direction of the plume almost symmetrical from the coast to Vieste, asymmetrical from Vieste towards the width with respect to the axis of the trench, with a greater extension on the south-east side of the same due to the typical hydrodynamics with current from north-west to south-east that detaches from the Gargano promontory to reattach itself in front of Orno. Please refer to the paragraphs on the baseline and the assessment of impacts on the seabed (see section 4.2.3) as well as to the investigations and modelling carried out in the study entitled *SIA.ES.7.2_01*, attached to the Environmental Impact Study.

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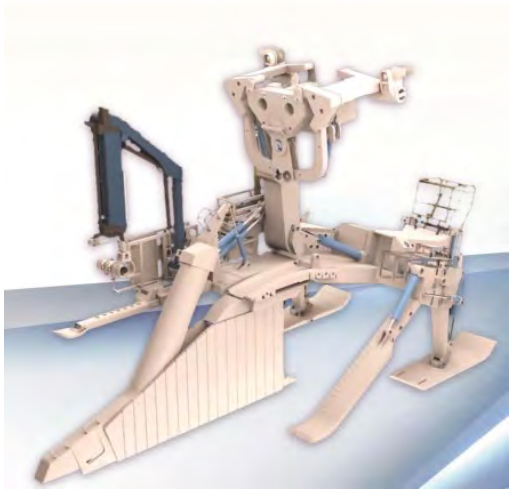
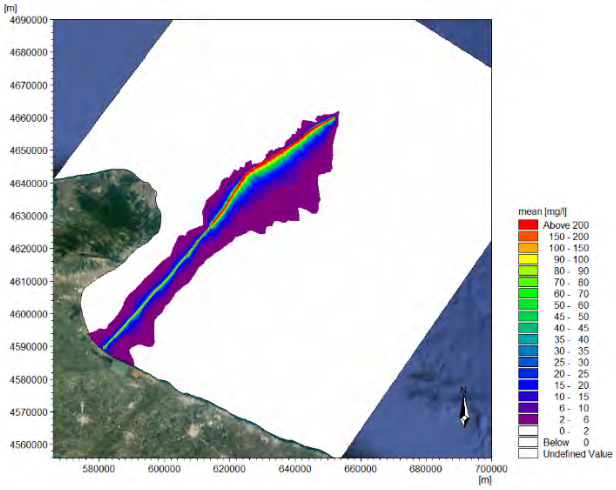




Marine plough and maximum concentration of suspended sediments

It should be noted that the excavation phase of the cable duct has a limited duration in time (about a week of operations at sea) and although noisy, this work is part of a context already marked by the presence of a strong background noise, as highlighted in the baseline scenario (see paragraph 4.1.6.1).

Finally, on the component of disturbance of the biocoenosis and reference habitats for small-scale coastal fishing, we remind you that the project provides for the differentiation of the type of installation (laying on support with protections and HDD technology), to ensure the preservation of the habitats, as represented in the following figures.

We will be able to conclude that the construction phase for the construction has a certain **High Negative Impact** on the fishing sector of the area inhibited from fishing for obvious reasons of construction sites, but the measures envisaged, including the compensatory measures and the attention applied, make the impact **reversible** in the short term.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

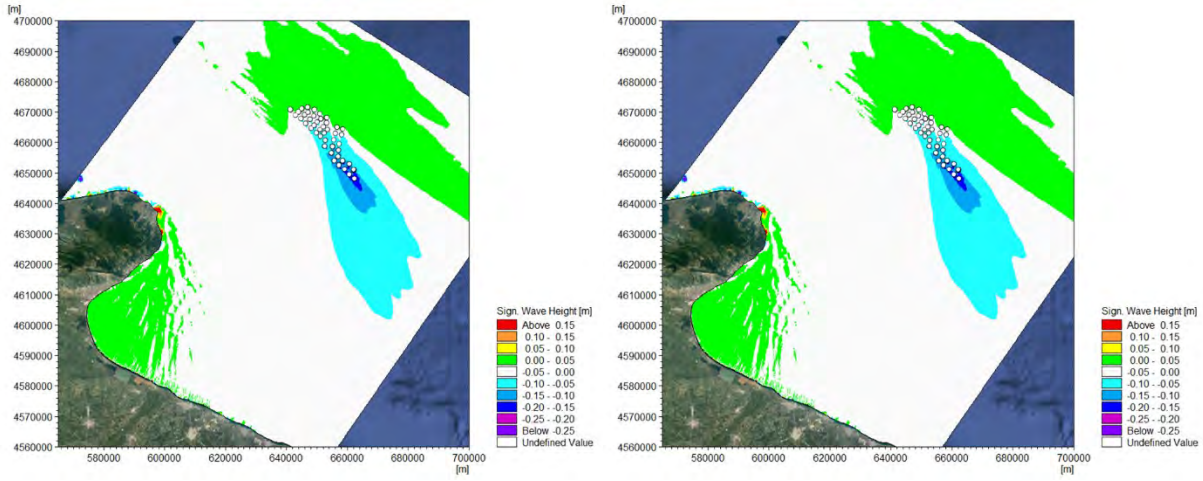
4.2.14.2 Operation phase

The presence of the Nemetun Island plant will also have an impact on fishing during the operation phase. We can say that the main impact components are the same as those analyzed during the construction phase, but the boundary conditions are the same as those analyzed during the construction phase.

In summary, we can observe that:

Even at this stage, due to theinhibition to navigation, fishing activity is affected by the removal of part of the marine environment, but the negative effect is mitigated by the following conditions:

- The possibility that the area taken away from fishing is the subject of a natural effect of fish repopulation, especially of the seabed, removed from the industrial practice of trawling, with the creation of a nursery effect and the consequent increase in catch.
- The possibility of using the installation areas of the offshore wind farm for the co-installation of aquaculture facilities favoured by the calm areas, an effect of wave modification (see paragraph 4.2.2).



Wave Reduction Effect in Wind Farm Areas

The negative effect on industrial fishing activity is negligible because, as introduced in the baseline (see paragraph 4.1.10), the route of the pipeline is not really affected by bottom trawling. The KPs 0-45 of the cable duct (land side) have a depth of less than 50 meters and therefore the interactions with trawling are negligible (illegal trawling); two interactions are recorded at KP 33 and 40 probably associated with the passage of vessels without trawling activity. For all the other KPs of the cable duct, trawling has a very limited number of passages (maximum 4 passages per year).

Frequency of interaction with cable ducts for trawling boats

As indicated in the baseline scenario, in the specialist documentation and in the section on offsetting interventions, **fishing activity in the area of the Nemetun Island project (wind farm and cable duct area) appears to be practiced at low intensity**.

Therefore, in consideration of the above, it is believed that the marine area chosen for the Nemetun Island project is not among those most suitable for fishing activities. In **Operation phase** because of theinhibition to navigation, the area will benefit from a natural effect of fish restocking, especially of the seabed, with the creation of a nursery effect and the consequent increase in catches, even in the areas around the wind farm. In addition, there is the possibility of using the installation areas of the offshore wind farm for the co-installation of aquaculture facilities favored by the quiet areas, as an effect of wave motion modification (see *ES.7.2_01*).

For the above, the impact during the year will be classified as **positive** of **medium entity**, for an increase in fish stocks due to the presence of fishing inhibition and the possible nursery areas that would be created in the park. For a long-term effect, the non- **reversibility**.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.14.3 Decommissioning phase

For the impact during the decommissioning phase, considerations similar to those described during the construction phase apply, the extent of the impact is mitigated by the shorter duration of the work.

We will have the following evaluation:

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.15 ESTIMATION OF IMPACTS ON NAVIGATION

The estimate of the impacts on navigation of the Nemetun Island wind farm was carried out by the company RINA – Italian Naval Register – and is contained in the specialist report called *SIA.ES.4.1_01* attached to the Environmental Impact Study.

RINA is a non-profit private law body, accredited to carry out investigations, including state investigations, relating to the safety of navigation and the tonnage of ships.

The study carried out aims to assess the risk associated with navigation in terms of:

- Frequency of interaction between wind turbines / substation and maritime traffic (passing ships);
- Frequency of interaction between sinking ships, falling anchorages and objects, and the cable duct laid on the seabed.

4.2.15.1 Impacts on navigation

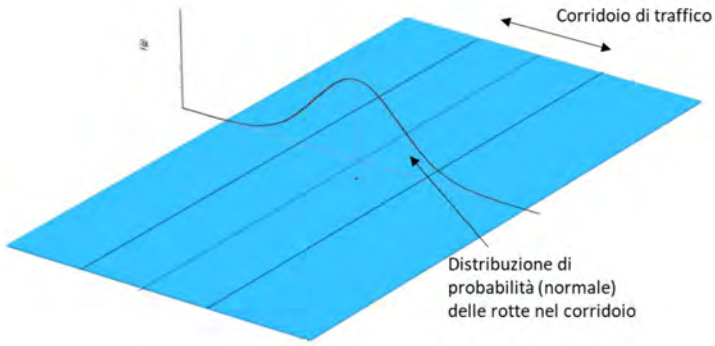
The maritime traffic analysis data shall be included in the baseline scenario in paragraph 4.1.10.5 and shall be obtained from the processing of Automatic Identification System (AIS) data, a tracking system that identifies the routes and the position and speed of vessels in transit.

On the basis of these data, the parameters relating to:

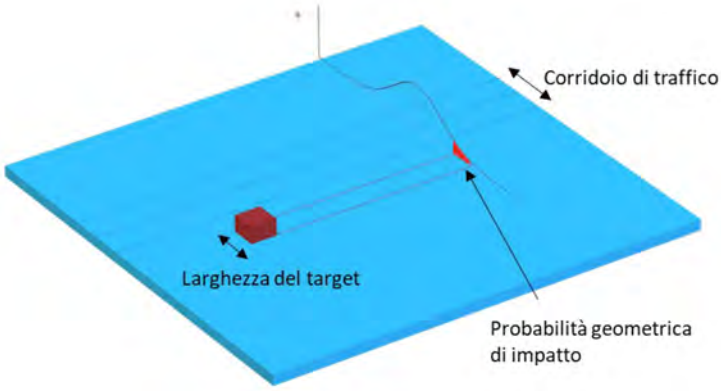
- **Annual frequency of ship passages (Ni)**

- **Probability of loss of control of the vessel (P1)**
- **Geometric probability of impact with the target considered (P2)**

  P_2 It is defined as the "geometric probability of collision", i.e. the probability that the damaged ship is on a collision course with the target considered. For the calculation of P_2 It is assumed that the trajectory of the ship does not change after the event that caused the loss of control, i.e., that the ship maintains the trajectory it had at the time the failure occurred.



Route distribution in the traffic corridor



Evidential graph of the collision course with a target

- **Probability of failure of mitigation barriers**

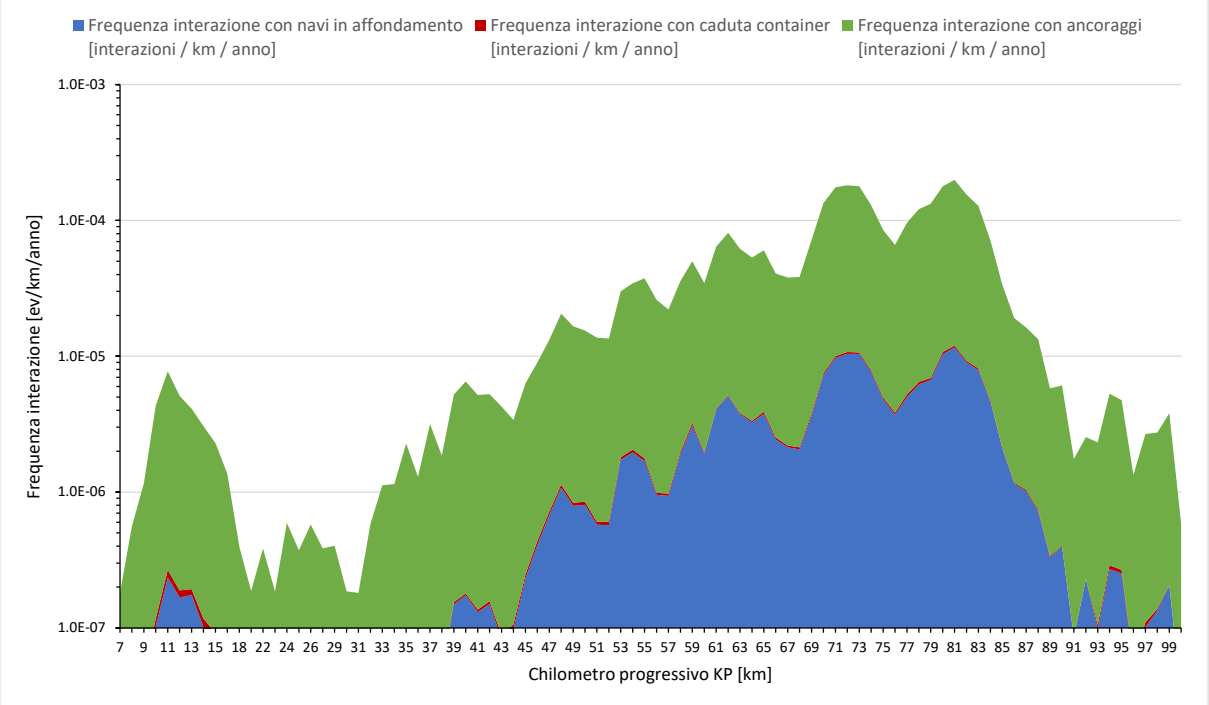
  Depending on the specific case, there may be systems (barriers) that help to avoid the impact between the passing ship and the target. In principle, the term P3 will be given by the combination of the probabilities of failure of all the identified barriers.

4.2.15.2 Impacts with subsea structures (marine cable duct)

The events analyzed by evidentiary calculation that can damage underwater structures are:

- Impact due to sinking ships;
- Impact caused by falling objects transported by merchant ships (containers);
- Interaction with anchors in the event of emergency anchorage and/or adverse weather conditions (considering direct impact and dragging);
- Interaction with fishing equipment.

On the basis of these data, the values shown in the following graph have been defined:



Frequency of interaction with cable ducts for each contribution related to maritime traffic

In summary, the frequency of cable duct interaction is:

- In the order of 10^{-7} interactions year for 15 km
- In the order of 10^{-6} interactions year for 33 km
- In the order of 10^{-5} interactions year per 31 km
- In the order of 10^{-4} interactions year per 11 km

For interference between subsea installations and bottom trawling, see the relevant paragraphs of the baseline and fisheries impact assessment (see paragraphs 4.1.10 and 4.2.14).

4.2.15.3 Measures for navigation safety

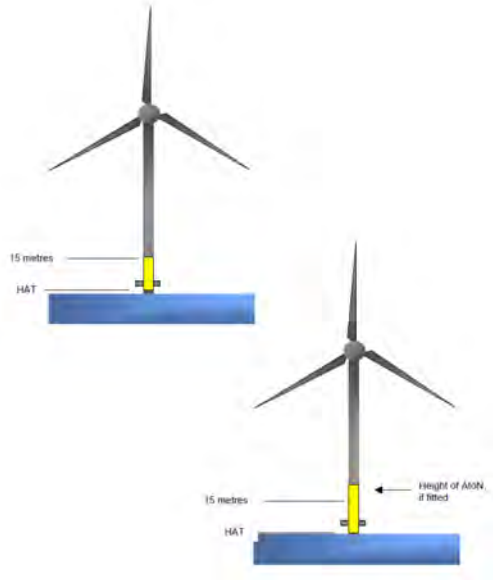
In order to ensure navigation safety following the installation of the Nemetun Island wind farm, a series of measures and interventions have been described and adopted. The measures are described in the study conducted by the RINA Company contained in the specialist report *SIA.ES.4.1_01.*

The safety measures to be taken, reported by the Rina Company are:

- **The adoption of a speed limit for ships passing near the wind farm;**
- **The use of maritime signalling systems;**
- **Insert a no-go zone around the wind farm;**
- **Use a standby vessel system at the wind farm;**
- **Use an anti-fog siren installed, for example, at the perimeter wind turbines;**
- **Provide for a RACON or radar beacon;**
- **The burial of cables, where feasible, to reduce the interactions of the cable duct with trawling and increase its protection. In addition, if the burial depth is sufficient to insulate the cables from possible impacts with anchors, a significant reduction in the frequency of interaction would be obtained (as accidental anchoring is an important cause of interaction).**

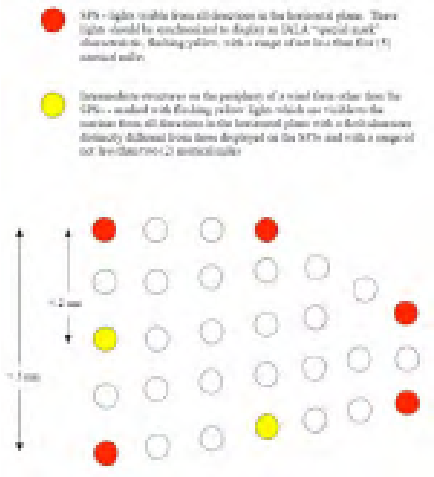
In addition, further measures relating to signalling are envisaged:

- **Signalling systems for individual wind turbines**, consisting of backlit or reflective identification panels and yellow colouring of the spindle up to the 15 m level.



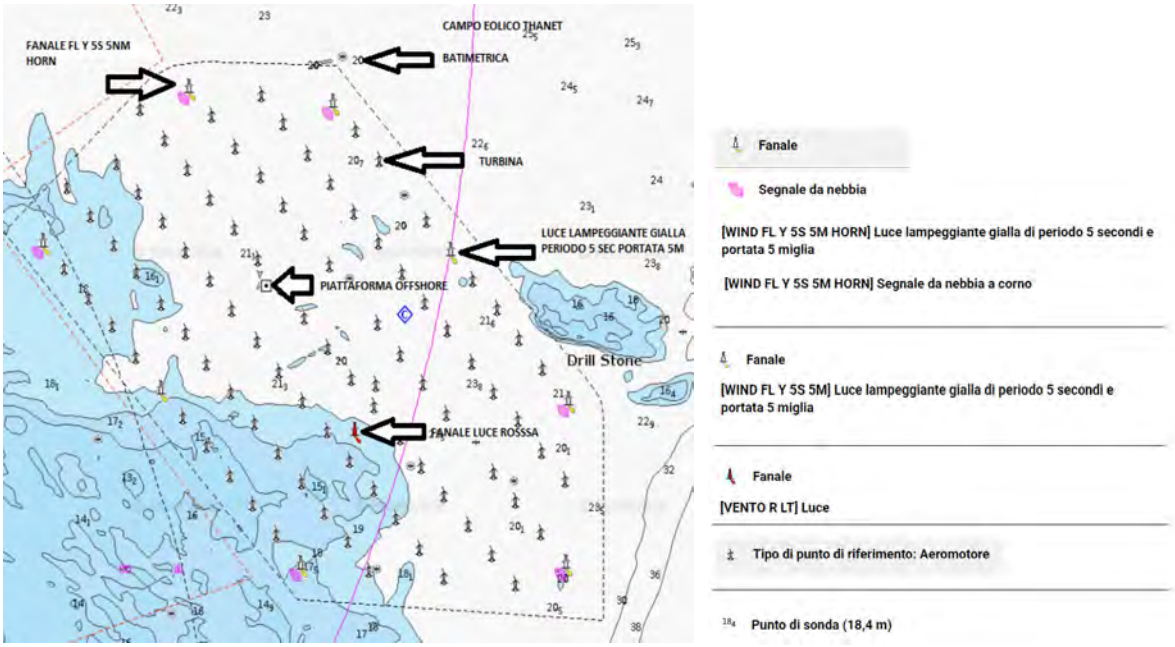
Wind turbine signalling

- **Lighting systems,** both perimeter structures and internal structures. For **SPS (Exterior Perimeter Lights)**, the flashing yellow light with MO(U) ≤15s range ≤5 miles, visible at 360 degrees, is prescribed. The maximum distance between SPS must never exceed 3 miles. For **IPS (Intermediate Lights)** it is prescribed that they are marked with a yellow flashing light with a range of not less than 2 miles and with a distance between them not more than 2 miles.



Lighting system SPS and IPS

- **Adoption of control systems**: RACONS, Radar Reflector and Radar Target Enhancers, AIS system as an aid to navigation, Fog Signaling system with a minimum range of 2 miles.



Example of electronic cartography NAVICONS with signalling systems

Given the above, the following paragraphs evaluate the impacts on navigation referred to the phases of the life cycle of the plant.

4.2.15.4 Construction phase

The impact on navigation during the construction phase is certainly the most magnificent, because it refers to the period of construction and construction of works at sea, such as the preparation and launch of wind turbines and the laying of the submarine cable duct.

Starting from the assumption that it will be appropriate to inhibit ship traffic for the area of positioning of the wind farm and for the entire life cycle of the plant, we can describe the following sub-phases:

- **Launching and towing of floating foundations and wind turbines**

The semi-submersible platforms, both in steel and concrete, are made entirely on the ground, where the erection of the wind turbine is also carried out, and then transported to the installation site, by tugboats.

Realization, launch and transport of foundations and wind turbines

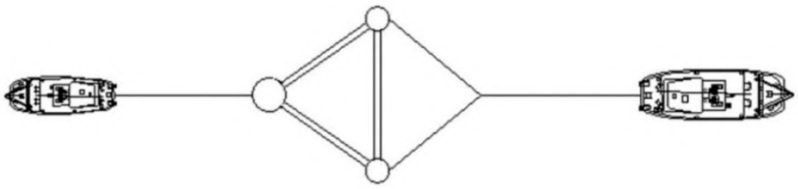
Among the different assembly scenarios, envisaged in the initial phase, we will have the construction and erection in port or the construction of the floater in port with the subsequent erection in sheltered areas along the coast.

There is a timing of execution and **launch of 1 floater every two weeks**, once the assembly phase is completed, there is a towing phase to the point of installation, depending on the port of origin this phase lasts several hours.

Configuration of the towing phase

This work is potentially interfering with the navigation of other boats in the area, it must be appropriately marked and organized in a ***Secure browsing***, which prevent the risk of collision with other ships during the hours of execution.

Positioning in the place of installation, with connection of the mooring line, will take place with the help of another tow boat.



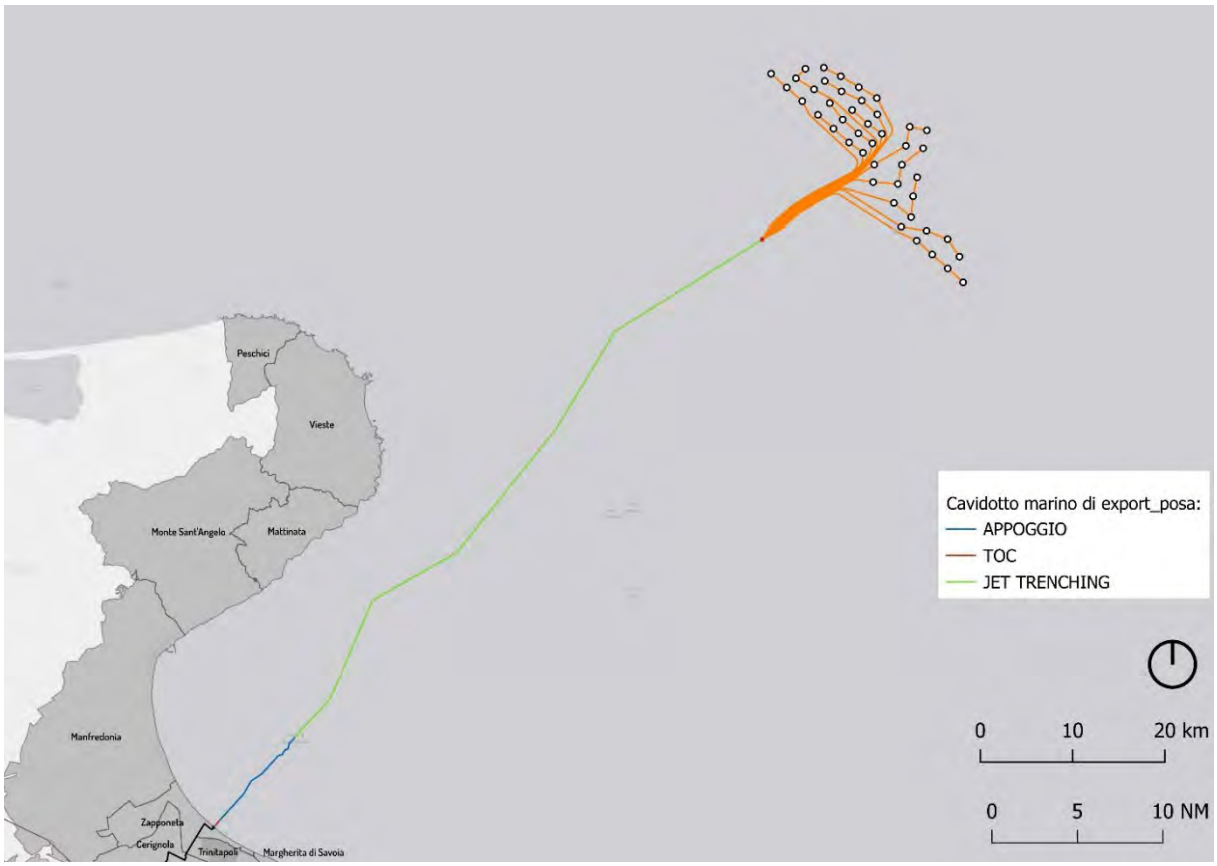
Setting up the mooring line connection

This phase will take place in the area where the wind farm is installed, which is inhibited from further navigation; therefore, please refer to the considerations in the paragraph on the operating phase to establish its impacts.

- **Laying of the submarine cable duct**

The laying of the submarine cable duct is the phase that has the greatest impact on navigation.

Different installation methods are envisaged, as better specified in the figure and in the paragraphs relating to the description of the construction site.



Type of laying of the marine cable duct

The *jet trenching* It will take place through the use of special boats set up for towing the underwater plough and laying the cable, as shown in the following diagram:

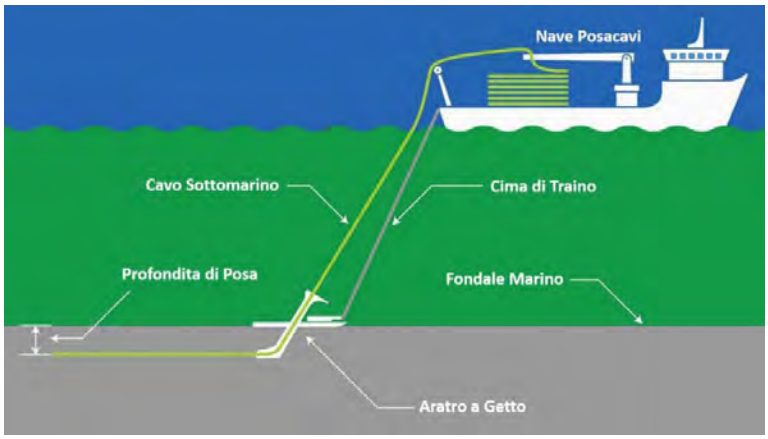
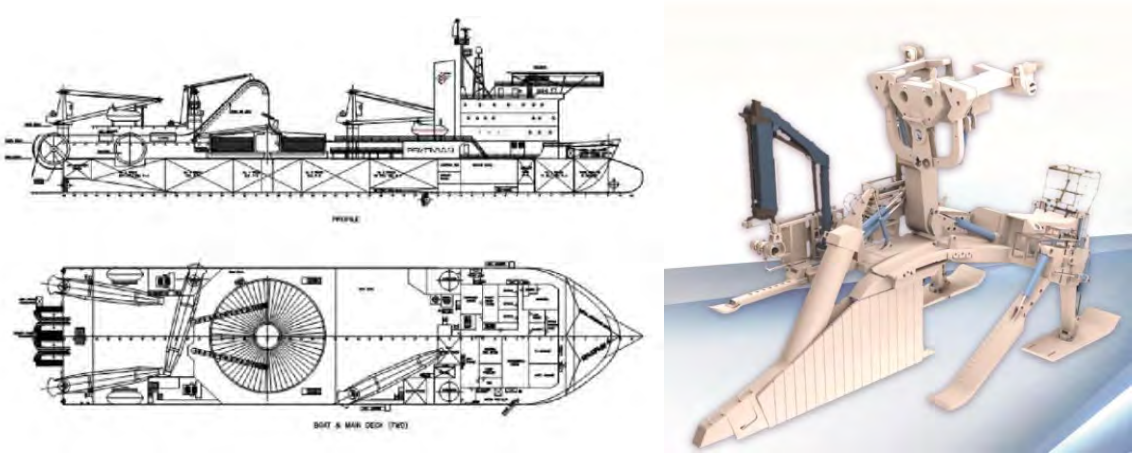


Diagram of cable laying with technology Jet TRenching



Tow and plough for laying the submarine cable duct

The expected duration is about 78 hours, the installation operation will take place without interruption.

Throughout the length of the path in *jet trenching* (about 87 km) it will be necessary to ***total inhibition of ship traffic*** in order to ensure their safety. Therefore, the operation has a high negative impact on navigation, but limited to the duration of one week.

For the other phases of installation (support with protection, HDD), it will also be necessary to inhibit ship traffic, but these operations will take place close to the coast, for stretches of much shorter length and with estimated durations in the order of a few hours.

The assessment of the impact on the construction phase, as described, can only be **negative**. The time-extended operation and the short duration of the salient phases will define **The average entity**. The operation is certainly **reversible** because it is confined to the time of realization.

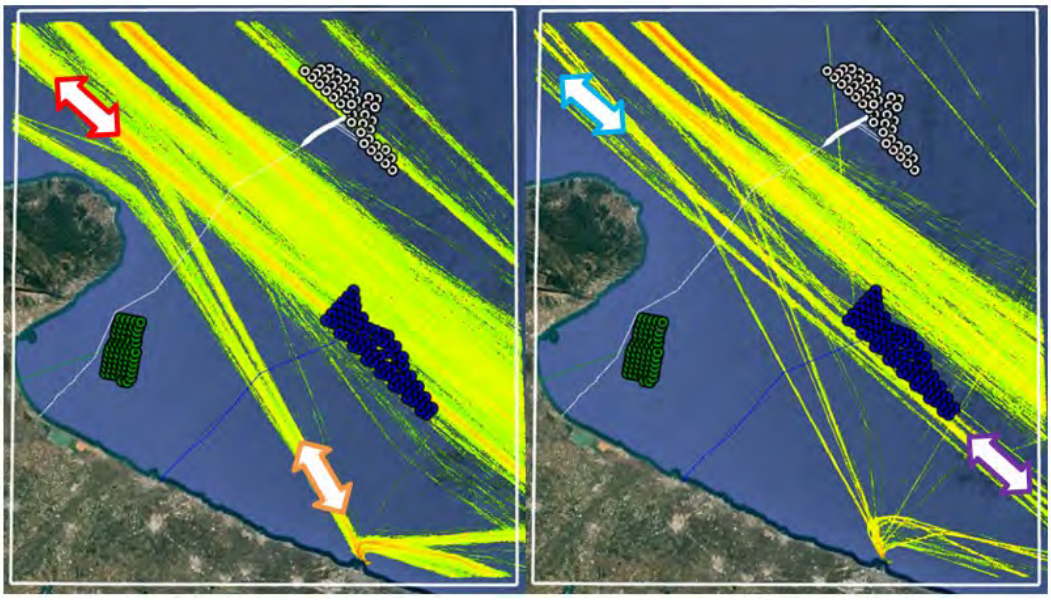
CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.15.5 Operation phase

For the operation phase, and also for the entire duration of the state concession, reference is made to the study carried out by the RINA company on the redistribution of maritime traffic passing through the area where the wind farm will be present. The nearby wind farms of Barium Bay S.r.l. and Seanergy have also been included in the area of interest, in order to include, in the representation of the traffic corridors, the potential impacts generated by the combined presence of the three fields. The Seanergy wind farm (located further along the coast in front of Manfredonia) does not seem to cause significant impacts on the direction and position of the traffic corridors of interest for the risk assessment of the Nemetun Island field.

The routes will be relocated based on engineering considerations and with reference to the current distribution of the routes. A total of 15 maritime traffic corridors were identified from the analysis of AIS data.

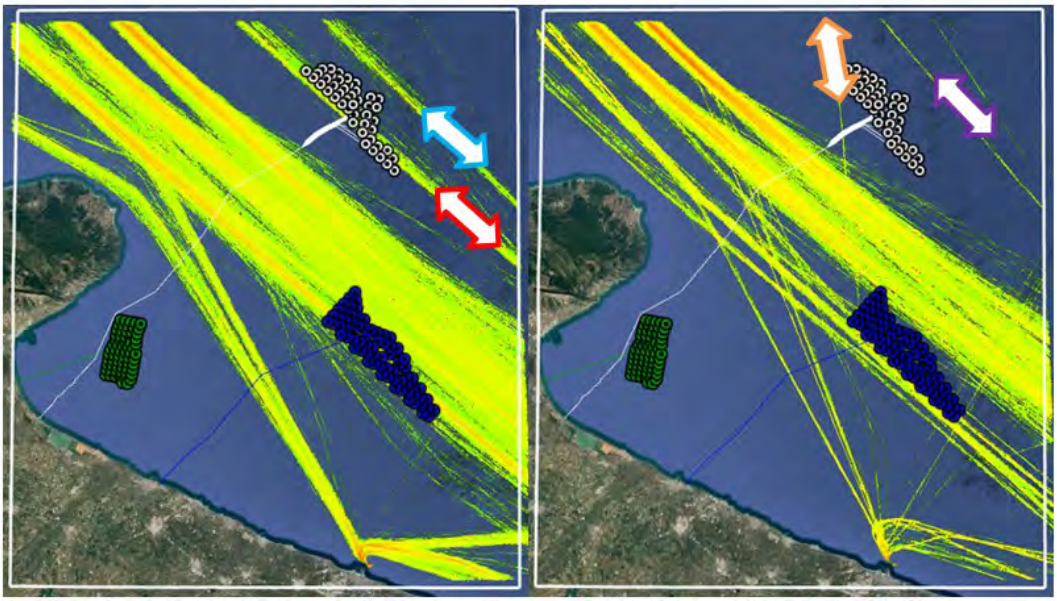
The first two traffic corridors cross the area of interest in a north-west/south-east direction; they are corridors characterized by a high number of passages of ships belonging to all GRT classes (about 6000 passages/year); both corridors tend to open up moving southwards; It is reasonable to expect that, in the presence of wind farms and their no-go zones, ships will continue to maintain a more centered distribution on the axis of the corridor, minimizing the lateral spread. Corridor 2 is also characterized by a potential interaction with the Barium Bay wind farm and in the analyses it was considered that this corridor moves north-east maintaining a minimum distance of 1 nautical mile from the Barium Bay wind turbines (and slightly approaching the wind turbines of the Nemetun Island wind farm).



Traffic corridors 3 (light blue), 4 (purple), 5 (orange), and 6 (red)– GRT class 5 (left) and GRT class 6 (right) density map. In white Nemetun Island wind farm, in blue Barium Bay wind farm and in green Seanergy wind farm

Corridors 3, 4, 5 and 6 describe the traffic along the coast north of the port of Barie; this traffic is characterized, in the north-west part of the control area, by a series of very clear corridors followed by ships in class GRT 6 (corridor 3, in total about 1000 passages per year divided into three sub-corridors), by a larger corridor that collects the passages of ships in class GRT 4 and 5 and, further along the coast, GRT 1 (corridor 6, about 250 ships in GRT 1 class and 1200 in the major classes). Part of this traffic is connected to ships entering/leaving the port of Bari to the north (corridor 5, about 700 ships/year); the remaining traffic is instead directed towards the south-east (corridor 4).

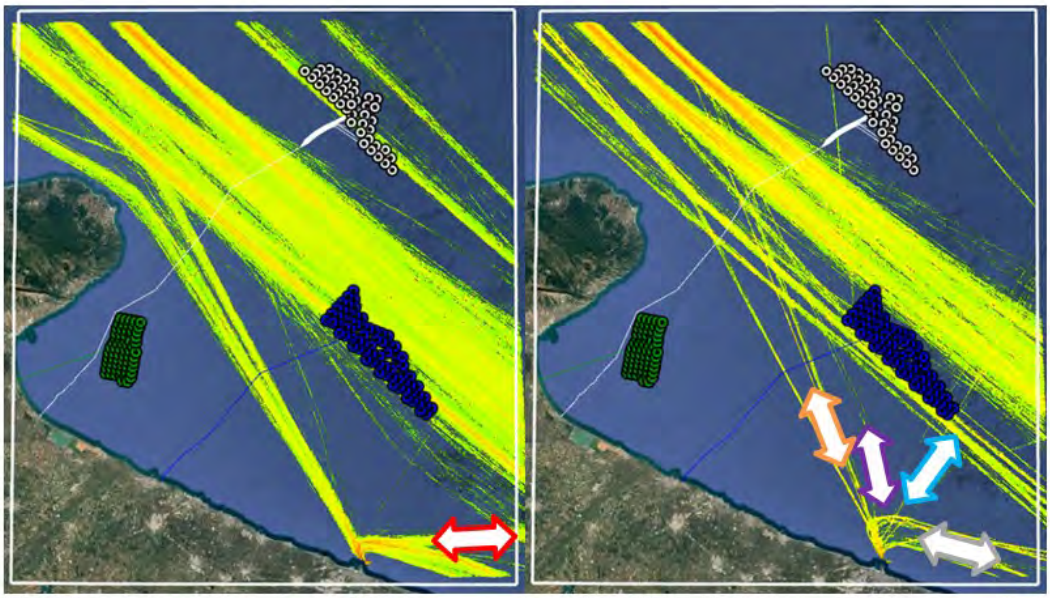
Corridors 3, 4 and 6 are characterized by a possible interaction with the Barium Bay field; the relative route was therefore considered slightly closer along the coast at a minimum distance of 1 nautical mile from the wind turbine turbines.



Traffic corridors 7 (red), 8 (light blue), 9 (orange), and 10 (purple) – GRT class 5 (left) and GRT class 4 (right) density map. In white Nemetun Island wind farm, in blue Barium Bay wind farm and in green Seanergy wind farm

The remaining corridors (7 -14) follow less busy routes, however, it is significant to note that:

- corridors 7 and 9 cross the area planned for the Nemetun Island wind farm; they were therefore conservatively moved further along the coast, maintaining the minimum safety distance from the Nemetun Island wind turbines and the Barium Bay field;
- corridor number 12 shows potential interference with both wind farms; a route rotated to the west was therefore considered in order to maintain a minimum distance of 1 nautical mile from the wind turbines;
- corridor number 14 shows potential interference with the Barium Bay wind farm; a route rotated to the east was considered in order to maintain the minimum safety distance.



Traffic corridors 11 (red), 12 (purple), 13 (orange), 14 (light blue) and 15 (grey) – GRT class 5 (left) and GRT class 3 (right) density map In white Nemetun Island wind farm, in blue Barium Bay wind farm and in green Seanergy wind farm

The impact described will be of a **negative**, but the measures taken to ensure safe navigation and the identification of alternative corridors will define a**Medium entity**, resulting in some changes to navigation. The impact is classified as **Non-reversible** due to its duration corresponding to the entire life cycle of the Nemetun Island plant.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***
■				■				■

4.2.15.6 Decommissioning phase

In the decommissioning phase, activities are very similar but reverse to those of the construction phase.

With a good approximation, we can say that the assessment of the impact on navigation is the same as that estimated for the implementation.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***
■				■			■	

4.2.16 ESTIMATION OF IMPACTS ON TOURISM

The potential effect of the Nemetun Island plant on the tourism sector is mainly due to the combination of the tourist vocation of the places and its visibility.

The potential impact, focused in the operation phase, is given by a combination of the factors described in the baseline scenario and in the paragraph on landscape and visibility, but also by the measures taken in the compensation measures. Thanks to the involvement of the world of art and architecture, in fact, the wind farm from a potential detractor could certainly become a strong attraction, as well as a lever to strengthen the tourism sector and improve onshore infrastructure.

4.2.16.1 Construction phase

During the construction of the plant, the pressures that could have an impact on the tourist use of the areas are:

- Transit of naval vehicles used for the construction of the wind farm – interference with tourist boats: it is certainly considered negligible, both for the very high distance from the coast of the wind farm, and for the reduced execution time of the works that may determine the prohibition of navigation along the route of the marine cable duct (at most about a week, considering that the works will take a net time span of about 78 hours).

- Transit of the naval vehicles used for the construction of the wind farm – visual disturbance: this is a temporary impact (the towing of each wind turbine lasts about 2.5 hours, with a frequency of one towing every two weeks) which, if properly treated, could also become an element of attraction.

- Increase in water turbidity during the laying period of the marine cable duct: from the models carried out (cf. *ES.7.2_01*), it emerges that the maximum concentrations at the bottom of the suspended material show how the shape of the plume is almost symmetrical from the coast to Vieste, asymmetrical from Vieste towards the open sea with respect to the axis of the trench, with a greater extension on the south-east side of the same due to the typical hydrodynamics with current from North-West to South-East that detaches from the Gargano promontory to reattach itself in front of about Orno. The concentration of the suspended material decreases to values of 100 mg/l, 20 mg/l and 2 mg/l respectively at distances of an average of 800 m, 7 km and 18 km on the south-east side with respect to the axis of the trench. The extent of the dispersion is similar in the different seasons, while its minimum extension occurs, overall, in winter. The overcoming of the condition of clear water remains concentrated around the axis of the trench, with an asymmetrical shape towards the south-east due to the typical hydrodynamics. From a seasonal point of view, the least persistence in terms of both intensity and spatial extension occurs in winter, while the most severe combination occurs in spring. In winter, in fact, the column is mixed, so there is no confinement; therefore, the sediments are more distributed along the column and at the bottom the persistence is minimal. Therefore, the summer season is the one in which the effect of the works is less burdensome, due to the limited extension of the plume and the dispersion of the sediment along the seabed, while the winter season is the one in which the effect of the works is less burdensome due to the intensity and extent of the persistence of the condition of turbid waters. As pointed out in paragraph 4.2.3.1 It is planned to organize the laying of the excavated cable duct outside the bathing period in order to limit the effects of sediment suspension and not to interfere with the summer and spring tourist season.

The evaluation at this stage sees a **negligible and reversible negative impact**:

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.16.2 Operation phase

The installation of large offshore wind farms in areas far from the coast has among its motivations the reduction of the visibility factor of the wind turbines, thanks to the system of floating foundations it is possible to install them in areas several kilometers away from the coast, in the case of the Nemetun Island plant, the minimum distance from the coast is 55 km.

The perceptibility of the plant and the connected infrastructures is reduced, but the plant is not "invisible", rather we will talk about inter-visibility and low perceptibility. On the other hand, however, it is good to consider that reducing the impact on the landscape and consequently on tourism to visibility alone would be unreliable, the wind turbines will be part of the seascape, an innovative landscape that integrates renewable energy and the protection of our environmental heritage with the sea ecosystem: a modern, innovative and necessary "seascape" to produce clean energy and local development. The planned intervention will be attentive to alterations and at the same time ready to repay and compensate for them in the appropriate way.

For the description of the environmental compensations envisaged, please refer to the relevant paragraphs of this Study and to section 6 of the final project. In this analysis, specific to the effects on the tourism sector in the operating phase, it seems appropriate to highlight some actions planned for the improvement of the tourist attractiveness of the wind farm and its correct inclusion in a modern and technologically advanced "seascape":

- **Creation of experiential stations along the coast**

  Installation of interactive cabins or totems thanks to which the visitor can see and hear what is "happening" in the wind farm, for example navigating among the wind turbines, viewing the biodiversity present with underwater webcams and being informed about the energy produced in real time.

- **Strengthening the network of paths for slow mobility**

  The system of choice and cataloguing of interventions is based on the idea of promoting slow mobility in the context of sustainable tourism. We have identified cultural itineraries linked to religion and folklore, working to enhance them. This process can be supported by resources from the Nemetun Island plant.

- **Creation of artistic installations on wind turbines**

  The idea is to launch and promote competitions for artists aimed at the "transformation" of wind turbines into works of art with low environmental impact. To identify the lines of action, memoranda of understanding have been stipulated with important cultural associations and bodies operating in the sector.

- **Promotion of sustainable tourism activities towards the wind farm**

  It is planned to promote activities and carry out interventions aimed at allowing tourist usability of the wind farm, such as:

  catamaran tour to the wind farm,

  fishing tourism activities in quiet areas,

realization of architectural interventions for the use of the offshore substation as an observation point and underwater aquarium.

- **Diving and biocoenosis monitoring**

  The organization of scuba diving campaigns, both for scientific and recreational purposes, is planned for the study of coralligenous and the entire marine ecosystem. These dives will make it possible to explore the precious biocoenoses present in the landing area or along the first stretch of the marine cable duct, raising awareness among the population of the importance of the ecosystem present. In addition, the dives will make it possible to observe the propagation effect of the biocoenoses on the substrate constituted by the cable duct protection system, which, as is desirable, will be a hard substrate that can be easily colonized by new organisms, favoring an increase in biodiversity, biomass and ecological functions of that habitat thanks to the presence of the wind farm.

For the above, the impact assessment is **positive nature** but classified with a **Low entity**, it is not supposed that the presence and tourist attractiveness of the wind farm can in any way replace that linked to the beauty of the places. The intention is to create sustainable integration over a long period of time, so as to **Non-reversible**.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.16.3 Decommissioning phase

For the period of decommissioning of the wind farm, the same considerations made during the construction phase and also the same pressure assessments apply.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.17 ESTIMATION OF IMPACTS ON THE TERTIARY SECTOR AND EMPLOYMENT

The impact on the tertiary sector of the planned plant can be classified as positive, the entire initiative is in fact able to produce significant socio-economic repercussions associated with the construction, management and decommissioning of the plant. These repercussions concern in summary:

- **The development of investments** such as those related to the **construction and adaptation of port facilities** necessary for the preparation of the components that make up the wind farm. This will require significant investments, but once adapted, port facilities can be used for other production purposes and for the same development as other offshore wind farms, defining a new regional supply chain capable of creating many jobs, but above all new professionalism.

- **The development of local businesses**: Floating offshore wind farms are characterized by complex structures, which require the use of large quantities of materials, posing a very important issue both in terms of supply and associated processing. It is clear that being able to maintain supplies and labor locally has great advantages both from an economic and environmental point of view (transport costs and related impacts avoided). In addition, foundations, whether steel or concrete, they are made using materials normally used in construction, which local companies can therefore easily manage. The role that these plants will determine in the development (and birth)

of companies in the field of plant design and maintenance activities is certainly relevant. In particular, in the design sector, and more generally in engineering and professional services.

- **Creation of new jobs**: from the above considerations it is clear that the number of companies, professionals and operators involved in the process of design, construction and management of these plants is very high.

The professional figures and operators involved in the process of design, construction and management of these plants is very high. There are numerous references on the grid, from which it is possible to deduce that an offshore wind farm with a capacity of 1 GW can commit over 5,000 resources in total, most of which can be found locally. The development forecasts of these plants speak of about 4 GW for Puglia alone in the next 10 years, which would mean generating about 20,000 new jobs locally. Below is a summary table of the professionals involved (these are estimates in order of magnitude) in the various phases that characterize the construction and operation of the Nemetun Island plant: in the table the number of resources is divided between local and non-local resources, in this regard, it should be taken into account that the distribution shown does not represent a snapshot of the current state, where the professionals are not yet trained and available, but the target is reachable.

As described in the report *descriptive R.6_01_Descriptive Report on Compensation and Enhancement Measures,* the construction of offshore wind farms requires specific and specialized high-level skills, to ensure the maximum commitment of the local production fabric it is certainly necessary to introduce substantial training actions. Below are the summary tables of the resources that the wind farm will use during its useful life, from construction to decommissioning, indicating the local resources that can potentially be used: we are talking about 6,000 jobs.

The tables show that the training demand will be divided into different levels:

1. **Higher education**, intended for designers and university structures: for the development of the design Nemetun Island has involved, so far, a very large number of professionals, university structures and operators, and thanks to the know-how acquired it will be able to organize, with professional associations and local university structures, specific training courses. In particular, the figures for whom the greatest training needs have been recorded are in the structural design of offshore works, with particular reference to floating foundations and related anchors, and the construction site of offshore works

   Specific training courses can be organized with the professional associations, while twinning with university structures in possession of the necessary skills can be promoted with the competent university departments and the structures adhering to the Erasmus program can be expanded, up to introducing specific addresses in existing degree courses.
2. **Vocational training** for the creation of suitable professional figures: from the design phase to the implementation phase, the figures required are really very numerous, and for this reason it is believed that the most profitable way to go is to introduce industrial institutes and dialogue with the ITS Puglia system, creating a specific ITS Energy sector.
3. **Corporate training,** to allow the local production fabric to respond to new needs: from metal carpentry to the offshore industry, the construction of these works will require a considerable development of the local supply chains and it is not possible to ignore the relationship between the local production fabric and the operators who have specific and consolidated experience and who are already in the support network used by Nemetun Island.

4.2.17.1 Construction phase

Already in the design phase and then in the construction and assembly phases of the plant components (wind turbines, floating foundations, substation), the initiative in question has an impact on the tertiary sector.

Reference is made, as mentioned in the introduction, to the investments necessary for the adaptation of port infrastructures, to new jobs in the engineering and services sector, to the development of local businesses.

In the following table, in order to provide an order of magnitude of the resources used and their origin, the numbers calculated analytically and on the basis of previous experience are inserted:

Fase/Attività	Risorse_tipologia	Parco eolico Offshore 1 GW	di cui locali	non locali
Progettazione e sviluppo	Progettisti civili	30	20	10
	Progettisti elettrici	20	10	10
	Specialisti (biologi, archeologi, geologi, ecc.)	25	20	5
	Altri (legali, comunicazione, finance, ecc.)	15	10	5
	Totale	**90**	**60**	**30**
Costruzione fondazioni	Personale amministrativo	30	20	10
	Personale tecnico	60	50	10
	Operatori specializzati opere civili	2000	1800	200
	Operatori non specializzati opere civili	1000	900	100
	Totale	**3090**	**2770**	**320**
Costruzione aerogeneratori	Personale amministrativo	20	10	10
	Personale tecnico	50	40	10
	Operatori specializzati opere elettromeccaniche	800	600	200
	Operatori non specializzati opere elettromeccaniche	400	360	40
	Totale	**1270**	**1010**	**260**
Opere elettriche	Personale amministrativo	20	10	10
	Personale tecnico	40	30	10
	Operatori specializzati opere elettriche	150	135	15
	Operatori specializzati posa cavi marini	150	100	50
	Operatori non specializzati	100	90	10
	Totale	**460**	**365**	**95**
Trasporti	Personale amministrativo	15	10	5
	Personale tecnico	30	20	10
	Operatori specializzati trasporti terrestri	80	72	8
	Operatori specializzati trasporti marittimi	200	180	20
	Operatori non specializzati	100	90	10
	Totale	**425**	**372**	**53**
Montaggi e ancoraggi	Personale amministrativo	15	10	5
	Personale tecnico	30	20	10
	Operatori specializzati sollevamenti	200	180	20
	Operatori specializzati lavori marittimi	150	135	15
	Operatori non specializzati	100	90	10
	Totale	**495**	**435**	**60**
TOTALE RISORSE IMPEGNATE - FASE DI CANTIERE		**5830**	**5012**	**818**

Estimation of the resources used during the construction phase

It is clear that the activities related to the "*starting*" of the initiative have a positive impact on the sector analyzed, we will therefore have the following assessment:

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

Positive impact is classified as ***Non-reversible*** for the possible definition of a *"sector supply chain"* which could generate positive impacts in the long term.

4.2.17.2 Operation phase

During the operation phase, the maintenance and monitoring activities of the work are mainly reported, aimed at ensuring its correct operation, maintaining and repairing any damage to the works at sea and carrying out the monitoring required by the Environmental Monitoring Plan.

The data are estimated on an annual basis and then projected over the entire life cycle of the wind farm, estimated at 30 years.

Fase/Attività	Risorse_tipologia	Parco eolico Barium Bay	di cui locali	non locali
Manutenzione, monitoraggio				
(su base annua)	Personale amministrativo	10	10	0
	Personale tecnico	20	15	5
	Personale tecnico per attività di monitoraggio	25	25	0
	Operatori specializzati	150	135	15
	Operatori non specializzati	100	90	10
	Totale	**305**	**275**	**30**
TOTALE RISORSE IMPEGNATE FASE DI ESERCIZIO per l'intero ciclo di vita (30 anni)		**5490**	**4950**	**540**

Estimation of the resources used during the operation

Also in this case, the resources used are huge, so we will have an impact of **positive sign**. This estimate does not include the induced employment due to the improvement in the tourism sector and the tourist exploitation of some parts of the plant envisaged in the mitigation and compensation works.

We will have the following evaluation:

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.17.3 Decommissioning phase

For the decommissioning of the plant we will have the following estimate of the resources used:

Fase/Attività	Risorse_tipologia	Parco eolico Barium Bay	di cui locali	non locali
Dismissione	Personale amministrativo	20	15	5
	Personale tecnico	40	30	10
	Operatori specializzati	500	450	50
	Operatori non specializzati	350	315	35
	Totale	**910**	**810**	**100**
TOTALE RISORSE IMPEGNATE - FASE DI DISMISSIONE		**910**	**810**	**100**

Estimation of the resources used in the decommissioning phase

Again, the impact assessment is **positive, but medium and reversible**:

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.18 ESTIMATION OF THE IMPACTS DERIVING FROM ELECTROMAGNETIC EMISSIONS

As part of the final project attached to the Environmental Impact Study, a prior assessment of the electromagnetic fields was carried out in order to describe the emissions of these magnetic, electric and electromagnetic fields generated during the operation of the plant and the connection works and to define the compatibility of the project with the regulatory limits of exposure and protection of the population and

fauna, as well as allowing the verification of compatibility and interference of the system with any electrical and electronic systems in the area.

Please refer to the "*ES. ES.3.1_02_ Assessment of Electric and Magnetic Fields in Onshore Areas"* for the necessary further information.

4.2.18.1 Construction phase

The impact during the construction and decommissioning phase is to be considered zero because the electrical and electronic equipment will be turned off, therefore not able to generate electromagnetic emissions.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

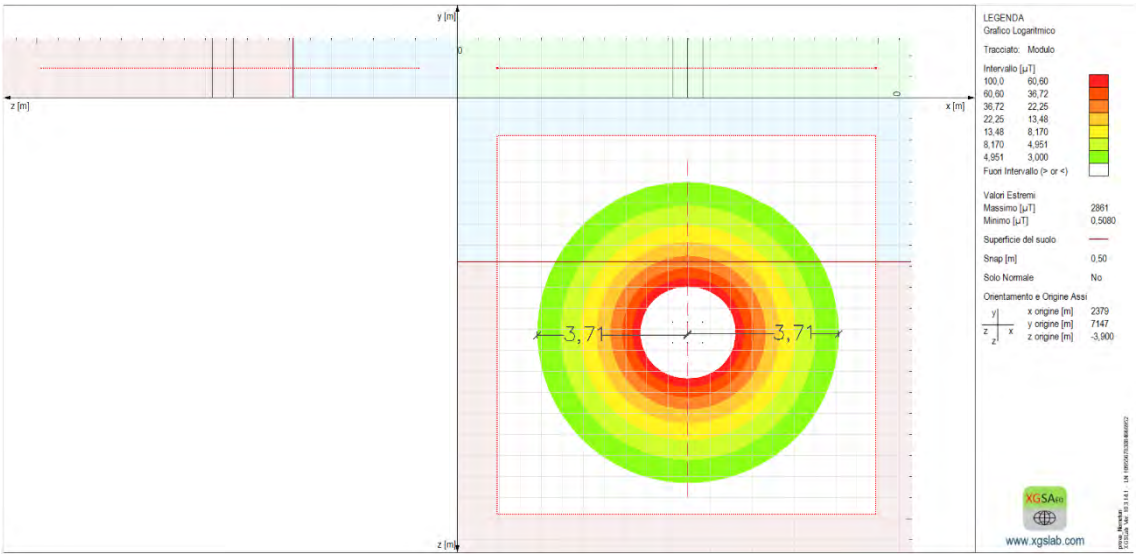
4.2.18.2 Operation phase

As part of the EIS, a preventive assessment of the potential influence of the electromagnetic field that will be generated around the land power cables and the new electrical substation has been launched.

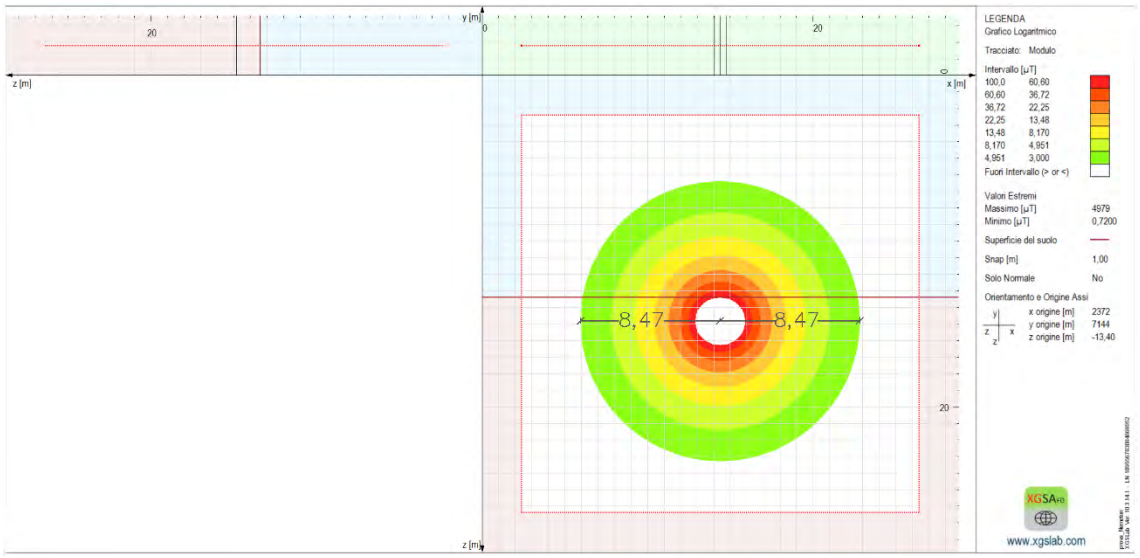
The figures graphically show the intensity of the magnetic field generated by the 2 triads of underground cable ducts.

Remembering that the objective to be respected is the quality objective of 3 μT, set by the Prime Ministerial Decree of 08/07/2003.

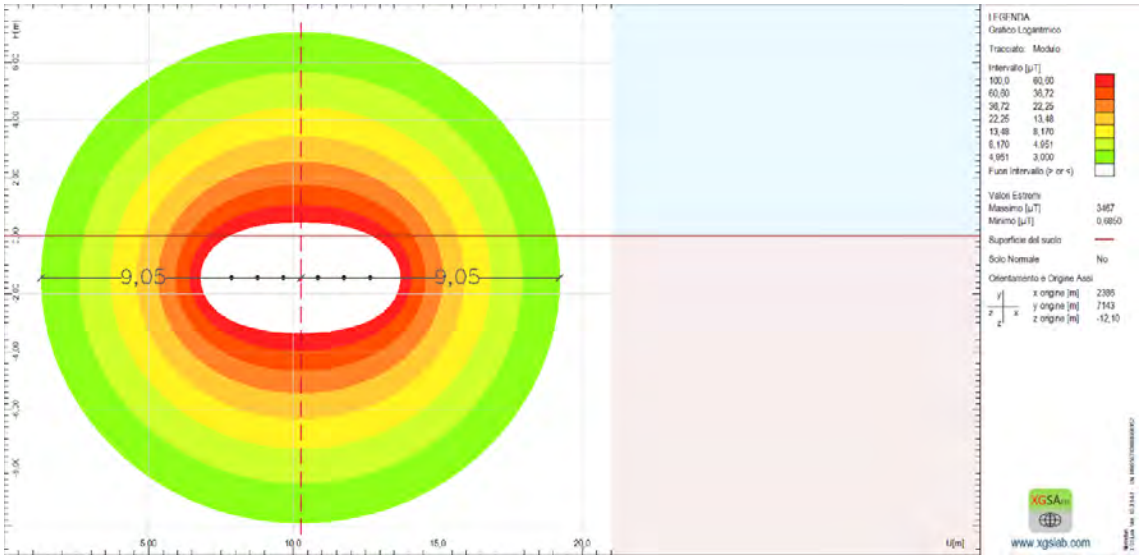
Some of the results of the analyses carried out in the report are reported below. *ES.3.1_02_Assessment of Electric and Magnetic Fields in Onshore Areas* to which reference is made for further information.



Magnetic Indiction Calculation on the section of 2000 mm AAT cables[2]



Magnetic Indiction Calculation on the section of 2500 mm AAT cables[2]



Magnetic Indiction calculation on the cable splice section at the 2000 mm AAT landing point[2]

As regards the impact component relating to **electromagnetic radiation** produced by the electrical components of the connection systems, following the studies conducted on the calculation of First Approximation Distances (DPA) (cf. *ES.3.1_02*), we can make the following considerations:

- At the point of landing on land where the transition between marine and land cable begins by means of a Joint Bay, in no case are the buildings located within the calculated buffer zones (18.2 m);

- along the route of the new AAT cable duct underground in double circuit in no case are the buildings located within the buffer strips calculated both in the case of flat underground installation (7.5 m) and in the case of HDD (22.2 m) or Joint Bay (10.2 m);

- along the route of the new underground AAT cable duct connecting the AAT between the electrical transformer substation and Terna's SE, in no case are the buildings located within the calculated buffer zones (17 m);

- The user electrical substations built in GIS and the NTG electrical substation determine electric and magnetic fields near the fences to be considered negligible, therefore, only the DPAs relating to the incoming lines will be considered for these structures;

- along the route of the new 380 kV junctions to the "Manfredonia 380 – Andria" line, in no case are the residential properties located within the calculated buffer zone (116 m);

- along the route of the new 380 kV underground power line connections, for the connection of the new Switching Station to the SE RTN 380 kV "Cerignola 380" under construction, in no case are residential properties located within the buffer zone identified in paragraph 5.6.

Although there is no presence of sensitive receptors (structures inhabited by people for a time of more than 4 hours) within the buffer zones calculated and represented in the reference graphic drawings (*T.5.4.1*, *T.5.4.2_01, T.5.4.3_01*), the project involves the adoption of shielding systems for the underground line and the holes that have reached (which represent the points where the calculated DPA assumes the highest values) along the most critical sections of the power line. In particular, these measures will be adopted at the land landing Joint Bay in the municipality of Zapponeta (FG).
During the executive design phase, more precise assessments and calculations will be carried out and, if necessary, the proposed mitigation measures can be adopted in correspondence with further sections. Please also refer to this phase for the design and correct sizing of the shields adopted to ensure compliance with the quality objective of 3 μT everywhere, provided for by current legislation. In the same way, in correspondence with the HDD sections, it will be possible to increase the depth of laying of the conductors by confining the buffer zone underground.
In light of the above, it is believed that the project, both for its territorial location and for its construction characteristics, will comply with the limits imposed by Law 36/2001 and the Prime Ministerial Decree of 8 July 2003 on the protection of the population from the effects of electromagnetic, magnetic and electric fields, guaranteeing the protection of human health. **Therefore, the effect of ionizing radiation on human health can be considered nil.**

The other category of impact deriving from electromagnetism was considered as part of the impact assessment on nature and biodiversity and concerns the submarine power cables necessary for the wiring to the underground substation connected to the offshore wind farm.

A qualitative assessment of the possible effects of electromagnetic fields emitted by submarine cable ducts on marine fauna has been launched as part of the EIA. In particular, literature searches were carried out by overlapping the results obtained from it with the data deriving from the surveys and sampling carried out for the SIA of this project. Please refer to paragraph 4.2.7.2 for a description of this impact.

Following the assessment carried out for both the onshore and offshore components, we will be able to consider this impact, during the operation phase, of **negative sign** but **negligible** and **Non-reversible**.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.18.3 Decommissioning phase

The impact during the construction and decommissioning phase is zero because the electrical and electronic equipment will be turned off, therefore unable to generate electromagnetic emissions.

CLASSIFICA			ENTITA'				REVERSIBILITA'	
N	P	Nullo	A	M	B	T	R	NR

4.2.19 USE OF RAW MATERIALS AND NATURAL RESOURCES

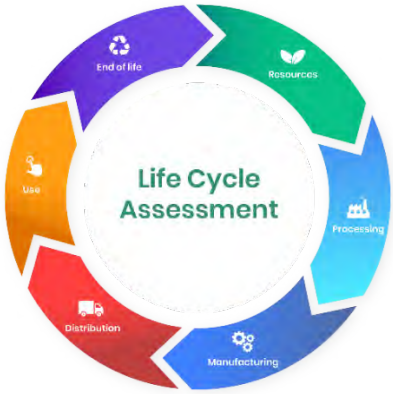
4.2.19.1 Premise

Offshore wind energy can provide access to additional resources, overcoming some problems related to onshore wind installations, this paragraph is based on a study conducted by the Politecnico di Milano, Department of Civil and Environmental Engineering DICA (Gaia Brussa, Mario Grosso, Lucia Rigamonti -

Life Cycle Assessment of Offshore Wind Farms - Life Cycle Analysis of an Offshore Wind Farm with 15 MW Wind Turbines on Floating Foundations, located off the coast of Brindisi), on the offshore wind farm planned off the coast of Brindisi and consisting of the installation of 35 turbines of 15 MW for a total of 525 MW, the turbines of the plant analyzed - as in the case of the Nemetun Island plant - are installed on floating foundations anchored to the seabed. Wind turbines, floating foundations and their moorings, the structure of the offshore transformer substation (SSO) and the electrical system for the transmission of electricity generated by wind turbines were included in the modelled system.

The functional unit chosen is the supply of 1 GWh of electricity to the onshore grid: this means including in the analysis also the electrical system necessary for transmission, consisting mainly of submarine cables.

The work consists of the life cycle assessment (LCA), "from cradle to grave", of the floating offshore wind farm. LCA is an analytical and systematic methodology that assesses the environmental footprint of a product or service, throughout its entire life cycle.



Indicative LCA analysis scheme

In this study, for the impact categories assessed by the Environmental Footprint 3.0 method, the potential environmental impacts of the offshore wind farm analysed are mainly determined by the life cycle of the semi-submerged floating foundation and the wind turbine: more specifically, the most substantial contributions were found for the procurement of the necessary raw materials. The analysis of the contributions showed that the impacts are mainly related to the large quantities of materials required and in particular to steel. A phase of the life cycle of the plant that has proved to be particularly important is the operational one, and in particular, maintenance operations; As evidenced by sensitivity analysis, modeling this step can significantly affect the overall results of the analysis. It could, therefore, be useful to improve their representativeness by introducing primary data, in order to obtain more accurate results and reduce uncertainties.

With a view to decarbonisation, it should be noted that the estimated impact on global warming is 30 t CO_{2eq}/GWh; This carbon intensity is competitive with other low-emission technologies for electricity generation.

This type of wind installations also show a good performance in terms of payback time of greenhouse gas emissions and energy invested in the construction of the plant, estimated at 2 and 3 years respectively, compared to an expected life of 30 years.

The study conducted on the Lupiae Maris plant is considered significant and related to the infrastructure in the project, albeit with the due proportions in terms of size and therefore expected impacts, since the Nemetun Island plant will have a larger size.

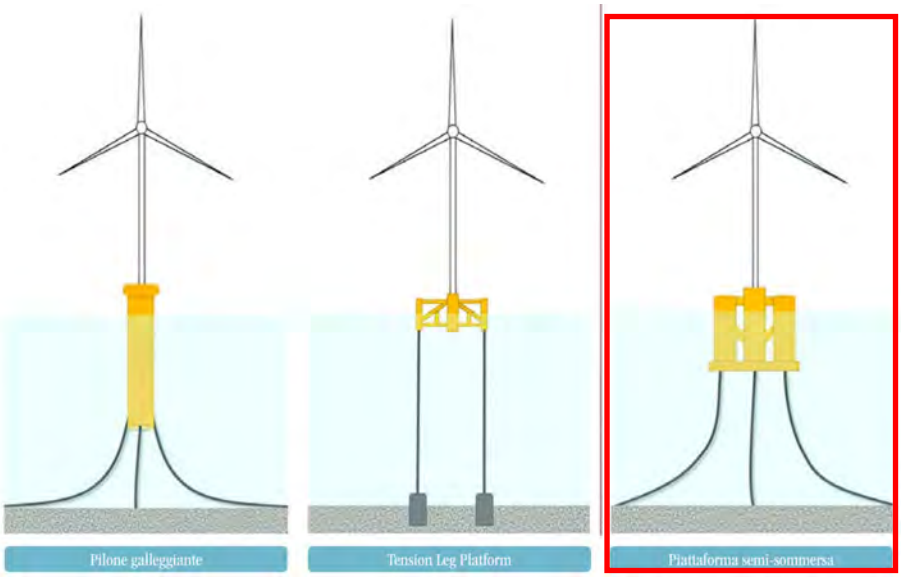
4.2.19.2 Main impacts and comparison with the Case Study

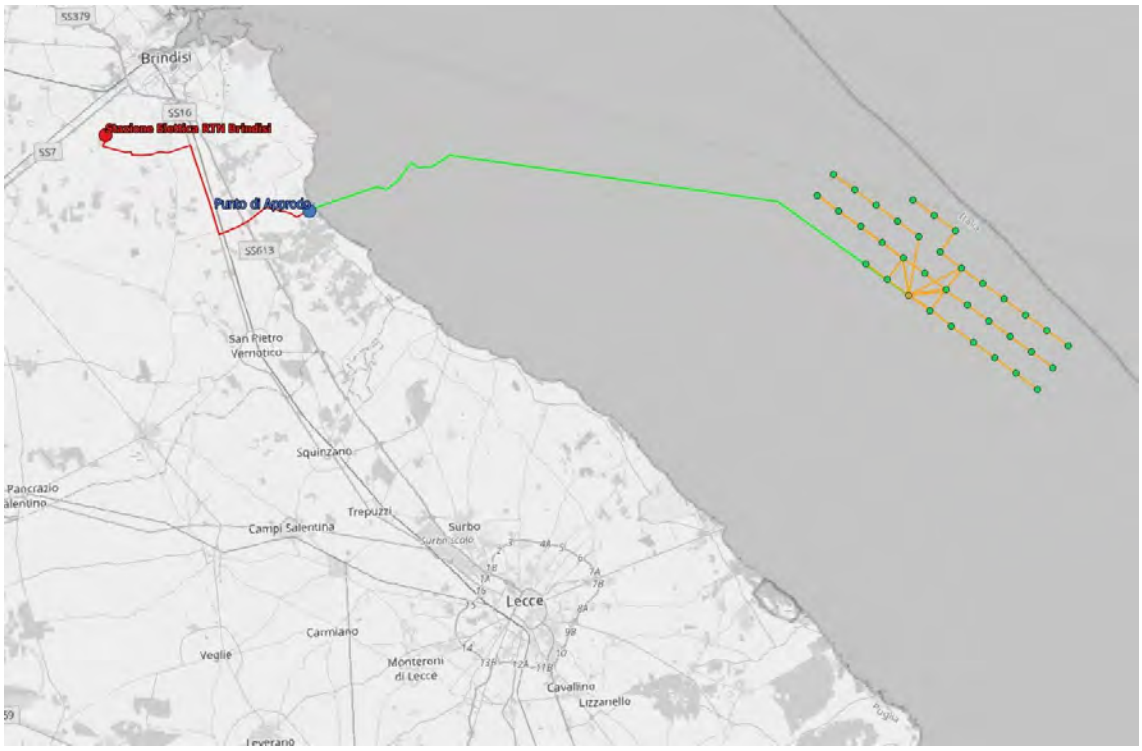
As mentioned, an LCA study makes it possible to consider all phases of the life cycle of a wind turbine and the infrastructure of a wind farm, so as to also assess the emissions and environmental impacts generated by the consumption of materials and energy, not limited to the operational phase.

A potentially critical phase in the life cycle of a wind turbine that can be analyzed through an LCA is the end of life.

It is assumed that most of the components, being metallic, can be recycled: some estimates consider that between 85% and 90% of a wind turbine is recyclable. However, the handling of the material that makes up the rotor blades, i.e. glass fibre reinforced plastic (GFRP) is still problematic: as a composite material and designed to withstand loads and fatigue, it is particularly difficult to separate its constituent elements in order to recycle it; therefore, it is generally incinerated or disposed of in landfills.

The turbines installed in the Case Study (Lupiae Maris) are the same as those used in the Nemetun Island plant, and the installation site of the analyzed plant, located at a distance from the coast of about 20 km compared to 55 km of Nemetun Island, has generated the need to build floating foundations with a semi-submerged platform, anchored to the Apulian seabed with depths between 120 m and 190 m. Finally, the Lupiae Maris plant, like the one on Nemetun Island, includes long stretches of marine cable ducts, for the connection of the plant's wind turbines to the mainland and to the grid infrastructures built for its connection. The electrical production of the Lupiae Maris plant is remarkable for the number of machines installed, but the impacts, the infrastructures should be lower than those expected in the Nemetun Island plant.





Offshore Wind Farm Case Study

In terms of comparison, it is useful to underline that the Nemetun Island plant provides for the installation of 45 turbines - compared to the 35 in the case study - and provides for the construction of a new ground-mounted electrical substation, not envisaged by the Lupiae Maris plant.

4.2.19.3 Description of the method used

The most relevant contents that make up an LCA can be summarized in the following main phases:

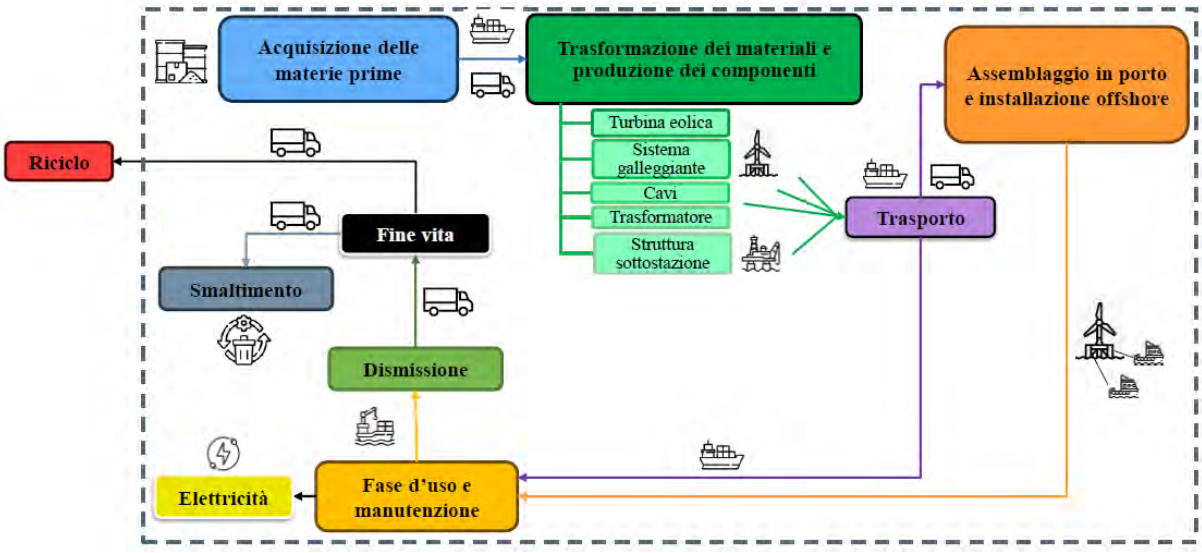
- definition of the objective and scope,
- data collection and inventory analysis,
- impact assessment.

Definition of the objective and scope of application

In the first phase, the objectives of the study and the field of application are defined, therefore, in particular, the system to be studied, its functions, the boundaries of the system, i.e. the processes included in the analysis, the hypotheses and limitations.

The analysis was carried out considering as a functional unit of the system "the supply to the ground-based electricity grid of 1 GWh of electricity produced". This type of definition implies that not only floating turbines are included in the analysis, but also the electrical system necessary for the transmission of the generated energy. As mentioned, the methodology applied by the Politecnico di Milano for the LCA of the Lupiae Maris plant is particularly comparable and transferable to the Nemetun Island plant, bearing in mind the leap in scale and the main infrastructural differences.

The perspective adopted for the definition of the boundaries of the system is *"From the cradle to the grave"* And, therefore, the phases included in the life cycle are: production of the main components of the wind farm, procurement of the individual components of the wind farm, assembly and installation phase of the wind farm elements, operational phase, decommissioning phase of the plant and end of life of the main components.



Flowchart of the boundaries of the system

The impact assessment methods used in the study are the Environmental Product Declaration (EPD 2021) in relation to the end of life, the Environmental Footprint Impact Assessment Method (EF Method), version 3.0 developed for the European Commission by the Joint Research Centre (Fazio et al., 2018) and the energy indicator Cumulative Energy Demand - CED (Hischier et al., 2010), typically expressed in MJ. The CED indicator assesses the direct and indirect energy uses of a system, considering both non-renewable (fossil fuels and nuclear) and renewable (biomass, wind, solar, geothermal and hydroelectric) energy resources. In contrast, the resource consumption impact category of the EF method, energy carriers, is focused only on the impact associated with the consumption of fossil fuels and uranium alone. The calculation of the impacts on each category was carried out by applying the relevant characterization models provided for by the method. The SimaPro 9.3 software (provided by Pré Sustainability), which contains version 3.8 of the international ecoinvent database and the aforementioned characterization method, was used to support the analysis calculations.

The method chosen for the assessment of the impacts is EF3.0 which provides for sixteen impact categories divided into subcategories: environment (climate change CC, ozone layer thinning AO, photochemical ozone formation FO, acidification A, eutrophication in freshwater ED, marine eutrophication EM, terrestrial eutrophication ET, freshwater ecotoxicity EC), human health (ionizing radiation RI, Particulate matter intake AP, non-carcinogenic human toxicity TU_{NC}, human toxicity carcinogenic TU_{C}) and resource consumption (CS land consumption, AC water consumption, resource consumption, CR fossil energy carriers$_{And}$, consumption of resources, minerals and CR metals$_{M}$).

Based on these methods, the following objectives have been defined:

- **End-of-life modeling**

  Carried out considering a 100-0 method, this approach applies the "polluter pays" principle which provides that those who generate the waste must bear the impacts deriving from its subsequent management, while in the case of recycled materials the impacts of the "first life" of the material do not affect subsequent uses.

- **The characterization method**

  The analysis was conducted using the SimaPro 9.3 software, developed by Pré Sustainability, which allows to create a virtual model of the object of study and apply different characterization methods and to be related to the EDP categories.

- **Payback Indexes**

  Starting from the results, the so-called payback indices were then evaluated which, in general, indicate the time needed to recover an investment and which, in the specific case of energy production from renewable sources, can be declined in terms of greenhouse gas and energy emissions. The carbon payback time (CPBT) indicates how many years the estimated greenhouse gas emissions are recovered over the entire life cycle, assuming the emissions "saved" by avoiding the use of a fossil energy source. In the case of this analysis, the fossil energy source used to estimate the emissions saved is natural gas, in particular in combined cycle plants, this choice was dictated by the fact that it will probably remain the most widespread fossil fuel in the near future.

  The energy payback time (EPBT) refers, on the other hand, to the primary energy invested in the construction of the plant recovered through the generation of energy from the plant itself over its entire life cycle and net of the energy expended during the operational phase, including maintenance. According to these indices, a system is all the more cost-effective the sooner it "pays off" the investments in terms of emissions and energy.

- **Sensitivity analysis**

  In addition to the analysis of the base scenario, some sensitivity analyses were carried out to assess the influence on the results of some assumptions and assumptions.

  In particular, the study focuses on the sensitivity regarding the possible benefit that can be obtained from a reduction in the mass of steel structures; how European production of floating steel foundations can reduce the impact of the same breakthrough in China; on the use of wind turbine models for lower wind classes (more suitable for installations in the Adriatic Sea) produced entirely in China and then transported to the port of Taranto for assembly; whether the request, more or less frequent in the 30 years of the plant's life, for spare parts for maintenance can significantly affect the final results of the environmental impact.

Data collection and inventory analysis

The primary data used for this evaluation derive from Lupiae Maris s.r.l., i.e. from the client and proponent of the plant project off the coast of Brindisi. These data reflect the state of progress of the project at the time of carrying out the analysis, in particular, they refer to what is described in the documentation of the preliminary design of the plant (subject to Environmental Impact Assessment and available on the portal of the Ministry of the Environment and Energy Security).

The data provided relate to the following aspects:

• components of the wind farm (turbines, floating system and transformation substation): quantity and total weight, where possible indication of the main constituent material(s);

• electrical cables: length, number of triplets, cross-section and conductive and insulating material;

• fuel consumption during installation operations at sea.

In the absence of primary data, secondary data from scientific literature and from recognized international LCA databases such as ecoinvent (version 3.8) were used. The background processes (material and energy production, transport, ...) have been modelled from specific datasets available in the ecoinvent database (version 3.8, with the allocation, cut-off by classification approach) for the most representative geographical context, updating them, where possible, in accordance with the project indications.

The collection of numerical data to be included in the LCA study concerned the phases of the life cycle of the plant, specifically the approach used for the phases can be described as follows:

- Acquisition of raw materials

  The first phase of the life cycle of the wind farm is represented by the procurement of the necessary materials, this phase includes the operations to extract the raw materials, their transformation and subsequent importation into Italy.

  The quantities of raw materials were extrapolated from inventory data, from comparison with other similar studies and from data from public archives (ecoinvent, Wang, etc.) and concern wind turbines, floating foundations and their moorings, the structure of the offshore transformer substation (SSO) and the most relevant electrical elements contained therein (transformers), medium voltage submarine cables and high voltage cables, both submarine and land-based.

- Material processing and component transport

  The production of the components was modelled only as material processing, using raw material processing datasets from public archives and other studies.

  The transport phase of the components was included by assuming the distances to be covered by land and sea to reach Puglia, in particular the port of Taranto.

- Assembly and installation

  The assembly operations of the structures can generally be carried out in port; In the modelling, both diesel and medium-voltage electricity energy consumption for the lifting equipment were included in the modelling. In particular, the use of electricity was estimated starting from the 0.5 kWh/kg of material to be lifted.

  The main advantage of the semi-submerged platform, compared to other floating structures, is that it can be towed to the installation site at sea, already with the turbine mounted. Therefore, the installation phase was modelled in terms of fuel consumption for specialised vessels such as tugboats.

- Use and maintenance phase

  The duration of the operational phase is estimated, in the preliminary project, to be 30 years, during which the plant will supply electricity and will be subjected to a series of scheduled or exceptional maintenance interventions. The use phase was then modelled in terms of the spare parts needed for maintenance, including their procurement.

- Cessation

  At the end of the estimated service life, there are two options for the plant: repowering or decommissioning (WindEurope, 2020). In the present study, the decommissioning of the plant is assumed, which involves the transport of the floating wind turbine back to port and its dismantling. Modelling is therefore the same as the assembly and installation phase.

- End of life

  To carry out a complete LCA study, it is necessary to include in the analysis the end of life, i.e. the management of the waste produced at the end of the useful life of the plant; However, this is not easy because there are several uncertainties, mainly related to the time front, i.e. the regulatory environment, future processing technologies and the corresponding markets that will occur at the end of life. For steel and aluminum, but also copper cables and electronic components, there are well-established recycling processes. The question remains open, however, for the material that makes up the rotor blades, i.e. plastic reinforced with glass fibers. It is plausible that over the lifetime

of the plant, options for recycling composite materials, such as glass fibre reinforced plastics, will have reached a level of technological readiness where they can be applied on an industrial scale.

4.2.19.4 Results and impact assessment

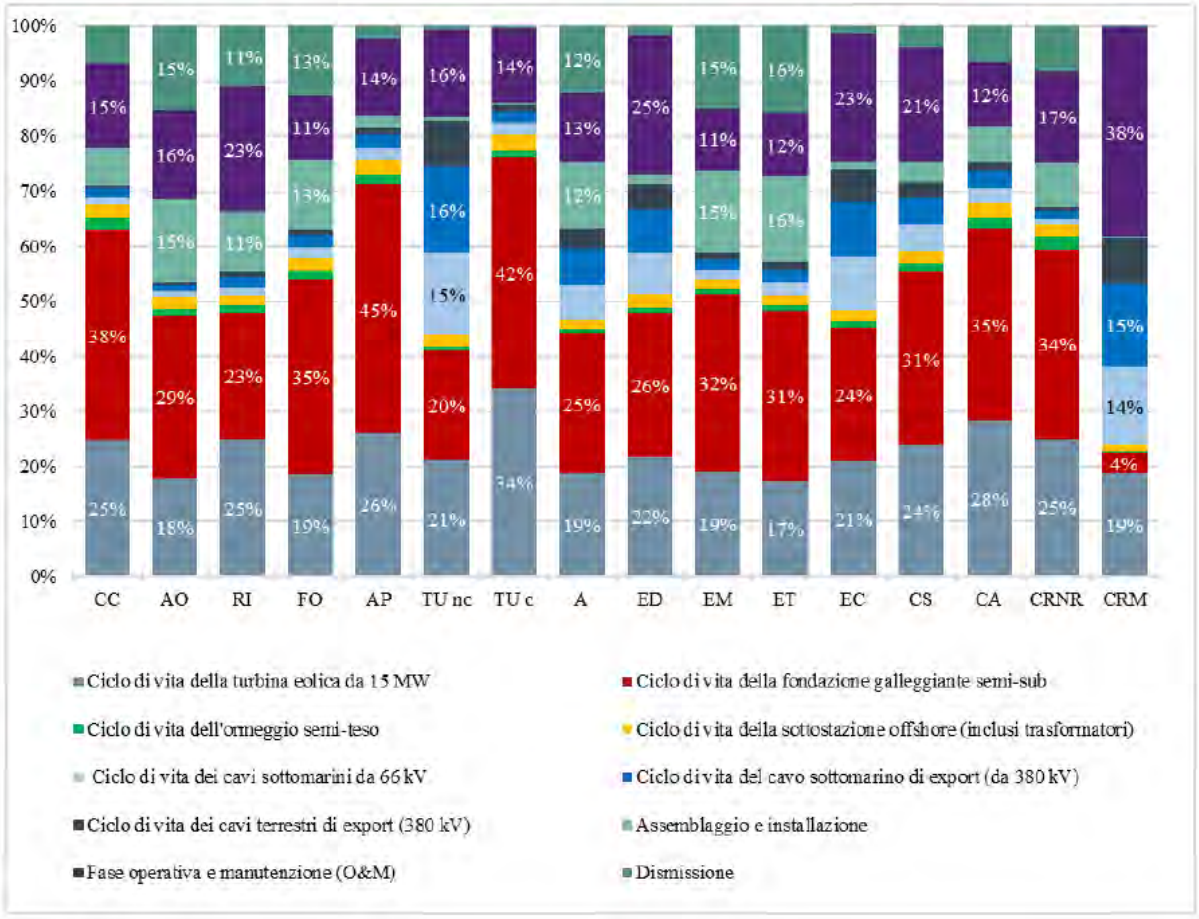
The potential overall impacts per functional unit (1 GWh) estimated by the EF 3.0 method, for the sixteen planned impact categories, and the results of the CED method are shown in the following table.

Categoria d'impatto; metodo EF 3.0	Abbreviazione	Unità	Totale
Cambiamento climatico	CC	t CO_2 eq	30
Assottigliamento dello strato di ozono	AO	g CFC_{11} eq	2
Radiazioni ionizzanti	RI	kBq U-235 eq	1.935
Formazione di ozono fotochimico	FO	kg NMVOC eq	171
Assunzione di materiale particolato	AP	disease inc.	0,0020
Tossicità umana non cancerogena	TU nc	CTUh	0,0016
Tossicità umana cancerogena	TU c	CTUh	0,0002
Acidificazione	A	mol H^+ eq	266
Eutrofizzazione in acqua dolce	ED	kg P eq	17
Eutrofizzazione marina	EM	kg N eq	50
Eutrofizzazione terrestre	ET	mol N eq	528
Ecotossicità delle acque dolci	EC	CTUe	1.360.932
Consumo di suolo	CS	Pt	120.020
Consumo di risorse idriche	CA	m^3 depriv.	12.632
Consumo di risorse energetiche non rinnovabili	CRNR	GJ	353
Consumo di risorse, minerali e metalli	CRM	kg Sb eq	3
Metodo CED	**Abbreviazione**	**Unità**	**Totale**
Risultato complessivo	CED	GJ	413

Total environmental loads of the functional unit (1 GWh of electricity produced by the offshore wind farm and supplied to the onshore NTG) in the base scenario, calculated using the Environmental Footprint 3.0 method and the Cumulative Energy Demand method

The following graph graphs the analysis of the contributions with respect to the potential total impact for each category analyzed. It should be noted that in order to make this representation more detailed, the six phases of the life cycle described above have been taken up, separating some of them in order to also highlight the contributions of the different components.

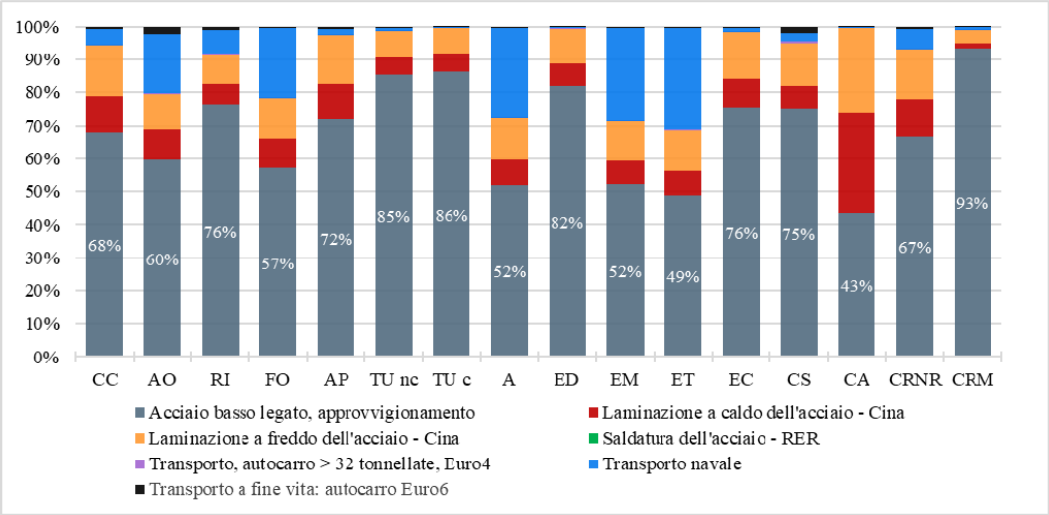
Specifically, the total contribution of the raw material procurement phase was divided between the following elements of the plant: wind turbine, semi-tensioned mooring, floating foundation, power cables (land and submarine) and offshore substation.



Analysis of contributions to potential total environmental loads (16 impact categories) of the functional unit (1 GWh) in the base scenario, calculated using the EF 3.0 method

It is evident that the life cycle of the floating foundation constitutes a very significant contribution in all impact categories, ranging from 20% (Non-carcinogenic human toxicity) to 45% (Particulate material intake) of the total impacts, with the sole exception of Consumption of resources, minerals and metals (4%). Another important contribution is that of the life cycle of the wind turbine, ranging from 17% (terrestrial eutrophication) to 34% (carcinogenic human toxicity) of the overall environmental loads. In fact, in almost all impact categories they are the first or second main contribution. In particular, the life cycle of the floating foundation is the main hotspot in 13 out of 16 impact categories, while the life cycle of the turbine in 2 categories (Ionizing radiation and Non-carcinogenic human toxicity) out of 16. The exceptions are the Consumption of resources, minerals and metals category, where the operation and maintenance (O&M) phase is the main contributor to the total impacts (38%) and the Ionising radiation category where the O&M phase has the same contribution as the life cycle of the floating foundation (23%). This phase is also the second most important contribution in freshwater eutrophication and freshwater ecotoxicity, accounting for 23% of the total impacts, in both cases. For all other categories, the O&M phase is the third or fourth contribution in order of relative incidence. The assembly and installation phases and the decommissioning phase (the two phases of the life cycle are modelled in the same way and therefore present the same results in the assessment of impacts) determine a contribution of more than 10% in 6 impact categories (Ozone layer thinning, Ionising radiation, Photochemical ozone formation, Acidification, Marine eutrophication and terrestrial eutrophication). Finally, in the categories of Non-carcinogenic human toxicity and Consumption of resources, minerals and metals, the contributions of some elements of the electricity system are appreciable, in particular of submarine export cables, respectively equal to about 16% and 15%, and of 66 kV submarine cables, respectively equal to 15% and 14%.

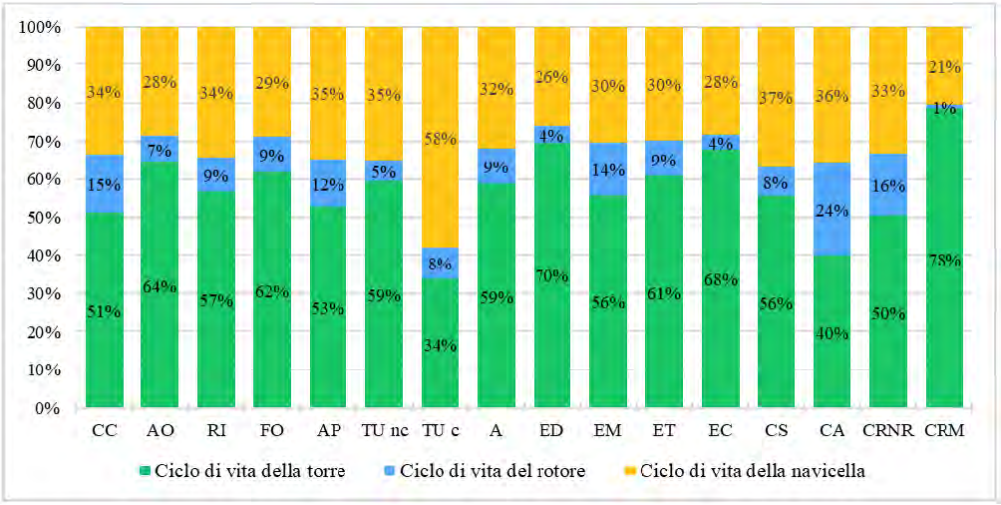
In light of the relevance of the floating foundation, the relative analysis of the contributions is reported so as to better highlight the phases of its life cycle and its relative importance with respect to the overall result.



Analysis of contributions to the potential life-cycle environmental impacts of the floating foundation in the baseline scenario, calculated using the EF 3.0 method

Separating these results from the total, it can be seen that the supply of raw material, i.e. steel, is the most influential life phase on the overall result, as it contributes between 43% (Water consumption) and 93% (Consumption of resources, minerals and metals) to the total.

As regards the life cycle of the wind turbine, represented so far as a whole, the contribution of the three main components: tower, rotor and nacelle is separated.



Analysis of contributions to the total impacts of the wind turbine, in the base scenario, calculated using the EF 3.0 method

It is evident that the life cycle of the tower provides the most significant contribution for all impact categories except for Carcinogenic Human Toxicity where, on the other hand, the life cycle of the spacecraft covers 58% of the total environmental load. The life cycle of the three components can be further divided to analyze the most impactful phases (see the graphic representation shown in Appendix D – details on the interpretation of the results and analysis of the contributions). In most categories, the impacts of steel, both low alloy and stainless, are particularly significant; Other significant elements are copper and electronic components.

Payback Indexes

Considering that wind energy, as well as other renewable sources, is essential to reduce emissions from the electricity sector and counteract the effects of the use of fossil fuels on climate change, the result on category "1 global warming" is important: the potential emissions of climate-changing gases, expressed in CO_2 equivalent amount, are equal to 30 t CO_{2eq}/GWh.

Considering the climate change impact factor of electricity produced from natural gas in a combined cycle plant (456,117 kg CO_{2eq}/GWh and therefore $3.8 \cdot 10^6$ t CO_{2eq}/year), the CPBT is equal to 2 years. On the other hand, the EPBT is slightly higher than 3 years for the implant analyzed in the study. **The payback indices must be interpreted with respect to the 30-year useful life of the plant and therefore it can be concluded that the investments in terms of emissions and energy for the construction of the plant will be amply repaid.**

4.2.19.5 Conclusions and Impact Assessment of the Nemetun Island Plant

In order to reduce climate-changing gas emissions related to the production of electricity, it is now clear that it is necessary to invest in generation technologies based on renewable sources. However, even technologies that exploit renewable energy sources are not without environmental impacts, especially if we do not consider only the operational phase. The life cycle analysis methodology can therefore be used to quantitatively estimate the greenhouse gas emissions related to the entire life cycle of the plant, not only related to the operational phase, but above all determined by the production and management, even at the end of their life, of the components of the plant under study.

4.2.19.6 Construction phase

For the categories analysed in the LCA study, the potential impacts on natural resources and raw materials are mainly determined by the life cycle of the semi-submerged floating foundation and the wind turbine: more specifically, the most substantial contributions were found for the procurement of the necessary raw materials. The analysis of the contributions showed that the impacts are mainly related to the large quantities of materials required and in particular to steel. A phase of the life cycle of the plant that has proved to be particularly relevant is the operational phase, and in particular, maintenance operations. The plant represented in the LCA study is more than the plant described in this study, also considering the impacts due to the assembly of the turbines in the port and their launching, we will be able to assess an impact during the construction and construction phases of a negative sign, of medium magnitude but reversible, because it is focused on the construction and procurement phases of materials and "returned" by the high payback indices.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.19.7 Operation phase

Considering the results of the payback indices of the case study, it can be said that the plant amply repays the investments in terms of emissions and energy and use of resources; In addition, carbon intensity is within the ranges found in the literature for offshore wind are of an order of magnitude comparable to those of other renewable sources such as photovoltaic and hydropower. A large-scale floating wind farm, such as the Nemetun Island plant, requires large quantities of materials and, although it does not emit greenhouse gases and air pollutants during operation, it has significant impacts over the entire life cycle. Nevertheless, it can still be concluded that the use of wind resources allows to greatly reduce the impacts on global warming compared to alternatives based on fossil fuels, especially if the estimate is made over

the entire life cycle. The impact assessment at this stage therefore changes sign, becoming **positive** and **High Entity**, with an extension "***Non-reversible***", that is, capable of giving high levels of performance in the long term.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.2.19.8 Decommissioning phase

The impacts on the natural resources of the Nemetun Island plant focused in the decommissioning phase are similar to those of the operation phase with regard to the dismantling operations of the turbines and related infrastructures, the possibility of recycling metallic materials contributes to mitigating the impacts on the use of raw materials and also, in the future, the possibility of recycling composite materials according to industrialized methodologies that are currently not available but expected by the end of life of the Nemetun Island plant.

The impact assessment, although negative, will have a low entity and can be classified as reversible.

CLASSIFICA			*ENTITA'*				*REVERSIBILITA'*	
N	***P***	***Nullo***	***A***	***M***	***B***	***T***	***R***	***NR***

4.3 ASSESSMENT OF CUMULATIVE IMPACTS

4.3.1 IDENTIFICATION OF POTENTIALLY INTERFERING INITIATIVES

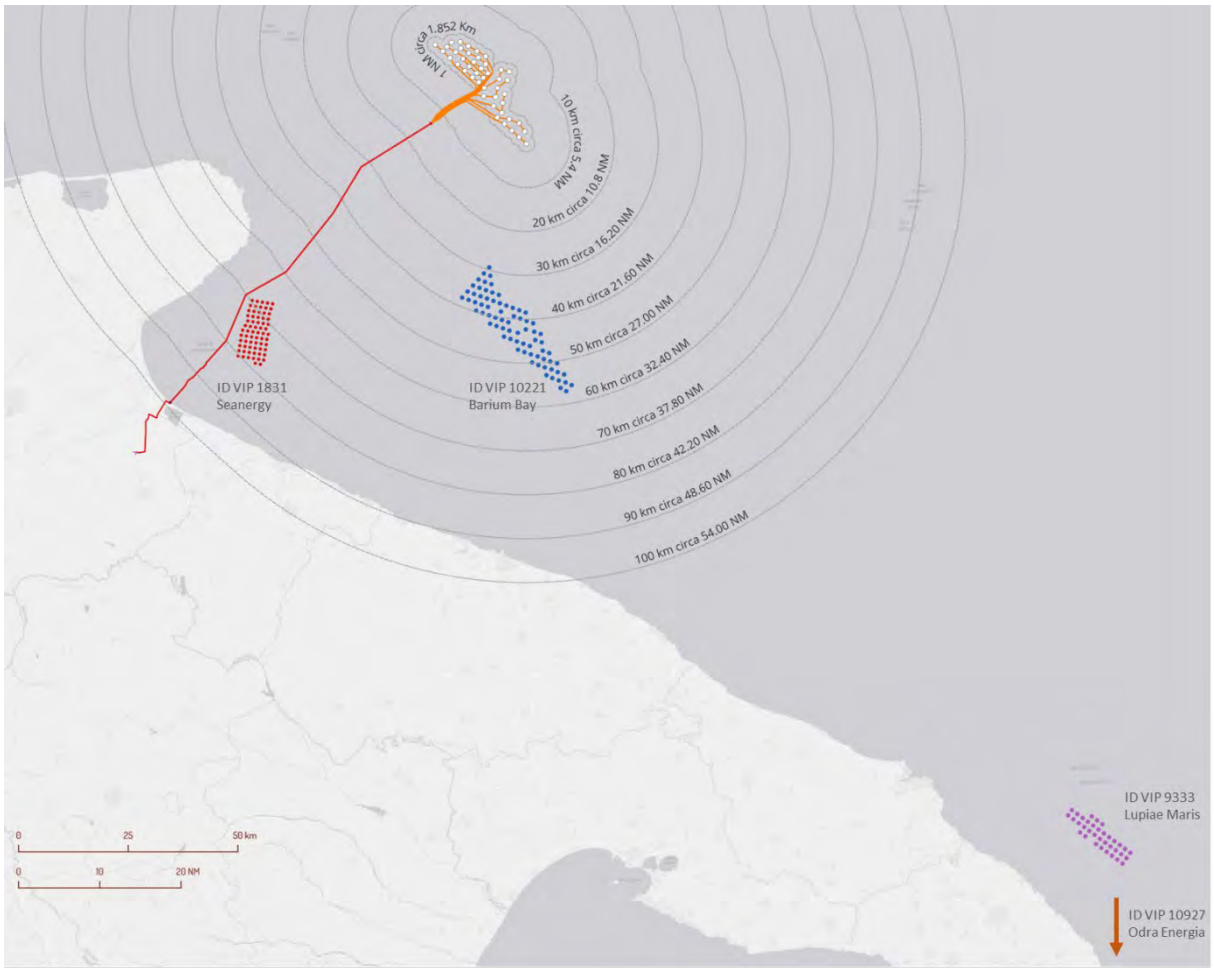
The plants considered are those located in the Southern Adriatic Sea basin and which, according to the directives of the PNIEC PNRR Technical Committee, have started the Environmental Impact Assessment (EIA) process in accordance with Article 23 of Legislative Decree 152/2006 or have received a positive opinion from the PNRR PNIEC CTP in the context of the EIA procedures.

The following initiatives may therefore be mentioned:

- **VIP ID 1831**, a plant presented by the proponent **Seanergy** located in the Gulf of Manfredonia. The project, which started in 2012, received a positive environmental opinion with prescriptions in April 2023.
- **VIP ID 9333**, a plant presented by the proponent **Lupiae Maris** located in the Strait of Otranto. The project, which started in 2022, received a positive environmental opinion with prescriptions in November 2023.
- **VIP ID 10221**, a plant presented by the proponent **Barium Bay**, located in front of the coasts of Bari, Barletta, Giovinazzo and Molfetta. The project, which started in August 2023, was awarded the EIA in May 2024.
- **VIP ID 10927,** plant presented by the proponent **Odra Energy** located at the southern tip of Puglia. The project started in January 2024 and the first publication was opened on 22.02.2024.

It is important to note that the ID VIP 1831 and ID VIP 10221 installations, being within a spacer radius of approximately 90 km and 50 nautical miles from the initiative under analysis, could generate a potential cumulative effect. For installations ID VIP 9333 and ID VIP 10927, which are located more than 190 km and 100 nautical miles from the Nemetun Island installation, any cumulative interference in all contexts can be excluded.

Please refer to the *S.8_02_Study on cumulative impacts and interferences* for more information.



Map of identification of potentially interfering initiatives

4.3.2 LANDSCAPE VIEWS AND VISUAL ACCUMULATION

In order to assess the cumulative impact of the 3 plants, it was decided to follow an approach that considers the potential visibility of each wind farm as a whole, highlighting the areas from which one, two or three can potentially be observed, regardless of the number of wind turbines actually visible.

The cumulative raster map is the result of the chromatic combination of the individual 3 visibility maps of the wind farms, to which the 3 RGB bands (Red, Green, Blue) have been assigned as shown in the following figure. Specifically, the color combinations that can be obtained are more clearly represented in the table, with the potential visibility of the individual systems explicit.

The color combination of the three primary colors red, green and blue provides an immediate visual assessment of the overall potential impact on the territory, as can be seen from the following images.

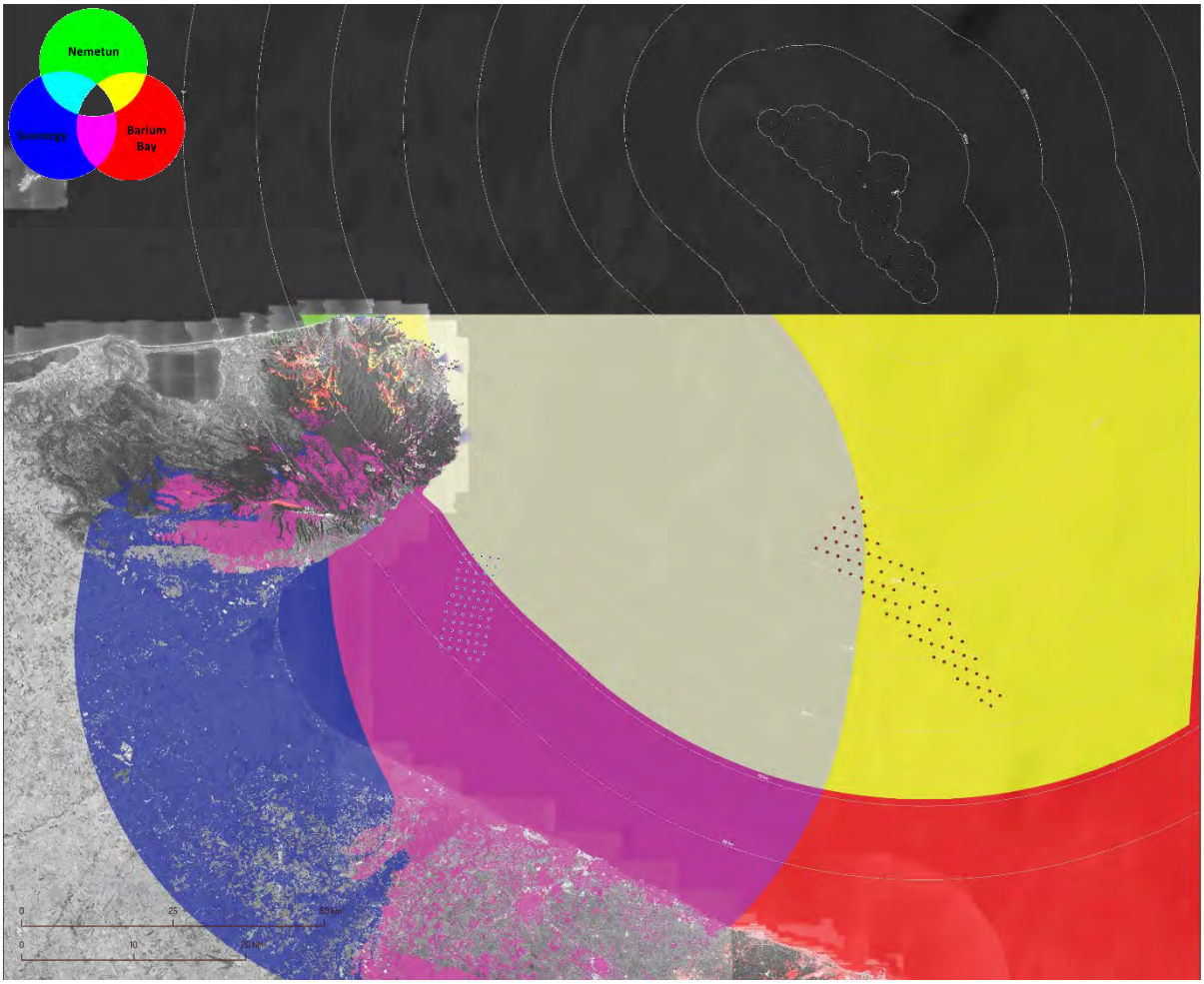
The cumulative potential visibility map was used as a basic document to carry out the specific landscape impact assessments for each sensitive point.

Below are the renderings of visual insertion of the points with possible cumulative impact of the three initiatives:

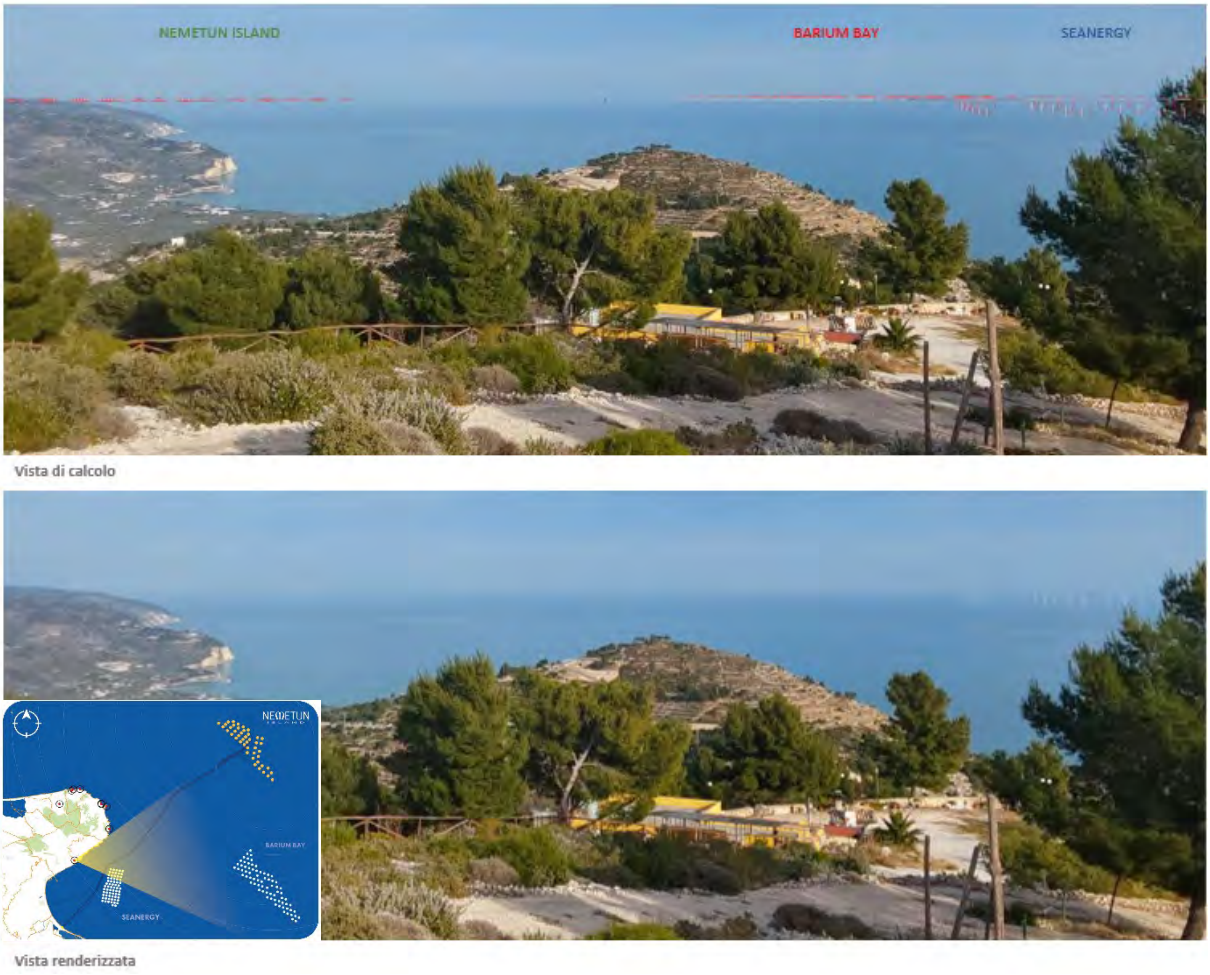
- Monte Saraceno
- Torre dell'Aglio
- Vieste

Extrapolated considering the white areas of the cumulative visual map represented here.

Reference is made to the landscape report (*ES.8.1_01*) for more information



Cumulative intervisibility map and key to interpretation



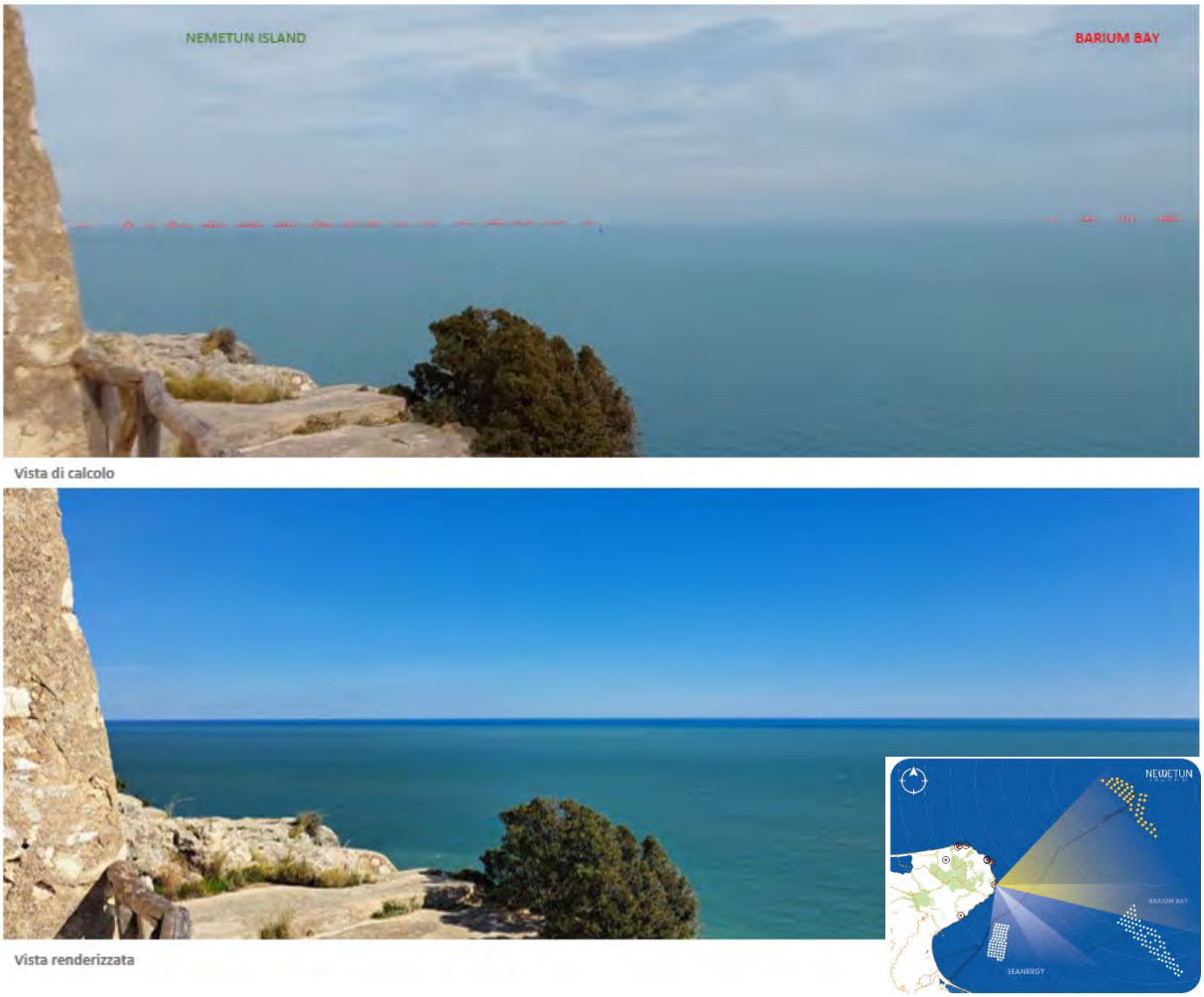
Cumulative image from Monte Saraceno

From Monte Saraceno's point of view, the wind farms are potentially all three visible.

Nemetun Island has a distance from the point of view of about 77 km, while Barium Bay is located at a distance that exceeds 80 km, the Seanergy plant is located about 14 km.

The widths of the visual cone are 26 km for Nemetun Island, 24 km for Barium Bay and 12 km for Seanergy.

As can be seen from the discrepancy between the computational photographic simulation and the rendered one, the real intervisibility of the Nemetun Island plant from this point is practically non-existent, while the Barium Bay plant appears barely visible and potentially hidden by the Seanergy plant, located only 14 km from the observation point.



Cumulative image from Torre dell'Aglio

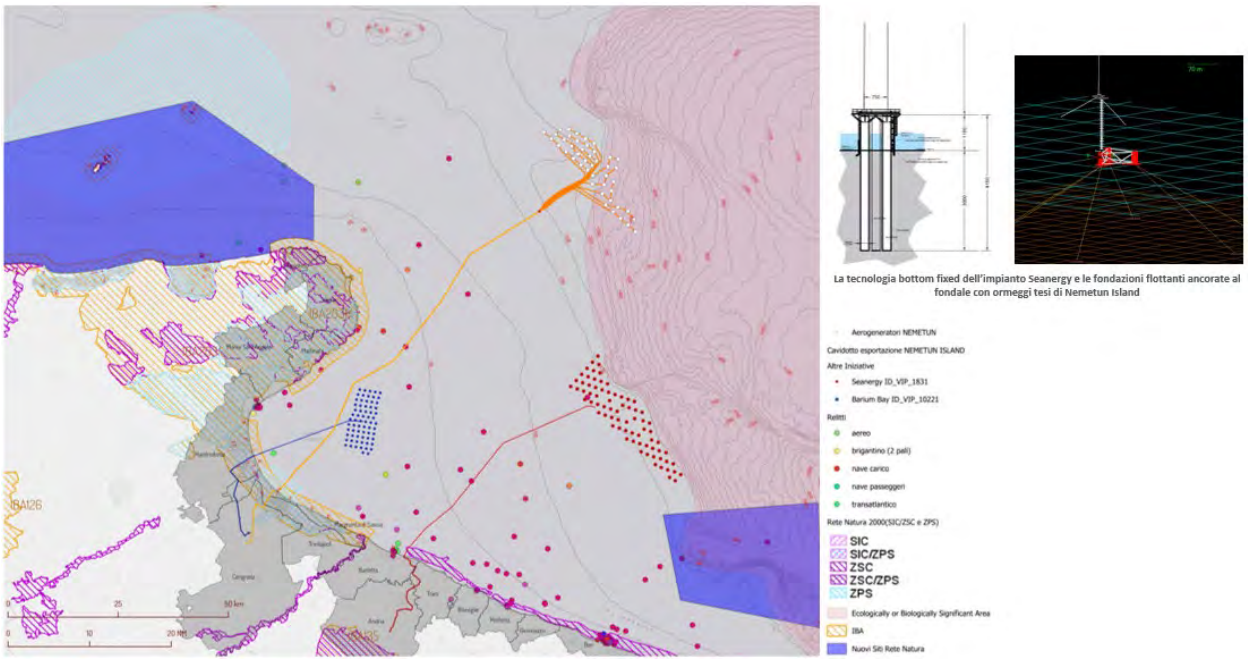
From the view of the Garlic Tower, only the Nemetun Island and Barium Bay lifts are visible. In order to see the Seanergy plant, you need to turn your gaze to the south.

Nemetun Island has a distance from the point of view of about 63 Km, while Barium Bay is located at a distance that exceeds 50 Km.

The widths of the visual cone are 21 km for Nemetun Island and 14 km for Barium Bay.

As can be seen from the discrepancy between the computational photographic simulation and the rendered one, the real intervisibility of the plants from this point of view is very low, The wind turbines are below the horizon line for most of their height and are hardly visible even in the absence of haze.

4.3.3 IMPACTS ON CULTURAL HERITAGE AND IDENTITY



Cultural heritage and identity

As regards the impact on cultural and identity heritage, excluding the analysis of the visual impact on listed assets, extensively covered in the previous section, it is reflected in the accumulation of impacts associated with the presence of listed areas and known archaeological assets. The Nemetun Island and Barium Bay plant affect areas that are distant from each other and such that they do not create a cumulation effect on protected areas. However, it should be noted that the export cable duct of the Nemetun Island plant with the "Aloisa – Carapelle" marine SPA and the Barium Bay plant with the "Aloisa – Carapelle" IT9110041 marine SCI/SAC IT9120009 "Posidonieto San Vito – Barletta" is interfering.

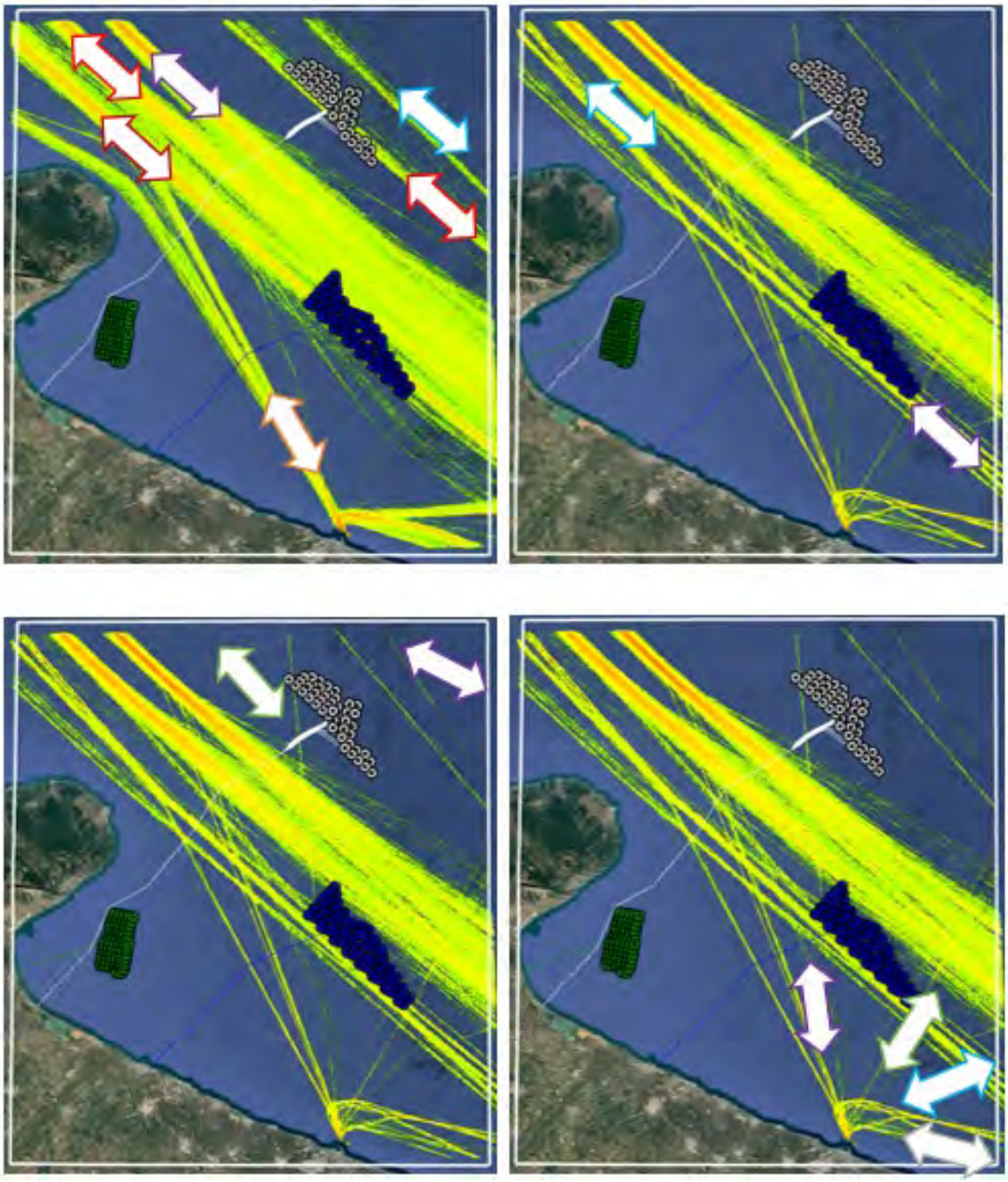
The planned connection works have completely different technologies and involve landing areas located 50 km away from those planned for the Barium Bay plant and 20 km away from those planned for the Seanergy plant.

The interference between the Seanergy and Nemetun Island export pipelines affects sandy bottoms without the presence of biocoenosis.

The Nemetun Island and Barium Bay plants are floating offshore wind farms based on a very similar and low-impact technology, the Seanergy plant uses a bottom fixed technology, the distance between the installations is such as to avoid the risk of direct interference.

4.3.4 IMPACTS ON NAVIGATION

The analysis of maritime traffic in the area planned for the Nemetun Island wind farm was carried out on the basis of the processing of ship traffic data detected by the AIS tracks and conducted over an area of about 15000 km^2 around the location of the wind farm. The nearby Barium Bay wind farm was also included in the area of interest in order to include, in the representation of traffic corridors, the potential impacts generated by the combined presence of both fields. As observed in the assumptions, no significant impacts due to the Seanergy field (located closer to the coast) on maritime traffic in the vicinity of the Nemetun Island field were identified.

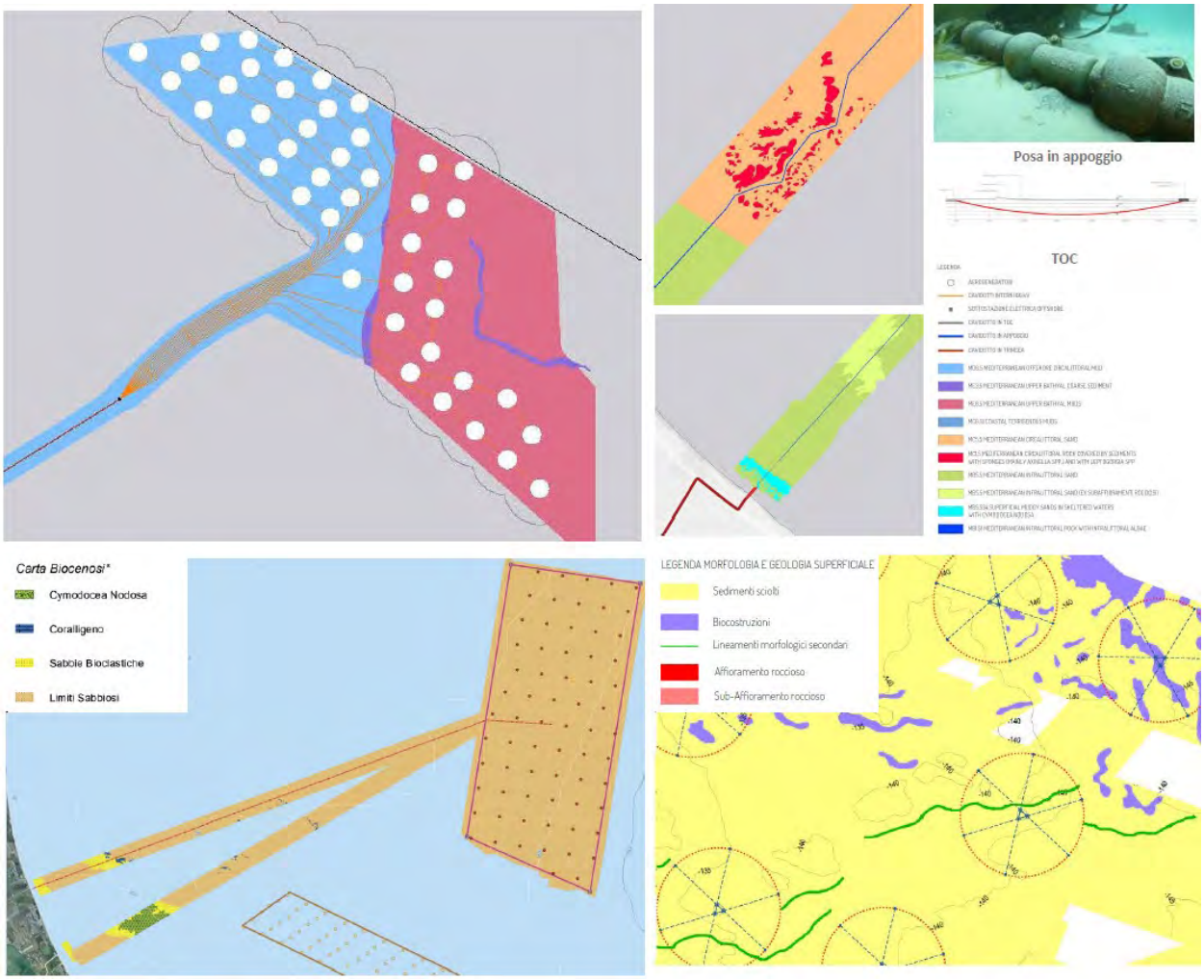


Evaluation of alternative routes

From the evaluations conducted by RINA, 15 main routes were identified for ships of all sizes. These routes will make it possible to keep the condition of ship traffic substantially unchanged even with the presence of the wind farms taken into consideration, through some slight changes to the current trajectories.

Please refer to the *ES.4.1_01* for more information.

4.3.5 IMPACTS ON BIODIVERSITY AND ECOSYSTEMS – SEABED



Impact on nature and biodiversity – seabed

Given the considerable distance between the three initiatives examined, a cumulative effect on the seabed component is not expected. It is important to note the differences between the bottom-fixed technology used in the Seanergy plant, which installs wind turbines on seabeds characterized by "sandy silts", and the Nemetun Island plant, which involves the installation of floating wind turbines on seabeds characterized by the habitats MD6.5-Mediterranean offshore circalittoral mud and ME6.5-Mediterranean upper bathyal muds. The suction box installation technique is generally considered to be minimally invasive for this type of habitat. Finally, the Barium Bay plant provides for the installation of anchors whose positioning is designed to ensure the best protection of the bioconstructions present. As regards the laying of export cable ducts, the targeted choices of the Nemetun Island plant installation criteria are highlighted, aimed at ensuring the minimum possible subtraction of priority habitats, adopting simple support laying and Horizontal Directional Drilling (HDD).

4.3.6 IMPACTS ON BIODIVERSITY AND ECOSYSTEMS – BIRDLIFE AND MARINE FAUNA

- **Avifauna**

As indicated by literature data and monitoring conducted, the main migratory routes follow the Apulian coast to reach the "Adriatic Flyway" north of the Gargano, then crossing the coast in the direction of the Balkans

with a stop at the Tremiti Islands. The main migration routes are located outside the territories occupied by the three wind farms and a significant cumulative impact is not expected.

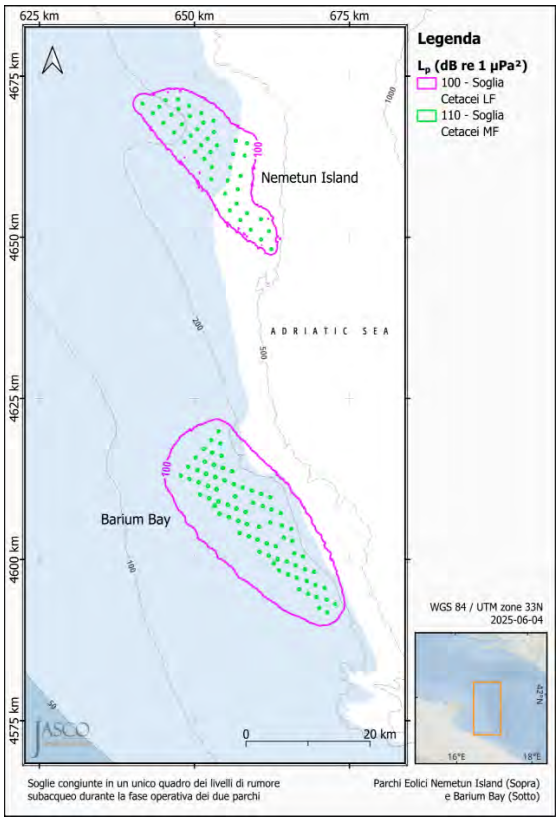
Migratory routes of birdlife in the Adriatic Sea

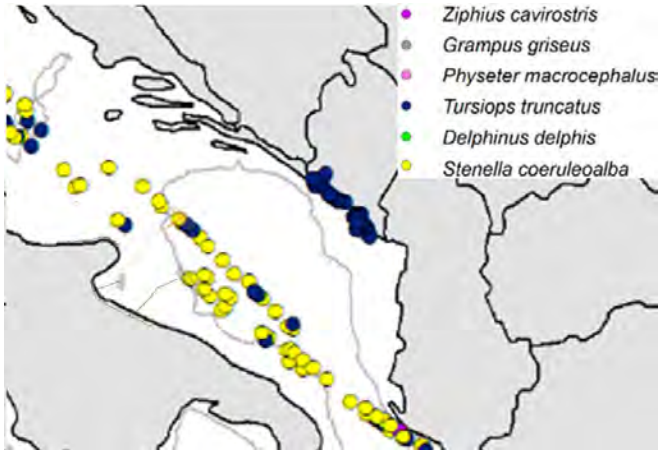
- **Marine fauna**

As regards marine megafauna and considering the results of the monitoring, which highlight the presence of different cetacean species in the sites of interest, the focus was on the cumulative impact, focusing mainly on the noise levels generated.

It is important to note that the noise emitted represents the main component of impact on these species, especially during the construction phase. However, given that the development of the three initiatives does not take place at the same time and that the simultaneous construction of two or more offshore wind farms would create considerable logistical problems, it is possible to prevent the overlapping of the construction periods for the three plants and to assess with sufficient confidence that they will be built one at a time and in any case without overlapping of offshore operations.

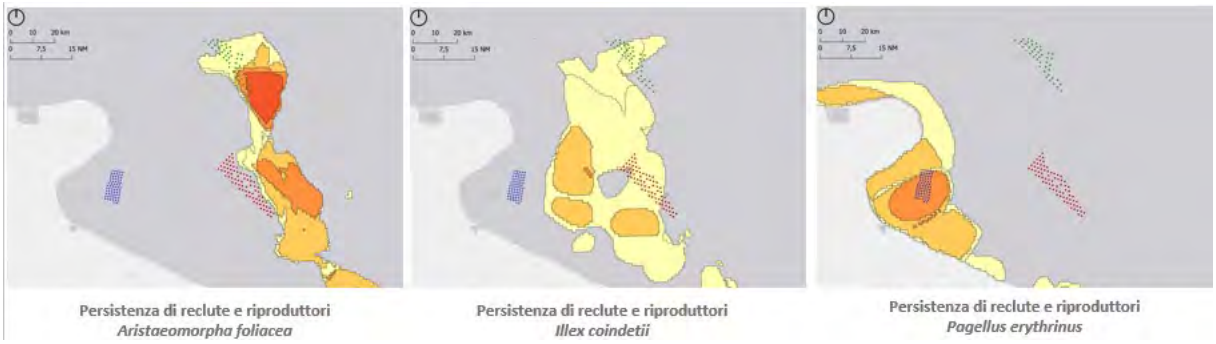
For the operation phase, it was considered appropriate to conduct a joint acoustic modelling of the two closest initiatives: Barium Bay and Nemetun Island. From the analysis of the graph obtained using the Jasco software, it emerges that during the operational phase of the two plants there are no overlaps of the disturbance thresholds. This principle also applies to the Seanergy plant, located at a greater distance and equipped with smaller wind turbines. Finally, it should be noted that the modeled disturbance thresholds are lower than the baseline noise level, calculated at around 120 dB on both sites.





Monitoring and modelling of the impacts on the mega Marine Wildlife

As far as species of commercial interest are concerned, it is important to note the overlap of the three plants with the areas of persistence of recruits and breeders of different species. However, any impact on this fauna is mainly related to the construction phase, so it is unlikely that a cumulative impact will occur due to the non-simultaneous construction phases of the three plants. In the temporal planning of the activities of the individual plants, it will be essential to consider the reproductive periods of the fauna of commercial interest to minimize the impact on the marine ecosystem.



Marine Wildlife Species of Commercial Interest

4.3.7 IMPACTS DUE TO ONSHORE WORKS

The three systems that can potentially interfere have different connection solutions. Seanergy and Nemetun Island will both be connected to the expansion of the new 380 kV electrical substation in Cerignola, while for Barium Bay the construction of a new 380 kV electrical substation is planned to be connected to the Terna Foggia Palo del Colle and Andria Brindisi Sud lines.

The territories affected by the power lines are different: Manfredonia, Zapponeta and Cerignola for Seanergy; Zapponeta and Cerignola for Nemetun Island; Barletta, Andria and Trani for Barium Bay. The landing points of the offshore cable pipeline are 10 km away between Nemetun Island and Seanergy and 20 km between Barium Bay and Nemetun Island. Considering the sequentiality of the works, their scope and the diversity of the territories crossed and the constraints, there are no cumulative effects between the ground connection works.

The onshore works of the three plants

4.4 ASSESSMENT OF THE IMPACTS DERIVING FROM VULNERABILITY TO CLIMATE CHANGE AND ADVERSE EVENTS

4.4.1 ASSESSMENT OF THE EFFECTS OF CLIMATE CHANGE ON THE OFFSHORE WIND FARM

The impact of climate change on offshore wind farms is a topic of increasing importance in the current context of energy sustainability. The increased frequency and intensity of extreme weather events, such as storms and hurricanes, poses a significant threat to the stability and resilience of such structures. Meeting this challenge requires the implementation of strict structural design criteria, constant monitoring and maintenance during operation, as well as the adoption of high standards for decommissioning. These approaches, which cover the entire life cycle of the plants, aim to ensure safety, continuity and efficiency, while preventing potential environmental damage resulting from any structural failures and the consequent dispersion of pollutants into the surrounding environment.

As part of the complete study conducted on this topic, the assessment of the spillage of pollutants into the sea is reported as an indication and example, considering the possible negative impacts on the main environmental components:

- The risk associated with this event, for the project in question, is substantially zero: the only liquid substances present in the plant are the lubricants of the wind turbine engines, present in very limited quantities and which in the event of a leak would remain contained in the turbine structures;
- the oil used for transformers in offshore applications is of the biodegradable type, so as not to cause damage to the environment even if released into the sea (see attached example data sheets);
- The transformer oils provided for in the offshore substation will be installed inside dedicated rooms equipped with an oil collection tank, which can be embedded inside the structure or raised on it. The oil collection tank will be sized in such a way that its volume can contain not only the entire amount of oil inside the transformer, but also the volume of water/foam necessary in the event of a fire in the same;
- to facilitate the recovery of substances (oil/water/foam) there is an additional common collection tank;
- Transformers for offshore applications are generally designed in such a way as to prevent the rupture of the tank ("rupture resistant tank"), in order to: i) decrease the risk of oil spillage that could damage the environment; ii) reduce the risk of fire due to oil spillage; iii) increase the reliability of the machine.

Please refer to the *R.4_01_ Technical and Illustrative Report on the Offshore Substation* for more information on the technical characteristics of the offshore substation.

In addition to what has been mentioned, it should be remembered that the design of the structural elements of the plant was carried out taking into due consideration the need to provide adequate guarantees in the event of exceptional events. In particular, the following aspects were examined as part of the development of the project:

- **Structural sizing** conducted in accordance with IEC 61400-3-2:2019 standards, which requires structural elements to be able to withstand exceptional events with a return time of 50 years.
- Preparation of a **Continuous structural monitoring system** able to allow predictive maintenance and to carry out the continuous updating of the structural model, in order to arrive at a model capable of returning the real behavior of the structure, appropriately calibrating the alert and intervention thresholds.
- Preparation of a **Preliminary contingency plan** in which the main hazards that may occur during the operation of the plant are identified.

In relation to the **structural sizing**, as mentioned, was conducted in accordance with the IEC TS 61400-3-2:2019 technical standard, "Wind Power Generation Systems Part 3-2: Design requirements for floating offshore wind generators", with reference to the following load conditions:

- Extreme wind operating condition (DLC 1.4)
- Operating condition with extreme waves (DLC 1.6)
- Non-operating condition (free-spinning blades) with 50-year return period (DLC 6.1)

With regard to the tightness of the anchor lines, the system has been designed with a high level of redundancy: it is therefore considered extremely unlikely that all the sized lines can break and leave the platform adrift. The redundancy checks will however be further deepened in the executive design phase through the design load cases (DLC) 9.1, 9.2, 10.1, 10.2 described in the IEC TS 61400-3-2 standard, aimed precisely at minimizing the danger that these types of events may occur.

Furthermore, from the recent experiences gained in the field of offshore floating foundations, and specifically by Principle Power, it has emerged that these structures, to date, have not shown any type of damage even for meteorological events with associated waves of height up to 20 m, a circumstance that in the Adriatic Sea is not part of the most extreme conditions that can be assessed.

In relation to the **Continuous structural monitoring**, the structures and their anchoring systems will be equipped with specific wireless sensors for monitoring the following parameters:

- corrosion of metal structures,
- inclinometers,
- strain gauges,
- Tensions
- vibration
- 3D accelerometers,
- seabed analysis,
- noise
- imagery.

The aim is to estimate the MTBF (mean time between failures) in order to reduce maintenance costs and machine downtime, as well as maintain the integrity of the structural system and ensure the census of damage or subsidence due to adverse natural events, (both on mooring lines and foundations but also on the wind turbines themselves). In other words **The system will be able to monitor the state of the structures and to activate a more than timely emergency system in the event of unpredictable natural events.**

In addition to this, a continuous monitoring system also allows the structural model to be updated and calibrated, carrying out the so-called "model updating". In essence, the purpose of the system is to identify and report degradation phenomena that correspond to slow changes in the mechanical properties of resistant structures. Thanks to the recorded data, statistical references can be obtained on the trend of deformations, displacements and accelerations, which can also be used to express judgments on the measurements of the controls and interventions carried out. With the statistical references it is possible to define 3 thresholds for each monitored quantity:

- Attention threshold: inferred from data acquisitions;
- Alarm threshold: derived from the control of serviceability limit states;
- Alert threshold: derived from the control of serviceability limit states.

The combination of these factors makes it possible to support the structural maintenance process by making it more effective, since the most vulnerable parts are intervened in an optimized manner.

It is a system that also makes it possible to evaluate the effectiveness of the interventions adopted from an analytical point of view, since it allows the most important parameters of the structural response to be compared before and after the interventions.

It will also be possible to assess the state of health of the structures at any time, and especially following exceptional events, fully falling within the tools useful to the forces deployed in the field for emergency management.

4.4.2 ASSESSMENT OF THE EFFECTS OF OFFSHORE WIND ON CLIMATE CHANGE

The impact of the Nemetun Island offshore wind farm on climate change is an aspect of considerable interest in the design study conducted. This plant, during the operation phase, will play a key role in reducing greenhouse gas (GHG) emissions into the atmosphere, generating approximately 2,740,000 megawatts of clean energy per year. However, to comprehensively assess the environmental impact of the plant, it is essential to consider the entire life cycle, including the design, construction, maintenance and decommissioning phases. This holistic approach allows us to fully understand the contribution of the Nemetun Island plant to climate change mitigation.

The study on the reference LCA commissioned by the designer to POLIMI is structured on a cluster of offshore wind farms in the Adriatic, with specific site assessments for the Lupiae Maris project. These results were finally reworked by analogy on the Nemetun Island plant (small variations due substantially to the distance from the coast and the assembly ports). The result is very low playback indexes: the Carbon PBT is equal to 2 years. On the other hand, the Energy PBT turns out to be slightly higher than 3 years. These data confirm that in relation to GHGs, the project is certainly virtuous.

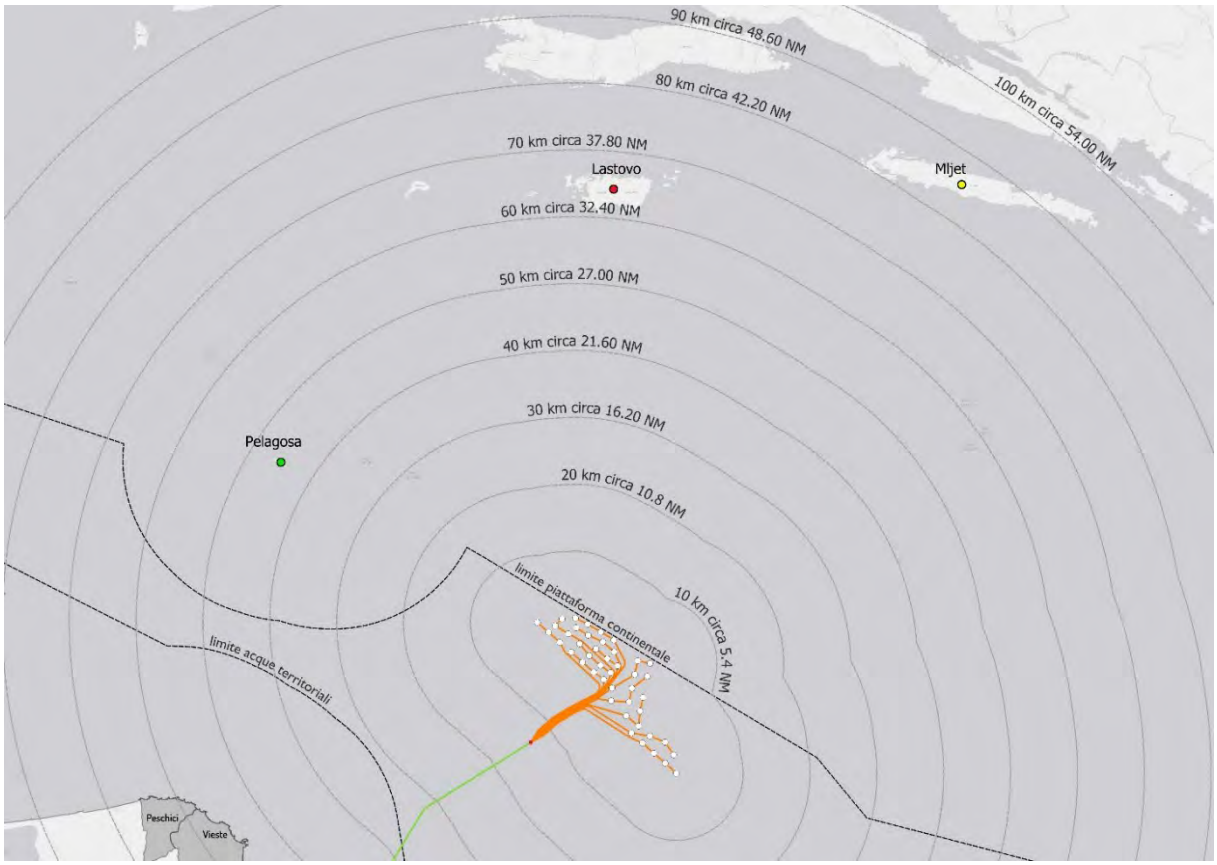
4.5 ASSESSMENT OF TRANSBOUNDARY IMPACTS

According to Article 32 of Legislative Decree 152/06, the "plans, programs, projects and plants that may have significant impacts on the environment of another State (…)" are subject to a transboundary impact assessment.

In the case of the Nemetun Island project, the potential effects that the facility could have on other foreign States have been assessed, in particular Croatia, located on the opposite coast of Gargano and on its coastal islands.

Given the considerable distance between the plant and the Croatian coast, environmental impacts can be excluded; these, in fact, could derive mainly from onshore works or from the laying of works for the export of electricity, which are instead located in Italian territory.

With regard to the component related to visual impact, a more detailed analysis has been carried out, identifying coastal or insular areas with potential visual interference.



Identification map of cross-border territories

In order of distance from the wind farm, the following Croatian islands are mentioned:

- **Pelagosa**

It is a Croatian islet renowned for its rich biodiversity, currently uninhabited and without tourist infrastructure, and accessible only occasionally through private tours. Located more than 40 km and about 23 nautical miles west of the plant, the study on the visual interference of the plant (chapter 4.2.1) has shown that from this distance it is not possible to distinguish the Nemetun Island wind turbines, both because of the curvature of the earth and the limited resolution of the human eye. In addition, its condition as an uninhabited islet, although of scientific importance, makes the visual impact negligible.

- **Lastovo**

It is an island located in the Dalmatian archipelago, off the southern coast of Croatia. Known for its natural richness, the island is over 60 km from the Nemetun Island facility. Therefore, the intervisibility from the coast is negligible.

- **Mljet**

It is a larger island than Lastovo located in the southern region of Dalmatia, in this case the Nemetun Island plant is more than 80 km away, about 46 nautical miles, the intervisibility of the plant, also in this case is negligible.

5 SUMMARY OF THE ASSESSMENT OF THE IMPACTS DUE TO THE CONSTRUCTION OF THE WORK

5.1 SUMMARY SCHEME OF THE IMPACT ASSESSMENT

Summarizing the estimated impacts in the previous chapter, we can represent the following table:

PRESSURES AND PHASES	NEGATIVE ENTITY				POSITIVE ENTITY				REVERSIBILITY	
	A	M	B	T	A	M	B	T	R	NR
Impacts on the Atmosphere										
Construction phase										
Operation phase										
Decommissioning phase										
Climate impacts Meteomarine										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on the Seabed										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Soil, Subsoil and Hydrology										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Nature and Biodiversity Avifauna										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Nature and Biodiversity Marine Wildlife										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Nature and Biodiversity Terrestrial Fauna and Flora										
Construction phase										
Operation phase										
Decommissioning phase										
Noise and Vibration Related Impacts										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Archaeological Heritage										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on the Landscape - Visibility										
Construction phase										
Operation phase										
Decommissioning phase										

Impacts on Population and Human Health										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Fisheries										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Navigation										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on Tourism										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts on the Tertiary Sector and Employment										
Construction phase										
Operation phase										
Decommissioning phase										
Impacts deriving from Electromagnetic Emissions										
Construction phase										
Operation phase										
Decommissioning phase										
Use of raw materials and natural resources										
Construction phase										
Operation phase										
Decommissioning phase										

5.2 SIGNIFICANCE OF IMPACTS

As analysed in the environmental framework and summarised in the table in the previous paragraph, the trend of the impacts and pressures exerted by the Nemetun Island wind farm on the various environmental, anthropogenic and economic components is fluctuating, i.e. it varies between positive, negative and zero impacts.

In the first analysis, it emerges that the red impacts, therefore negative, although they are a large number, do not have particularly high entities. On the other hand, it is logical to expect that a very large and expensive work, such as the planned wind farm, could develop a series of negative impacts on the territory. Reasoning on their significance, however, we can see that almost all negative impacts are defined as "reversible", i.e., it is ascertained that their duration does not extend in the long term or indefinitely, but once the phase in which the alteration occurs is over, it is possible to restore the previous environmental, social, production conditions or improved by the presence of the plant itself.

An emblematic example is the impact on fishing activity: it is reasonable to think that work in the construction phase with the movement of several tons of steel by sea, the construction of underwater excavations, the laying of electrical components, have a high negative impact over the entire time span of the work. At the end of this phase, however, fishing activities will be able to obtain a long-term benefit, due to the compensations introduced and the design criteria adopted (see chapters 4.2 and 6 for further information).

In conclusion, the significance of the negative impacts appears to be not very high or in any case reversible, on the other hand the opportunity provided by the installation of the system Nemetun Island and the production of **clean energy of 2570 GWh/year**, seems indispensable and very significant in terms of

environmental protection and triggering virtuous processes, such as decarbonisation, which are very necessary and advantageous.

The planned intervention will be attentive to alterations and at the same time ready to repay and compensate for them in the appropriate way.

5.2.1 IMPACTS DURING CONSTRUCTION

In the implementation phase, the general scheme of impacts can be simplified as follows:

PRESSURES AND PHASES	NEGATIVE ENTITY				POSITIVE ENTITY				REVERSIBILITY	
	A	M	B	T	A	M	B	T	R	NR
Impacts on the Atmosphere										
Construction phase										
Climate impacts Meteomarine										
Construction phase										
Impacts on the Seabed										
Construction phase										
Impacts on Soil, Subsoil and Hydrology										
Construction phase										
Impacts on Nature and Biodiversity Avifauna										
Construction phase										
Impacts on Nature and Biodiversity Marine Wildlife										
Construction phase										
Impacts on Nature and Biodiversity Terrestrial Fauna and Flora										
Construction phase										
Noise and Vibration Related Impacts										
Construction phase										
Impacts on Archaeological Heritage										
Construction phase										
Impacts on the Landscape - Visibility										
Construction phase										
Impacts on Population and Human Health										
Construction phase										
Impacts on Fisheries										
Construction phase										
Impacts on Navigation										
Construction phase										
Impacts on Tourism										
Construction phase										
Impacts on the Tertiary Sector and Employment										
Construction phase										
Impacts deriving from Electromagnetic Emissions										
Construction phase										
Use of raw materials and natural resources										
Construction phase										

The construction phase of the work is the most critical in terms of the pressures exerted. It should be noted, however, that many of the negative pressures, such as those on the atmosphere, will be amply repaid in terms of playback in the subsequent phase of operation. The positive impact on the tertiary sector and employment is instead permanent: with the Nemetun Island offshore plant, a real surge in employment and training will be introduced, capable of creating a production chain with long-lasting employment implications.

5.2.2 IMPACTS DURING OPERATION

In the operation and production phase of the plant, the general scheme of impacts can be summarized as follows:

PRESSURES AND PHASES	NEGATIVE ENTITY				POSITIVE ENTITY				REVERSIBILITY	
	A	M	B	T	A	M	B	T	R	NR
Impacts on the Atmosphere										
Operation phase										
Climate impacts Meteomarine										
Operation phase										
Impacts on the Seabed										
Operation phase										
Impacts on Soil, Subsoil and Hydrology										
Operation phase										
Impacts on Nature and Biodiversity Avifauna										
Operation phase										
Impacts on Nature and Biodiversity Marine Wildlife										
Operation phase										
Impacts on Nature and Biodiversity Terrestrial Fauna and Flora										
Operation phase										
Noise and Vibration Related Impacts										
Operation phase										
Impacts on Archaeological Heritage										
Operation phase										
Impacts on the Landscape - Visibility										
Operation phase										
Impacts on Population and Human Health										
Operation phase										
Impacts on Fisheries										
Operation phase										
Impacts on Navigation										
Operation phase										
Impacts on Tourism										
Operation phase										
Impacts on the Tertiary Sector and Employment										
Operation phase										
Impacts deriving from Electromagnetic Emissions										
Operation phase										

Use of raw materials and natural resources										
Operation phase										

The operation phase of the plant is the one richest in positive impacts, the negative evaluations present are low. It is important to note that the impact on the atmosphere, which is strongly positive, is related to the favorable impact on human health, with the reduction of pollutant emissions and the production of clean energy by 2570 GWh per year.

5.2.3 IMPACTS DURING DECOMMISSIONING

PRESSURES AND PHASES	***NEGATIVE ENTITY***				***POSITIVE ENTITY***				***REVERSIBILITY***	
	A	***M***	***B***	***T***	***A***	***M***	***B***	***T***	***R***	***NR***
Impacts on the Atmosphere										
Decommissioning phase										
Climate impacts Meteomarine										
Decommissioning phase										
Impacts on the Seabed										
Decommissioning phase										
Impacts on Soil, Subsoil and Hydrology										
Decommissioning phase										
Impacts on Nature and Biodiversity Avifauna										
Decommissioning phase										
Impacts on Nature and Biodiversity Marine Wildlife										
Decommissioning phase										
Impacts on Nature and Biodiversity Terrestrial Fauna and Flora										
Decommissioning phase										
Noise and Vibration Related Impacts										
Decommissioning phase										
Impacts on Archaeological Heritage										
Decommissioning phase										
Impacts on the Landscape - Visibility										
Decommissioning phase										
Impacts on Population and Human Health										
Decommissioning phase										
Impacts on Fisheries										
Decommissioning phase										
Impacts on Navigation										
Decommissioning phase										
Impacts on Tourism										
Decommissioning phase										
Impacts on the Tertiary Sector and Employment										
Decommissioning phase										
Impacts deriving from Electromagnetic Emissions										
Decommissioning phase										

Use of raw materials and natural resources										
Decommissioning phase										

The decommissioning phase is similar to the construction phase, the extent of the impacts is in some cases mitigated by the shorter duration of the operations and the possibility of recycling or reusing most of the materials used, such as steel, copper and aluminum.

6 MEASURES TO OFFSET EXPECTED IMPACTS

6.1 ENVIRONMENTAL COMPENSATION AND ENHANCEMENT INTERVENTIONS RELATED TO THE WORK

As reported in paragraph 1.1, offshore wind farms will be the protagonists of the future energy transition, and if on the one hand they are the essential tool to achieve the goal of sustainability and autonomy, on the other hand they are also a unique opportunity to strengthen and start territorial redevelopment interventions and to activate a new prolific satellite industry. Therefore, in the light of these considerations and the provisions of the Ministerial Decree of 10.09.2010, it being understood that the compensation measures will be punctually identified within the framework of the service conference, in this project we have proceeded to define the overall framework within which the compensation interventions have been identified, attributable to the following topics:

- **Enhancement of the landscape and natural heritage**: it is certainly the issue most immediately attributable to the concept of compensation, the resources that will be made available will be able to guarantee the implementation of a large area project capable of covering the infrastructural needs of the territory and starting virtuous environmental redevelopment paths. The basic paradigm is based on a more modern concept of "seascape", which synergistically includes biotic, abiotic, meteorological elements, but also human settlements and human activities that take place along the coast overlooking the intervention area. To this end, a memorandum of understanding with IN/ARCH for the development of design concepts and design competitions.

  In the current design phase, a compensatory criterion has been adopted for the territories involved, in order to identify a list of interventions that could be started and supported thanks to the construction of the offshore wind farm. In particular, considering also a possible, albeit minimal, impact on the areas of the Natura 2000 Network, it is proposed to implement a series of interventions envisaged in the **Management Plan of the Wetlands of the Capitanata and the Marshes at the Gulf of Manfredonia,** beyond **in the 2022-2026 Action Plan of the Gargano National Park**. These protected areas are partially affected by the transit of the road transmission cable duct necessary for the connection of the wind farm. The system of proposed interventions considers two macro-areas: the Gargano National Park and the Margherita di Savoia Salt Pans.
  The system of choice and cataloguing of interventions is based on the idea of promoting the **Slow mobility** in the context of sustainable tourism. We have identified cultural itineraries linked to religion and folklore, working to enhance them. This process can be supported by resources from the Nemetun Island plant.
- **Support and training for local communities for the green economy**: dissemination and awareness raising are essential activities to be supported by projects such as the one under consideration, through which local communities will be able to become aware of the energy transformation path undertaken and the great opportunity underlying the implementation of renewable energy.

  To achieve this goal, we have planned a series of cycles, interventions and seminars which, together with the creation of experiential stations along the coast, can illustrate the operation of the Nemetun Island wind farm and its relationship with the marine environment in which it is located.
- **Support for the research and specific training sector**: the construction of offshore wind farms is an important opportunity to activate and/or strengthen research activities for the study of marine flora and fauna, to analyze the state of health of the seabed, determining the elements of threat and strategies to defend them. The idea of to build a laboratory and observatory for Marine Sciences on the offshore platform that houses the electrical substation is accompanied by the provision to activate a series of

Education and research, up to the possibility of activate specific addresses dedicated to energy within the Apulian Higher Technical Institutes (ITS) and specific interventions aimed at training and supporting the productive fabric. To date, a Memorandum of Understanding with Jonian Dolphin, setting out a number of specific actions in the field of marine research, and understandings are being developed with other research institutions. Contacts were then made with the fishing communities of the Barletta, Molfetta and Manfredonia marinas in order to propose that they sign a series of memoranda of understanding with the aim of ensuring that the construction of offshore wind farms can contribute to the strengthening of research activities on the marine environment and maximize the benefits for fishing communities and local navies in general.

- **Promotion of creativity and the arts**: these are apparently secondary measures, which instead take on great importance if we think of the appeal and resonance that art can generate, amplifying the already described awareness-raising and training actions, as well as those aimed at supporting local communities. Think of the possibility of providing for art installations at the wind turbines (e.g. murals or light shows) and to be able to view them not only from the sea, but also from the coast, setting up multimedia stations from which to "see" and "listen" to the wind farm.

The intent of the study carried out as part of the project in question is to build a track that can be used as a starting point for the structuring of a planning tool dedicated to the definition and implementation of compensation interventions that will accompany the construction of offshore wind farms, obviously not only of the Nemetun Island project. Therefore, the structure of the interventions reported here is to be understood in this perspective, i.e. it is to be considered as part of a vision that will have to be finalized with the involvement of institutions and communities.

With regard to the distribution of measures on the territory, two macro-areas have been identified at this stage:

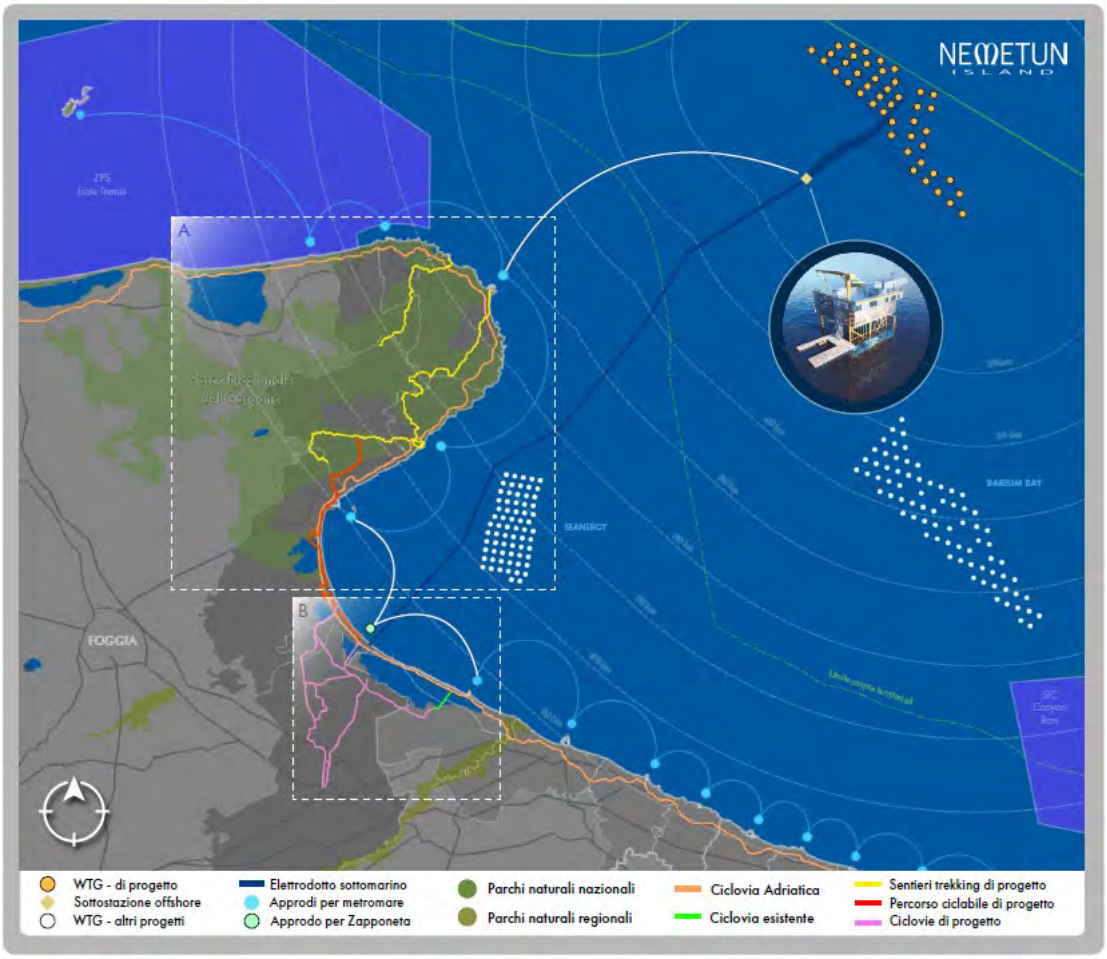
A. the **Gargano**, which although it is not subject to particular elements of impact (intervisibility, as can be seen from the processed photographic simulations, is substantially negligible), represents the territory on which the park essentially overlooks, probably the ports will be affected by the presence of operators in the construction phase and in the subsequent maintenance phases;
B. the **coastal strip affected by the landing**, which falls specifically in the municipal territory of Zapponeta, and by the connection works, with the electrical substation that falls in the countryside of Cerignola, in an area currently already partly occupied by the recent construction of an RTN station.

The actual quantification of the distribution of resources can only be the result of a consultation that will take place in the subsequent phases. It goes without saying that it would certainly be desirable for local authorities to be able to activate useful agreements already at this stage.

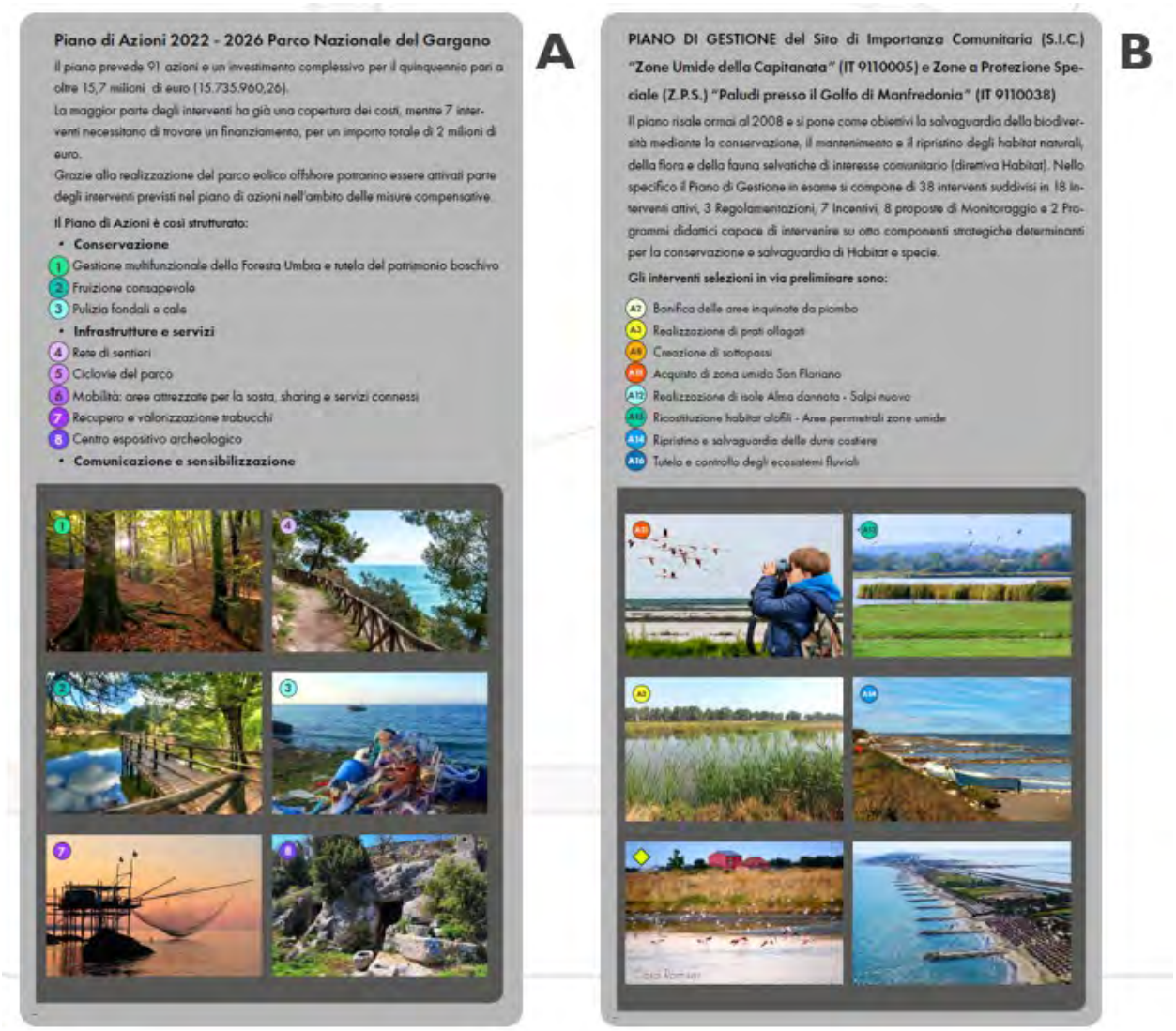
For example, discussions have been initiated with the municipality of Zapponeta whose territory is affected by the installation of the Giunti Tank and a significant section of the underground cable duct. The meeting was held at the municipal offices on 10 July 2024 and led to a council resolution with which the municipal administration, in acknowledging the project and the low relevance of the environmental impacts associated with its construction, indicated a series of possible compensation works to be discussed during the authorization process and subsequently during the entire life cycle of the offshore wind farm, based on the following criteria:

- Compatibility with the needs and priorities of the Municipality of Zapponeta;
- Effectiveness in terms of positive effects on the environment and the community;
- Environmental, economic and financial sustainability.

Please refer to the series *6 – Compensation and enhancement measures* of the final project for the necessary in-depth analysis.



General Framework of the Planned Interventions



The system of interventions

6.1.1 OFFSHORE ELECTRICAL SUBSTATION AS AN OBSERVATORY AND ENVIRONMENTAL LABORATORY

As discussed in the *6 compensation interventions*, the transformation of the role of the offshore substation from a mere technical building to a multimodal infrastructure was assessed. The possibility of making it accessible to visitors and using it as a marine outpost not only for technical, but also scientific and attractive purposes was examined.

It is therefore hypothesized to make the electrical infrastructure more human and accessible, transforming it into an aesthetically appealing structure, in tune with the concept of "seascape", using modern architectural solutions and innovative materials. The substation will be open to visits by students and tourists via catamaran tours or guided tours. Researchers and marine scientists will be able to use it as a basis for their scientific activities, for research campaigns, for marine observation periods. It is also possible to create an underwater compartment with transparent walls, allowing visitors to literally walk below sea level, thus creating a kind of "reverse aquarium" where people can be observed by the surrounding marine fauna.

Axonometric scheme of interventions

The architectural concept proposed for the functionalization of the substation is inspired by contemporary naval architecture, conceiving the substation as a distinctive and modern marine element. However, this does not deprive the structure of its industrial character and its function as an energy infrastructure. The aim is to avoid making the building look like something it is not, such as a ship, a "flying saucer" or a castle, but rather to give it an authentic and valid architectural image. This image should communicate not only the function of a marine substation, but also its potential usefulness as a visitable outpost, study center and experiential place.

The first action taken on the structure containing the electrical equipment was to give it an architectural sense through its protective casing. Simply, a "skin" of stainless metal fabric has been added to the metal paneling that covers the spaces intended for control rooms and electrical equipment. This update aims to

give the building a distinctive character and to separate the technical spaces from those used for inhabited functions.

With the idea of affixing the "skin" in metal fabric, the aim is to give the substation:

- a play of shadows iridescent throughout the day,
- an air-transparent element for sections that need cooling such as transformers and radiators,
- A partial visual screen of the technical part in line with the accessibility of the structure.

The addition of the metal mesh "skin" to the substation aims to confer several characteristics:

- Iridescent shadow play: The texture of the metallic fabric creates an effect of changing shadows throughout the day, adding dynamism and visual interest to the building.
- Air-transparent element: The metal mesh part allows air to circulate, making it ideal for sections of the building that require cooling, such as transformers and radiators. This helps to maintain an optimal internal temperature and ensure the proper functioning of the systems.
- Partial visual screen: The texture of the metal mesh offers an effect of partial visual shielding of the technical part of the building, in line with the idea of making the structure accessible and inviting. This balance between transparency and privacy helps to create a welcoming and harmonious environment.

The hypothetical functionalization it provides for the inclusion of added and inhabited spaces in the marine object. Allowing the visibility and habitability of an object several miles away from the coast inspires strong architectural and structural reasoning, hypothesized in this phase in order to lay the foundations and allow its detailed development in the executive design and construction.

The mooring platform, anchored to the structure of the pylons, allows catamaran trips from the coast to dock safely. To access the places of visit, it is planned to add a system of vertical, panoramic connections and fast.

The "reverse" aquarium It is designed as an organically shaped glass box located below sea level, which allows - in an inverse and invertible way - marine fauna to see man and man to safely enjoy the biodiversity present and recreated in the wind farm thanks to the inhibition of navigation.

The study center It is a protected place, located on the roof of the substation, accessible from the vertical link or faster from the helicopter platform.

The "naval skin" protects the spaces that can be visited dedicated to scientific activities: a laboratory, a "marine museum" and a guesthouse that allows scientists to safely and comfortably carry out long periods of observation at sea. From the volumes resting at the height of the roof, it is possible to access the marine observatory, designed as an open and thin volume, equipped with large continuous windows that do not interrupt the continuity of the sky and sea. In addition to providing an extraordinary outpost for the observation of bird biodiversity, the multifunctional space can be used as an educational facility or conference room.

The offshore observatory

The landing system, the panoramic vertical connections and the reverse aquarium

6.2 VISUAL MITIGATION INTERVENTIONS AND ONSHORE ARCHITECTURAL INTERVENTIONS

The project involves the construction of new infrastructure to connect to the NTG in the municipality of Cerignola. In particular, the plant will be equipped with a new Electrical User Substation located near the 380 kV Electrical Sorting Substation in addition to the Cerignola Electrical Substation. The 380 kV Switching Station is also included in the Nemetun Island project and will allow the energy produced to be connected to the National Transmission Grid (NTG).

For the insertion of the new user station in GIS, the intervention involves the construction of an industrial building that can house and protect the electrical infrastructure. In this context, the new substation has been designed with an appearance similar to that of an industrial architecture, integrating harmoniously into the rural landscape and drawing inspiration from local agricultural buildings, such as silos and stereometric architectures typical of large farms in the board, using the materials available on site.

The industrial building will be a large parallelepiped in white plaster and local stone. The goal is to work on the transparencies of the perimeter walls and the regular metal structure to give the industrial equipment container an authentic and sincere look. Transparency aims to encourage communication and interaction between the internal and external spaces, in the industrial building an attempt is made to allow a view of the internal machines, while maintaining a harmonious integration with the surrounding environment. In this way, the systems become an integral part of the architectural composition, creating a unique visual experience that enhances both the industrial functionality and the aesthetic appearance of the building.

In addition, the project aims to create new visual screening elements towards the provincial road and the surrounding agricultural context, using essences and intervention techniques typical of the area. This approach is in line with the recommendations of the ISPRA guidelines for the landscape insertion of infrastructures, which underline the importance of choosing a route that follows the conformation of the territory and landscape and of using native vegetation to ensure better adaptation.

The stereometry of the main building of the power factor correction station

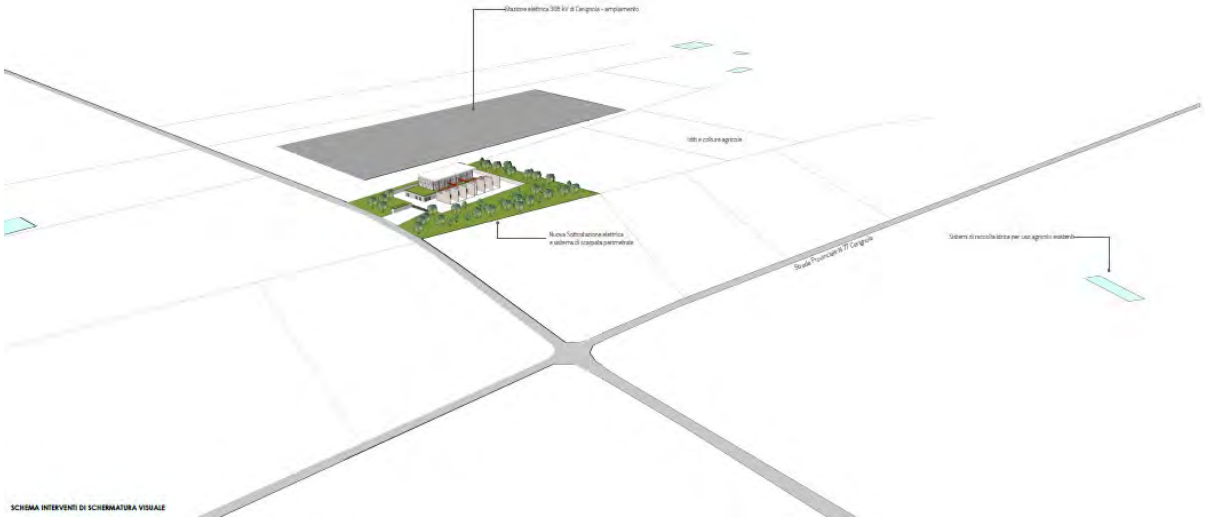
The creation of new natural areas is envisaged through the modeling of tree-lined slopes, using the excavated material for the construction of the substation.

The covering with ground cover essences and shrubs of short stature will help to recreate an ecological terrain suitable for wildlife habitats, promoting biodiversity and improving the ecological connectivity of the area.

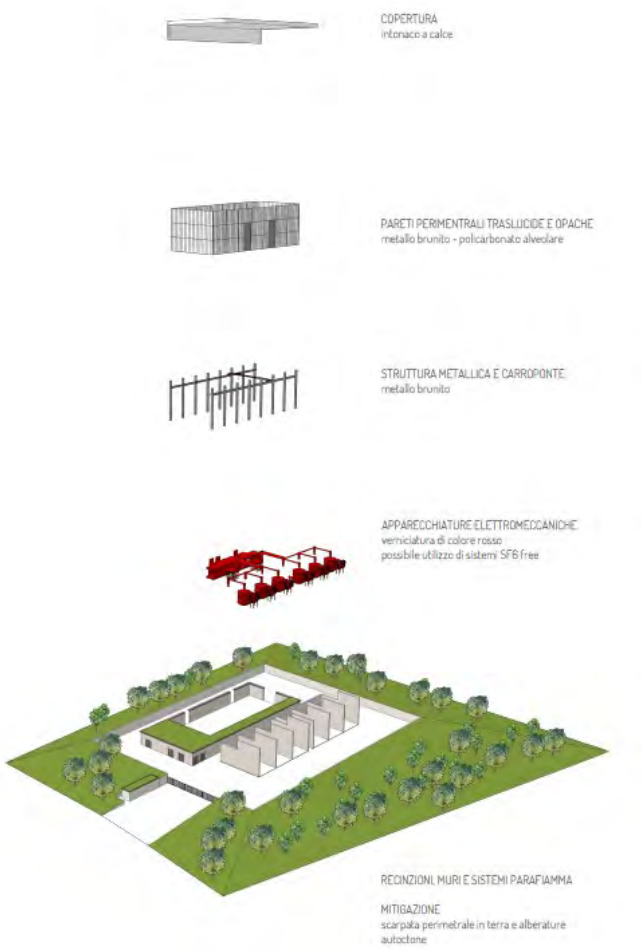
The intervention involves the creation of two new tree and shrub strips located on the artificial slopes positioned around the Electrical User Substation and around the 380 kV Electrical Sorting Substation. These strips made up of native essences, aim to improve local biodiversity, provide habitats for fauna and contribute to the ecological connectivity of the area.

The main façade and the transparencies towards the interior

The planned environmental inclusion interventions, for which reference is made to the *T.6.1.4_01, T.6.1.5_01*, a broader scheme was thought of, which can be evolved and used for ongoing and future interventions in the agricultural area of Cerignola.



The visual screening system towards the SP 77



The new onshore axonometric exploded substation

The scheme of interventions with artificial slopes and tree strips

The operation of the tree-lined slopes of visual screening

7 MITIGATION MEASURES OF EXPECTED IMPACTS

Finally, the design solutions envisaged for the Nemetun Island wind farm and the compensation works described in the previous paragraphs, are also designed to improve and mitigate the "purely environmental" insertion of the work, intervening on various sectors as specified below:

- **Atmosphere** – the benefit of the presence of the plant on the emission of pollutants is clear, the impact of greater traffic and movement of vehicles in the construction phases are largely mitigated by the payback of the plant and its long-term production of "decarbonized" energy.

- **Seabeds** – the project provides for the protection of the seabed by differentiating the type of installation and implementing minimally invasive solutions of the valuable areas crossed by the cable duct (SPA site IT9110041 Aloisa – Carapelle, habitat MB5.534 - Superficial muddy sands in sheltered waters with *Cymodocea nodosa*, MB1.51 - Mediterranean infralittoral rock with infralittoral algae MC.1.5 - Mediterranean circalittoral rock covered by sediments with sponges (mainly *Axinella spp.*) and with *Leptogorgia spp.*).

- **Turbidity monitoring**: ante operam, in corso di lavoro and post operam.

  In the "ante operam" phase, the reference value for turbidity (natural background value) will be determined.

  In the "in progress" phase, it must be verified that any variations in turbidity are contained within the reference value defined in the "ante operam" investigations. For this purpose, special turbidity meters will be positioned in the laying area for real-time monitoring of turbidity levels and control of compliance with the limits imposed. In the event of exceeding the limits, operations will be suspended, adopting any mitigation measures (such as anti-turbidity breakdowns), and resumed when the values within the threshold levels are restored. It will thus be possible to adapt the processing methods in order to minimize the impacts on the ecosystem, while reducing the repercussions on the timing of construction activities.

- **Soil, subsoil and hydrology** – the slight impacts assessed as slightly negative in the environmental framework are repaid with interventions included in the compensation works that will be based on the actions contained in the Management Plan of the SAC Zone "Wetlands of the Capitanata".

- **Biodiversity** – As demonstrated in the environmental reference framework, the framework of the impacts of the plant on the biodiversity present in the area, even if sometimes negative, do not report high entities, however even the compensation interventions are aimed, at least, at raising awareness of the population towards the issues of protection and beauty of biodiversity, see for example the construction of the "reverse" aquarium. Finally, it should be remembered that the inhibition of navigation in a particularly noisy stretch can only introduce a strong improvement of this marine and terrestrial component.

  However, measures relating to the protection of marine birds, flora, fauna and terrestrial habitats, and the containment of underwater noise during construction and require further discussion, for which reference is made to paragraph 7.1 below.

- **Landscape and visibility** – As repeatedly described and demonstrated, the work several miles from the coast has a minimal visual impact, the compensation measures, for example the idea of transforming wind turbines into works of art, aim at the construction of a modern "seascape" that integrates landscape and renewable sources in an innovative way.

- **Population and human health** – The benefit that the wind farm will bring to the employment sectors and to human health during operation is clear.
- **Productive activities - Fishing** – The negative impact of the construction phases is definitely compensated by the compensation measures introduced. In addition, the inhibition of the plant area in the operating phase and other conditions described in the environmental reference framework will create the change of impact sign during the operating phase.
- **Productive activities – Tourism** - As explained in the environmental reference framework and in the previous paragraphs, the Nemetun Island plant, without wanting to replace the beauty of the places in any way, wants to integrate its presence in the tourist accessibility of the area, allowing observation points and uses that are currently unavailable, such as the experiential stations and the observatory planned on the offshore substation. sustainable, improving the existing network of cycle paths and historical-cultural paths.

7.1 BIRDLIFE AND MARINE FAUNA – MITIGATION MEASURES OF THE EXPECTED IMPACTS

7.1.1 INSTALLATION OF AVIAN RADARS ON WIND TURBINES

The mitigation measure is necessary to avoid the impact of single or flock birds on the wind turbines in operation or during the installation of the Nemetun Island wind farm.

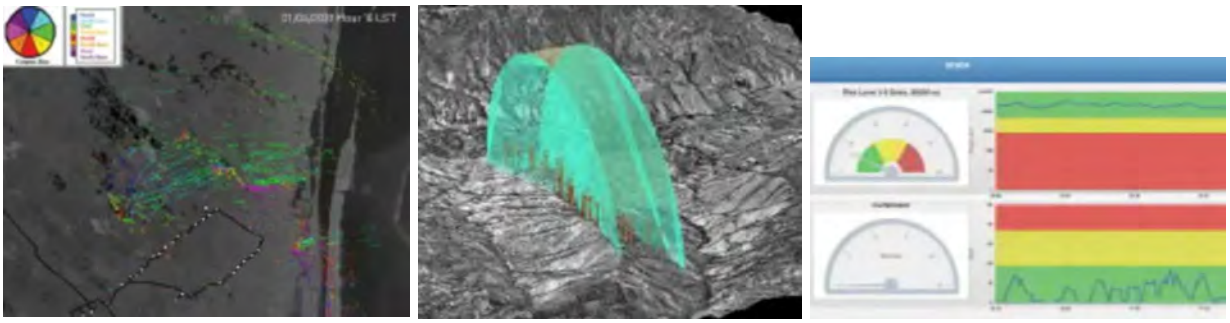
As part of the Operation Technology system studied, the installation of modern radar systems is envisaged **Shut down 'on demand' (SDOD)**, these are the so-called "**Avian Radar Systems**" that are already in operation in large wind farms in America and Europe, these systems are able to detect incoming birds and then stop the turbines long enough to avoid collisions.

On site, these systems can be used for the long-term collection of scientific data on the migratory movements of birds in the area planned for the wind farm, as they automatically detect and record hundreds of birds simultaneously, their size, speed, direction and flight path.

In operation, avian radars continuously measure the number of birds flying over a predetermined and defined range by wind turbines. Based on the set parameters, the system determines the shutdown for a group, for individual wind turbines, or for the entire fleet, depending on the specific situation on site.

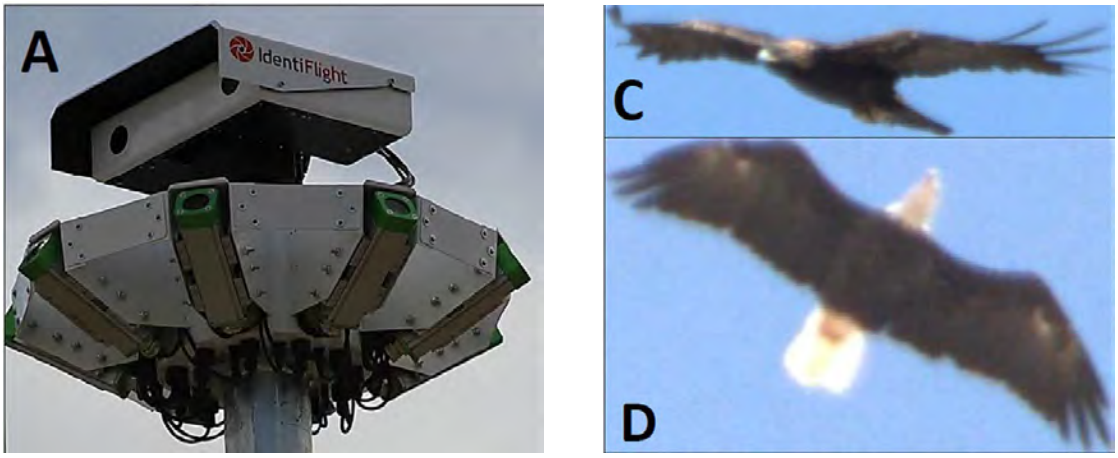
Proponents of avian radars point out that these systems could prevent the death of several specimens of small migratory species but also avoid risks for larger birds.

SDODs with radar systems can identify animals in flight (especially flocks), distinguishing them approximately based on echo characteristics and/or wingbeat frequencies and size. Both systems can be coupled with automated image or radar signal analysis systems that can identify potential collisions. The latter allow an automatic blocking of the turbine(s), even in the absence of an operator, or alternatively the emission of an acoustic or light signal of dissuasion that "warns" the animal of the presence of a potential danger. The possible presence of an operator allows, however, a finer evaluation of the images/videos/radar signal. The scientific studies that have evaluated the validity of active systems in mitigating the risk of collision are many and cover a wide variety of environmental and ecological conditions as well as have involved numerous species of birds and bats.



Avian radars, operating diagrams

In addition, they can be used **Active deterrence systems**. From a technological point of view, various systems are now available, commercially known by various acronyms (e.g. DTBird, IdentiFlight, nvbirds, etc.). In general, they all use an image detection system in the visible or infrared range (thermal cameras) to which an analysis system is associated and is associated with the analysis system of the approaching object. Depending on the distance from the turbine, the system implements priority deterrence measures through the acoustic emission of warning sounds, which can be followed, if a change in trajectory is not recorded, the blocking of the turbine.



Example of an active deterrence system: IdentiFlight Camera System – A) the image shows the different Wide Field and high-resolution cameras mounted on a pole and capable of making movements on the vertical axis. C) Photograph of a Golden Eagle correctly classified by IdentiFlight. D) White-headed eagle photograph correctly classified by IdentiFlight

In conclusion, SDOD systems based on images in the visible or infrared range (thermal cameras) have reached a very high technological level, thanks to the adoption of high-resolution video cameras capable of operating with illuminance values below 100 lux and returning high-resolution images. These images are processed by special software, capable of detecting the "objects" in flight, classifying them on the basis of special recognition algorithms and activating a sequence of deterrence mechanisms which, as a last resort, can lead to the shutdown of the turbine.

The SDOD systems have shown high performance in the ability to detect birds in flight, with detectability >80% in a 1 km wide band around the turbine, and excellent classification capabilities (target species such as eagles are correctly classified in 90% of cases). Once an animal approaching the turbine has been identified, SDOD systems reduce flights in the collision risk zone by 50%.

7.1.2 REDUCTION OF IMPACTS FOR BIRD SPECIES IN THE IT9110041 SPA

Considering the importance of the SPA site IT9110041 for bird species, precautions will be taken during the construction phase for the laying of the export cable duct:

- Cfocus on the activities related to the last section of the cable duct during the months **Not** indicated as wintering (October-March) for the species *Mergus serrator* for which the SPA area was established. All mitigation works will also be implemented, such as anti-turbidity pans to prevent excessive dispersion of sediment in the protected area.
- Precise monitoring to assess any impacts deriving from these project phases which will be based on ISPRA guidelines and manuals (in particular Manuals and Guidelines 190/2019), as described in the report *S.7.1_02.*
- The cable duct laying techniques adopted (HDD and laying on support) allow:
    - a lower impact on the environment and living organisms and limited only to the period of the works;
    - the natural recolonization of the installation area after the works;
    - No impact after laying.

7.1.3 REDUCTION OF IMPACTS ON TERRESTRIAL FLORA, FAUNA AND HABITATS

Considering the flora, fauna and terrestrial habitats present in the sites of the Natura 2000 Network, measures will be taken to minimize the disturbance and impact deriving from the construction works. Any dust generated by site activity, as well as acoustic or vibrational impacts will be limited to a period of maximum 27 months and will be continuously monitored during the construction phases to minimize dispersion and the consequent possible impact (according to the Monitoring Plan described in the S.7.1_02). Moreover, after the installation, the state of the places will be restored, respecting the habitats present.

Mitigation measures include the following:

- The removal of the surface soil will be carried out after its conservation and protection;
- The removal of soil will be limited to the areas and strictly necessary. The removed soil will be deposited in a dedicated area of the project site to prevent it from being mixed with the material coming from the excavations;
- he restoration will be carried out using the local soil removed to avoid the development and spread of invasive herbaceous species, removing all the material used, in order to accelerate the natural process of reconstitution of the original vegetation cover;
- During the works, the protection of the plant species present will be guaranteed as much as possible through the adoption of measures to protect the foliage, stems and root systems;
- non-native floristic species will not be introduced into the spontaneous vegetation environment;
- During the decommissioning phase of the plant, the surfaces altered with the construction of the wind farm will be restored to their original conditions

More generally, the following mitigating measures will be adopted during the construction phase:

- measures that minimize noise and vibration emissions through the use of technologically advanced equipment in the sector and equipped with special shielding;
- logistical and operational measures consisting in positioning the construction infrastructures in areas with less visibility;
- movement of means of transport of the land with the use of suitable measures to avoid the dispersion of dust (wetting of the heaps);

- implementation of management regulations such as anti-pollution devices and devices for all construction site vehicles (mufflers, soundproofing systems, etc.) and safety regulations to avoid the risk of accidents;
- excavation, filling and/or possible demolition must be carried out using methods, systems and means of work such as not to create environmental problems, waste deposits, soiling of the road system and disfigurement of the landscape;
- the construction site will be carried out for stretches of 85 meters in length, this extension makes the component of habitat loss of terrestrial fauna negligible; to reduce the dispersion of dust, indications will be given to companies on the road system to be followed to avoid rising dust; tyres that are not particularly worn and that can therefore promote the rise of dust will be checked; to have mitigation measures adopted in a reasonable time to avoid the rise of dust;
- periods of work stoppage during the spring months in order to reduce the disturbance of potentially nesting species during the reproductive period;
- monitoring that makes use of the ISPRA guidelines "Manuals for the monitoring of species and habitats of Community interest (Directive 92/43/EEC) in Italy: Animal species" and "Manuals for the monitoring of species and habitats of Community interest (Directive 92/43/EEC) in Italy: Habitats" as described in the *S.7.1_02*;
- measures limiting noise and vibration emissions as described in the report *ES.2.3.1_02*.

7.1.4 REDUCTION OF CONSTRUCTION SITE AND OPERATING NOISE IN THE MARINE ENVIRONMENT

On the basis of the considerations reported in paragraph 4.2.7 on the impacts on marine fauna and the measurements and modelling carried out as part of the study *ES.2.2_02*, it is desirable that the construction phase of the marine works and the operation phase of the plant be provided for appropriate measures to mitigate noise emitted into the underwater environment.

Potentially harmful noise is caused by noisy work (laying the cable duct in *jet trenching* and the construction of anchorages) and by the operation of the plant itself, which propagates some emissions in the undersea environment, of low frequency and magnitude but potentially harmful to large marine cetaceans.

The possible measures to be introduced refer to the technical report of ISPRA (Higher Institute for Environmental Protection and Research) of 2012 called *"Assessment and mitigation of the acoustic impact due to geophysical prospecting in the Italian seas".*

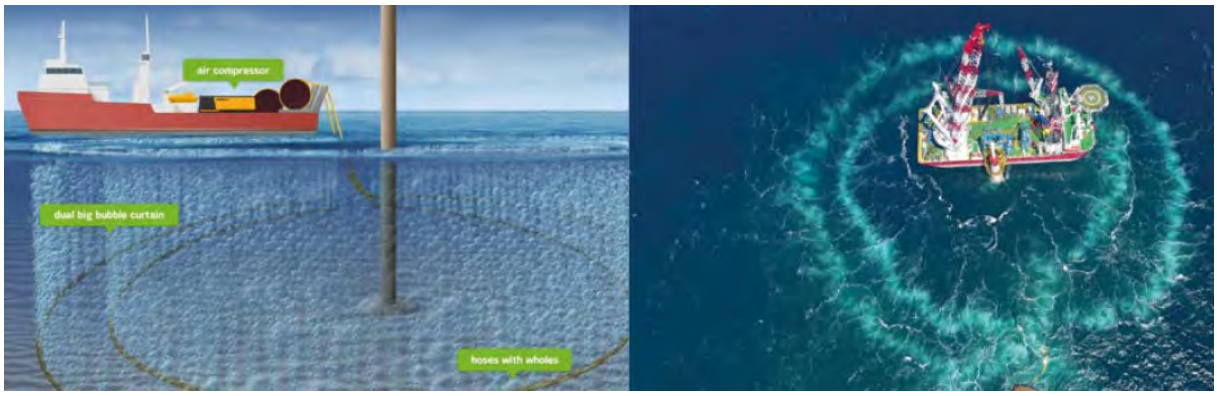
The table below describes the different types of mitigation that can be selected depending on the source of the noise and the environmental context in which the activities that generate the alterations are carried out, on the basis of this scheme some measures to be envisaged in the implementation phase will be evaluated, the actual methods of execution will be defined in detail as part of the executive design.

Tipo	Metodologia	Descrizione
Mitigazione geografica	Restrizioni durante tutto l'anno	Le attività sono limitate tutto l'anno in aree ad alto rischio dove si trovano specie in via di estinzione; in aree dove è nota la presenza massiva di specie vulnerabili e in aree la cui conformazione geografica (baie, canali, canyon) potrebbe rendere gli animali particolarmente sensibili all'inquinamento acustico. Le restrizioni geografiche sono risultate particolarmente efficienti per la salvaguardia dei mammiferi marini.
	Restrizioni stagionali	Le attività possono essere limitate in una certa area per evitare alcuni periodi dell'anno in cui sono presenti specie sensibili. Restrizioni stagionali sono fortemente raccomandate nel caso delle grandi balene migratrici
	Selezione del sito	I mammiferi marini e altri organismi marini possono essere evitati attraverso un'attenta selezione del sito dove operare. Questo tipo di misura funziona molto bene per attività quali le esercitazioni militari che fanno uso di sonar in quanto possono essere pianificate con maggiore flessibilità.
Mitigazione della fonte del rumore	Ingegneria e modifiche meccaniche	La fonte del rumore può essere modificata per ridurre l'impatto sull'ambiente marino. L'alterazione di alcune caratteristiche chiave del suono, quali la frequenza, può risultare molto efficiente in particolare per ridurre l'impatto della navigazione commerciale.
	Riduzione delle attività	Possono essere utilizzate tecnologie alternative e simulatori per ridurre il tempo di attività di una particolare fonte di rumore.
	Contenimento del suono	Esistono sul mercato degli espedienti che funzionano da inibitori del suono (*bubble curtains, blasting mats*, etc) in grado di contenere il suono in un'area ristretta. Generalmente sono utilizzati per attività quali il pile driving.
Mitigazione operativa	Area di sicurezza	Gli operatori possono stabilire un raggio di sicurezza intorno alla sorgente e quindi disattivare o ridurre il rumore nel momento in cui mammiferi marini o altri animali si avvicinano all'area. Le aree di sicurezza sono molto utili nel ridurre il rischio di esposizione dei cetacei ad alti livelli di rumore.
	Suoni di allarme	Sono spesso usati come deterrenti per non far avvicinare i mammiferi marini alla fonte del rumore. La tecnica più comune negli Stati Uniti consiste nel *ramp up* o *soft start*, ovvero la stessa sorgente viene utilizzata per emettere suoni blandi che man mano aumentano di potenza prima dell'inizio dell'attività. Nonostante sia una tecnica largamente utilizzata esiste l'evidenza che alcune specie non si allontanano.
	Restrizioni temporali	L'attività può essere interrotta per alcune ore a causa di cattive condizioni meteo, oscurità, etc. tali da non permettere un efficiente monitoraggio visivo.
	Limiti di potenza	Può essere diminuita la potenza della fonte del rumore, sia temporaneamente che per tutta la durata dell'attività.
	Altri requisiti procedurali	Man mano che aumentano le informazioni inerenti agli effetti del rumore sulla vita marina, aumentano anche le procedure preventive che vengono messe in atto. Ad esempio, le linee guida elaborate dalla NATO per le ricerche sul sonar evidenziano la necessità di pianificare le esercitazioni in maniera tale da assicurare vie di fuga per i mammiferi marini evitando così eventuali spiaggiamenti.

ISPRA 2012 report mitigation table

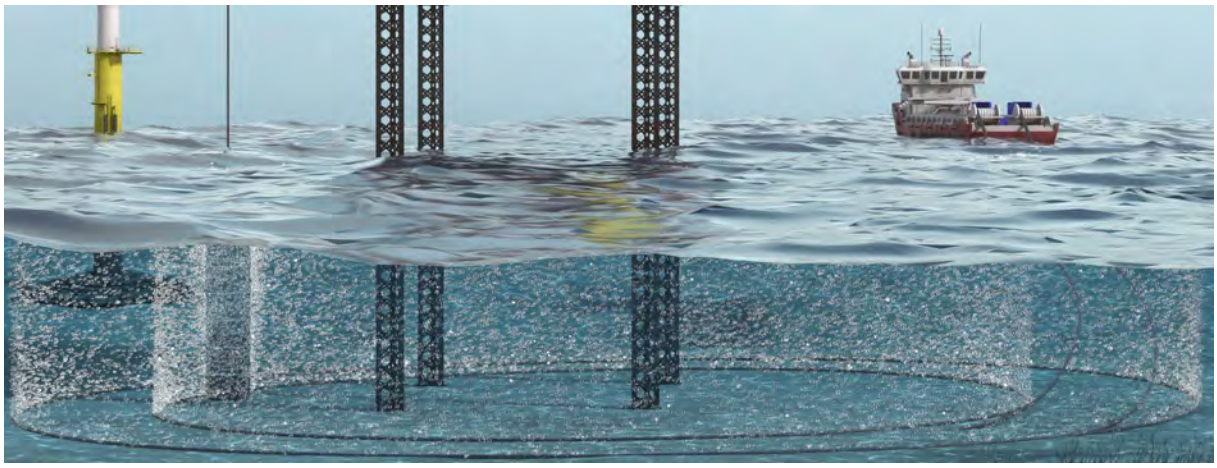
7.1.4.1 Construction phase – noise source mitigation – bubble curtains

The noise containment system consists in the creation of fences around the processing area, consisting of micro-perforated plastic pipes inside which compressed air is injected in a continuous jet during noisy execution (e.g. driving anchor poles), the effect is to create a barrier capable of absorbing underwater noise and preventing hearing loss of any marine mammals in the vicinity.



Noise reduction when running piles Submarines

From reading the data modeled in the *ES.2.2_02* it is possible to highlight that the exclusion zone *"Exclusion Zone"* to be dealt with with the operations of "*Mitigation"* it is in the order of a few hundred meters.



Noise mitigation via bubble curtains

7.1.4.2 Operation phase – mitigation of noise sources – safety areas

From the reading of the values modeled in the *ES.2.2_02* it appears that during the operation phase of the farm, the noise generated by each turbine remains above the ambient noise level only in a locally circumscribed area; this suggests that the noises (tones and creaks and squeaks of the catenaries) are discernible from the background noise only within less than 100 meters of the relative wind turbine. Any behavioral changes caused by exposure to underwater sounds should be short-term and localized in areas adjacent to wind turbines. Therefore, the wind farm would seem not to generate sounds that could cause a danger of damage to the auditory system of marine mammals.

7.2 SUMMARY OF MITIGATION MEASURES FOR HABITATS AND SPECIES OF CONSERVATION IMPORTANCE

A summary table of the mitigation measures envisaged for habitats and species of conservation importance is presented below, reporting indications on the spatial and temporal distribution of mitigations and expected results.

Marine area

PHASE	PROJECT ACTION	SIGNIFICANT PROJECT PRESSURES AND IMPACTS	HABITATS AND MARINE SPECIES CONCERNED	MITIGATION MEASURES	SPATIAL DISTRIBUTION OF MEASUREMENTS	TEMPORAL DISTRIBUTION OF MEASURES	EXPECTED RESULTS
CONSTRUCTION PHASE **(in progress)**	• Cable duct placement • Transport and installation of offshore anchors, wind turbines and electrical substation (SSE)	• Mobilization of marine sediment and possible variations in water column parameters • Possible impact on marine biota (biocoenosis, macrozoobenthos, megafauna, birdlife) • Noise and vibration	• Habitat MB5.534 • Habitats MB1.51 and MC1.5 • *Caretta Caretta* • Cetaceans (*Tursiops truncatus, Stenella coeruleoalba, Grampus griseus*) • Birds (*Calonectris diomedea, Puffinus yelkouan, Larus ridibundus, L. melanocephalus, L. michahellis, Thalasseus sandvicensis, Chlidonias niger, Tridactyla brawl, Mergus serrator, Gavia stellata, Melanitta fusca, M. nigra, Podiceps auritus, P. cristatus, P. nigricollis*)	1. Use of anti-turbidity creams 2. Type of installation and minimally invasive solutions 3. Use of systems to reduce propagation and noise level and certified mammal observers 4. Avian radars 5. No work in delicate phases of the life cycle marine fauna and birdlife 6. Compliance with EU regulations regarding the prevention of the spread of alien species by the vessels involved (International Convention for the Control and Management of	1. Along the cable duct positioned in jet trenching and HDD 2. Installation in HDD on habitat MB5.534 and resting on MB1.51 and MC1.5 3. Throughout the project area (wind farm and cable duct) 4. In the wind farm area 5. Throughout the project wind farm (wind farm and cable duct) 6. In the wind farm area and in the ports involved	1. During the positioning phase of the cable duct in jet trenching and HDD 2. During cable duct laying 3. During the laying of the cable duct, the driving phase of the beaten piles and in the construction phases of the wind farm 4. During the installation phase of wind turbines 5. During the construction phases 6. During the construction phases	1. Significant reduction of sediment plume 2. Not significant negative impact on habitat + increase in hard colonizable surface 3. Reduction of noise emissions and reduction of impacts on megafauna 4. Significantly reduce the risk of bird collision 5. Significant reduction of impacts on reproductive organisms 6. Significant reduction in the dispersal of alien species

				Ships' Ballast Water and Sediments, BWM Convention)			
OPERATION PHASE (post operam)	Operation of wind turbines and offshore SSE	• EMC emissions, noise and vibration • Possible impacts on marine birds and marine organisms	• *Caretta caretta* • Cetaceans (*Tursiops truncatus, Stenella coeruleoalba, Grampus griseus*) • Birds (*Calonectris diomedea, Puffinus yelkouan, Larus ridibundus, L. melanocephalus, L. michahellis, Thalasseus sandvicensis, Chlidonias niger, Tridactyla brawl, Mergus serrator, Gavia stellata, Melanitta fusca, M. nigra, Podiceps auritus, P. cristatus, P. nigricollis*)	1. Avian radars for blade movement interruption 2. Safety areas and cetacean and turtle detection systems 3. Compliance with EU regulations regarding the prevention of the spread of alien species by the vessels involved (International Convention for the Control and Management of Ships' Ballast Water and Sediments, BWM Convention)	1. In the wind farm area 2. In the wind farm area 3. In the wind farm area and in the ports	1. Throughout the life cycle of the plant 2. Throughout the life cycle of the plant 3. Throughout the life cycle of the plant	1. Significant reduction in the risk of bird collisions 2. Significant reduction in the risk of collision of marine megafauna 3. Significant reduction in the dispersal of alien species
DECOMMISSIONING PHASE (post operam)	Unmooring of wind turbines, removal of the offshore substation and removal of cable duct	• Mobilization of marine sediment and possible variations in water column parameters • Possible impact on marine biota (biocoenosis, macrozoobenthos, megafauna, birdlife) • Detachment of biofouling organisms that	• Habitat MB5.534 • Habitats MB1.51 and MC1.5 • *Caretta Caretta* • Cetaceans (*Tursiops truncatus, Stenella coeruleoalba, Grampus griseus*) • Birds (*Calonectris diomedea, Puffinus yelkouan, Larus ridibundus, L. melanocephalus, L. michahellis, Thalasseus*	1. Use of anti-turbidity creams 2. Use of systems to reduce propagation and noise level and certified mammal observers 3. Avian radars 4. No work in delicate phases of the life cycle marine fauna and birdlife	1. Along the cable duct 2. Throughout the project area (wind farm and cable duct) 3. In the wind farm area 4. Throughout the project area (park and cable duct) 5. In the wind farm area and in the ports involved	1. During the cable duct removal phase 2. During the removal of offshore SSE, wind turbines and cable ducts 3. During the removal phase of wind turbines 4. During the decommissioning phases	1. Significant reduction of sediment plume 2. Reduction of noise emissions and reduction of impacts on megafauna 3. Significantly reduce the risk of bird collision 4. Significant reduction of impacts on

		have colonized surfaces • Noise and vibration	*sandvicensis, Chlidonias niger, Tridactyla brawl, Mergus serrator, Gavia stellata, Melanitta fusca, M. nigra, Podiceps auritus, P. cristatus, P. nigricollis*)	5. Compliance with EU regulations regarding the prevention of the spread of alien species by the vessels involved (International Convention for the Control and Management of Ships' Ballast Water and Sediments, BWM Convention)		5. During the decommissioning phases	reproductive organisms 5. Significant reduction in the dispersal of alien species

Land area

PHASE	PROJECT ACTION	SIGNIFICANT PROJECT PRESSURES AND IMPACTS	TERRESTRIAL HABITATS AND SPECIES CONCERNED	MITIGATION MEASURES	SPATIAL DISTRIBUTION OF MEASUREMENTS	TEMPORAL DISTRIBUTION OF MEASURES	EXPECTED RESULTS
CONSTRUCTION PHASE (in progress)	• Burying of the cable duct and intermediate Joint Bays • Construction of electrical power factor correction and user substation • Construction of the NTG electrical substation • Construction of the pit joints in the landing area	• Soil mobilization, dust raising and emission of chemicals into the air and soil • Possible impact on terrestrial biota (habitats, flora and fauna) • Noise and vibration	• Habitats 1150*, 1420, 1310, 2110, 3150 • Flora and fauna of conservation importance present in the IT9110038 sites and IT9110005+ birds of conservation importance sighted during spring and autumn monitoring (see *ES.9.1_01*)	1. Type of cable duct laying in HDD (minimally invasive solution) 2. Continuous monitoring of sludge pressure, installation of geotextile barriers, fluid packaged by mixing guam gum with water 3. Periodic wetting of the construction site tracks and heaps of materials in storage; covering of vehicles used for the transport of powdery materials both loaded and empty by means of tarpaulins; the areas of fixed construction sites with a pitch intended for washing the wheels of vehicles leaving the construction site area; constant washing and wet sweeping of the streets adjacent to	1. In the landing area, laying of the HDD cable conduit 2. In the landing area, laying of the HDD cable conduit 3. On fixed and mobile construction sites of project works 4. On fixed and mobile construction sites of project works 5. On fixed and mobile construction sites of project works	1. During the HDD laying phase of the export marine cable duct 2. During pilot drilling, boring the hole and inserting the cable duct into HDD 3. During all fixed and mobile construction works 4. During all fixed and mobile construction works	1. No negative impact on the habitats of the IT9110038 and IT9110005 sites 2. Significantly reduce the risk of soil and biota contamination 3. Significantly limit the raising and spread of dust and pollutant emissions 4. Significant reduction of impacts on local

	• HDD laying of the cable duct in the landing area			the construction site and of the first stretches of public roads leaving these areas; constant maintenance of the vehicles in place, with particular regard to the regulation of engine combustion to minimize emissions of pollutants at the exhaust (periodic exhaust gas check in accordance with the law); use of vehicles with low emission impact and falling within the discharge regulations provided for by the European Union 4. Conservation and protection of the removed surface soil and restoration of the original vegetation cover using the removed local soil to avoid the development and spread of invasive herbaceous species; protection of habitats, flora and fauna present; non-native species will not be introduced into the environment; periods of downtime during the months and reproductive periods of the fauna species; The excavation, filling and demolition works must be carried out using methods, systems and means of work such as not to create environmental problems, waste deposits, soiling of the road system and disfigurement of the landscape. 5. Use of construction machinery and equipment that complies with Directive 2000/14/EC and is subject to constant maintenance; organization of the hours of access	6. On fixed and mobile construction sites of project works	5. During all fixed and mobile construction works 6. During all fixed and mobile construction works	habitats, flora and fauna 5. Significant reduction in noise and vibration emission 6. Significant reduction in waste dispersion

				to the construction site by means of transport, in order to avoid the concentration of the same during peak hours. Management of road surface demolition operations, with temporal coordination of activities during the most sensitive periods; development of a work program that avoids situations of simultaneous use of several machines with high noise emissions in neighboring areas; adoption of sound-absorbing panels to be connected to the construction site fence, certified in the laboratory according to the UNI EN ISO 140-3 2066 and UNI EN ISO 717-1 1997 tests; use of shock-absorbing materials or layers of insulation between equipment and the ground; control of vehicle speeds and routes; Constant noise and vibration monitoring 6. On-site reuse, in the highest possible quantity, of the excavated material, in particular the surface vegetal soil layer; transfer of excavated material, which is not reusable on site, to an authorised landfill in accordance with current regulatory provisions or to other construction sites; collection and separate disposal of waste produced by construction site activities (packaging, timber, iron, etc.).			
OPERATION PHASE	• Operation of the power factor	There are no significant negative	-	-	-	-	-

(post operam)	correction and user electrical substation • Operation of the NTG electrical substation • Activation of the pit when arriving in the landing area	impacts at this stage for these project works					
DECOMMISSIONING PHASE **(post operam)**	User works that will be decommissioned	• Soil mobilization, dust raising and emission of chemicals into the air and soil • Possible impact on terrestrial biota (habitats, flora and fauna) • Noise and vibration	• Habitats 1150*, 1420, 1310, 2110, 3150 • Flora and fauna of conservation importance present in the IT9110038 and IT9110005 sites + birds of conservation importance sighted during spring and autumn monitoring (see *ES.9.1_01*)	1. Periodic wetting of the construction site tracks and heaps of materials in storage; covering of vehicles used for the transport of powdery materials both loaded and empty by means of tarpaulins; the areas of fixed construction sites with a pitch intended for washing the wheels of vehicles leaving the construction site area; constant washing and wet sweeping of the streets adjacent to the construction site and of the first stretches of public roads leaving these areas; constant maintenance of the vehicles in place, with particular regard to the regulation of engine combustion to minimize emissions of pollutants at the exhaust (periodic exhaust gas check in accordance with the law); use of vehicles with low emission impact and falling within the discharge regulations provided for by the European Union 2. Conservation and protection of the removed surface soil and restoration	1. In the construction sites of the user works that will be decommissioned 2. In the construction sites of the user works that will be decommissioned 3. In the construction sites of the user works that will be decommissioned 4. In the construction sites of the user works that will be decommissioned	1. During the decommissioning phases 2. During the decommissioning phases 3. During the decommissioning phases 4. During the decommissioning phases	1. Significantly limit the raising and spread of dust and pollutant emissions 2. Significant reduction of impacts on local habitats, flora and fauna 3. Significant reduction in noise and vibration emission 4. Significant reduction in waste dispersion

				of the original vegetation cover using the removed local soil to avoid the development and spread of invasive herbaceous species; protection of habitats, flora and fauna present; non-native species will not be introduced into the environment; periods of downtime during the months and reproductive periods of the fauna species; The excavation, filling and demolition works must be carried out using methods, systems and means of work such as not to create environmental problems, waste deposits, soiling of the road system and disfigurement of the landscape. 3. Use of construction machinery and equipment that complies with Directive 2000/14/EC and is subject to constant maintenance; organization of the hours of access to the construction site by means of transport, in order to avoid the concentration of the same during peak hours. Management of road surface demolition operations, with temporal coordination of activities during the most sensitive periods; development of a work program that avoids situations of simultaneous use of several machines with high noise emissions in neighboring areas; adoption of sound-absorbing panels to be connected to the construction site fence, certified in the laboratory according to the UNI EN ISO 140-3 2066 and UNI EN			

				ISO 717-1 1997 tests; use of shock-absorbing materials or layers of insulation between equipment and the ground; control of vehicle speeds and routes; Constant noise and vibration monitoring 4. On-site reuse, in the highest possible quantity, of the excavated material, in particular the surface vegetal soil layer; transfer of excavated material, which is not reusable on site, to an authorised landfill in accordance with current regulatory provisions or to other construction sites; collection and separate disposal of waste produced by disposal activities (packaging, timber, iron, etc.).			

8 ENVIRONMENTAL MONITORING PLAN

In this section, please refer to the contents of the Environmental Monitoring Plan drawn up for the Nemetun Island wind farm project, drawn up "*SIA_S.7.1_02 "*.

In accordance with the technical indications contained in the "Guidelines for the preparation of the Environmental Monitoring Project (PMA) of works subject to EIA procedures (Legislative Decree 152/2006 and subsequent amendments, Legislative Decree 163/2006 and subsequent amendments), the purpose of the proposed monitoring is to of:

- verify the environmental reference scenario used in the Environmental Impact Assessment document and determination of the starting environmental conditions (before operam);
- verify the actual occurrence of the impact forecasts identified in the document of VIA by means of the detection of Parameters of reference for the various environmental components (during construction and after operam);
- correlate the various stages of monitoring, ante operam, corso d'opera and post operam, to estimate the evolution of the situation environmental;
- identify any unforeseen or greater environmental impacts than the forecasts of the EIA document and plan any measures Corrective;
- communicate the results of previous activities (to the authorities responsible for control and public).

8.1 MONITORING PLAN REQUIREMENTS

The Plan of Monitoring Represents a document who Albeit with One Their autonomy must ensure full consistency with the contents of the EIA document relating to the determination of the state of the environment in the reference scenario prior to implementation of project (ante operam) and to forecasts of Impacts Environmental Significant deriving from the realization (in course of work and post operam). The Plan of Monitoring must therefore meet the following Requirements:

- must have as its object the planning of the monitoring of environmental components for which significant impacts have been identified, in line with what has been documented in the proceedings of ROAD and be commensurate to significance of the above Impacts;
- must foresee the coordination and Integration with the activity of monitoring Carried out by the authorities institutionally responsible for monitoring the quality of the environment, which operate in the field of protection and use of resources Environmental;
- it must contain the spatio-temporal planning of monitoring activities with definition of the tools and methods of detection consistent with the current legislation and use of validated methodologies with proven rigor technical-scientific;
- it must identify parameters and indicators that are easily measurable and representative of the various environmental situations;
- must define the number, types and spatial distribution of the measurement, justifying the choice based on interference and sensitivity/criticality environment concerned and planning the frequency of measures in a proportionate manner to the components to be monitor;
- must provide for the periodic and scheduled return of information and data structured and georeferenced, easy to use and update.

8.2 TIME EXTENSION OF THE MONITORING PLAN

8.2.1 PURPOSE OF PRE-CONSTRUCTION MONITORING

The monitoring Doors operam Has the purpose of furnish a picture comprehensive on state of environmental components, mainly with the aim of of:

- define the physical state of the places, the characteristics of the natural and anthropic environment existing before the start of the activity;
- represent the situation of departure from use Which one term of comparison for evaluate the outcome of the subsequent surveys relating to the phase in progress and the post-construction phase operam.

8.2.2 PURPOSE OF MONITORING DURING CONSTRUCTION

The monitoring in course of work Has the purpose of allow the control of evolution of environmental parameters influenced by construction site activities and material handling, at the points Subject receptors per major impact Identified also on base of models of simulation. This monitoring has the purpose of:

- analyze the evolution of the parameters compared to the pre- operam;
- control specific situations, in order to adapt the conduct of the Work.

The following paragraphs describe the monitoring that will be carried out during the execution of the processes and in relation to the various components Environmental.

They will be coordinated with the execution times expected for the complete execution of the works, as reported in the timetable of activities.

8.2.3 PURPOSE OF POST-CONSTRUCTION MONITORING

Post-construction monitoring includes the pre-operation and operation phases of the work and must begin strictly not before the complete dismantling and restoration of the construction site areas. Such monitoring Will Aimed per comparison of indicators Defined In state Doors and post operam and to the control of the levels of admissibility.

8.3 IDENTIFICATION OF THE ENVIRONMENTAL COMPONENTS SUBJECT TO MONITORING

Below is a table summarizing the project actions that generate significant environmental impacts on the individual environmental components that must therefore be monitored:

PHASE	PROJECT ACTION	SIGNIFICANT IMPACTS	ENVIRONMENTAL COMPONENT	MITIGATION MEASURES
In progress CONSTRUCTION PHASE	• positioning of submarine cable ducts, • transport and installation of wind turbines and offshore electrical substation,	• Mobilization of marine sediment (turbidity) and possible variations in water column parameters, • Possible impact on marine biota (biocoenosis, macrozoobenthos, megafauna, birdlife)	• Atmosphere; • Water environment; • Biodiversity; • Physical agents • Soil and subsoil • Landscape and cultural heritage	• Anti-turbidity creams; avoid work during the bathing season • Less invasive type of marine cable duct laying in the valuable areas crossed by the cable duct • Use of systems to reduce propagation

	• burial of land cable ducts and Joint Bays, • Construction of substation and onshore electrical substation	• Noise and vibration emitted both onshore and offshore • Onshore dust lifting and chemical emission		and noise level such as less noisy vessels • Mammal observers certified to spot cetaceans and other organisms • Reduce or cease work in the breeding seasons of endangered marine and terrestrial species • Avian radars • Preventive measures to reduce the rise of dust in the atmosphere and to reduce terrestrial noise
Post operam **OPERATION PHASE**	• Operation of the wind turbines of the offshore plant • Operation of the offshore electrical substation • Operation of the onshore electrical substation and substation	Impact on birds and marine organisms	• Biodiversity • Physical agents	• Avian radars • Security areas and detection systems (radar-sonar or remote sensing)
Post operam **DECOMMISSIONING PHASE**	• Unanchoring wind turbines • Removal of the offshore substation and submarine cable ducts • If foreseen, decommissioning of onshore works	• Mobilization of marine sediment (turbidity) and possible variations in water column parameters • Possible impact on marine biota (biocoenosis, macrozoobenthos, megafauna, birdlife) • Noise and vibrations deriving from onshore and offshore decommissioning works • Onshore dust lifting and chemical emission	• Water environment; • Biodiversity; • Physical agents	• Anti-turbidity creams; avoid work during the bathing season • Use of systems to reduce propagation and noise level such as mitigated hammers and bubble curtains, less noisy boats • Mammal observers certified to spot cetaceans and other organisms • Reduce or cease work during the breeding seasons of endangered marine species; • Avian radars • Preventive measures to reduce the rise of dust in the atmosphere

				and to reduce terrestrial noise

On the basis of the impact assessment contained in the SIA and in relation to the Ministerial Guidelines, the environmental components for which monitoring will be necessary are:

- Atmosphere;
- Water environment;
- Soil and subsoil;
- Biodiversity;
- Physical agents;
- Landscape and cultural heritage.

Monitoring will take place for all project works, both offshore and onshore, that may generate impacts on the environment, please refer to the documents *S.7.1_02 and S.7.2_02.*

Two tables are presented below, the first summarizing both onshore and offshore monitoring activities, the second integrating the project actions proposed in the environmental monitoring plan to be implemented in the construction, operation and decommissioning phases concerning the offshore compartment and how these are able to meet the provisions of Legislative Decree 13/10/2010, n.190.

8.4 SUMMARY OF MONITORING ACTIVITIES

Below is a summary of the monitoring activities for each environmental component considered, with an indication of the frequency and type of investigation that will be carried out.

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
ATMOSPHERE							
Air	Physico-chemical investigations (meteoclimatic, O_3, PM2.5, PM10, NO_x, PTS and atmospheric deposition fluxes on the ground)	13 Stations onshore works onshore	1 time during the year preceding the start of the works	During specific construction site activities that involve significant negative effects on the air	1 time after the end of the work. During the life cycle of the plant it is not necessary due to the absence of significant negative impacts	During specific construction site activities that involve significant negative effects on the air. At the end of the work 1 time	Weather and climate data provided by the Decentralized Functional Center of the PC Section of the Puglia Region, annual monitoring by ARPA Puglia Second Legislative Decree 155/10, Legislative Decree 152/06
WATER ENVIRONMENT (GROUNDWATER)							
Groundwater and related water resources	Qualitative and quantitative status, hydrographic characteristics and hydrological and hydraulic regime (piezometry, flow rate, physical characteristics, T air, T water, O content$_2$, specific conductivity, nitrates, NH_4+, turbidity, chemical parameters-macrodescriptors and trace elements),	11 points where HDD is carried out 3 points at the base site	6 months before the construction site is set up: - Quantitative status of continuous surveys throughout the area - Quality status: 3 times	Daily, weekly, monthly periodical according to survey	Quantitative status: monthly for the first 6 months from completion then semi-annually until restoration of pre-construction conditions Qualitative status: quarterly for the first 6 months from completion, then half-yearly until the restoration of pre-construction conditions and the assessment of the absence of significant effects on the	Daily, weekly, monthly periodical according to survey during the works, then quarterly in the year after the end of the works	Analytical and visual investigations according to ISPRA manuals and guidelines and monitoring ARPA Puglia, US-EPA, IRSA, UNICHIM and ASTM, Legislative Decree 152/2006, Legislative Decree 30/2009

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
	riverbed profile, waste, oils, lubricants, pollutants				groundwater environment		
WATER ENVIRONMENT (MARINE WATERS)							
Water column	Temperature, density, salinity, pH, fluorescence, dissolved oxygen, total suspended solids, speed and flow rate of currents, phytoplankton, mesozooplankton and macrozooplankton	Pre-construction phase: 11 stations along the cable duct and in the wind farm area In progress and after decommissioning: 3 stations along the HDD cable duct and support; stations positioned, along transects orthogonal to the laying of the jet trenching cable duct, at an increasing distance from the trench (200 m, 500 m, 2 km and 5 km); in the wind farm area within the area where the beaten poles are positioned Operational post-operam: 10 mede gateway stations	Surveys during the year prior to the start of the works: daily for 10 days each season with multi-parameter probe and water sampling; 1 time/season with current meters	Daily, during specific site activities that may cause significant negative effects on the water column	Half-yearly for all parameters until the initial conditions are restored (ante operam) or exclusion of medium/long-term impacts	Daily, during specific site activities that may cause significant negative effects on the water column Then 1 time/semester until the restoration of the conditions before the construction or exclusion of medium/long-term impactsand	Multi-parameter probe, wireless sensors, current meter, water sampling with Niskin bottle, WP2 screen, with 200 µm mesh gap, visual census According to Legislative Decree 152/06, Art. 11, Legislative Decree 190/2010, Legislative Decree 172/15, Legislative Decree 219/10, Ministerial Decree 173/16, Ministerial Decree 260/2010, ISPRA Manuals and Guidelines, MLG 206/2023
Marine sediments	Particle size, Moisture percentage, Specific gravity, TOC, Total nitrogen, Total phosphorus, Total organic matter,	51 stations along the cable duct and in the wind farm area	1 time/semester during the year prior to the start of the construction phase	No sampling activities are planned during the construction site activities while sampling will be carried out at the	Along the cable duct 1 time/semester for 3 years and in the wind farm area 1 time/semester for 5 years or until the restoration of pre-	No sampling activities are planned during the decommissioning activities. At the end of the works, 1 time/semester for 5	Van Veen Bucket Sampling and Analytical Characterization According to Legislative Decree 152/06,

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
	Metals, PAHs, Pesticides, Hydrocarbons C> 12 and C<12, PCBs, Organotin compounds, faecal and total coliforms, faecal streptococci, ecotoxicological tests (3 sample test species)			end of the project implementation in the pre-operation phase	construction conditions	years or until the initial conditions are restored (ante operam)	Ministerial Decree 24.01.1996, Ministerial Decree 260/2010 and Legislative Decree 219/2010, Reg. 2455/2001/EU, Ministerial Decree 173/2016, UNI/CEN/ISO and EPA analytical methods, ICRAM 2001 manuals and subsequent updates
Biota	Benthic community of movable bottoms (analysis of the structure of the community with calculation of structural indices) and reporting of sensitive species and non-indigenous	51 stations along the cable duct and in the wind farm area	1 time/semester during the year prior to the start of the works (in spring and autumn due to the seasonality of the biota)	No sampling activities are planned during the construction site activities while sampling will be carried out at the end of the project implementation in the pre-operation phase	along the cable duct 1 time/semester for 3 years and in the wind farm area 1 time/semester for 5 years or until the restoration of pre-construction conditions	No sampling activities are planned during the decommissioning activities. At the end of the works, 1 time/semester until the restoration of the pre-construction conditions	Van Veen Bucket Sampling and Taxonomic Characterization According to Legislative Decree 152/06, Ministerial Decree 24.01.1996, Ministerial Decree 260/10, Legislative Decree 219/10, ICRAM 2001 manuals and subsequent updates, ISO/DIS 16665 of 2003
Morphology of the seabed	Biocenotic and bathymetric cartography, morphology, geological status and stratigraphy of the seabed	Parallel routes on the cable duct and around 1 km and routes covering the wind farm area	1 time in the year prior to the start of the construction phase	1 time at the end of construction site activities	For bathymetry 2 times/3 years, for morphology and stratigraphy of the seabed 2 campaigns after 3 and 6 years from the end of the works	1 time at the end of the disposal activities	Multibeam, Side Scan Sonar and Sub Botton Profiler surveys According to MSFD, 2008, Legislative

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
							Decree 152/06
WATER ENVIRONMENT (BATHING WATER)							
Salt water	*Escherichia coli* and intestinal enterococci; short-lived organic and inorganic pollutants or from abnormal situations; cyanobacterial or macroalgae proliferation, phytoplankton (*O. cf ovata*) or marine phytobenthos	20 stations along the coastline	Monthly sampling during the bathing season	Monthly monitoring during the main construction phases that coincide with possible alterations in the quality of bathing water	Six-monthly monitoring for 3 years or until the initial conditions are restored (ante operam)	Monthly monitoring during the main phases of removal of offshore works that may result in changes in bathing water quality conditions Then six-monthly monitoring for 3 years or until the initial conditions are restored (ante operam)	Sampling and analytical characterization according to ISPRA guidelines ARPA Puglia report for bathing water According to Ministerial Decree of 19 April 2018 amending the Ministerial Decree of 30/3/2010, Legislative Decree 152/06
SOIL AND SUBSOIL							
Soil, earth, excavated material	Soil subtraction, volume of excavated earth, landslides and erosion, chemical contaminants (As, Cd, Co, Ni, Pb, Cu, Zn, Hg, Cr tot, Cr VI, C>12 hydrocarbons, asbestos, BTEX, PAHs)	Pre-construction phase: 73 stations onshore onshore Phase in progress and post operam (decommissioning): near the various active construction sites, near the HDDs and/or crossing points of the hydrographic network, at least one monitoring point every 10 km of the route Post-construction phase (operation):	1 time in the year prior to the start of the construction phase	Quarterly for the entire duration of the construction site and during the salient processing phases, with control of the storage of the excavated material	Not necessary	During the removal phases of onshore works that may lead to significant adverse effects	Sampling and analytical characterization, spill detection sensors, remote control and telemetry systems According to Presidential Decree 120/2017, Legislative Decree 152/06

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
		not necessary					
BIODIVERSITY (MARINE ENVIRONMENT)							
Hard bottom habitat – habitat MB1.51 and MC1.5	Morphobathymetry, potential habitat extension, area of presence, abundance and condition of structuring species and population structure	4 200 m long transects	1 time/semester in the year preceding the start of the construction phase (in spring and autumn due to biota seasonality)	During the laying phases of the cable duct that may have significant negative effects on the biocoenosis, respecting the seasonality of the biota	1 time immediately after the installation of the wind farm and then 1 time/semester until the restoration of the initial conditions (ante operam)	During the phases of removal of the cable duct that may cause significant negative effects on the biocoenosis and then 1 time immediately after the installation of the wind farm and then 1 time/semester until the restoration of the initial conditions (ante operam)	Side Scan Sonar, Multibeam, Sub Botton Profiler and ROV (Remotely Operated Vehicle) and scientific scuba diving, image analysis According to Legislative Decree 152/06, Legislative Decree 190/2010, SNPA Guidelines 191/2020, SNPA Guidelines 190/2019
Seagrass habitats – habitat MB5.534	Morphobathymetry, grassland extension, bundle density, macrozoobenthos characterization, physico-chemical parameters, water column, grain size, nutrients and sediment contaminants	4 transects 200 m long	1 time in the year prior to the start of the construction phase	During the laying phases of the cable duct that may have significant negative effects on the biocoenosis, respecting the seasonality of the biota	1 time immediately after the installation of the wind farm and then until the initial conditions are restored	During the phases of removal of the cable duct that may cause significant negative effects on the biocoenosis and then 1 time immediately after the installation of the wind farm and then after 3 years	Side Scan Sonar, Multibeam, Sub Botton Profiler and ROV (Remotely Operated Vehicle) and scientific scuba diving, analytical and taxonomic analysis According to Legislative Decree 152/06, Legislative Decree 190/2010, Manuals and Guidelines 190/2019

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
Fish and invertebrates of commercial interest	Census of species present in taxonomic and quantitative terms Presence of chemical contaminants (PAHs, PCBs, pesticides, organotin compounds and metals) in the tissues of these organisms	10 stations along the cable duct and in the wind farm area	In the year before the start of the construction phase	Quarterly frequency	1 time after the end of the works and after 3 years from the start of the operation phase	Quarterly frequency during the works, at the end of the works 1 time and then 1 time/year for 3 years	Acoustic monitoring, visual observation, sampling, underwater surveys and implementation through dedicated software, analytical analysis According to Regulation 1881/2006 and subsequent amendments, Legislative Decree 190/2010, ISPRA and SNPA manuals and guidelines
Marine fauna (reptiles and mammals)	Presence and abundance of individuals in the wind farm area and along the cable duct For nesting *C. caretta*: abundance of females, distribution of nests, success of hatching eggs in nests	26 linear transects in the wind farm area and along the entire cable duct Monitoring on the landing beach	Seasonal monitoring in the year prior to the start of the works and 1 monitoring during turtle nesting	Continuous monitoring during offshore installations, especially starting 30 minutes before the start of noisy work	3 campaigns respectively after 6, 12 and 18 months from the start of plant operation then annual for at least 5 years Annual monitoring for nesting for the first 5 years	Continuous monitoring during offshore deinstallations, especially starting 30 minutes before the start of the noisiest work. At the end of the works, six-monthly monitoring for the first 2 years and then annual monitoring for 3 years	Visual and acoustic surveys and implementation through dedicated software According to Legislative Decree 190/2010, ACCOBAMS, Manuals and Guidelines 190/2019, ISPRA guidelines (2013), (UNEP/MAP, 2017)

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
Avifauna	Presence, abundance, spatial and temporal distribution, migratory routes	• 26 linear transects in the wind farm area and along the entire cable duct • 6 fixed stations on the ground • In the area of the SPA affected by the cable duct	Seasonal monitoring in the year prior to the start of the works	During the installation of wind turbines and the laying of offshore power lines	Semester for a minimum period of 3 years	During the decommissioning phases of wind turbines and offshore power lines, thereafter quarterly for a period of 3 years	Visual and acoustic surveys and implementation through dedicated software According to Legislative Decree 190/2010, Manuals and Guidelines 190/2019, LIPU, 2009, Manuals and Guidelines 142/2016, Manuals and Guidelines 141/2016
Alien species	Presence, abundance of organisms, temperature, salinity, transparency and particle size	• 9 Stations in the wind farm area • Ports of Taranto and Brindisi	1 sampling in the year before the works	Quarterly monitoring of the port area and continuous monitoring of the vessels	- six-monthly monitoring of the abiotic and biotic components in the wind farm, in the first two years after the wind farm is put into operation, then 1 time/year - in port areas when maintenance activities are required	Quarterly monitoring of the port area and continuous monitoring of the vessels	Visual surveys, sampling following ISPRA and SNPA protocols According to Legislative Decree 190/2010
BIODIVERSITY (TERRESTRIAL ENVIRONMENT)							
Habitat, flora and fauna	Taxonomic recognition and areal cover of habitats and plant and animal species	500 m buffer area for long/near side onshore works	1 time in the year prior to the start of the construction phase	During the laying phases of onshore works that may cause significant negative effects on fauna	1 time/year for at least 3 years	During the removal phases of onshore works that may cause significant negative effects on fauna and then 1 time/year for at least 3 years	Visual surveys and implementation through dedicated software According to Manuals and Guidelines

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
							142/2016, Manuals and Guidelines 141/2016
PHYSICAL AGENTS							
Noise at sea	Qualitative (biological and anthropogenic signals) and quantitative (frequency bands and sound pressure levels, SPL) description	Pre-construction phase: 6 wind farm area and cable duct stations Phase-in-progress and post-construction of decommissioning: mobile detection stations (PAM/MMO surveys), positioned in the Exclusion Zone (within the generic threshold of 120 dB re 1 µPa) Operational post-operam: sensors on some gateway beacons	1 time in the year prior to the start of the works. 15 days, even non-contiguous, chosen according to suitable weather and sea conditions, distributed over the 60 days prior to the start of the works	Throughout noisy machining Survey for monitoring sensitive animals	Recovery/redeposition cycle every three months for at least 12 months and continuously where wireless sensors are installed Survey for monitoring sensitive animals	Throughout noisy machining Survey for monitoring sensitive animals	Fixed type recorders on acoustic buoys and mobile (PAM), wireless sensors Visual surveys Second ISPRA 2011 guidelines
Ground noise	Quantitative description (equivalent continuous A-weighted sound pressure level; noise trends in the different time bands both day and night; spectral analysis to identify the main sound sources) Qualitative description (sources	Pre-construction phase, in progress and post-construction of decommissioning: stations at the 14 nearest receptors (rural houses, scattered houses and accommodation activities); post-construction phase of operation:	1 time in the year preceding the works: 1-2 weeks before the start of the works for the duration of 1 hour in the 7-17 time slot	A single monitoring in conjunction with the passage of the construction site near the receivers and electrical substations to be carried out during working hours lasting 10 hours	1 time after the start-up of the wind farm in the electrical substations of Cerignola	A single monitoring in conjunction with the passage of the construction site near the receivers and electrical substations to be carried out during working hours lasting 10 hours	Microphones and R1 and R2 method Second Prime Ministerial Decree 14.11.1997 and Law No. 3/2022, UNI standards, EEC Directives, ISO standards

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
	of anthropogenic noise and identification of sensitive terrestrial species)	stations at the sensitive receptor near the electrical substation and the extension of the NTG station and overhead connections					
Vibrations at sea	RMS Acceleration and RMS	Pre-construction phase: 6 wind farm area and cable duct stations Phase-in-progress and post-construction of decommissioning: mobile detection stations (PAM/MMO surveys), positioned in the Exclusion Zone (within the generic threshold of 120 dB re 1 µPa) Operational post-operam: sensors on some gateway beacons	1 time in the year prior to the start of the works	For the entire duration of noisy work during working hours Survey for monitoring sensitive animals	Recovery/redeposition cycle every three months for at least 12 months and continuously where wireless sensors are installed Survey for monitoring sensitive animals	For the entire duration of noisy work during working hours Survey for monitoring sensitive animals	Accelerometers on wireless sensors Visual surveys
Vibrations on the ground	RMS Acceleration and RMS	14 residential sensitive receptors at a minimum distance from the forward edge where present	1 time in the year preceding the works: 1-2 weeks before the start of the works for the duration of 1 hour in the 7-17 time slot	1 time at the passage of the construction site at the nearest receptor	Not required due to no significant negative impacts	1 time at the passage of the construction site at the nearest receptor	Sensors and method V4, According to UNI 9614/2017, ISO 10811-1 and ISO 10811-2
Electromagnetic fields at sea	Magnetic fields Detection of susceptible species	9 stations along the cable duct and in the wind farm area	1 time in the year prior to the start of the works (one week	Not required due to no significant negative impacts	Every six months for the first 3 years continuously for a week	Not required due to no significant negative impacts	Sensors for both magnetic and electric fields

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
			continuously)		Survey for monitoring sensitive animals		Visual surveys According to DIRECTIVE 2008/56/EC, DECREE of 15 February 2019, CEI standards
Electromagnetic fields on the ground	Non-ionizing radiation	Pre-construction phase: at high voltage cable ducts and electrical substations in the area of the project works Post-construction phase of operation: 9 stations near the project works that generate EMF	1 time in the year prior to the start of the works: a continuous weekly monitoring in the weeks prior to the start of the works	Not required due to no significant negative impacts	Every three months for a week continuously for at least 12 months	Not required due to no significant negative impacts	Isotropic probe for measuring the low-frequency alternating magnetic field (ELF, 5 Hz – 100 kHz) According to CEI standards, Law no. 36 of 22 February 2001, Prime Ministerial Decree of 8 July 2003, Ministerial Decree of 29 May 2008
LANDSCAPE AND CULTURAL HERITAGE							
Offshore archaeology	Presence of archaeological finds	Pre-construction and in-progress phase: in the entire area affected by the offshore works (500 m buffer)	1 time in the previous year the works for characterization of the component	During the construction phases that may cause significant negative effects on the component	Not required due to no significant negative impacts	Not required due to no significant negative impacts	Visual surveys according to current regulations: underwater prospecting (bathymetric, morphological and stratigraphic survey, video and/or underwater inspection)
Onshore	Presence of	Phase before the	1 time in the	During the	Not required due to no	Not required due to	Geophysical

ENVIRONMENTAL MATRIX	PARAMETERS ANALYZED	NUMBER OF STATIONS	MONITORING FREQUENCY				TYPE OF SURVEY
			ANTE OPERAM	IN PROGRESS	POST OPERAM		
					EXERCISE	CESSATION	
archaeology	archaeological finds	works: Cerignola area where project works Onshore phase in progress: throughout the area affected by onshore works	previous year the works for characterization of the component	construction phases that may cause significant negative effects on the component	significant negative impacts	no significant negative impacts	investigations and any preventive archaeological tests Visual surveys according to current regulations

8.5 OFFSHORE MONITORING AND LEGISLATIVE DECREE 13/10/2010, N.190

Below is a table, which integrates the project actions proposed in the environmental monitoring plan to be implemented in the construction, operation and decommissioning phases concerning the offshore compartment and how these are able to meet the provisions of Legislative Decree 13/10/2010, no. 190. In particular, it is believed that the Nemetun Island project may be in line with the provisions of the MSFD Directive, 2008/56/EC since it proposes to implement compensation and mitigation measures appropriate to maintain the good environmental status of the marine environment if the individual project works may cause some impact or pressure on the environmental matrices, beyond the threshold of attention. In addition, the general interest of the proponent is to ensure a sustainable use of marine resources in compliance with the 11 descriptors of the MSFD.

PHASE	PROJECT ACTION	SIGNIFICANT PROJECT PRESSURES AND IMPACTS	PRESSURES AND IMPACTS Annex 3 of Legislative Decree 190/2010	LEVEL OF PRESSURES AND IMPACTS	DESCRIPTORS Annex 1 of the Legislative Decree 190/2010	MONITORED PARAMETERS	MITIGATION MEASURES
CONSTRUCTION PHASE (in progress)	• Positioning of submarine cable ducts • Transport and anchoring of wind turbines • Transport and installation of	• Mobilization of marine sediment with alteration of the chemical-physical characteristics of the water column and possible impact on biota • Disturbance on marine fauna and flora, deriving from offshore works, effects	• Physical loss: choking • Physical damage: changes in sedimentary rates; abrasion	Medium reversible	• 1 • 2 • 3 • 4 • 5 • 6 • 8	• Physico-chemical-biological investigations of the water column (temperature, density, salinity, pH, fluorescence and dissolved oxygen, total suspended solids, turbidity, *Escherichia coli* and intestinal enterococci, short-lived organic and inorganic pollutants or from	• Use of anti-turbidity creams; avoid work during the bathing season to reduce potential impact on water quality • Use of systems to mitigate noise that

	offshore electrical substation	on biocoenosis due to increased turbidity, cable duct laying and chemical alterations of the water column • Noise and vibrations from onshore and offshore construction sites	• Other physical disturbances: underwater noise • Contamination by hazardous substances: introduction of non-synthetic compounds (pollution from ships)		• 9 • 10 • 11	abnormal situations, cyanobacterial or macroalgae proliferation (*O. cf ovata*), phytoplankton or marine phytobenthos) • Current surveys (speed and flow) • Sediment: Particle size, Moisture percentage, Specific gravity, TOC, Total nitrogen, Total phosphorus, Total organic matter, Metals, PAHs, Pesticides, Hydrocarbons C> 12 and C<12, PCBs, Organotin compounds, faecal and total coliforms, faecal streptococci, ecotoxicological tests (3 sample test species) • Benthic community of movable bottoms (analysis of the structure of the community with calculation of structural indices) and reporting of susceptible species • Biocenotic cartography, taxonomic recognition and area cover, bathymetry, seabed morphology, geological status and stratigraphy of the seabed • Qualitative and quantitative monitoring of nursery areas (analysis of the structure of the community with calculation of structural indices) • Presence and abundance of individuals of megafauna • Birdlife: presence, abundance, spatial and temporal distribution, migratory routes	would bother marine organisms; reduce or cease work during the breeding seasons of endangered marine species; type of installation and minimally invasive solutions in the valuable areas crossed by the cable duct • Compliance with EU regulations regarding the prevention of the spread of alien species by the vessels involved (International Convention for the Control and Management of Ships' Ballast Water and Sediments, BWM Convention) • Avian radars • Mammal observers certified to spot cetaceans and other organisms

						• Alien species: monitoring of ports and vessels used for the construction phase • Noise and vibrations: qualitative and quantitative description	
OPERATION PHASE **(post operam)**	• Operation of the wind turbines of the offshore plant • Passage of electricity in marine cable ducts	• Physical impact on birds and marine organisms • Possible spread of alien species	• Physical damage: abrasion • Other physical disturbances: underwater noise • Changes in the thermal regime (heat emitted by the ducts) • Introduction of non-native species and translocations	Low Non-reversible	• 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • 10 • 11	• Physico-chemical-biological investigations of the water column (temperature, density, salinity, pH, fluorescence and dissolved oxygen, total suspended solids, turbidity, *Escherichia coli* and intestinal enterococci, short-lived organic and inorganic pollutants or from abnormal situations, cyanobacterial or macroalgae proliferation (*O. cf ovata*), phytoplankton or marine phytobenthos) • Current surveys (speed and flow) • Sediment: Particle size, Moisture percentage, Specific gravity, TOC, Total nitrogen, Total phosphorus, Total organic matter, Metals, PAHs, Pesticides, Hydrocarbons C> 12 and C<12, PCBs, Organotin compounds, faecal and total coliforms, faecal streptococci, ecotoxicological tests (3 sample test species) • Benthic community of movable bottoms (analysis of the structure of the community with calculation of structural indices) and reporting of susceptible species	• Avian radars that identify any incoming flocks and interrupt the activity of the wind farm for the time necessary to avoid collisions; • Safety areas and detection systems (radar-sonar or remote sensing) that interrupt the operation of the plant in the event of the approach of large cetaceans that could be subjected to noise beyond the threshold of risk of exposure • For the introduction of alien species: monitoring of the offshore plant and the hydrography of the area to control; periodic visual monitoring of the biofouling

						• Biocenotic cartography, taxonomic recognition and area cover, bathymetry, seabed morphology, geological status and stratigraphy of the seabed • Qualitative and quantitative monitoring of nursery areas (analysis of the structure of the community with calculation of structural indices) • Presence and abundance of individuals of megafauna • Birdlife: presence, abundance, spatial and temporal distribution, migratory routes • Alien species: monitoring of abiotic and biotic components (plankton, benthos and fish) and monitoring of vessels • Noise and vibrations: qualitative and quantitative description • Electric and magnetic field	community; ensure that they are not transported by ships through the control of compliance with protocols concerning alien species (International Convention for the Control and Management of Ships' Ballast Water and Sediments, BWM Convention)
DECOMMISSIONING PHASE (post operam)	De-anchoring of wind turbines and removal of offshore substation and submarine cable ducts	• Mobilization of marine sediment with alterations in the chemical characteristics of the water column and possible impact on the biota • Disturbance on marine fauna and flora, deriving from offshore works, effects on biocoenosis due to increased turbidity, cable duct laying and chemical	• Physical damage: changes in sedimentary rates; abrasion • Other physical disturbances: underwater noise • Contamination by hazardous substances: introduction of non-	Low reversible	• 1 • 2 • 3 • 4 • 5 • 6 • 8 • 9 • 10 • 11	• Physico-chemical-biological investigations of the water column (temperature, density, salinity, pH, fluorescence and dissolved oxygen, total suspended solids, turbidity, *Escherichia coli* and intestinal enterococci, short-lived organic and inorganic pollutants or from abnormal situations, cyanobacterial or macroalgae proliferation (*O. cf ovata*),	• Use of anti-turbidity creams; avoid work during the bathing season to reduce potential impact on water quality • Use of systems to mitigate noise that would bother cetaceans and other organisms; reduce or cease

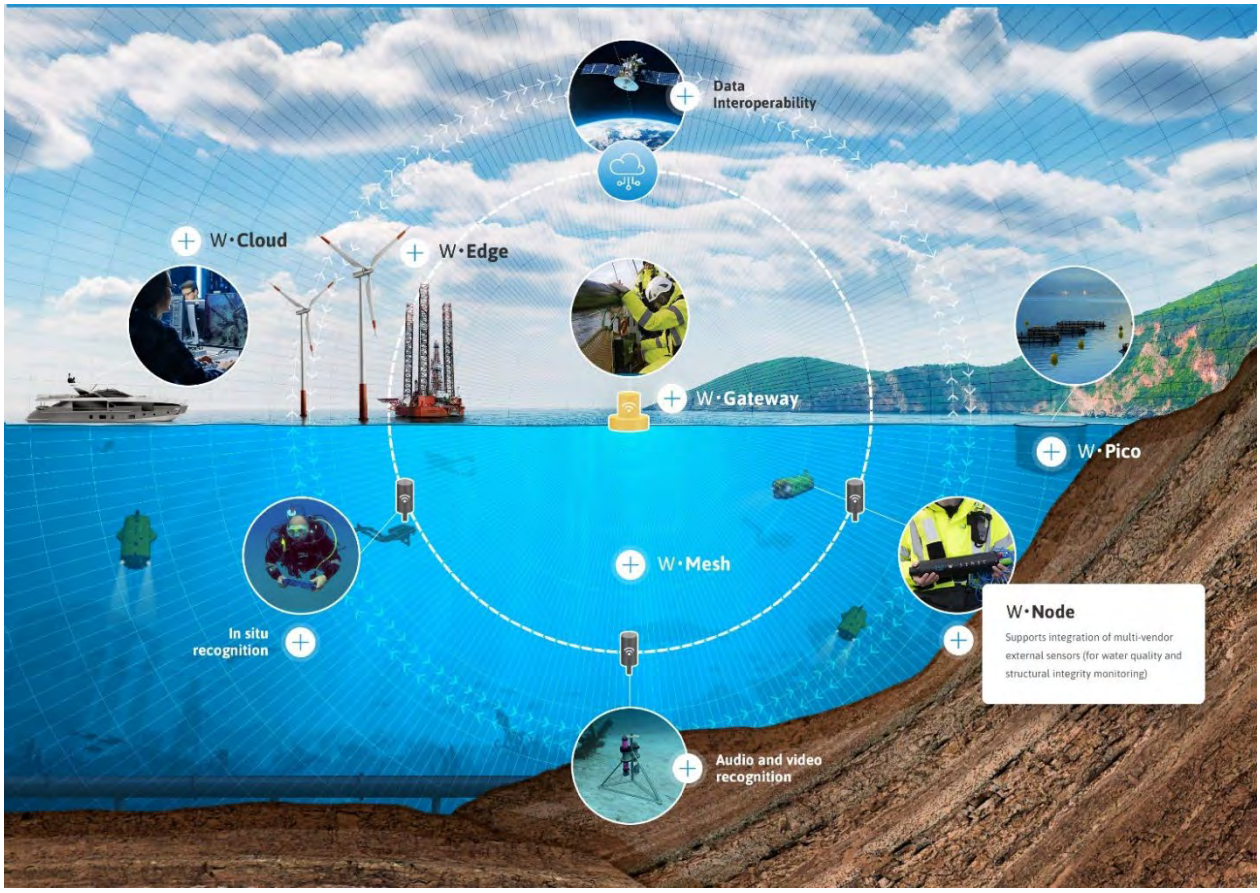
		alterations of the water column • Detachment of biofouling organisms that have colonized surfaces • Noise and vibrations from onshore and offshore construction sites	synthetic compounds (pollution from ships) • Selective extraction of species, including non-target bycatch • Introduction of non-native species and translocations			phytoplankton or marine phytobenthos) • Current surveys (speed and flow) • Sediment: Particle size, Moisture percentage, Specific gravity, TOC, Total nitrogen, Total phosphorus, Total organic matter, Metals, PAHs, Pesticides, Hydrocarbons C> 12 and C<12, PCBs, Organotin compounds, faecal and total coliforms, faecal streptococci, ecotoxicological tests (3 sample test species) • Benthic community of movable bottoms (analysis of the structure of the community with calculation of structural indices) and reporting of susceptible species • Biocenotic cartography, taxonomic recognition and area cover, bathymetry, seabed morphology, geological status and stratigraphy of the seabed • Qualitative and quantitative monitoring of nursery areas (analysis of the structure of the community with calculation of structural indices) • Presence and abundance of individuals of megafauna • Birdlife: presence, abundance, spatial and temporal distribution, migratory routes	work during the breeding seasons of endangered marine species; • Compliance with regulations for the organization of activities at sea • For the introduction of alien species: visual monitoring of the biofouling community adhered to structures and removal of non-native species; ensure that they are not transported by ships through the control of compliance with protocols concerning alien species (International Convention for the Control and Management of Ships' Ballast Water and Sediments, BWM Convention) • Mammal observers certified

						• Alien species: monitoring of ports and vessels used for the decommissioning phase • Noise and vibrations: qualitative and quantitative description	to spot cetaceans and other organisms

8.6 CONTINUOUS MONITORING AND OPERATION TECHNOLOGY

Following the in-depth studies carried out on the aspects related to the physical and IT security systems of Operation Technology, it is believed that environmental monitoring can be usefully integrated through the provision of a continuous monitoring system with IoUT (Internet of Underwater Things) solutions, developed by WSense, a spin-off company of the La Sapienza University of Rome specialized in the creation of underwater networks through the use of acoustic modems (WNode) and marine gateways (WGateway).

The submarine wireless networks created by WSense, exploiting underwater IoT (Internet of Things) technologies can enable the following: **Wireless real-time marine environment**, enabling the collection of parameters such as, for example, the **water quality, current/wave/tidal intensity, noise levels, image production and sonar data**. This technology is being tested, in collaboration with Terna, in the waters of the Tyrrhenian Sea, in the strait of Piombino, reporting very promising results in the monitoring of the marine ecosystem.



The multi-parameter environmental monitoring system based on real-time underwater wireless communication systems, provides for the identification of areas for the installation of the stations at strategic points of the planned layout.

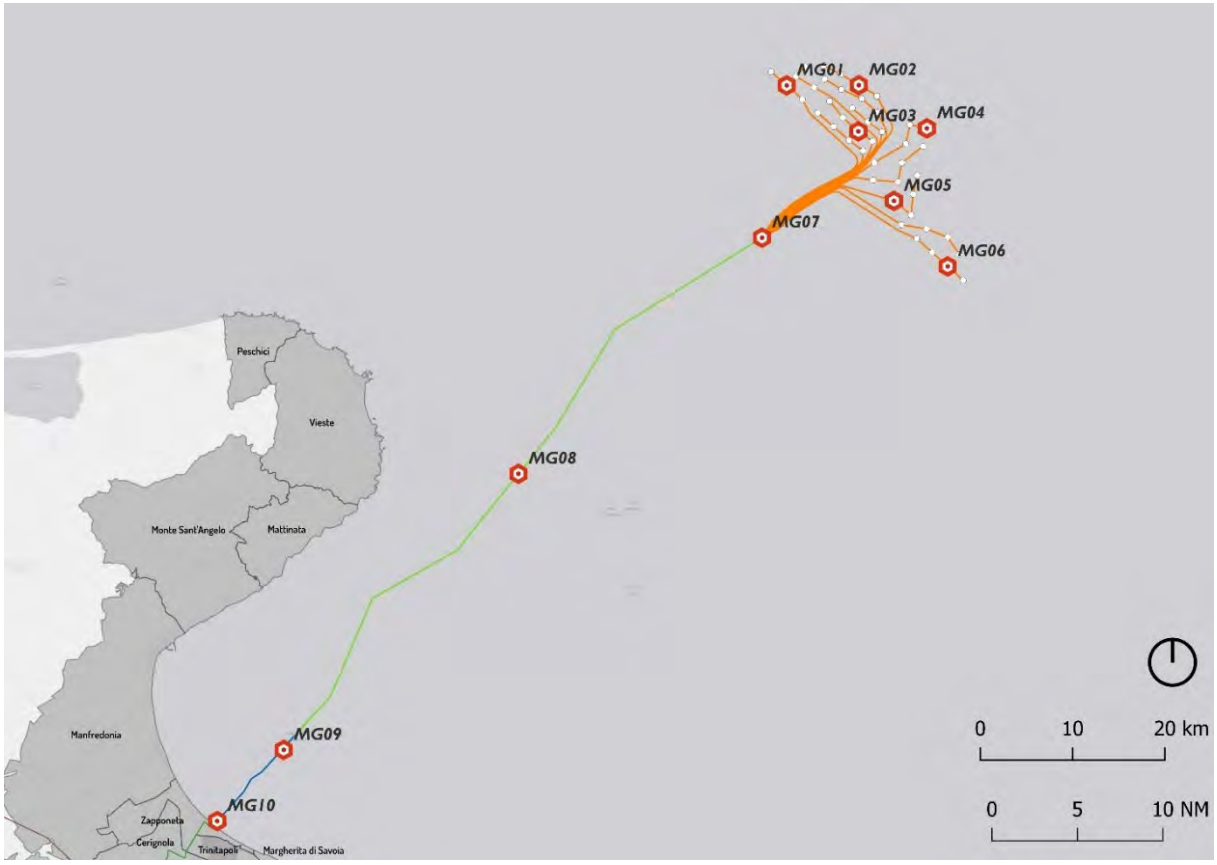
In addition, it will be designed to be scalable from the point of view of measurable parameters starting from those fundamental to monitor the Environmental quality before, during and after the Operations. The basic parameters are: noise, pH, CO_2Or_2, chlorophyll, currents, turbidity, noise, vibrations, electromagnetic fields, to which others can be added, depending on the needs (e.g. temperature and salinity).

The activity will be distributed in 3 distinct phases:

- **Ante operam** for a period of 12 months to measure the blank values relating to the environmental quality of the area;

- **In progress** installations to measure the impacts of the works on the ecosystem;
- **Post operam** to measure any impacts on the ecosystem and to provide for operational or compensatory adjustments.

In total, the Mede Wireless Monitoring Gateway expected to be 10.



Codice	Coord N	Coord E
MG01	4669244	643324
MG02	4669269	651133
MG03	4664278	651084
MG04	4664597	658508
MG05	4656759	654939
MG06	4649666	660761
MG07	4652774	640649
MG08	4627238	614262
MG09	4597380	588831
MG10	4589679	581632

Map and coordinates of Mede Gateway

In the **ante operam** of the wind farm it will be planned to install the Mede Gateways connected with satellite connectivity systems creating a constellation of measurement points around each gateway for measurements at different depths at a distance of 800 m from the gateway. The system will generate correlated data of all the measured parameters, creating a history of information necessary to enable the subsequent control phases. The system will be able to collect data for a period of 12-24 months.

In the **in progress** of the wind turbines, the cable duct and the offshore electrical substation will be activated on the cloud monitoring system of the alert systems in real time when critical thresholds are exceeded compared to what was measured in the pre-construction phase.

Post operam With the fleet in operation, it will also be possible to add more monitoring stations than the previous ones, positioning them in such a way as to have the maximum degree of information in the most critical area from an operational point of view.

9 CONCLUSIONS

In this report and in the specialized studies carried out, alongside a qualitative and quantitative description of the type of work, the design choices, the constraints and the conditions concerning its location, the nature and type of impacts that the work generates on the surrounding environment in its broadest sense have been identified in an analytical and rigorous manner.

For the design configuration, an **Estimation of potential interferences**, both positive and negative, that the intervention determines on the complex of environmental components, reaching a a solution that due to its characteristics and the benefits created can be said to be **overall positive**.

Furthermore, it must be remembered that the **Electricity production** through the exploitation of the wind presents the indisputable **environmental advantage of not releasing pollutants into the ecosystem** in the form of gases, dusts and heat.

In addition to the above, as mentioned several times, the Nemetun Island wind farm project has been developed in terms of compensations and enhancements suitable for repaying the inclusion of the work in the context in the right way and establishing a beneficial use for the territory and respectful of its peculiarities. In this sense, **the proposing company intends to develop an innovative business model based on the creation of social and environmental value** which, starting from a careful analysis of the context, has identified the main actions and interventions aimed at **Environmental qualification**.

In conclusion, it can be said that **the overall impact** of the works that are intended to be carried out is **fully compatible with the carrying capacity of the environment** of the area analyzed.